

## Background

- We recently demonstrated that brief, high intensity resistance and impact training (HiRIT) was safe and improved BMD, muscle force and function in postmenopausal women with low to very low bone mass when supervised under randomized controlled trial conditions<sup>1</sup>
- Whether similar benefits could be achieved in ‘the real world’ was unknown
- We therefore established a translational research clinic to examine effectiveness, feasibility and acceptability of the HiRIT program (Onero™) when delivered on a user-pays basis to patients with osteopenia and osteoporosis
- Systematic longitudinal monitoring of clients provides the ability to examine the effectiveness of the Onero™ program in a ‘real world’ setting
- The aim of the current work was to examine client outcomes from the first 3 years of operation of the Clinic

## Methods

- Clinic clients undergo comprehensive testing for biometrics, LS, total hip, and FN BMD, lean and fat mass, kyphosis angle, back extensor strength, functional performance (tandem walk, timed up-and-go, functional reach, 5-times-sit-to-stand), falls and fracture at baseline and annually thereafter
- Dietary consults for daily calcium are conducted at the same timepoints (AusCal diet Q<sup>2</sup>)
- Twice-weekly supervised HiRIT with balance training (Onero™) is adopted on a voluntary, user-pays basis
- Compliance (attendance and weight lifted) and adverse events are recorded
- Clients with >30% HiRIT compliance (32/96 sessions/yr) were included in the current analyses
- In the absence of a control group in this real world sample, training effects were examined using one-sample T-tests of percent change in outcome measures (2-tailed,  $\alpha = 0.05$ )



## Results

- We report outcomes from the first 121 Clinic clients to complete 12 mths of Onero™ training
- Average compliance of the sample was  $84.9 \pm 30.2\%$  (100% = 2 sessions x 50 weeks)
- Improvement was observed in 15 of 18 measured outcomes, and positive trends were observed in the remaining 3 (Table 1, Figure 1)
- While mean LS BMD improvement was 4%, 86% of clients gained bone at the spine (maximum +18.8%; Figure 2) and 69% gained at the hip (maximum +18.6%; Figure 3)
- Number of falls decreased 46.6% and fractures decreased 95.2%
- 20 minor soft tissue injuries were sustained in a combined total of 27,840 training sessions
- The dietary consult increased Ca consumption from food sources 23.5%

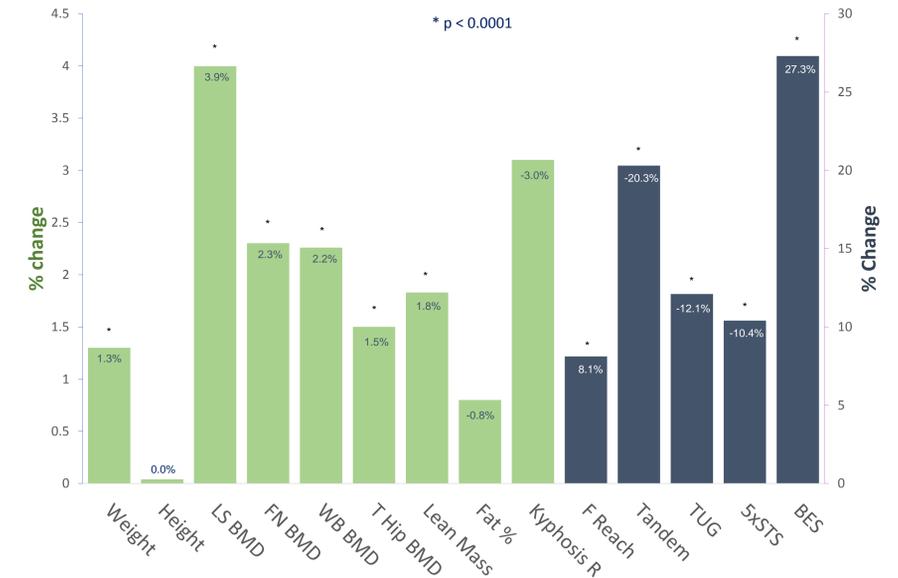
**Table 1.** Client characteristics at baseline and 12 months (n=121, 6.7% men)

