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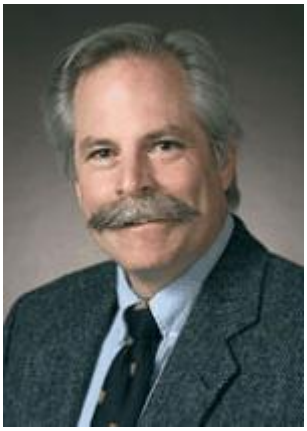

Super Stiffness

Stuart McGill, Professor of Spine Biomechanics

At a gymnastics or martial arts meet, or at a weightlifting competition, listen to the coaches advice to the athlete – Stay tight! This means to maintain stiffness. Being stiff ensures that there will be minimal energy losses as forces are transmitted through the linkages. Optimal performance requires stability, and stability results from stiffness. Stiffness in the body results from muscular co-contraction. Be stiff, and be compliant. Knowing the difference and when to be one or the other is a major way to improving performance.

When a muscle contracts, it creates both force and stiffness. Force creates joint torque to support postures and create movement – but sometimes the force will enhance joint stability and sometimes it will compromise stability. It depends on the magnitude of the force and its relative magnitude relative to all other muscle forces acting at the joint. In contrast, muscle stiffness is always stabilizing. A stiff muscle buttresses against perturbations from all directions. Stiffness at one joint buttresses the development of explosive power at another. Stiffness is also enhanced by positional techniques of the body segment linkage where one segment can be stiffened against another– for example, stiffening an arm against the torso.

When all muscles at a joint stiffen together a "super stiffness" phenomenon generally occurs. The total stiffness at a joint suddenly becomes more than the sum of individual muscle stiffnesses. Consider the abdominal wall in creating "core stability". Rectus abdominis, external and internal oblique and transverse abdominis appear to bind together when all are

active to create a super stiffness higher than the sum of each individual muscle. For those activities that demand high core or torso stability, all muscles must be activated – never isolate one. Furthermore, as will be shown later, high performance in athletics requires rapid muscle activation onset and force development, together with equally rapid reduction of muscle force. Super stiffness needs only to occur briefly in such cases, but if it needs to be brief, the motor control system must be highly tuned to ensure optimal super stiffness.

Consider a lifter in competition. The core must be extraordinarily stiff to minimize energy losses and ensure that the torso will not buckle. Super stiffness is required with all muscles contributing. Some individuals have recently begun to advocate "drawing in" the abdominal wall during the exertion – this is ill founded. Not only does super stiffness and stability demand all muscles to be stiffened but they must be maintained at a distance from the spine. Sailboats with masts needing stability achieve this with rigid spreaders of the guy wires or rigging. Vasily Alexeyev achieved the spreading of the muscles to enhance stability with girth. In contrast to the manoeuver of abdominal hollowing (not recommended), try performing the abdominal brace. Here is how to begin teaching the brace. Begin by standing in a relaxed upright standing posture with sufficient erectness so that the torso extensors are inactive – palpate them to be sure. Then contract the entire abdominal wall and feel the back musculature contract. This is the brace – all muscles around the torso stiffen to ensure stability. Now the focus is on matching the intensity of the contraction to the stability demand of the task. Interestingly enough, stiffness and stability is an asymptotic function – in other words a lot of stability is achieved in the first 25% of the maximum contraction level. Thus 100% muscle contraction levels are rarely needed – the trick is to activate many muscles to achieve symmetric stiffness around a joint.

As a professor and consultant I see too many people who succumb to bad backs during the effort to increase fitness. No wonder. Building true strength and function is elusive for many following the traditional American approach dominated by body building concepts. Of all the variables required for optimal performance, building muscle strength is the easiest component to enhance with training. Far more difficult is the enhancement of the foundation components of healthy motion and motor patterns, joint stability and endurance. And only then with this foundation can serious strength with speed and power be developed.

The Ultimate Approach

Our work on back fitness and injury mechanisms over the years has led to the development of a 5 stage program documented in my textbook "Ultimate Back Fitness and Performance".

