

Effects of resistance training under unstable conditions on risk factors for falls – A Comparative Study

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Introduction

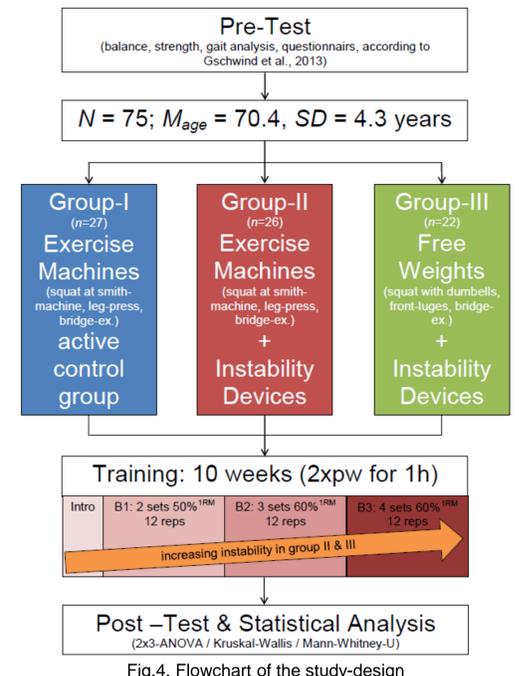
In the course of the aging process a gradual decline of physical and psychological abilities occurs. These functional impairments become evident in increased falls in elderly people. Even though the cause of falls is assumed to be multifactorial, loss in muscle strength and balance control seems to be most crucial (Rubenstein & Josephson, 2002). Several studies have demonstrated positive effects of pure balance and pure resistance training on risk factors for falls (Granacher et al. 2012). Combined training of strength and balance was conducted in various situations and found effective (Behm & Colado, 2012). No study has been done yet, investigating additive effects of combined balance and resistance training on risk factors for falls.



Objective

To compare three fall prevention strength training programmes with increasing instability

Methods



Results

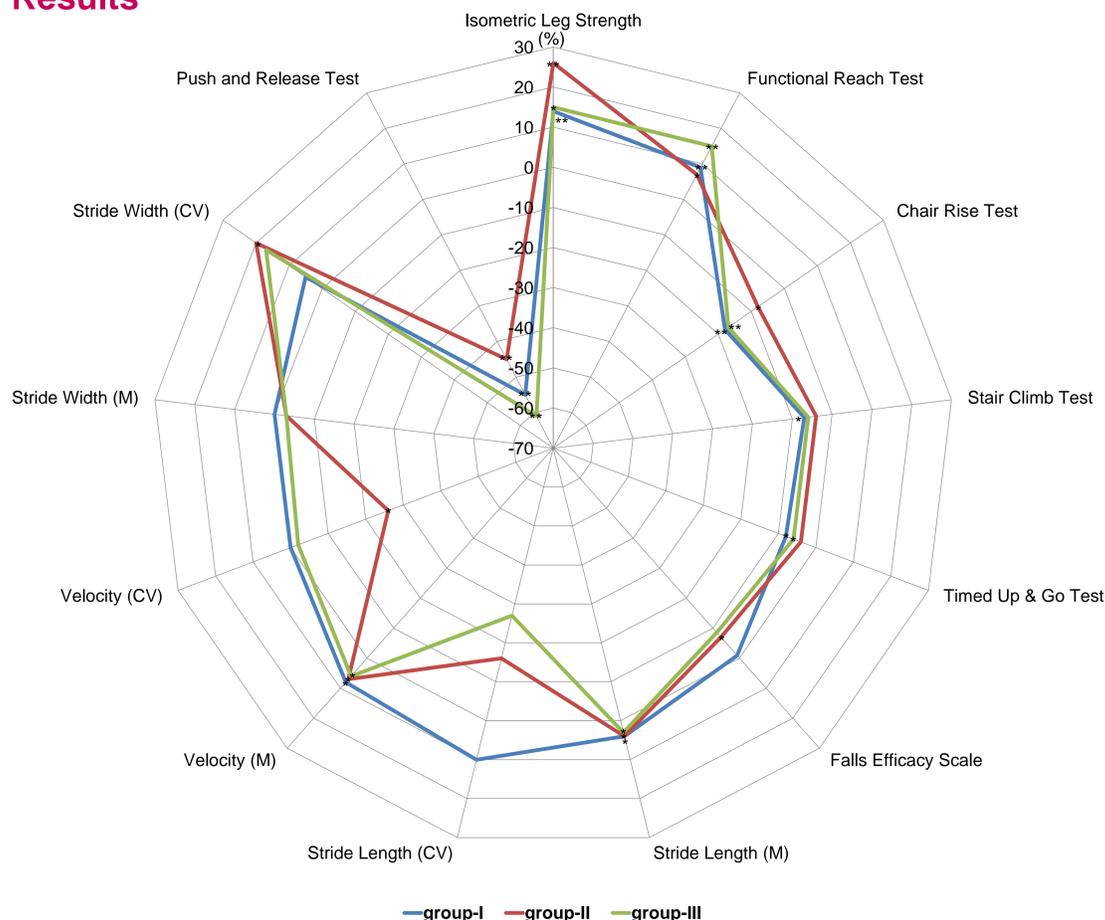


Fig.5. Results from clinical tests. Gait analysis data is presented as means (M) and coefficient of variation (CV).

Almost every clinical test indicated significant changes from pre to post testing ($p < .05$, $.08 \leq f \leq .52$) (see Fig.5) except group-II in the Timed Up and Go Test and group-II & III in the Stair Climb Test. The gait analysis was less homogenous with significant changes in the mean stride length and velocity in every group ($p < .05$, $.30 \leq f \leq .34$) and significant changes in group-II for the coefficient of variation of velocity and stride width. After conducting a Bonferroni-Holm familywise alpha-adjustment for multiple comparisons to protect against inflation of type 1 error risk, no significant interaction effects could be found.

Training load has been estimated prior to every training block and been found significantly different among group-III vs. group-I & II ($p < .001$, $2.97 \leq f \leq 3.06$) (Fig. 6).

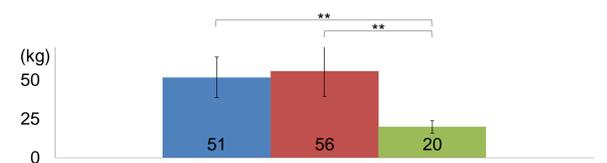


Fig.6. Mean load in block 3 (e.g. squat)

Results are diagrammed in Fig.5 as percentaged difference from pre to post testing. Statistical significance is labelled with * = $p < .05$ and ** = $p < .01$. Effect size (Cohen's d) is displayed as f .

Conclusion

All three training programs seem to be equally feasible fall prevention programs for seniors. Although most parameters show no differences between groups it should be pointed out that group-III has used significant lower loads than the other groups, nevertheless achieving comparable results.

To sum up, combining strength and balance is a save and effective way to improve fall indicators in the elderly.

References

- Behm, D. G. & Colado, J. C. (2012). The effectiveness of resistance training using unstable surfaces and devices for rehabilitation. *Int J Sports Phys Ther.*, 7(2), 226–241.
- Granacher, U. et al. (2012). A qualitative review of balance and strength performance in healthy older adults: impact for testing and training. *J of aging res.*
- Gschwind, Y. J. et al. (2013). A best practice fall prevention exercise program to improve balance, strength / power and psychosocial health in older adults. *BMC Geriatrics*, 105 (13).
- Rubenstein, L. Z. & Josephson, K. R. (2002). The epidemiology of falls and syncope. *Clin Geriatr Med.*, 18 (2),141-58.

