ACL Prevention begins in grade school.

Everything else is too late.

Brandon Hetzler

ACL tears are occurring at rates that are continuing to climb. ACL tears are occurring in younger and younger individuals every year. In the clinic I work at we see 100+ ACL patients per year. The average age - 14. The youngest - 8. The most common mechanism - non-contact. Females outnumber males. I would tend to say this is a fairly reflective picture of what is happening across the country - it has been happening like this here for the past 10+ years. The only thing that has changed is the average and youngest age, both keep dropping.

Parents of these kids always ask the same question once they walk in our door for rehab - what can we do to keep this from happening again. My answer for the past 10 years has been "Join the chess team". After an ACL tear has occurred, the risk of re-tear is always going to be higher than normal - the #1 predictor of future injury is previous injury. I think it is a sad state of the industry when we in healthcare cannot change this, because the fact of the matter is we haven't.

ACL tears are big business. Here in Southwest Missouri, when someone tears their ACL it brings upwards of $40,000 into the hospital system - Physician visits, diagnostics, surgery, rehab, follow-up. Add into that the personal cost (pain, suffering, mental anguish, etc) plus the burden on the family (travel, cost, worry, etc) and we have a very costly injury.

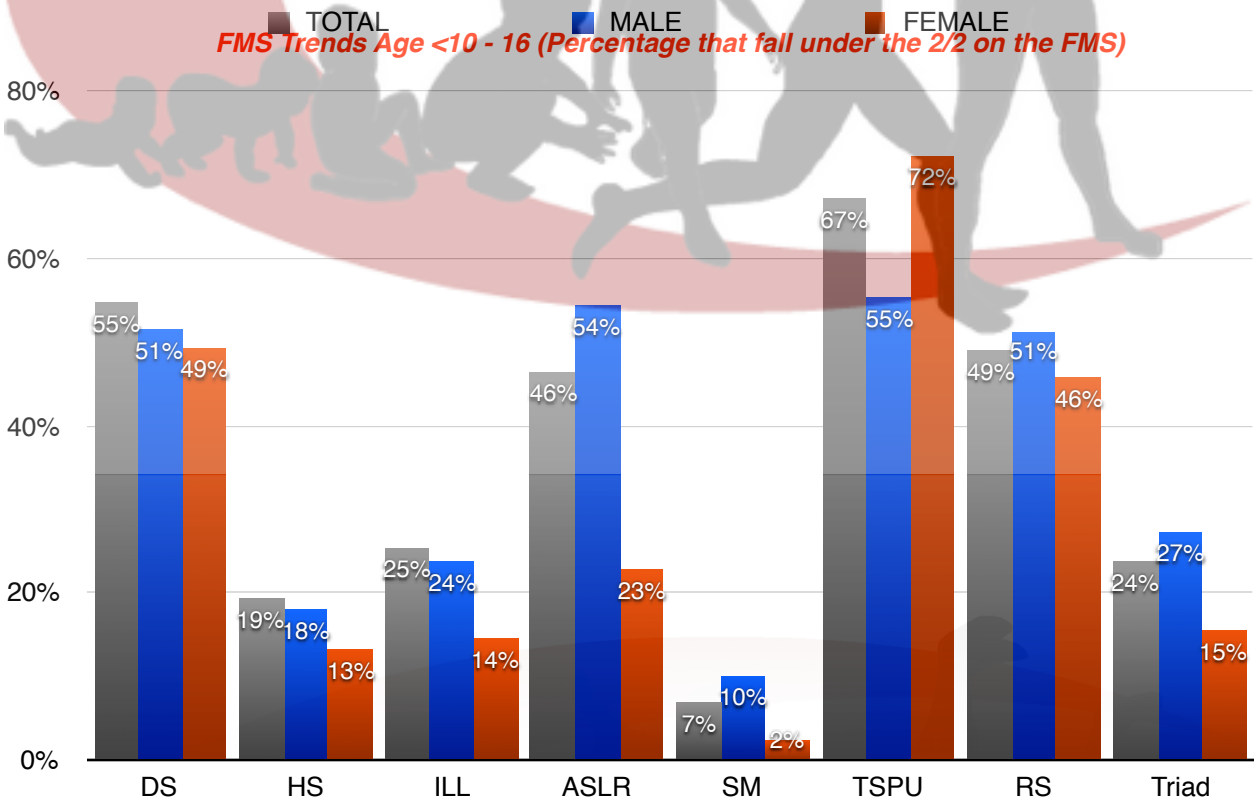
Both the healthcare industry and the fitness industry have been advertising "ACL Prevention" programs for the past several years. Using the fear factor to get concerned parents in the door. Lets consider this - huge popularity in preventing ACL tears, but the rate of ACL tears has not changed at all. There is big money in this, unfortunately it is mis-spent.