Briefly, building the ultimate back requires core stability and follows a 5 stage process that ensures a foundation for eventual strength, speed and power training. The stages are:

Stage 1. Groove motion patterns, motor patterns with corrective exercise
- basic movement patterns through to complex activity specific patterns
- basic balance challenges through to complex balance specific environments

Stage 2. Build whole body and joint stability (with super stiffness)
- build stiffness and stability while sparing the joints
- ensure sufficient stability commensurate for the demands of the task

Stage 3. Increase endurance
- basic endurance training to build the foundation for eventual strength
- activity specific endurance (duration, intensity)

Stage 4. Build strength
- spare the joints while maximizing neuromuscular compartment challenge
- speed strength and multi-articular functional strength
- optimal timing and "steering" of strength

Stage 5. Develop power, agility
- develop ultimate performance with the foundation laid in stages 1-4
- blend compliance with stiffness

Overlay for all stages: The position of performance
The balance environment

Short range stiffness, super stiffness and performance

The abdominals form an interesting illustrative study. They are not designed for great length change. Consider the rectus abdominis that has transverse tendons interrupting the series arrangement of sarcomeres. This is to transmit significant hoop stresses, developed in the abdominal wall, transversely through rectus so that it is not ripped apart. The key is to realize that the rectus muscle is designed to develop short range stiffness. Trying to train the muscle by performing curl ups over a gym ball misses the point of its function. Top boxers, martial artists and weight lifters, know how to train the muscle group for short range stiffness. Plyometric training of the group with medicine ball catches and throws, ballistic short range, and rapid contractions are techniques to optimize the storage and recovery of elastic energy potential. Read "The Naked Warrior" by Pavel, to see

the tests and training for super stiffness in sustained contractions – his technique of using a stick looking for "soft areas" when performing a pushup is an excellent example.

Super stiffness is used by the best football hitters, golfers, martial artists and weightlifters. Consider the hit in football where maximum speed of approach requires the combination of sufficient stiffness and compliance. But at the instant of impact a total body stiffness is generated by rapid contraction of all muscles. This is what makes the impact so devastating by some. Breaking the board by the martial artist requires the skill of compliance to build speed with rapid super stiffness just at impact. The axeman splitting wood uses the same technique. The professional golfer who has a relaxed backswing but rapidly obtains super stiffness at ball impact is the one who achieves the long ball. The one who tries to swing too hard too soon actually decreases speed of movement. Muhammad Ali, Bruce Lee, Vasily Alexeyev, all knew the secret of Super stiffness. Understand the relationship between speed, compliance and stiffness and you will be achieving ultimate performance.

Source

McGill, S.M., Ultimate back fitness and performance, Wabuno publishers, 2004. Available from www.backfitpro.com

About the Author

Stuart McGill is a Professor of Spine Biomechanics and is the Chair of the Department of Kinesiology at the University of Waterloo in Canada. He has been the author of over 200 scientific journal papers that address the issues of low back function, injury prevention and rehabilitation, and performance training. Collectively this work has received numerous scientific awards. He sits on the editorial boards of the journals SPINE, Clinical Biomechanics, and Journal of Applied Biomechanics. As a consultant, he has provided expertise on assessment and reduction of the risk of low back injury to various government agencies, many corporations and legal firms and professional/international athletes and teams from many countries. In addition to seeing patients sent for consult, he teaches clinical courses regularly around the world. His other textbook was entitled "Low Back Disorders: Evidence Based Prevention and Rehabilitation" published by Human Kinetics.

"FIT Extreme Makeover" by Gabe Rinaldi, FIT General Manager

If you've turned on the television any time in the last few years, then you've likely seen at least one makeover show. Makeover shows run the full spectrum from housewives having numerous different cosmetic surgeries to home makeovers where a deserving family gets a completely remodeled home. These shows are appealing because people enjoy a positive transformation. Well, at F.I.T. we are no different. We too want a makeover. It's been 5 years and some aspects of the gym are looking pretty worn; e.g., the carpet has seen better days. Let's look at what's in store for F.I.T. moving forward.

F.I.T. will be closed from about noon on Friday, July 7th until Monday July 18th. We will start by removing all the equipment, tearing up the carpet, and ripping out the raised platform The carpet will be replaced with Mondo rubberized flooring on the large side of the gym (the side with the cardio, cable machines, etc.) and black rubber mats on the small side of the gym (the side with the lifting platforms). This rubberized flooring is designed to withstand the wear and tear of your training. You won't have to feel guilty about how hard you are working and that puddle dripping off of you – with the new floor we'll be able to simply mop it up. The black rubber mats on the small side of the gym will open that side up to a multitude of uses providing a large open space for doing things such as active dynamic warm-up drills, free motion drills such as boxing and tumbling, acceleration sprint work, as well as Olympic lifting without platforms.

