

Injury Prevention / Exercise in the Elderly

Background

1. Definitions
 - Elderly
 - Of, relating to, or characteristic of older persons or life in later years
 - Exercise
 - Bodily or mental exertion, esp. for the sake of training or improvement of health
 - Interventions include gait and balance training, strength training, flexibility, movement, general physical activity, endurance
 - Frailty
 - A body-wide set of linked deteriorations including, but not limited to, musculoskeletal, cardiovascular, metabolic, and immunologic systems¹
 - Injury
 - Harm or damage that is done or sustained
2. General information
 - Large proportion of studies seeking to establish specific effect of exercise on injury rates in the elderly, many lack the power to suggest any causality
 - Large variation between trials as they have been conducted with highly variable patient populations (e.g., community dwelling vs. long-term care facility dwelling; old vs. very old; frail vs. non-frail)
 - Large variation between exercise program goals, content, and duration

Epidemiology

1. One-third of people in the community aged 65 and older fall at least once annually
 - Falls are the most common cause of injury in older people
 - Falls account for more than half of the injury related hospitalizations for older people³
 - Fall rates in the general older population are reported to be 1.2 falls per person per year
2. Only 30% of those aged 65 and older report any regular exercise
 - Studies in the United States show that older Americans are the least physically active of any age group
3. Risk factors for falls that can be modified by exercise³
 - Reduced muscle strength
 - Impaired balance/gait
 - Impaired functional ability
 - Cognitive impairment
4. Morbidity/ mortality
 - Hip fractures are the most serious fall-related injury in older people⁵
 - 15% die in hospital, one-third do not survive beyond 1 year post-fracture

Recommendations

1. General physical activity
 - The benefits of regular physical activity in older adults are extensive
 - Physical activity by itself may reduce falls and fall injuries by as much as 35-45%²
 - A 2008 meta-analysis of 44 trials provided strong evidence that exercise programs can reduce fall rates in older people. Greater benefits were seen in programs that challenge balance, use a higher dose of exercise, and do not include a walking program³
 - A 2009 Cochrane Database meta-analysis of 111 trials concluded that multiple component group or home-based exercise interventions reduce the risk of falling and rate of falls in community dwelling older adults⁶
 - Virtually all older adults should be physically active⁷
2. Balance
 - The American College of Sports Medicine (ACSM) and the American Heart Association (AHA) suggest that community dwelling older adults with substantial risk of falls (e.g., frequent falls or mobility problems) should perform exercises that maintain or improve balance⁷
 - The inclusion of balance training in exercise programs appears to be more superior than those which do not³
 - 17% lower falls risk from exercise programs that included balance training but not from other forms of exercise³
 - With appropriate supervision and prescription, exercise that challenges balance can be administered safely⁸
3. Movement training
 - A 2009 Cochrane Database meta-analysis of 111 trials concluded that Tai Chi reduces the risk of falling and rate of falls in community dwelling older adults⁶
 - The Registered Nurses Association of Ontario recommends Tai Chi to prevent falls in the elderly for those whose length of stay in a long term care facility is greater than four months and for those clients with no history of a fall fracture⁹
 - A 2004 randomized controlled trial concluded that participation in once per week tai chi classes for 16 weeks can prevent falls in relatively healthy community dwelling older people¹⁰
4. Strength training
 - Shown to be safe and effective means by which to increase muscle strength, mass and walking speed to improve physical capabilities, reduce the risk for falls and prevent functional limitations¹¹
 - Strength training has been shown to improve bone density in older adults which decreases the risk of osteoporotic fractures¹¹
5. Flexibility
 - The American Heart Association and the American College of Sports Medicine state that the specific health benefits of flexibility activities are unclear⁷
 - It is unknown if flexibility activities reduce the risk of exercise-related injury

6. Frail elderly
 - Positive effects are less conclusive as many studies exclude the "frailtest" participants who are unable to complete performance based tests¹²
 - The Canadian Task Force on Preventive Health Care concludes that there is insufficient evidence to recommend selective interventions that address one domain of risk, e.g., exercise of physiotherapy alone to improve muscle weakness in the elderly living in long-term care facilities¹³
 - There appears to be lesser relative reduction in fall rates in studies that included people at high risk of falls³
 - Fall-preventive moderate intensity group-exercise programs have positive effects on falling and physical performance in pre-frail but not in frail elderly¹
 - However, a four controlled trial meta-analysis of a home exercise program proved to be significantly more effective in reducing fall-related injuries in those aged 80 and older compared to younger subjects in the trial²
 - Tai Chi reduced falls in those "transitioning to frailty" however was not found to be effective for falls prevention for people living in long-term care facilities¹⁴
7. Cognitive impairment
 - There is some evidence that physical activity prevents or delays cognitive impairment; a risk factor for falls¹⁵