There was a meta-analysis on ACL prevention programs that was performed in 2012. The study looked at the effectiveness of ACL prevention programs. Of the 440 studies that have bee published on this topic, only 11 met inclusion criteria - meaning 97.5% of the research on this topic is very poor. They did find the prevention programs decreased the ACL injury rates in the groups that utilized them. The other most notable data they found was that to prevent 1 ACL tear it would require 108 athletes to take part in a prevention program 3x per week for 1 full season. In practicality this translates to having a full soccer team going thru a prevention program for **5 complete seasons** in

order to prevent 1 ACL tear. Then, and only then could 1 ACL tear be prevented. We saved one, but is that efficient and effective? Absolutely not.

I pulled the FMS data for the past 2 years from our "healthy" performance athletes (age 8-18). The trends are not good. The total number of athletes we screened was 1560. Here are the numbers of athletes that scored below a symmetrical 2 (what is considered 'functional' on the FMS):

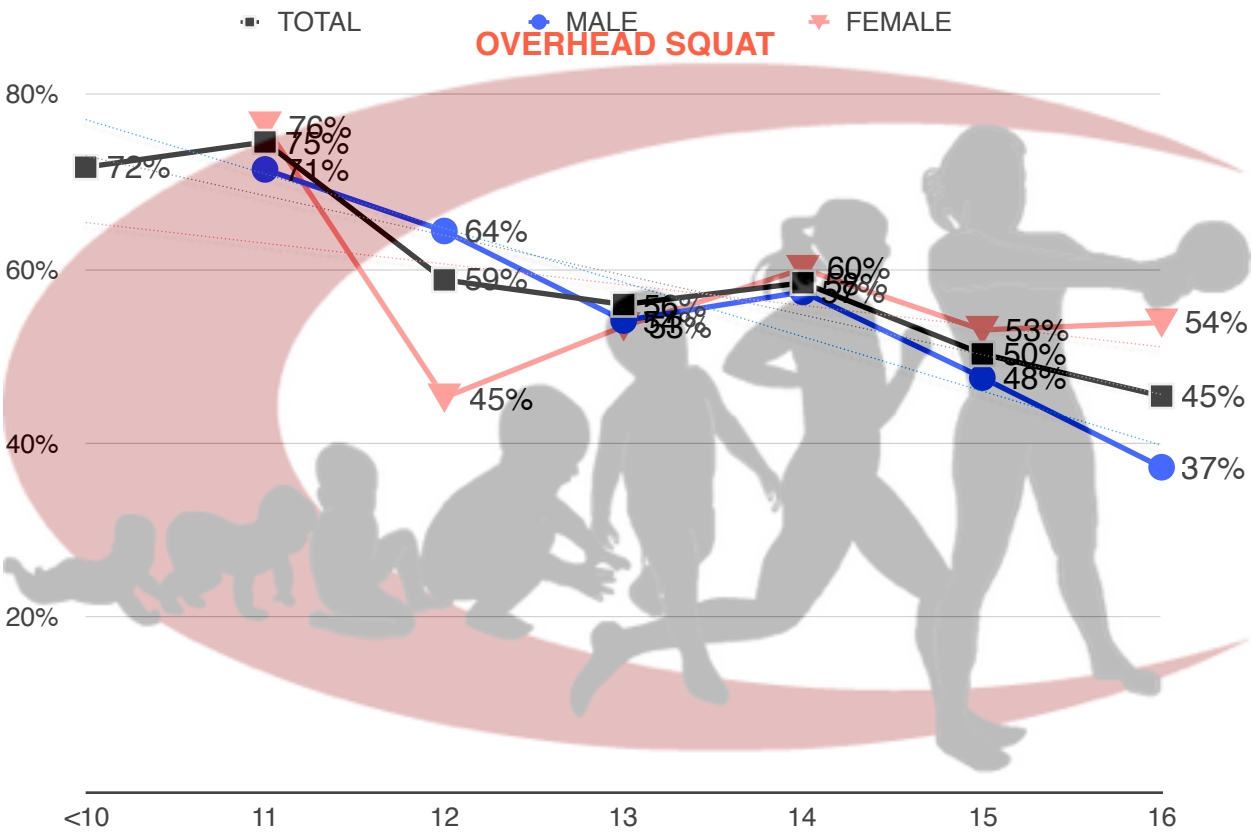
- Deep squat - 55%
- Trunk Stability Push Up - 67%
- Active Straight Leg Raise - 42%
- Hurdle Step - 19%
- In Line Lunge - 24%
- The "TRIAD" (OHS, TSPU, ASLR) - 24%



