The Effects of Suspension Devices on Muscle Activation During Exercise: A Systematic Review

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Background

- Suspension devices have gained a great deal of popularity as a means of strength training with less equipment.
- Manufacturers report that suspension training improves the recruitment of muscle fibers, thereby enhancing the effect of the exercise performed, as compared to traditional stable exercises.
- Systematic Review

Study Design

- Search terms: suspension training®, instability device(s), TRX®, electromyography, EMG, exercise, sports, physical fitness, fitness, therapeutic exercise, kinesiotherapy, muscle, and skeletal muscle.
- Included only trunk and upper extremity (UE) muscles.
- All participants were healthy and active.

Methods

- Systematic Review.
- Search terms: suspension training®, instability device(s), TRX®, electromyography, EMG, exercise, sports, physical fitness, fitness, therapeutic exercise, kinesiotherapy, muscle, and skeletal muscle.
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Results

- Analyzed exercises included: push-ups, planks, pikes, and inverted rows in stable and suspended conditions.
- EMG values were measured for 12 muscle groups of the upper extremity and the core.
- Consistently shown that the rectus abdominis was recruited at higher levels with suspension training across all exercises.
- Values for the other 11 muscle groups differed across studies.

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Suspension Device Use</th>
<th>Anterior Deltoid</th>
<th>Biceps Brachii</th>
<th>External Oblique</th>
<th>Erector Spinae</th>
<th>Internal Oblique</th>
<th>Latissimus Dorsi</th>
<th>Middle Trapezius</th>
<th>Posterior Deltoid</th>
<th>Pectoralis Major</th>
<th>Rectus Abdominis</th>
<th>Triceps Brachii</th>
<th>Upper Trapezius</th>
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<tbody>
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<td>Push-Up</td>
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<td>Plank</td>
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Conclusions

- The use of a suspension device may be suitable for exercise progression of the push-up, plank, and pike positions, but not for the inverted row.
- Based on EMG values:
  - Rectus Abdominis Muscle - suspension devices are an appropriate progression of all of these exercises for those wanting to challenge their anterior core.
  - Remaining Core Musculature - suspension devices are an appropriate progression overall for the pike and push-up; plank is inconclusive; inverted row was not analyzed.
  - Upper Extremity Musculature - suspension devices are appropriate for exercise progression of push-up when targeting the posterior UE; not appropriate for push-up or inverted row when targeting the anterior UE; plank and pike were not analyzed.
- Studies were not performed in a rehabilitation setting, making these conclusions inapplicable to an injured population.

Clinical Relevance

- Standardization
  - Studies lack procedural consistency in data processing which limits the ability to compare data between them.
- Recommendations
  - Muscle activation alone may not fully explain why suspension training can be more difficult for individuals than traditional, stable training; clinicians should consider all patient factors before prescribing suspension training.
  - Further research should look to diversify the subject pool and look at other exercises to enhance the understanding of suspension devices and their effects.

Acknowledgements / References

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