Exercise regimens, bone health and fracture prevention in later life: evidence still needed

The need to do everything possible to reduce fragility fractures in later life is agreed. By far the largest research investment and resulting evidence to date has targeted drugs to enhance bone mineral density (BMD), and the broad benefit/risk effectiveness of these agents in the primary and secondary prevention of fractures is established. There remain, nevertheless, some issues of treatment duration, medication compliance, relative cost-effectiveness and drug safety.

The potential contribution of non-pharmacological approaches is therefore important, and it is perhaps unsurprising that this is largely marginalised in the industry drug trial literature. There is, nevertheless, a growing body of evidence. Most importantly, falls incidence can be reduced by interventions that include defined exercise regimens either alone or as part of a multifactorial approach (depending on the population group and individual assessment), although the proportional contribution of falls reduction to fracture prevention has yet to be definitively quantified.

A related question is whether BMD might be conserved or enhanced by exercise regimens. There is broad generic, age-independent evidence for a positive effect of weight bearing and mechanical loading on bone mass and mineralisation, but remaining unclarity on the efficacy of exercise interventions targeting this amongst older people—for whom? when? exactly how? and for how long? Although other measures of structural bone strength (v. mineralisation) are recognised, BMD looks set to remain the broad pragmatic indicator of risk/benefit for the foreseeable future.

The available literature suggests a small potential benefit, but it has been heterogeneous in terms of (i) defining the exercise intervention and outcome measurement, (ii) BMD sites affected, (iii) duration of intervention and follow-up and (iv) population groups (although most studies have focused on relatively small samples of healthy community-dwelling older women) [1]. The study by Duckham et al. [2] published in the current issue comprises one of the larger subject samples to date (319) and investigates the effects of two commonly deployed falls prevention exercise regimens (the Otago Exercise and Falls Management Exercise Programmes—OEP & FaME) on BMD over 6 months, as part of a wider programme studying their influence on sustainable healthy physical activity in men and women over 65 recruited from primary care [3]. The finding of no beneficial effect on BMD in this ‘real world’ model is important and is relevant to commissioning in the immediate UK NHS context.
It raises questions, however, for the direction of further research, on which, despite recent efforts [4], there is still a need for developmental strategy. Key research issues may be as follows:

**Population selection**

In the absence of a unified regimen clearly beneficial in a broad population covering both falls prevention and BMD, the need either for individual ‘tailoring’, or stratifying by modified BMD-configured FRAX® risk [5], or both, appears inescapable for a better understanding of BMD enhancement. We need to be able to identify and target those likely to benefit most.

With falls prevention, this general concept has been inherent in OEP & FaME from the outset, and recently underlined [6] following a Cochrane review confirming a broad applicability of exercise regimens in older people (but in those at higher risk of falling the concurrent relevance of multifactorial interventions) [7]. With BMD as the focus, however, research study population selection has varied widely in the literature in terms of exercise regimens in those receiving (e.g.) bisphosphonates de novo and concurrent medication, need careful consideration funding age-associated variables, including cumulative diagnoses and concurrent medication, are indicated. Further controlled comparisons to determine the additive effects (or otherwise) of defined concurrent exercise regimens, at different BMD-related risk levels, and initiated at the onset of medication administration, are indicated.

Because of these questions, the strategy for clinical studies should probably in the short term remain developmental, exploratory and patient selective rather than broad and general. Safe weight-bearing physical activity is beneficial to bone health across the age spectrum. Though relevant to falls prevention, the precise contribution of defined exercise regimens to bone health in older people is still unclear.

**Key points**

- Some (but not all) exercise regimens may improve BMD in some (but not all) older people.
- Further studies are needed to establish which regimens may most benefit which groups.

**Conflicts of interest**

None declared.

**References**

2. Duckham R, Masud T, Taylor R et al. Randomised controlled trial of the effectiveness of community group and home based treatment duration of 1 year or more is commonly envisaged for BMD increase to achieve clinically significant fracture prevention. With exercise interventions, there is no clear pattern from the literature so far, but intuitively, similar or longer duration may be required. Loading force within the regimen is a further key variable. As with falls prevention, fracture incidence as an outcome requires very large trial numbers at potentially unrealistic cost. For developmental comparative studies, therefore, BMD enhancement, probably focusing on proximal femur and spine, remains the preferred valid surrogate marker.