These are healthy, non-injured, non-painful athletes. These athletes are going to at least 1 practice (and up to 3-4) per week. They are running, jumping, planting, cutting, falling down, and getting up without the needed ability to express minimal movement competency.

Lets just look at the squat. We 'believe' kids can squat, because we have been led down the path that moving like kids will make us better. Kids don't even move like kids. The goal of an infant isn't to move like an infant, it is to become an optimal adult. From day 1, infants are progressing towards moving like adults. Why in the world then are we

swinging the pendulum towards moving like functional kids? Its misplaced precision. Functional is not optimal - functional means pain free, minimal standards. Back to the Squat. Here is a breakdown of the OHS scores of 1 based on sex and age:



Again, these are the percentages of kids who don't meet minimal standards. These are also the kids right in the middle of the Elite Travel T-Ball Team season. True reference - elite travel t-ball, sounds a lot like the advanced basics. Why look at the OHS? This is referenced towards ACL tears. If someone cannot control their squat pattern with a PVC pipe, as soon as we add load (weight, velocity, volume) things will only get worse. Basic pattern competency before loading the pattern isn't vogue - its how skill develops, we cannot argue or dispute that.

This data clearly shows that by age 11, the vast majority of kids cannot squat with just their body weight. Why? Here are my theories:

1. Sitting
2. Shoes
3. Technology
4. 'Sport' Focus
5. Removal of PE

Sitting

Kids sit. A Lot. At school kids sit for several hours in ill-fitting desks. Behavior issues are on the rise. Childhood obesity is on the rise. Kids fidget. We know it is an undisputed fact that movement and cognition develop in conjunction with each other, but we force our kids to sit still as we try to keep their attention. The brain is designed to move. At home, our kids mirror what we as parents do (Mirror Neurons are A-MAZING!). Kids sit at school, they sit in the car, then we sit with them at home. Sitting does NOTHING good for movement (a whole other article). Caloric expenditure is dialed down by 20-30% when tasks are done in sitting versus standing. Want to target childhood obesity? Increase standing tasks at school and at home. In a nutshell, sitting has as negative impact on moving as anything else out there. Dr. Ed Thomas is an advocate for creating a 60 degree hip angle while sitting. He recommends we modify and change the school furniture to achieve this, along with an inclined desk surface set at 20degrees. We may not know and have lots of data to show that stand up desks at school are the best answer to fixing the problem, but we have seen what sitting does and we know the value on standing in regards to caloric expenditure and movement. It is time to do something else, chances are it will be better than sitting. It is our collective responsibility as parents.