We are also making some changes on the equipment front with our goal being to open up space in the gym for the wide variety of exercises that we prescribe. These changes include the addition of a multi-functional custom steel structure with stations for pull-ups, gymnastic rings, kickboxing bags and another climbing rope, the removal of equipment that is redundant or unnecessary; possible selling of the Treadwall; moving the leg press / shuttle to the physical therapy room; and organizing all the small pieces of equipment.

With this remodel you can expect that the floor may be dirty for a few weeks as we wear off the protective oils on the rubber. The black rubber mats will likely mark up the lighter rubber flooring. We will spend a lot of time mopping and cleaning initially. However, after this transition phase (recovery from makeover surgery) we should have a cleaner, more versatile, more productive, and safer facility that allows us to offer you the best training possible.

We will be offering free outdoor group workouts at select times throughout the week of July 10th – 14th. We will use these workouts to offer different things such as trail runs, mountain bikes rides, road rides, outdoor bootcamp/crossfit style classes, speed and agility classes etc. More specific details can

be found by checking this link on the forum:

http://www.focusedtrainers.com/forum/showthread.php?t=392

We hope you like F.I.T.'s new look and find it conducive to even better workouts.

"Fitness" by John Nguyen, FIT Exercise Director



FITNESS

The great thing about being human is our ability to examine things methodically by separating them into parts and studying their interrelations. That we can break anything down in the natural world, and then seek to understand it, is a skill that separates us from other animals. Our ability to analyze, understand and apply has advanced human development significantly since the dark-ages of throwing stones and swinging sticks. We've developed benevolent communication, worldly by wireless and satellite, to promote economy while raising humanity to new levels. In the lab we can break down matter beyond atomic sizes and analyze the trajectory of a celestial body like Jupiter. We can make nano-instruments for medical treatment and build enormous planes to span continents.

And with this intellectual capability it's only natural to break down and analyze something entirely fundamental to humans – fitness.

ANALYZING FITNESS

Fitness is defined in many ways by different people. For example, if a person can run a marathon, she is considered "fit." If a person can climb a mountain, he is considered "fit." Or, if a person lifts a barbell that weighs a ton, he is also considered "fit." Well, what if the marathoner cannot jump onto a three-foot platform, the mountain climber can't carry a bag of cement, and the weight lifter cannot run a mile? Would they still be considered fit?

The athletes above possess what is considered specific fitness, or the ability to perform very well at one thing but at the expense of doing well at other things. This isn't a "bad" thing if your passion is only that one thing – most elite athletes are that way. But for the rest of us who simply want to be fit, look great and enjoy life to its fullest, specializing in one thing at the expense of doing well in other things isn't the best choice. Instead of just one thing, general fitness means that we should do well in many things – a command of true, well-rounded

fitness.

UNDERSTANDING FITNESS

Fitness, then, means to possess the physical capacity to do many things, and to do them well. You should be able to run a good distance and be able to jump at a great height; you should be able to climb a ladder with confidence and lift a couch with ease; and you should be able to heave a heavy barbell and be able to run on the beach with your dog. If you are truly fit, there is no compromise. You are capable of accomplishing just about any task, and this requires that you possess many motor qualities.

In this article we'll focus on several basic but notable motor qualities, all of which expressed by various actions. Take, for example, a basketball player who jumps up for a slam dunk. The motor quality seen in the jump is expressed as power. Throwing a shot put is also an expression of power, as is swinging an ax down to split a log. There is also strength (or maximum strength), which is the motor quality of lifting or moving against a large resistance – such as when lifting a stone or pushing a couch. There's endurance, or the motor quality seen in continuous work – such as running a 10k or kayaking a long river. Agility is another motor quality that demonstrates how quickly a person can change directions, such as a football running back avoiding being tackled, or someone moving her feet fast to avoid a fall after tripping on a rock. Flexibility is also an important motor quality, because it allows you to move easily, gracefully, and without injury.

APPLYING FITNESS

I've seen far too many people in mainstream health clubs focus mostly on one aspect of fitness while neglecting the others. The aerobics fanatic, who devotes nearly an entire workout to aerobic classes or the Stair Master, might, as an afterthought, perform three reps of 5-pound dumbbell curls and then fixes her hair in the mirror before heading out the door. The meathead weight trainer might get his only aerobic training by walking from the gym to the car, strutting along the way to impress the aerobics fanatic.

So I might be exaggerating a little, but the point is that many people train the various motor qualities in an unbalanced way. This is like trying to build a vocabulary while using one-fifth of the alphabet.

