

## ABTEST FAQ

### 1. What is CORE strength and what muscles are involved?

CORE strength is difficult to define since there are many claims as to the muscles involved and how they function. According to biomechanists, the CORE is several groups of muscles acting as a stabilizing base that allows either the upper or lower torso to generate extreme forces during lifting or propulsive movements.

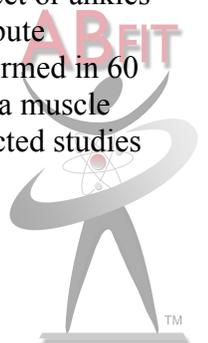
The CORE muscles help determine how far you can throw a ball, lift weights over your head, kick a soccer ball, or perform everyday activities such as carrying groceries from your car into your kitchen. Several studies have strongly suggested that the abdominal musculature is one of the key groups of muscles that make up the CORE and play an important role in athletic performance and the prevention of back injury (see the list of references below). A bodybuilder with a visible six-pack or a flat stomach may not actually have a strong CORE.

The CORE muscles include not only those in your abdominals and back, but also muscles in the hip or pelvic area and upper thighs. Many of your CORE muscles can't be seen because they're buried underneath other muscles. The transverse abdominis, for example, is hiding underneath your rectus abdominis and covers the area below the umbilicus (belly button). The rectus abdominis is the strongest of the abdominal muscles, while the transverse abdominis helps keep your posture upright and protects many of your internal organs. The erector spinae muscle group runs up and down your back, helping to maintain erect posture and giving support to your back. All these muscles, and more, work as a cohesive unit to keep your trunk stable while your upper and lower limbs are active. Strong CORE muscles keep your back healthy. They hold your body upright, improve your balance, and form the foundation that allows you to exert maximum effort with your arms and legs. If the CORE muscles are weak, your body doesn't work as effectively, and other muscles have to pick up the slack. This can result in injuries such as a twisted knee, a pulled shoulder, or your classic "bad back."

(See diagram of CORE muscle, pages 2-3)

### 2. How do we measure CORE strength?

Another tricky question. Because the weakest link in the chain of CORE muscles is typically the abdominals, and specifically the rectus abdominis, ABTEST was designed to measure, quantify, and classify the strength of this critical abdominal muscle. To our knowledge, ABFIT Products is the first to develop a Fatigue Index as a measure of Abdominal Endurance. Both of these parameters are considered crucial components to predict performance and risk of low back injury. Typical tests of abdominal strength that have been around for years do not truly measure strength, but only endurance. The classic bent-knee sit-up with feet held tightly together has been the test of choice when evaluating the rectus abdominis and other contributing musculature (see reference, AAHPERD, 1980). There are two inherent problems with the bent-knee sit-up. First, feet or ankles are supported during this test even though research has shown hip flexor muscles contribute significantly (see reference, Gutin & Lipetz, 1971). Second, the number of sit-ups performed in 60 seconds is a test of endurance since strength is defined as the single maximum effort by a muscle group (see reference, Howley & Franks, 1986). As ABTEST was developed, we conducted studies



comparing the results of timed sit-ups to the force recorded on ABTEST. We found little relationship between the two tests, indicating that the number of timed sit-ups does not measure abdominal strength.

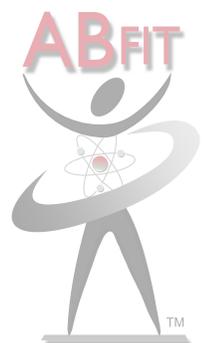
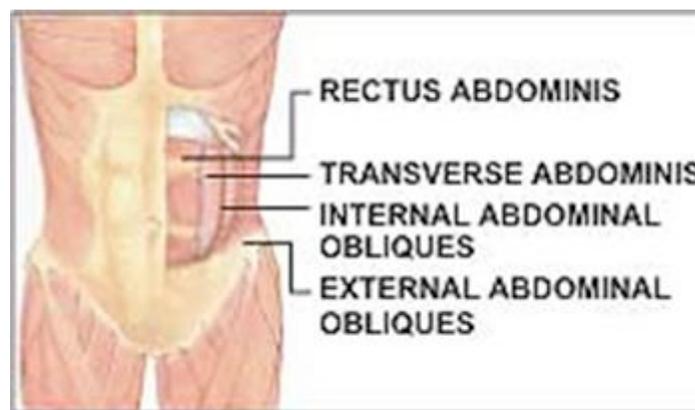
**3. How did we come up with the angles, foot and hip position, and pushing point for the cushioned arm for ABTEST?**

