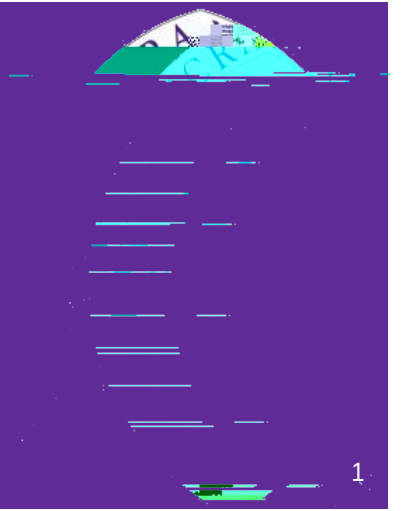
Thomas Helmstetter, SPT
Mark Merli, SPT
Ansis Ramolins, SPT
Dr. Leininger, PT, PhD, OCS



B

- Objectives
- Background
- Purpose
- Methods
- PRISMA
- PEDro Scores

- Results
- Conclusion
- Limitations
- Future Research
- Clinical Relevance
- Acknowledgments

B

By the end of this presentation, attendees will:

1. Understand the potential benefits of incorporating unstable surfaces into resistance training programs to optimize older adult balance outcomes.
2. Understand how to appropriately and safely utilize unstable surfaces

- Aging causes decreased function of body systems that maintain balance, potentially leading to falls which are the leading cause of injury in older adults.

Theorized additive benefits of unstable surface LE resistance training:

- Normalization of postural reflexes[5]
- Enhanced trunk activation[4]
- Improved proprioception in the LEs[5]
- Increased sensitivity of cutaneous receptors in the soles of the feet[5]

- The purpose of this systematic review was to determine the effects of unstable surface LE resistance training on balance in older adults.

- **Search Engines:**
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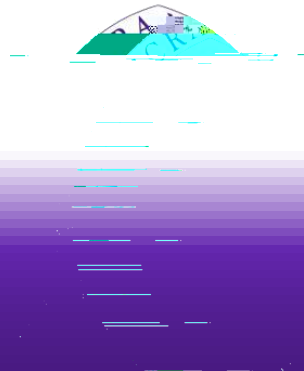
- Selection criteria included:
  - RCT design
  - Participants: 65+ years of age with no history of neurologic diagnoses



Intervention parameters:

- Study durations ranged from 3 weeks-6 months (1-5 sessions/week) and session durations ranged from 30-60 minutes
- Unstable surface groups (USG) differed by exercise selection and the instability devices used
- Stable surface groups (SSG) performed various LE resistance training protocols on firm, even ground

The USG demonstrated statistically significant improvements in balance outcomes compared to the SSG in five[5-9] studies:

- The USG held tandem stance 12.9 s longer and single leg stance (SLS) 6.0 s longer than the SSG after 2 months ($p<0.02$).[5]
- The USG walked 11.2% faster in the 10mWT after 3 weeks of training while the SSG improved by 6.6% ($p=0.049$).[6]

- The USG showed a significantly larger effect size than the SSG for center of pressure to the limits of stability, d=1.61 and d=0.23, respectively.[7]
- The USG increased their side reaching in the multidirectional reach test by 14% (p=0.036) while the SSG improved by 4% (p=0.398).[8]
- The USG improved their SLS on foam from 9.42 to 15.30 s (p=0.03) after 8 weeks while the SSG improved from 7.07 to 11.27 s (p=0.20).[9]

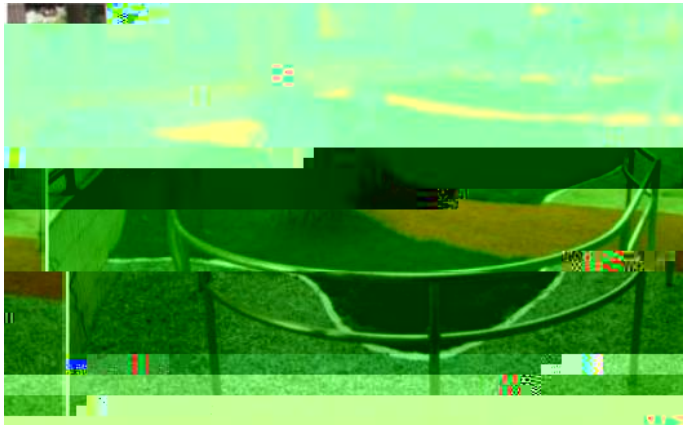
- There is **mixed evidence** in support of unstable surface LE resistance training programs for improving balance in older adults.
- Further high-level research should be conducted to determine optimal LE exercises and dosage in order to provide maximal balance gains in older adults.