Shoes

The feet were designed to interact with the ground. The current design of shoes prevents this from happening. Shoes are currently designed to do 1 thing, and 1 thing only - cushion the foot (specifically the heel) from the ground. This trains us to heel strike. The heel strike is a very recent evolutionary shift that we don't see in cultures that are Nike free or in kids. The heel strike develops from shoes, and leads to nothing that is good. The foot is expertly designed to both absorb force and transmit force. The cushioning of current shoe designs destroys the foots ability to be a foot. Arches fall, the plantar fascia gets PO'd, and heel chords shorten up because of the mini high heels everyone wears. Flip flops should be banned in kids (whole other rabbit hole we could go down, but for now just recognize they are only good from a fashionable sense but are ruining feet). Flat(ter) shoes are part of the answer - a gradual transition (weeks to months) must occur. Being barefoot as much as possible is awesome. Shoes need to get back to what they were originally designed to do- protect the foot from the ground, nothing more.

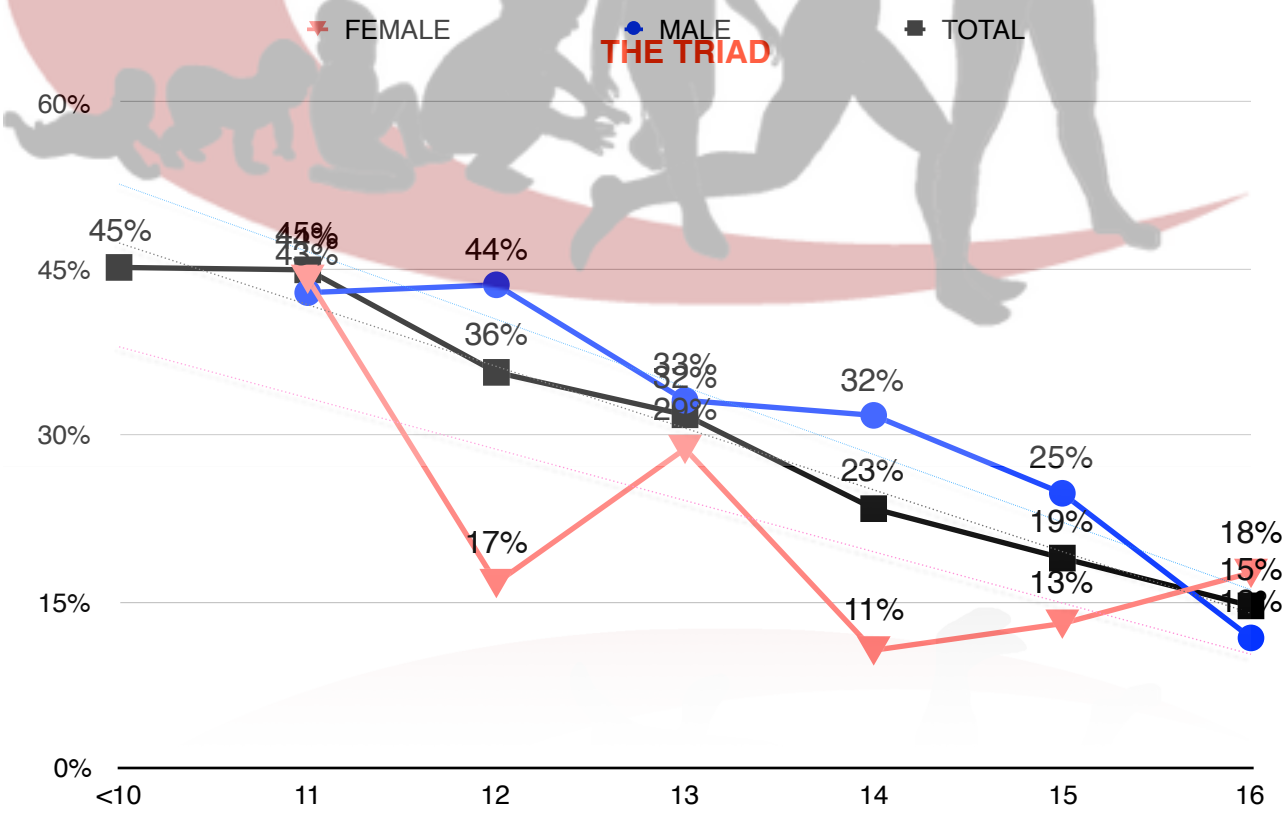
Technology

Adults and kids are on their smart phones for an average of 2.5 hours per day. A forward head and rounded shoulders have been recognized as bad at least since I took

my first Athletic Training college class in 1996. We've known about it, but what have we done other than acknowledge that it is bad? The average adult watches 2-4 hours of TV a day (likely in a seated position). Thats up to 6.5 hours of vegging out and disengaging everyday in crappy postures.

'Sport' Focus

Physical education has shifted in this country over the past 2-3 generations. Pre World War II, the emphasis was on developing physical literacy and as a side note those old timers established work capacity. This was accomplished through gymnastics, indian clubs, off the ground training, and military based principles. The old Turnverein systems that came over from Germany were an actual movement based system. What we have shifted to since then is an emphasis on sports - roll a ball out to the the kids and let them play. While sport does teach several good characteristics, we have lost the development of physical literacy. Kids lose the ability to move very early, and adults begin trying to layer sports skills onto a less than optimal base. How can we expect our 12 year olds to play basketball (or any jumping based sport) when they have shown that 60% cannot even squat with just body weight? We have looked at the FMS Overhead squat earlier. Now lets look at what I consider the "Triad" - can't squat, can't do a push up, and can't raise a leg.