Exercise Prescription

1. There remains debate regarding the recommendations for frequency, intensity and duration of exercise; and it is not clear how long the intervention effects will last¹⁶
2. Physicians play a vital role in motivating older adults and advising them regarding their physical limitations and medical conditions¹⁷
3. Barriers to exercise include lack of knowledge of the benefits and appropriateness of exercise and environmental barriers to exercise⁴
4. Patients must see the increase in physical activity as both desirable and achievable⁴
5. For adults who are not active at recommended levels, plans should include a gradual (or stepwise) approach to increase physical activity over time using multiple bouts of physical activity >10minutes.
6. The American College of Sports Medicine (ACSM) and the American Heart Association (AHA) suggest for those over 65 and those adults aged 50-64 with clinically significant chronic conditions or functional limitations that affect movement ability, fitness or physical activity⁷
 - Aerobic activity:
 - Frequency: Minimum of 5d/wk for moderate intensity (5-6 on 10 point scale) or 3d/wk for vigorous intensity (7-8 on 10 point scale).
 - Duration: At least 30min/d for moderate intensity, in bouts of at least 10min each; continuous vigorous activity for at least 20min/d
 - A combination of moderate and vigorous activity can be completed to meet this recommendation.
 - Muscle Strengthening activity
 - Frequency: At least 2d/wk
 - Exercises: 8-10 exercises involving the major muscle groups
 - Sets/Repetitions: 10-15 repetitions

- Flexibility/Balance
 - Perform activities that maintain or increase flexibility at least 2d/wk for 10 min/d
 - For those at risk for falls, include exercises to maintain or improve balance

Patient Education

1. <http://www.aafp.org/afp/2002/0201/p427.html>

References

1. Faber MJ, Bosscher R, Chin A, Paw MJ, van Wieringen PC. Effects of exercise programs on falls and mobility in frail and pre-frail older adults: A multicenter randomized controlled trial. *Arch Phys Med Rehabil.* 2006;87:885-896.
2. Robertson, MC, Campbell, AJ, Gardner, MM, Devlin, N. Preventing injuries in older people by preventing falls: A meta-analysis of individual level data. *J Am Geriatr Soc.* 2002;50:905-911.
3. Sherrington, C, Whitney, JC, Lord, SR, Herbert, RD, et al. Effective exercise for the prevention of falls: A systemic review and meta-analysis. *J Am Geriatr Soc.* 2008;56:2234-2243.
4. Heath, JM, Stuart, MR. Prescribing exercise for frail elders. *J Am Board Fam Pract;* 2002;15:218-28.
5. McClure, RJ, Turner, C, Peel, N, et al. Population-based interventions for the prevention of fall-related injuries in older people. *Cochrane Database of Systematic Reviews.* 2005; May 15(1):CD004441.
6. Gillespie, LD, Robertson, MC, Gillespie, WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database of Systematic Reviews.* 2009; Apr 15(2):CD007146.
7. Nelson, ME, Rejeski, WJ, Blair, SN, et al. Physical activity and public health in older adults: Recommendation from the American College of Sports Medicine and the American Heart Association. *Circulation.* 2007;116:1094-1105.
8. Province, MA, Hadley, EC, Hornbrook, MC et al. The effects of exercise on falls in elderly patients. A preplanned meta-analysis of the FICSIT trials. *Friality and injuries: Cooperative studies of intervention techniques. JAMA.* 1995;273:1341-1347.
9. Registered Nurses Association of Ontario (RNAO). Prevention of falls and fall injuries in the older adult. Toronto (ON): Registered Nurses Association of Ontario (RNAO). 2005; Mar:56p.
10. Voukelatos, MA, Cumming, RG, Lord, SR, Rissel, C. A randomized, controlled trial of tai chi for the prevention of falls: the central Sydney tai chi trial. *J Am Geriatr Soc.* 2007;55:1185-1191.
11. Seguin, R, Nelson, ME. The benefits of strength training for older adults. *Am J Prev Med.* 2003;25(3Sii):141-149.
12. Hubbard, RE, Fallah, N, Searle, SD, Mitnitski, A, Rockwood, K. Impact of exercise in community-dwelling older adults. *PLoS ONE* 2009;4(7):e6174.
13. Norris, MA, Walton, RE, Patterson, CJS, Feightner, JW. Prevention of falls in long-term care facilities. London (ON): Canadian Task Force on Preventive Health Care (CTFPHC); 2005. 4p.

14. Nowald, MP, Prendergast, JM, Bayles, CM et al. A randomized trial of exercise programs among older individuals living in two long-term care facilities: The FallsFree program. *J Am Geriatr Soc.* 2001;49:859-865.
15. Larson, E, Wang, L, Bowen, J. Exercise is associated with reduced risk for incident dementia among persons 65 years of age and older. *Ann Inter Med.* 2006;144:73-81.
16. McKay, C, Anderson, KE. How to manage falls in community dwelling older adults: a review of the evidence. *Postgrad Med J.* 2010;86:299-306.
17. Nied, RJ, Franklin, B. Promoting and prescribing exercise for the elderly. *Am Fam Physician.* 2002;65:419-26.

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