Clinical translation of brief, high intensity exercise for bone, muscle and functional outcomes in postmenopausal women with low to very low bone mass: First 12-month findings from The Bone Clinic.

Belinda Beck[1,2,3] and Lisa Weis[3]

[1] Menzies Health Institute Queensland, Griffith University, Gold Coast campus, Australia
[2] School of Allied Health Sciences, Griffith University, Gold Coast campus, Australia
[3] The Bone Clinic, Brisbane, Australia

Background

Under randomised controlled trial conditions, brief, targeted, supervised, high intensity resistance and impact training (HiRIT) has been shown to be safe and to improve bone, muscle and function in postmenopausal women with low to very low bone mass[1]. Whether similar benefits can be achieved in the 'real world', however, was unknown. The establishment of a translational research clinic, in which supervised HiRIT and balance training (Onero™) is offered with systematic longitudinal monitoring, provides the opportunity to examine effectiveness, feasibility and acceptability of the program as a legitimate osteoporosis therapy.

Our aim was to examine the effect of 12 months of HiRIT and balance training in the clinical setting on osteoporotic fracture and risk factors for fracture, including BMD, lean mass and functional indices of falling.

Table 1. Descriptive characteristics at baseline and 12 months (n=30)

Characteristic	Baseline	12 months	% change	P value
Age (yr)	64.8 ± 6.4	65.8 ± 6.4		
Height (cm)	160.07 ± 6.1	160.08 ± 6.5	0.006	NS
Weight (kg)	62.3 ± 13.3	62.9 ± 13.5	0.96	NS
Lean (kg)	37.6 ± 7.0	38.5 ± 6.2	2.4	0.049
Fat (kg)	25.4 ± 9.1	25.3 ± 11.7	-0.4	NS
LS BMD (g/cm^2)	0.865 ± 0.187	0.890 ± 0.182	3.06	0.009
LS T score	-1.69 ± 1.41	-0.51 ± 1.38	69.8	0.007
FN BMD (g/cm^2)	0.671 ± 0.088	0.679 ± 0.076	1.2	NS
FN T Score	-2.29 ± 0.73	-2.16 ± 0.64	5.7	NS
Prior 12m fx (n,%)	12 (33.4%)	4 (13.3%)	-66.7	NS
Calcium (mg)	1005 ± 320	1300 ± 513	29.4	0.003

7/30 (23.3%) taking long term bone medications (mean 32.3 ± 15.5 months); 1/30 (3.3%) discontinued bone medications at baseline

Results

Participant characteristics are presented in Table 1. Average training compliance was 68.6 ± 21.5%, reflecting excellent adherence to twice-weekly training, with typical absences for holidays and illness. Mean increase in maximum weight lifted was 224% (P<0.0001). Improvement was observed in every outcome measure, and reached significance for WB (P<0.002), LS (P<0.009), and TH BMD (P<0.025), lean mass (P<0.049), tandem walk (P<0.002), back extensor strength (P<0.0001), kyphosis angle (P<0.008), 12 month falls (P<0.020), and LS T-score (P<0.007) (Figure 1). Over 74% of clients gained LS BMD (maximum gain 10.9%; Figure 2). Over 65% of women gained FN BMD (maximum gain 13.6%). A 66.7% reduction in mimimal trauma fracture was observed during the 12 month period of training compared with the previous 12 months (NS). One training-related injury was sustained in a combined total of 6612 weeks exposure. The dietary consult effectively increased daily calcium consumption to the recommended level.

Conclusion

Supervised high intensity exercise improves factors of risk for osteoporotic fracture in postmenopausal women with low to very low bone mass in a 'real world' clinical setting. Excellent compliance and safety suggest the program is feasible for and acceptable to the relevant demographic.

Methods

Responses of the first 30 clients to complete 12 months of supervised HiRIT and balance training at The Bone Clinic are described. Comprehensive testing occurred at baseline and 12 months, including; biometrics, whole body (WB), lumbar spine (LS), total hip (TH) and femoral neck (FN) BMD, lean and fat mass (XR-800, Norland), daily calcium, previous 12 months falls and fracture, back extensor strength, kyphosis angle, and indices of functional performance (tandem walk, timed up-and-go, functional reach, 5-times-sit-to-stand). A dietary consult for daily calcium was conducted. Compliance (attendance and weight lifted) was recorded. Training effect was examined using a within-subjects repeated measures ANCOVA, adjusting for age and compliance.

