Physically active individuals often train their abdominal muscles inadequately or perform specific exercises incorrectly, which can be harmful to the spine. The quest to discover optimal core-strengthening exercises has been a primary objective of researchers, clinicians, and fitness and conditioning professionals over the past 50–60 years. During this time, numerous studies have attempted to provide objective data on abdominal exercises through the use of electromyography (EMG), videography, goniometers, mathematical modeling, and various other instruments and procedures. Also evolving from this quest have been many exercises, fitness fads, and proposed “quick fixes” promising a “six pack” physique with minimal work in the shortest possible time. Unfortunately, many of these fads and gadgets have not been tested in a controlled, scientific environment, and it is not until injuries occur that they are given such attention.¹

Many researchers have attempted to sort out the “good from the bad” when it comes to core stabilization, specifically as it relates to abdominal-muscle training. A consistent finding from these studies has been that there is no single best exercise that optimally works all of the various abdominal and back muscles. As a result, exercise variation in terms of position (legs, arms, neck, pelvis, etc.), speed, duration, and repetition must be incorporated to effectively train and strengthen the muscles of the core.² ³ The primary objective in exercise selection “is to challenge the targeted muscle(s) while imposing a minimal load penalty to the lumbar spine given the link between injury, spine posture, and compressive loading.”³³⁰¹ The traditional sit-up alone does not contribute to the development of lower back stability by this definition.⁴ Furthermore, a major aim of training and rehabilitation should be to develop muscular stabilization of the trunk rather than simply trunk-flexion or trunk-extension strength.⁵ Notwithstanding, this requires targeting the appropriate muscles while minimizing activation from muscles that do not contribute to core stability.⁶ The purpose of this article is to review the literature in an effort to determine the consensus position on the role of the abdominal and back muscles in different types of strengthening activities. We review the numerous investigations that have attempted to maximize core-muscle activation while minimizing the potential risk for injury.

Interpretation of Related Research

There are differing results reported in the literature from investigations on abdominal and back exercises. This might be, in
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Stabilization exercise is a generic term that can be applied to any exercise that challenges spinal stability while training patterns of muscle activity and spine posture to ensure “sufficient stability.”

The basic concepts have been recognized throughout history in many cultures and can be traced back to the origins of various forms of yoga and martial arts. In the Western world, stabilization training was developed in the 1980s as a rehabilitation approach for low back pain (LBP), although stabilization-related research can be traced back to the 1950s, when Floyd and Silver conducted one of the earliest studies examining the role of the various abdominal muscles during singing, coughing, straining, and straight-leg raises. Other early studies focused on the activity of the abdominal muscles during respiration and various abdominal exercises and trunk movements.

Research in the 1960s demonstrated slight technological advances in design and measurement. Cinematographic recordings were used with EMG to compare the functions of the external oblique and upper and lower rectus abdominis (RA) during sit-up exercises. This was the first of many investigations that focused on the role of the RA with feet anchored versus unanchored during abdominal exercise. A paradigm shift in the approach to muscle strengthening and back health emerged in the 1960s when Kennedy wrote of the ability of the abdominal muscles to function as a “brace” in an effort to protect the spine. This bracing technique is a static action of the trunk muscles working harmoniously to stabilize the lumbar spine as one unit. This concept has been embraced by various researchers and clinicians and continues to be an instrumental principle in current core-stabilization theory.

Many core-stabilization exercises employ either the abdominal-bracing position, in which the patient is instructed to contract the abdominals, or abdominal hollowing, in which the patient is asked to make the lower abdomen “cave in.” Abdominal hollowing has been shown to isolate the transversus abdominis (TrA) and multifidus muscles, but the optimal technique remains controversial. Abdominal-hollowing exercise is suggested to recruit less RA and external oblique activity than pelvic tilting, thereby minimizing activation of the large global abdominal muscles. Conversely,