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Evidence-Based and Evidence-Inspired: An Intergenerational Approach in the Promotion of Balance and Strength for Fall Prevention

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Key Words

Balance training · Force production · Intergenerational training · Postural control · Resistance training

Abstract

The risk of sustaining a fall and fall-related injuries is particularly high in children and seniors, which is why there is a need to develop fall-preventive intervention programs. An intergenerational approach in balance and strength promotion appears to have great potential because it is specifically tailored to the physical, social and behavioural needs of children and seniors. Burtscher and Kopp [Gerontology, DOI: [10.1159/000322930](https://doi.org/10.1159/000322930)] raised the question whether our previously published mini-review is evidence-based or evidence-inspired. These authors postulate that we did not follow a 4-stage conceptual model for the development of injury and/or fall-preventive intervention programs. In response to this criticism, we present information from the mini-review that comply with the 4-stage model incorporating evidence-based and evidence-inspired components. We additionally provide information on how to implement an intergenerational balance and resistance training approach in a school setting based on a study that is being currently conducted.

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First of all, we would like to thank Burtscher and Kopp [1] for having critically reviewed our manuscript entitled ‘An intergenerational approach in the promotion of balance and strength for fall prevention – a mini-review’ [Gerontology, DOI: [10.1159/000320250](https://doi.org/10.1159/000320250)]. Given the high prevalence of sustaining falls and fall-related injuries in children and seniors [2, 3] and the associated socioeconomic implications [4], we are pleased to be offered the chance to once again present information on this important issue.

Burtscher and Kopp [1] raised the question whether our recently published mini-review is evidence-based or evidence-inspired. The authors argue that the development of injury and/or fall-preventive intervention programs should follow a sequence of 4 stages presented by the Centers for Disease Control and Prevention involving: (1) problem definition; (2) risk factor definition; (3) strategy development and testing, and (4) effective program implementation [5]. Referring to the mentioned critique, we will focus our short reply on this model by presenting information from the mini-review that are specifically related to each of the 4 stages. Further comments were incorporated that refer to additional critical statements (i.e. different importance of intrinsic vs. extrinsic risk factors, different requirements for fall intervention programs, evidence regarding long-term adherence) raised by Burtscher and Kopp [1].

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Problem Definition

A problem definition was presented in the introduction of our mini-review when describing demographic change that particularly produced decreases in the proportion of young people and concomitant large increases in that of elderly people. We further illustrated that demographic change will undermine the sustainability of the public health care system since per capita health expenditures are 5 times higher for people older than 75 years of age than for those aged 25–34 years [6]. We additionally demonstrated that high medical treatment costs in children and seniors are amongst others caused by an increased prevalence of sustaining falls and fall-related injuries [4]. However, the main rationale of our mini-review was derived from epidemiologic data indicating a particularly high fall incidence rate in both, children and seniors [2, 3] (see ‘Risk of Falling’ section).

Risk Factor Definition

The section ‘Aetiology of Falls’ contains a description of factors responsible for an increased risk of falling in children and seniors. In general, the aetiology of falls is considered to be multi-factorial, involving extrinsic (environmental) and intrinsic (patient-related) circumstances. Extrinsic factors include playground equipment, monkey bars, obstructed walkways, inadequate handrails, etc. In terms of intrinsic fall risk factors, impaired static (e.g. increased postural sway) and dynamic postural control (e.g. gait instability) as well as deficits in muscle strength (e.g. impaired muscle power and rate of force development) have most frequently been reported to increase the risk of falling in children and seniors. The sections ‘Deficits in Postural Control’ and ‘Deficits in Muscle Strength’ clearly distinguish between mechanisms leading to deficits in postural control and strength in children (i.e. maturation, secular declines) or in seniors (i.e. biologic aging).

Strategy Development and Testing

The section ‘Fall Prevention in Children and Seniors’ illustrates that guidelines for the prevention of falls in children are limited to extrinsic factors only. According to those reports, fall-preventive strategies should include awareness campaigns like parents’ education about the mechanisms of falls, recommendations on parental su-

per vision during playing activities and the inspection of potential home environmental hazards. However, a systematic literature review [7] failed to detect significant effects of community-based fall-preventive programs in children that targeted extrinsic fall risk factors. Given the paucity in the literature on how to preventively counteract potential intrinsic fall risk factors in children, it appears reasonable to design and test adequate intervention programs that specifically focus on intrinsic fall risk factors. In seniors, there is evidence from systematic literature reviews and meta-analyses indicating that particularly the combination of balance and resistance training is effective in reducing the fall rate by 15–50% in community-dwelling older adults between the ages of 65 and 97. In children, there is also support in the literature for the effectiveness of a school-based intervention program on injury rate during physical education (50% reduction in injury rate). Further, preliminary data exist indicating that intergenerational relationships affect and influence participants of exercise programs in terms of providing motivation for older adults to exercise more regularly when children are included and to increase the older adults’ self-esteem as they act as role models for positive lifelong exercise habits [8]. Children’s motivation may be increased as they see older adults in a non-stereotypic role, and they may recognize the importance of exercise as a lifelong endeavour [8]. Further, it was recently demonstrated that an intergenerational approach as compared to a single generation program increased the level of social acceptance, willingness to help, and empathy for older people in children [9].

Effective Program Implementation

Studies describing the effects of balance or resistance training on intrinsic fall risk factors were presented in our mini-review in the section ‘Fall Prevention in Children and Seniors’. It was reported that these neuromuscular training regimens have the potential to counteract intrinsic fall risk factors in children and seniors by improving balance and strength performance. Based on these findings, it appears plausible to argue that the combination of balance and resistance training may not only be effective in reducing the fall incidence rate in seniors (as already shown) but also in children. Further, given that balance and strength exercises reflect the physical needs of children and seniors and because intergenerational exercise groups may enhance motivation of participants during training [8], it is suggested to apply bal-

ance and resistance training in an intergenerational fall prevention approach. In fact, high adherence rates (93%) were reported in such an intervention approach that aimed at improving health-related fitness [10].

We are currently conducting a study with school-aged children (third grade) and community-dwelling older adults who come together bi-weekly during physical education lessons to improve their balance and strength performance. Schools provide an excellent opportunity for fitness promotion as they access a large population of children across broad ethnic and socioeconomic strata. The integration of older adults in school-based intervention programs may substantially contribute to strengthen their social network, to increase physical activity and consequently to reduce the morbidity rate [11]. Therefore, the implementation of fall-preventive intergenerational intervention programs in school settings represents a major challenge for teachers, health professionals, community social workers, scientists, and politicians. Researchers in the field are encouraged to conduct studies inves-

tigating the effects of balance and resistance training on both, intrinsic fall risk factors and fall incidence rate in children and seniors. Exemplified exercise protocols were presented in our mini-review (see tables 1 and 2 therein) to support researchers in their effort to conduct intervention studies.

In summary, there is support in the literature that the combination of balance and resistance training is effective in counteracting intrinsic fall risk factors and in reducing fall incidence rate in seniors (evidence-based). Whereas data exist regarding the positive effects of balance and resistance training in children on measures of postural control and muscle strength (evidence-based), there is preliminary/limited evidence in terms of training-induced effects on fall incidence rate. Intergenerational intervention approaches are promising because they appear to be specifically tailored to the physical, social and behavioural needs of both, children and seniors (evidence-inspired).

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