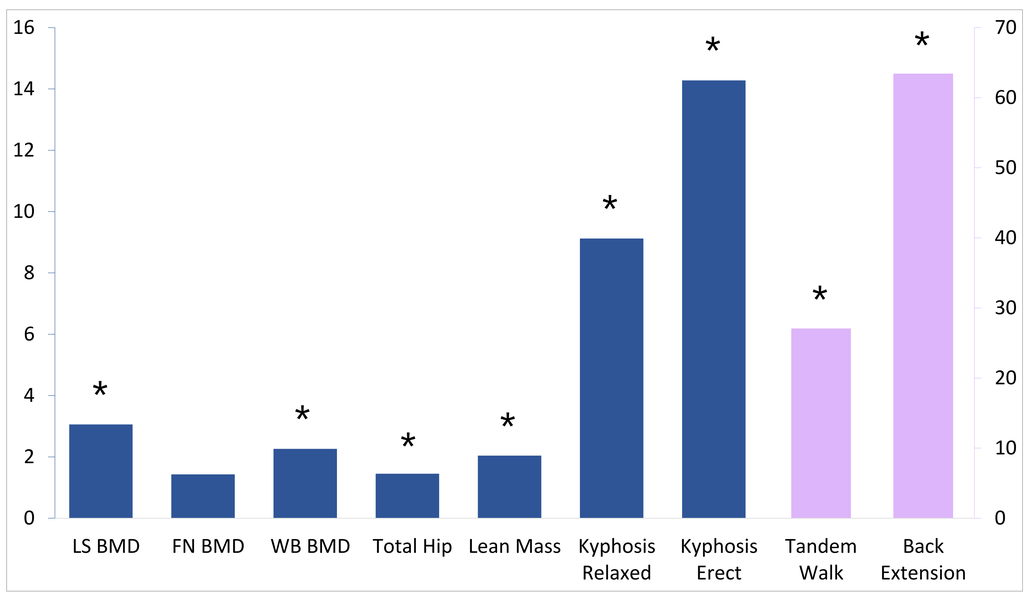

Figure 1. 12 month percent improvement in outcome measures (* P<0.05)

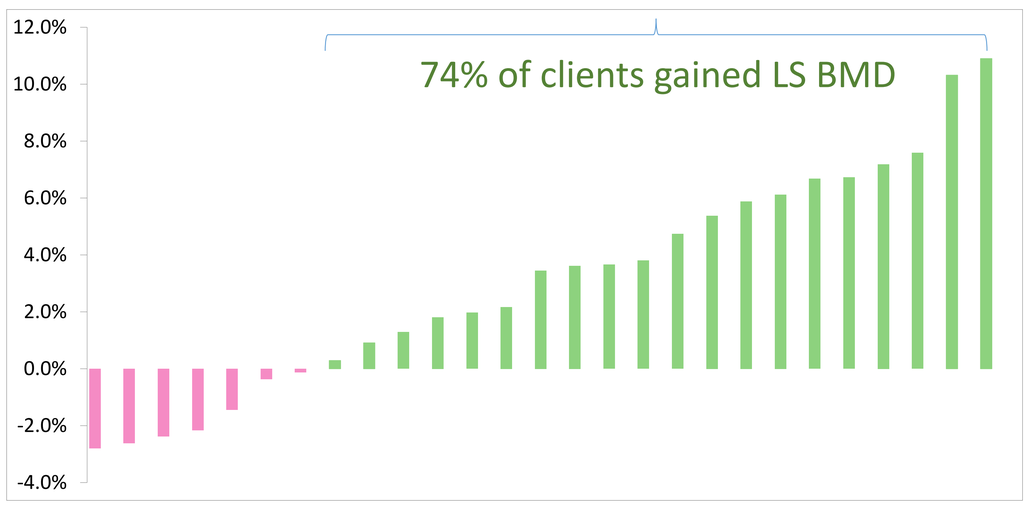

Figure 2. Individual 12 month percent change in LS BMD (n=27)

Reference

Watson SL, Weeks BK, Weis L, Horan SA, and Beck BR: Heavy resistance training is safe and improves bone, function and stature in postmenopausal women with low to very low bone mass: Novel early findings from the LIFTMOR trial. *Osteoporosis Int*, 26(12): 2889-2894, 2015