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Why these 3? I addressed the squat above. The FMS trunk stability push up is a test that looks at an individuals ability to connect the hips and shoulder while transmitting a load - this is what happens anytime we express power, and this (the expression of power) is present in almost every sport. If an athlete can't do this there will be performance leaks, but there will also be a breakdown in how they absorb and create force. If they can't do this, they will develop movement faults, and these faults lead to breakdowns and injuries. In my opinion, any athlete that cannot get a 2 on the FMS push up is at a noticeable risk of injury. I could easily get on the soapbox of how upper body weakness is a predictor of lower body injuries, but I'll save that for later. Why the Active straight leg raise? This looks at the ability to separate the right pelvis from the left pelvis and express 'minimal' motor control in this pattern. Splitting the pelvis up is essentially every expression of gait (walking, running) that there is.

In looking at the numbers, a very high percentage of our kids that are involved in athletics are playing with what I consider targets on their backs. It isn't if they will sustain a non-contact injury, it is when they will get hurt. 45% of our athletes under the age of 10 suffer from all 3 movement faults, but yet we throw them into sport. An article on training kids that was released in 2013 (Training the Developing Brain, Part I. Gregory Myer, et al. Current Sports Medicine Reports. Sept/Oct 2013; volume 12, number 5) states that "sports participation without adequate preparatory conditioning may increase injury risk." The authors recommend 3 months of preparatory training PRIOR to introducing sport.

Removal of PE

This ties into several of the prior headings. One reason kids are less active at school is because schools are cutting access to PE classes and the 'arts'. It is what it is. This results in nothing positive - kids are moving less and they are never being taught how to express themselves (in either a formal movement system, or artistically). Getting kids involved and getting them access to movement systems is extremely important - whether it be gymnastics, the martial arts, or some other 'formal' based movement system. Going to a gym or fitness center and doing your dads workout is not a formal movement based system. Personal trainers that train kids MUST be held to a higher standard - just taking an adult program, making it fun and giving it to kids is a failure.

