

**PICO: In community-dwelling older adults (age 65+) with low bone density, can an exercise program reduce fractures?**

<b>Purpose</b>	<b>Title/Year/ Design/ Rating: Jadad/PEDro</b>	<b>Subjects</b>	<b>Outcome Measures</b>	<b>Intervention</b>	<b>Significant Results (p&lt;0.05)</b>	<b>Conclusions</b>	<b>Comments/ Key points</b>
<b>Review of exercise interventions to reduce fall-related fractures and fall risk factors</b>	<b>de Kam et al.</b> 2009 Systematic Review N/A	N= 28 RCTs focus on exercise intervention effect on fractures, falls, and risk factors in individuals with osteoporosis	Balance, Strength, BMD (DXA), Fall/fracture risk	Balance training: 2x/wk-daily, 10 wk-30 mo; Strength training: avg 2x/wk, 12 wk-30 mo	Majority of article showed improvement after ex interventions: dynamic (but not static) balance, strength (LE, trunk, UE), and decreased fall risk/fracture; Improved BMD requires >1yr duration	Exercise interventions are effective at improving outcomes associated with fall risk which in turn lead to fracture risk in individuals w/osteoporosis	-There is a low number of RCTs specifically related to exercise interventions to address falls and fracture in osteoporosis. -Effective ex interventions avg 2x/wk, 3-12 mo. -Relationship among risk factors, falls, and fractures is uncertain. -Improved bone density requires ex >1 yr duration
<b>Effect of functional and balance exercises on falls and fracture risk as measured by balance, LE strength, and DXA</b>	<b>Hourigan et al.</b> 2008 RCT 3/5; 7/10	N=98 Women, 40-80 yo, Independent living, osteoporosis	Balance: mCTSIB, TUG, functional step, lateral reach; Strength: LE and trunk ext; Bone density: DXA	T: Functional and balance ex, 1 hr, 2x/wk, 20 wk; C: no ex	T>C for balance (most mCTSIB conditions) and LE strength measures after 20 wks	Exercise program was effective in improving balance and strength; may need longer intervention for improved bone density	-Functional strengthening and balance ex can decrease fall risk after 20 wk. -Insufficient description of ex intervention to replicate. May not be appropriate for all individuals.
<b>Effect of multimodal exercise on fall risk, balance, and quad strength</b>	<b>Swanenburg et al.</b> 2007 RCT 3/5; 8/10	N=24 Women, 65+ yo, Independent living, Osteoporosis or osteopenia	Risk of falling: Berg; Balance: sway; Strength: quad; PA: questionnaire; Health: SF-36; Falls: pt report; Bone density: DXA	T and C: vit D and calcium supplement  T: resistance, coord, balance, and endurance ex; 3x/wk, 70 min, 12 wk; protein drink  C: no ex	T>C Improved Berg; difference in PA and quad strength at 3 and 6 mo	Multimodal ex program decreased falls risk at end of program and f/u to 9 months afterward. PA and quad strength improve immediately after and 3 mo f/u	-3-month multimodal exercise training can produce benefits that last up to 9 months afterward. - Ceiling effect of Berg. Dynamic balance measure not included. -Protein shake may provide addtl benefit for resistance training.

<b>Effect of balance training on fall risk, sway, mobility and falls</b>	<b>Madureira et al.</b> 2007 RCT 2/5; 6/10	N=66 Women, 65+ yo, Osteoporosis	Functional balance: Berg; Static: CTSIB; Mobility: TUG; Falls: pt diary	T: Balance ex 1hr for 40 classes over 12 mo. HEP 3x/wk  C: no ex	T>C Berg, CTSIB, and TUG; decreased falls	4x/wk balance exercise program can decrease fall risk and falls	-Long duration, high freq balance ex program is beneficial in reducing fall risk, sway, and falls. -Dynamic balance measure not included.
<b>Effect of high-intensity resistance training vs. agility training on fall risk</b>	<b>Liu-Ambrose et al.</b> 2004 RCT 3/5; 7/10	N=98 Women, 75-85 yo, Osteoporosis or osteopenia, community-dwelling	Fall risk: PPA (vision, proprioception, strength, reaction time, balance); ankle df; foot reaction time; balance and mobility: CB&M	T1, T2, C: 50 min, 2x/wk, 25 wk  T1: resistance training 12-16 reps at 75-85% 1RM  T2: agility training for coord, balance, reaction time  C: stretching and posture ed	T1 and T2>C PPA fall risk (especially postural sway)	Resistance or agility training can decrease fall risk. Both are feasible programs for older women but agility training requires more supervision for safety. Control did not have significant change in fall risk.	-Both high-intensity resistance and agility training can reduce fall risk after 25 wk. -High-intensity and agility training may not be appropriate for all individuals. -Stretching and posture ed did not reduce fall risk score.
<b>Effect of low-intensity resistance exercise on balance, quad strength, and QOL</b>	<b>Carter et al.</b> 2002 RCT 3/5; 5/10	N=93 Women, 65-75 yo, community-dwelling, osteoporosis	Static balance: posturography; Dynamic balance: figure 8 walking test; quad strength; QOL	T: Osteofit program=20 week strengthening and posture ex;  C: no ex	T>C for dynamic balance and quad strength, non-sig static balance after 20 weeks	Osteofit program was effective in improving balance and strength; group-based ex program is cost-effective means to reduce falls risk	-Low-intensity resistance ex improves some but not all fall risk measures after 20 wk. -Should have a more reliable/valid dynamic measure -Need additional ex program details before able to implement. (available on request)
<b>Effect of multimodal exercise on fracture risk, bone density, quad strength, and sway</b>	<b>Lord et al.</b> 1996 RCT 2/5; 4/10	N=179 Women, 60-89 yo, community-dwelling	Bone density: DXA; Quad strength; Postural sway; Fracture risk (calculation)	T: Ex classes incl aerobic, balance, coord, and strengthening; 1 hr, 2-3x/wk, 10-12 wk sessions, 4x/year  C: no ex	T>C quad strength, postural sway, fracture risk; no change DXA	Multimodal exercise program can decrease fracture risk and risk factors assoc with falling	-Long duration, multimodal ex intervention can decrease fall and fracture risks. -No dynamic balance measure, questionable sway measure -No improvement in bone density at 1 yr.

(Jadad/PEDro score note: Maximum possible are 3/5 and 8/10 for these RCTs due to lack of double blinding available with exercise/education interventions)

## References

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