

REACTIVE CORE TRAINING:

INTEGRATION CORE EXERCISES ELICIT GREATER MUSCLE ACTIVATION THAN ISOLATION EXERCISES JINGER S. GOTTSCHALL,¹ JACKIE MILLS,² AND BRYCE HASTINGS

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Why train the Core?

The American College of Sports Medicine (1) and the United States Department of Health and Human Services (2) recommend that healthy adults, under 65 years of age, complete a strength training routine that includes core exercises twice a week.

There are countless exercises that target the primary core trunk muscles (abdominal and lumbar) with the aim of providing training benefits. However, it is unknown as to which exercises elicit the greatest activation thereby enhancing functional gains and peak performance.

Monfort-Panego et al. (3) completed a literature synthesis. The majority of the reviewed studies focus on isolation core exercises that target the primary muscle of the anterior trunk, the rectus abdominus (RA).

It is assumed that isolation exercises would elicit the greatest activity of this primary core muscle.

Despite the extensive previous research, one question that still remains is “Do isolation or integration exercises elicit the greatest activation thereby optimizing functional and performance gains (1)?” We define integration core exercises as movements that require activation of the distal trunk muscles (deltoid and gluteal) and activation of the proximal trunk muscles (abdominal and lumbar) in comparison with isolation core exercises that only require activation of the proximal trunk muscles.

Understanding the difference between these 2 core-training strategies will enable personal trainers, sport coaches, and medical providers to suggest the optimal type of exercises during a strengthening routine. Thus, our purpose was to evaluate the muscle activity of distal and proximal muscles during a series of both isolation and integration exercises.

Although we tend to think of muscles as separate entities their integrated function suggest that when training – replicating this integration - would deliver the best benefit.

The Research

Twenty, healthy college students, 10 men and 10 women, completed the protocol (age 22.47 +/- 3.00 years).

EMG electrodes were placed over the appropriate points of 6 muscles:

Anterior deltoid, Rectus Abdominis, External Oblique, Lumbar Erector Spinae and Gluteus Maximus.

Data was collected from each participant during a treadmill walking test to provide baseline data and determine functional activation patterns during gait.

We then collected data from 7 exercises performed at a repetition speed of 15 cycles per minute for the dynamic exercises and static holds of the hovers and planks.

The Results:

Overall, our results demonstrated that the activation of the abdominal and lumbar muscles was greatest during the integration exercises that required activation of deltoid and gluteal muscles.

Hover with Hand Reach Compared to Crunch:

Both the rectus abdominus and EO activity was 27% greater than during a traditional crunch. LE activity was over 2 times greater during the integration exercise.

Mountain Climber Plank

This addition of a higher center of mass and the tripod stance resulted in a significantly greater activity for all the muscles.

RA and AD activity were 7% greater, than the forearm hover while the EO and GM activity were 11% and 70% greater respectively.

Side Hover and Oblique Crunch

External oblique activity was 25% greater in side hover than forearm hover.

When comparing the isolation and integration exercises, the largest difference in muscle activity was for the TE and LE, which were 3 and 2 times greater respectively, during the side hover.

This extreme difference is an illustration of how the integration exercises may be a superior choice for a training regimen as they target a wider range of muscles for a more comprehensive strengthening effect.

Upper Back Extension and 4 Point Kneeling with Resisted Opposite Arm and Leg Lift

For the upper body extension exercises, we compared an isolation double arm extension and an integration horse stance pointer with resistance tubes. The primary muscles for both exercises were the erector spinae and the overall average activity during the integration task was 38% greater during the integration task.

Because of the contralateral limb movements of the integration exercise, the EO's were 3 times more active than for the isolation exercise.

Implications for progression:

Isolated → Integrated → Balance Challenge

Injury Prevention

Leeton et al. (5) reported that injured collegiate athletes had significantly less strength in the core musculature, especially the hip abductors.

Similarly, Hewitt and colleagues (6,7,8) conducted multiple studies with a focus on the connection between neuromuscular trunk training and knee injury. They concluded that for collegiate athletes non-contact knee injuries were less frequent in the group of participants that completed preseason core exercises.

CORE TRAINING DURING BODYCOMBAT:

Previous studies have documented the activation of the core muscles during aerobic activities such as cycling and running. Professional cyclists activate both the rectus abdominis and lumbar erectors in order to maintain an aerodynamic position on the bike and transmit force to the pedal (9).

Marathon runners activate the rectus abdominis and the external oblique muscles for movement efficiency and to assist with foot placement (10).

The aim of this study was to investigate if similar activation patterns are seen in a multi planar martial arts inspired workout such as BODYCOMAT™.

10 men and 10 women completed 22 randomly assigned exercises from the BODYCOMBAT™ 51 release. We collected muscle activity via surface EMG from rectus abdominis and external oblique. Finally, we calculated the number of crunches based on the total time and muscle activity for each of the 22 exercises, normalised to the time and muscle activity of a single crunch.

Our results demonstrated that a typical BODYCOMBAT™ class is equivalent to 1700 crunches. Upper body exercises such as hooks and jabs require core activation for trunk stability and force production, while lower body exercises such as jump kicks elicit activity for hip power and single leg balance.

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