Recommendations

1. **Be a good example** - Parents, coaches and teachers are where the solution lies. Kids will mirror the actions, postures, patterns and movements of those they look up to and spend the most time with. If these individuals are on their phones all day, sitting, are not active, display poor posture, and don't put an emphasis on making better decision those kids that observe this will do the same.

2. **Lose the shoes when applicable** - Unless you have a communicable disease or really gnarly feet, spend as much time barefoot as possible. If you need to protect your feet go flat - minimalist shoes with a 4mm drop or less, Vans, the good 'ol Converse All Stars, flat sandals (with a heel loop), or Bedrock sandals. Make a policy that at home you are barefoot - it will help address this and it will keep all the nasties on your shoes from transferring to your carpets and rugs. Less vacuuming.
3. **Be on your feet** - spend as little time sitting as possible. Get outside. Move around. If you have to sit, mix in 'movement breaks'. Eye doctors began promoting the 20/20/20 rule for eye health for those that spend a lot of time in front of the computer - every 20 minutes focus on an object 20 feet away for 20 seconds. Apply the same rule to sitting - Every 20 minutes stand up for 20 breaths and reach from the ceiling to your toes 20 times. For your kids at school, well that's tougher. Find someone influential (teacher, board member, other concerns parents, PTA, etc) and look into standupkids.org to investigate stand up desks. Recommend and demonstrate to your kids moving as much as possible when the opportunity presents itself.
4. **Go old school** - begin a path towards physical literacy. Take time to learn to move well, take time to play, enjoy and be engaged in the environment around you. Forget the sports for couple hours a week and investigate and play with what used to take place in the world of physical culture.
5. **Get back to what you learned in Kindergarten** - drink plenty of water, eat a healthy diet, and get plenty of sleep. Tissue quality is compromised 100% by what we ingest and how well we recover and rejuvenate. Hydration status, nutrition, and rest are the 3 horsemen when it comes to this.

BUT WAIT! That's the worst ACL prevention advice ever!

Or is it? By the time we get to the point of an ACL Prevention program it is too late. We are playing catch up. In times of stress we revert back to our learned movement behaviors. If we only spend 2 hours a week taking part in an ACL prevention program - which studies show to be less than useful- when we get to a point of physical fatigue (stress) we will go back to the postures and patterns we spend the majority of our time in. We need to change our habits and the habits of our kids as young as possible- that is the ACL prevention program. Seems monumental, and impossible. If you could make a 1% change to your habits, would you and could you? 1% equates to 14 minutes per day (14.4 minutes per 24 hrs/1,440 minutes). In a week, that is a little over 90 minutes total. In a year that is 84 extra hours you have taken towards improvement. Doesn't seem like a lot, but that is 84 more hours than I would bet you are spending making better decisions and being a better example. Plus, many of the recommendations above can be mixed into our daily lives and don't require a set aside time.

Making sure our kids don't lose their ability to move is the key. What we are seeing though is that by age 10, the majority of kids are displaying movements that aren't even considered functional, let alone optimal. The pure definition of prevention is the act of stopping something from happening or arising. If we turn the tide of movement at the earliest of ages, we can begin to prevent the vast majority of injuries and health related

issues that result from poor movements. But to truly prevent, we MUST begin much earlier than we think - by the age of 10 it is no longer prevention, we are in full response mode.

The beauty is that we are better positioned to impart positive change into the system than we have ever been. I had the privilege of spending several hours with Dr. Ed Thomas recently and he stated "your generation understands the problems, and actually has the resources to fix the friggin problem." We know what is wrong, we know what doesn't work, we have seen the consequences. It is now time for the brave soles to unite, step forward and impart change - it is time to contribute to the solution and not the problem.

Studies:

Sugimoto, D., Myer, GD., McKeon, JM., Hewett, TE. *Evaluation of the effectiveness of neuromuscular training to reduce anterior cruciate ligament injury in female athletes: a critical review of relative risk reduction and numbers-needed-to-treat analysis.* British Journal of Sports Medicine. November 2012; 46(14): 979-988.