If we are trying to maximize our fitness, then we should focus on all of the basic motor qualities – strength, power, agility, endurance and flexibility. While there are many other factors to fitness, such as heart rate, metabolism and nutrition, we should focus on the fundamentals while in the gym. Lift heavy

for a limited number of reps. Lift lighter for a higher number of reps. Lift slowly. Lift fast. Move gracefully. Move explosively. Move through a full range of motion. Move with good balance and control. And put spirit into every thing you do.

Aim to include many combinations of exercises in your workout sessions so that various aspects of your motor qualities and metabolism are trained. While no one fitness program is best for everyone, a workout plan that targets and maximizes all physical aspects of human ability is the best choice for people who want to be all-around fit, look great and feel their best. This is also how your body is designed to work in nature. Don't let human advancement in technology, medicine and culture take us too far from the fundamental – our fitness!

"A Calorie is NOT a Calorie" by Scott Kolasinski, FIT Metabolic Director

A Calorie is Not a Calorie

In the nutrition industry, it is commonly taught among dieticians and nutritionists that a calorie is a calorie. This is the cornerstone dogma that has established a number of metabolic rate calculations to estimate the proper number of calories for weight loss and food labeling. This means that in order to lose weight all you need to do is decrease your calories by 3500, the number of calories in a pound, and you will lose at least a pound of weight (hopefully fat weight), no matter if they come from fat, protein or carbohydrates; and vice versa for those wanting to gain weight.

Theoretically, calories in = calories out = no increase/decrease in body mass. This is true according to the First Law of Thermodynamics, which states that energy is neither created nor destroyed, only transferred as heat.

Also, the Second Law of Thermodynamics must be considered, which says processes always go in the direction of randomness or disorder (entropy). This law suggests that the exchange of energy will be imperfect, such that some energy will escape, as heat, thus increasing entropy in the universe.

In terms of our body, the metabolism of proteins, carbohydrates and fats may be very different depending on our hormonal state and enzymatic activity. Therefore, individual uniqueness should be expected among us as individuals.

The late Dr. Mel Siff suggests in his book The Facts and Fallacies of Exercise another problem comes when we look at how scientists accept the number of calories in foods. The calorific values of foods quoted in diet books may not be as accurate as previously thought.

First, Dr. Siff describes how calories are determined by a special chemical process called proximate analysis or by burning quantities of each food in a bomb calorimeter, a type of scientific furnace, which measures the amount of heat produced in each case. Scientists take this information in this environment, a laboratory process or high temperature combustion of a given food, and assume that it creates this same amount of heat in a low temperature combustion inside a person.

It is also assumed that all components of the food are metabolized according to the characteristics of the food (such as soluble fiber, which does not always get digested in all situations as a "soluble fiber" should by definition) according to proximate analysis estimations, and that the combustibility of the food does not vary with source and quality (even though the combustibility of coal varies with type and source). Doesn't seem to make sense, does it? Who started these assumptions? Somebody did not tell the whole story. Lets keep looking at this.

The calorific values of proteins, carbohydrates and fats and their components (such as, amino acids) vary with the foods and mixture which are in it. Protein, by itself, takes approximately 30% more energy to metabolize than fats or carbohydrates. This is one reason why many pro-high-protein promoters do promote these types of fat loss diets.

Also, food components change their characteristics during the cooking process (such as fiber content increasing after frying starch) or may not be fully digested because of the amount swallowed or because of the interaction of a food's components (affecting the overall glycemic index of the meal) or digestive enzymes involved. For example, sugar dissolved in water (such as in soft drinks) provides more energy and produces more bodyfat than sugar eaten in solid form.

Therefore, at the energy production level, there are major inaccuracies of computation. At the biological "furnace" level, each person's biochemical individuality determines how efficiently a given food will be digested, stored or used as a fuel for energy. Studies with twins on exactly the same exercise program and diets have shown that the amount of weight loss or gain differs with the individual. Other studies using various calorie equations for weight loss have resulted in no weight or little weight loss for obese individuals, making it a very frustrating experience.

However, there are thousands of successful stories of obese people decreasing body fat by reducing calories and exercising as part of a healthy lifestyle. So, clearly, it is not clear, and for some, a diet modification may still have to be further enhanced by personal judgment.