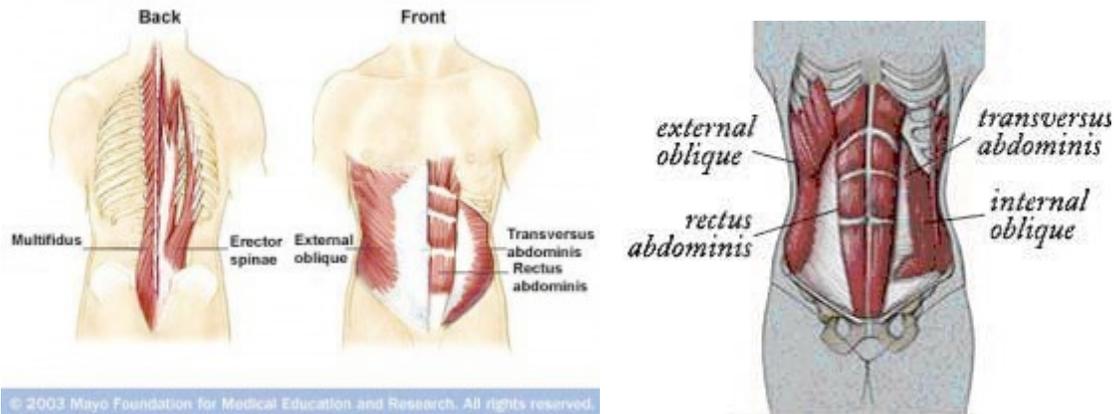
We began with angles (to the horizontal) ranging from 0 to 90 degrees. It was important that ABTEST discriminate a range of effort so that everyone would not be classified in the same category. At low angles, fewer than 30% of the people tested were able to generate any force. At high angles, gravity began to assist and the forces generated were due to factors other than abdominal strength. Further, the large numbers obtained at the higher angles failed to separate people into different categories.

Placement of the cushioned arm was determined after six months of trials. We determined a point of attachment of the rectus abdominis to remove most of the biomechanical effect of “effort arm” that was observed when the cushioned arm was placed higher up on the chest wall. The arm could not be placed too low because of the soft muscle tissue that could not support or withstand the forces generated and would result in muscle injury.

The hip and knee were placed at a standardized angle. This was used to maintain a semi-shortened position that would eliminate use of auxiliary muscles to assist the rectus abdominis in its effort to flex the lumbar spine. During ABTEST trials, we measured the forces produced when the ankles or feet were held, or were allowed to rest freely on the platform. Force increased by 50% when the ankles were held demonstrating that the hip flexors were being used to assist the rectus abdominis. Therefore, all testing is performed with ankles and feet unsupported and resting on an adjustable platform to maintain the hip and knee angle.

ABTEST evolved through five iterations of mechanical and mechanical-electronic systems over a period of four years until we arrived at the basic system. The system was further refined and a graphic display was added along with a measure of timed maximum effort resulting in development of the Fatigue Index.





4) **What actually does ABTEST measure and NOT measure or take into account?**

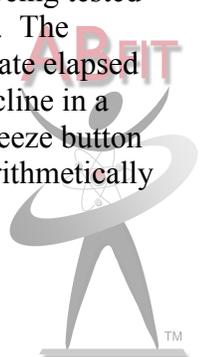
ABTEST measures the isometric strength of the Rectus Abdominis with assist from the Internal and External Obliques Abdominis and a minimal contribution form the Transversus Abdominis. The Maximum Strength Index (MSI) is a scale from 0 – 100 that displays the values on a scale that is easy to interpret and explain. It is not an absolute but an algorithmic representation of absolute strength. There are five categories displayed on each scale as follows:

- a) Needs Immediate Attention
- b) Needs Improvement
- c) Acceptable
- d) Above Average
- e) Excellent

These are description terms only and do not represent a medical interpretation of the risk for low back pain. There are many other factors that contribute to low back pain including a series of muscles located on the lower pelvic floor and muscle located on the back of the spine that include the multifidus and erector spinae (among several others). Structural abnormalities within the facets and actual pinching of the nerves as they exist through the intervertebral foramen may also be the etiology of pain. Deformities of the spinal column, itself and congenital factors from birth or through environmental influences may express themselves as a pain response. Acute injury or blow will certainly activate the pain response. It is believed and expressed in many kinesiology, biomechanical, orthopedic and several texts and research articles, that weak abdominal musculature is accountable for 50% of the low back pain and injury experienced by Americans. It is recommended that individuals not be tested if there is suspicion of a physical deformity or acute injury.

5) **What does the graph observed during the actual test mean?**

The graph seen during testing reflects the actual pounds of effort exerted by the person being tested in real time. The numbers on the left hand side (ordinate scale) are calibrated in pounds. The numbers on the bottom (and displayed in a separate box on the top left had corner) indicate elapsed time in seconds. As a person exerts his/her maximum effort, the graph will typically decline in a gradual manner over a 10 second time period. At the conclusion of the test (when the freeze button is clicked) you can see the decline in force exerted by the abdominals. This decline is arithmetically



calculated and presented as a Fatigue Index. This is simply the percentage decline in force over the 10 second period of time.

**6) How does this force reading correlate with CORE strength?**

As we continue to refine the ABTEST and conduct more research, the ABEST system will measure more than abdominal strength and will include a direct measure of back extension (reflecting strength of the multifidus and erector spinae groups). At present, most research data and in the opinion of many biomechanists, exercise scientists and kinesiologists, the abdominal musculature measured using the ABTEST remains the single most important group for looking at the potential for low back pain. Also, according to professional opinion (justified by the results of our research recently published research in National Strength and Conditional Journal) it is a major predictor of performance.

**7) What should I do with my result?**

After you look over the Personal Assessment Report carefully, decide if the MSI sCORE is at beyond Needs Immediate Attention. If not, you may wish to schedule an appointment with your physician for further diagnostics. If there is no medical/structural explanation for your low sCORE, then you may wish to embark on a carefully planned CORE exercise program. There are many programs that do not have a scientific basis underlying the progression or even specific exercises. Make sure that you check with your physician, qualified therapist, and certified trainer. We have developed a scientifically validated program with progressions from beginner to advanced. One of our Certified Intervention Trainers (CIT) may be available in your area.



## References

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