Characteristic	Baseline	12 months	% change	P value
Age (yr)	64.1 ± 10.1	65.8 ± 6.4		
Height (cm)	161.4 ± 7.0	161.5 ± 7.0	0.04 ± 0.4	0.368
Weight (kg)	59.8 ± 11.5	60.6 ± 11.2	<b>1.3 ± 3.3</b>	<0.0001
Lean (kg)	37.9 ± 7.3	38.5 ± 7.4	<b>1.8 ± 4.2</b>	<0.0001
Fat (%)	35.9 ± 9.0	35.4 ± 8.7	-0.8 ± 10.6	0.409
LS BMD (g/cm <sup>2</sup> )	0.798 ± 0.136	0.829 ± 0.143	<b>3.9 ± 4.2</b>	<0.0001
LS T score	-2.25 ± 1.0	-2.01 ± 1.08	<b>15.6 ± 59.6</b>	0.006
TH BMD (g/cm <sup>2</sup> )	729.2 ± 82.9	739.5 ± 79.3	<b>1.5 ± 3.4</b>	<0.0001
FN BMD (g/cm <sup>2</sup> )	0.674 ± 0.079	0.688 ± 0.074	<b>2.3 ± 4.5</b>	<0.0001
FN T Score	-2.26 ± 0.67	-2.11 ± 0.62	<b>4.87 ± 17.4</b>	0.003
Functional reach (cm)	35.9 ± 5.3	38.4 ± 5.1	<b>8.1 ± 12.2</b>	<0.0001
Timed up and go (s)	6.6 ± 1.0	5.7 ± 0.9	<b>-12.1 ± 12.9</b>	<0.0001
Tandem walk (s)	36.8 ± 23.6	24.7 ± 6.7	<b>-20.3 ± 29.4</b>	<0.0001
Sit to stand (s)	11.1 ± 2.2	9.7 ± 1.7	<b>-10.4 ± 17.5</b>	<0.0001
Back extensor strength (kg)	31.8 ± 13.1	38.7 ± 13.1	<b>27.3 ± 49.4</b>	<0.0001
Kyphosis angle (°)	35.0 ± 10.4	33.6 ± 11.8	3.0 ± 41.6	0.326
Falls (n/x/%)	45/0.39/2.4	25/0.22/2.4	<b>-44.4</b>	<0.041
Previous 12m fx (n/x/%)	42/0.36/2.4	2/0.02/0.2	<b>-95.2</b>	<0.0001
Dietary calcium (mg)	890 ± 391	1016 ± 461	<b>23.5 ± 63.0</b>	<0.0001

31/121 (25.6%) simultaneously taking long term bone medications (mean 32.3 ± 15.5 mths)



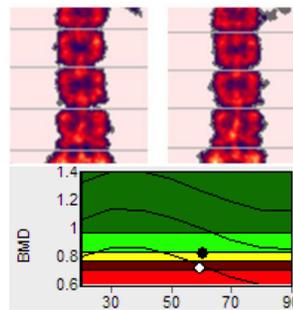
**Figure 2.** Individual 12 month % change in LS BMD after supervised in-clinic HiRIT (n=121)



**Figure 1.** Mean % improvement in bone and functional outcomes after 12-month supervised in-clinic HiRIT LS lumbar spine, FN femoral neck, WB whole body, T total, BMD bone mineral density, Kyphosis R kyphosis relaxed standing, F Reach functional reach, TUG timed up and go, STS sit to stand, BES back extensor strength

## Conclusion

- Supervised, bone-targeted, high intensity resistance and impact exercise notably improves bone and other 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 population at greatest risk
- Ongoing monitoring of this unique translational dataset will determine the long term success of exercise as a first line intervention for osteoporosis



**Figure 4.** Example of individual 12 month change in LS BMD after supervised in-clinic HiRIT



**Figure 3.** Individual 12 month % change in FN BMD after supervised in-clinic HiRIT (n=121)