- Small sample sizes
- Large age range which led to high variability in performance
- Subject variability may have also led to different motor strategies utilized
- Study protocols varied by frequency and duration
- Results cannot be generalized to less healthy or frail older adults

- Future studies should focus on:
  - Optimal training dosage, intensity, frequency, and duration parameters to maximize prevention of future falls
  - Studying the underlying mechanisms to explain why unstable surfaces may promote additional balance improvements to prevent falls

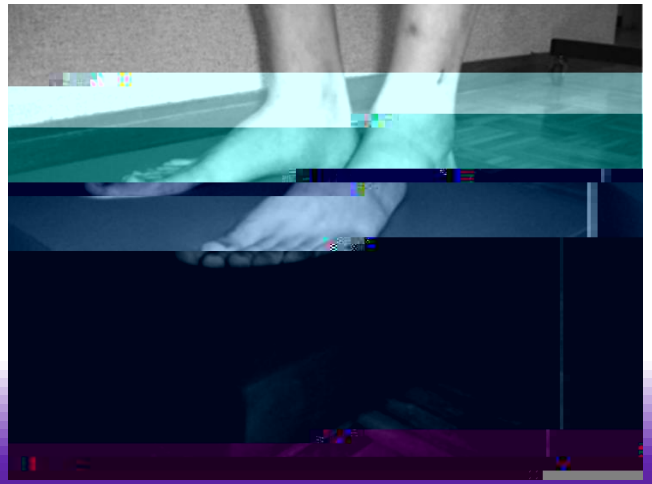
- Implementing unstable surface resistance training **may** reduce risk of future falls

- Renée Hakim, PT, PhD, NCS
- Ian O’Hara, MS

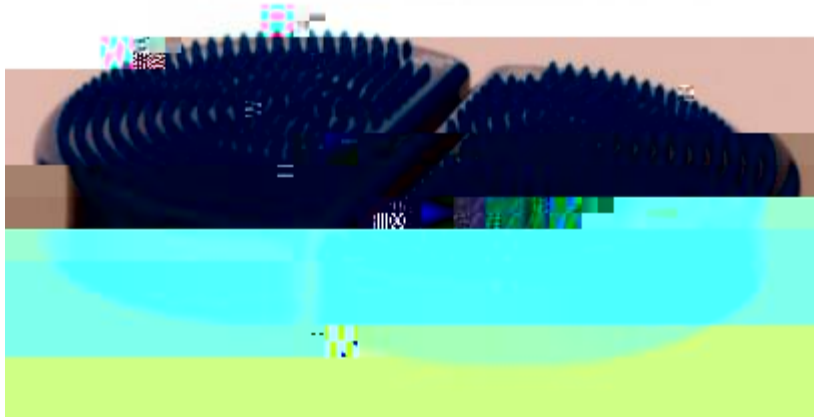


Outdoor multi-surface terrain environment

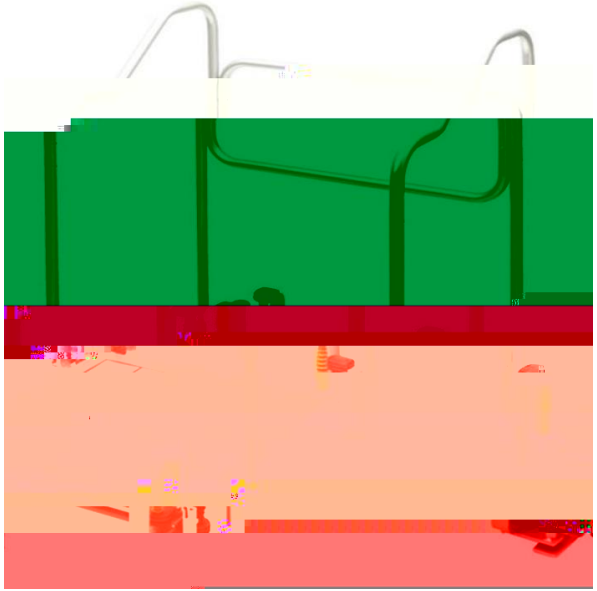
BOSU ball



Foam pad



TOGU Aero-step Balance Trainer pad



Posturomed device

Study	Unstable Surface Group (USG) Parameters	Key findings
Piraua et al. (2019)[3]	**Frequency:** 24 weeks, 3x/week **Duration/Volume:** 30-60 mins, 2-5 sets and 7-12 reps **Exercises:** 45º ROM leg press, bridges **Equipment:** BOSU ball, balance disc, Swiss ball	There were no statistically significant differences between the USG and the stable surface group (SSG) in TUG, BBS, and FES-I scores.
Eckardt (2016)[4]	**Frequency:** 10 weeks, 2x/week **Duration/Volume:** 60 mins **Exercises:** Squats, stair walker, front lunges, bridges, farmer carries **Equipment:** BOSU ball, wobble board, inflatable disc	Both groups improved in the FRT, however free weight USG (F-USG) revealed the largest effect size.There were no statistically significant differences between groups in TUG and FRT scores.
Zhou, Yuan, Ma (2020)[5]	**Frequency:** 5x/week for 3 weeks **Duration:** 30 min sessions **Exercises:** Bodyweight squats, single-leg squats, heel raises **Equipment:** Outdoor environment consisting of grass, sand, gravel, pebbles and plastic	The USG showed statistically significant improvements when compared to the SSG for the 10 mWT. No statistically significant differences were seen in TUG times, SLSTEO, or SLSTEC.
Hamed et al. (2018)[6]	**Frequency:** 2x/week for 14 weeks **Duration:** 1.5 hour sessions **Exercises:** Lunges, jumping, squatting **Equipment:** Wedged soft mat, soft pad, BOSU ball, balance beam, semicircular block, Posturomed device	The USG showed a significantly higher effect size than the SSG for improvements in their center of pressure towards the anterior limit of stability.

F