It is clear that the science of calorie counting based on food burning computations is scientifically and practically misleading. However, this does not mean that you can eat whatever you want and still expect to lose weight, or this does not mean that you have a right to stick to the "I'm a victim"-attitude and give up. You still do have an answer to achieve fat loss or muscle mass gain. Remember those equations are ESTIMATIONS, based on a large population, not you the individual, and the First and Second Laws of Thermodynamics still apply – they are laws, not theories or hypotheses. Therefore, the amount of calories you ingest still applies and cannot be ignored.

However, what is sometimes the missing link in this mess is the nutrient composition of the food. Foods that are nutrient dense, such as fruits and vegetables that include fiber (i.e. not lettuce), and meat that requires a little more energy for digestion will keep your metabolism up more than unprocessed, fiber-stripped food.

Utilize these foods based on a calorie estimated equation and see what kind of results you get. The calorie recommendation should be based on your goals and lifestyle. Do not expect the calorie recommendation to be the end-all-be-all. If you are trying to lose weight and you have been diligent about your food intake and you are not losing weight, then you must either lower your calories and/or improve the type of foods (i.e. fewer processed foods) and/or increase the intensity of your exercise program. If you stick with this suggestion, in the end, you will succeed.

Questions? Email me at scott@focusedtrainers.com.

Until next time…

FIT Client of the Month! Gary Wipfler

Gary Wipfler

Age: 47

FIT Member since: 5/9/05

Goal: Weigh 200lbs by 07

Results: Gary ran track (Decathlon and High Hurdles) at the University of Washington. He placed third in the High Hurdles at Canadian National Championships in 1980. He is currently Vice President, Corporate Treasurer at Apple. His wife Barbara is also a FIT client, an avid runner, ran track at University of Oregon (and in better shape than Gary). They have 4 children, Brian, Nathaniel (Jump campers) and the twins Angela and Bridget (future jump campers).

Gary has lost 15 lbs since he started at FIT (217 to 202). Having virtually not touched a barbell in 20 years, Gary now likes the Olympic lifts (clean and jerk and the snatch) setting recent personal bests of 85kg clean and jerk and 60kg snatch. More recently, Gary has included Crossfit into his workouts.....

Likes: Olympic weightlifting; rowing 500m (personal best of 1:38.5) and golf.

Dislikes: Crossfit

Keys to success: Less mash potatoes during Sunday dinner and making time to work out on the off days too

Quote from client: "I like the way our entire family has embraced fitness and healthier lifestyle choices, and FIT definitely helps foster some of that. The entire staff at FIT is terrific, patient, knowledgeable, and great with the kids!"

"Online Fitness", Cathy Sicilliano, CMO, Hyperstrike

Continue Training When You're Away from FIT
Cathy Siciliano, CMO, HyperStrike

It's tough to stay on your regular training schedule during this time of year, especially when vacations, summer camps and family obligations are scattered throughout the summer. But now, with HyperStrike, it's easy to continue your training program with customized workouts, even when you are away from FIT.

What is HyperStrike?
HyperStrike, a strategic partner of FIT, sells customized exercise workouts online. Using your unique exercise goals and experience as guidelines, the HyperStrike engine creates personalized workouts for you to do at home or on the road. Each workout is dynamically generated from HyperStrike's library of exercises, and with over 350 exercises in the HyperStrike exercise engine, your workouts are sure to be new and fun.

Effective and Efficient Workouts
HyperStrike training programs and workouts are highly effective because each workout works major muscle groups to raise your heart rate. This means you burn more calories per unit of time, ensuring each workout is an efficient use of your time.

HyperStrike workouts are also based on the current best practices used by FIT personal trainers, so your familiarity with many of the exercises will help ensure you have a great workout. And while the HyperStrike library does have many of the cutting-edge exercises that are used at FIT, there is no need to purchase any new equipment for your home or take with you on vacation, because you can customize your workouts to the equipment you have available on hand.

Stay On Your Training Program
Your commitment to your training program is a great habit. You've spent time, money and energy to create this good habit, and using a HyperStrike workout when you are away from FIT will help you maintain your investment. "One of the keys to a healthy lifestyle is to stay active, and using customized workouts from HyperStrike is the perfect way to keep your activity level high," said Mike Greeves, HyperStrike CEO. "It's easy to take a few days off when you're away from FIT, but signing up for HyperStrike and accessing a personalized workout will help you stay in top shape."

Sign Up for HyperStrike Now – It's Free!
To get started on HyperStrike and receive customized workouts, go to http://www.hyperstrike.com and click on "Sign Up" in the navigation bar. It's free to join, so don't miss out!

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