

50+ Yr Old Females – What can you expect when you “hit the gym”

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One of my clients performing an excellent S/L RDL at 66 years of age!!

STRENGTH TRAINING & AGING WOMEN

Firstly the good news, there has been significant research indicating that women can improve both upper and lower body strength with similar percentage improvements rates to that of their equivalent aged male counterparts.

There are some specific age related differences that need to be addressed and this article reviews some of these issues:

BONE MINERAL DENSITY (BMD) (Pre & Post Menopausal).

Peak bone mass is usually reached during a woman's 20s to 30s when the skeleton has stopped growing and bones are at their strongest. The female sex hormone oestrogen plays an important role in maintaining bone strength. After menopause oestrogen levels drop and this may result in increased bone loss.

The average woman loses up to 10 per cent of her bone mass in the first five years after menopause.

Research suggests that about half of all women over the age of 60 years will have at least one fracture due to osteoporosis.

It is widely believed that resistance training will assist in improving bone density in women, unfortunately it seems that resistance training alone isn't enough to ensure that Bone Mineral Density (BMD) is maintained as you age.

There have been several studies to show that exercise resistance and low impact loading alone has limited influence upon BMD: Strength training alone over 9 months did not lead to significantly greater change in total body or regional BMD in premenopausal women. & walking showed no significant effect upon preservation of BMD at the spine in postmenopausal women . These studies were follow-ups to three very important studies on BMD and exercise:

The classical studies by Rubin and Lanyon have established that bone responds to **dynamic loads** while it is **insensitive to static loads**, independent of their magnitude, and have defined the following principles of the maximal osteogenic (bone growth) mechanical stimulus:

- a few load cycles are necessary and sufficient (for instance: 4-5 jumps);
- loads must be of high magnitude;
- loads must be applied at high rate;
- loads should produce an unusual distribution of strain (strain is the unit of deformation)

Further studies from the same authors have established that bone responds to loads of a progressively lower magnitude, provided that the frequency of their application increases. In other words, the higher the frequency of load application, the lower the threshold of bone sensitivity to the load itself.

Undertaking both endurance and dynamic resistance exercise are potentially osteogenic.

Walking and jogging increase modestly the loads on the skeleton above gravity (2-3G) and do not lead to increase in muscle force and power. Not unexpectedly this type of exercise has proved to be relative ineffective in osteoporosis prevention.

JUMP TRAINING & BONE MASS DENSITY (BMD)



Undertaking any form of jump training can be problematic for postmenopausal females due to either a loss of BMD already (making the bones more fragile to loading) and/or joint issues with aging (deterioration in the shock absorption capacity of joints such as ankles, knees, hips and

lower back).

There has been much research on the importance of impact training and BMD in premenopausal females with some results below:

1. Women were randomly assigned three groups – control, 10-jumps group and 20-jumps group (both jump groups completed either 10 or 20 jumps twice per day for 16 weeks).

Results highlighted that the 20-jump group had significantly greater BMD than the 10-jump group who in turn had significantly greater BMD than the control group.

2. Women were randomly assigned to two groups (controls and exercisers (combination of resistance and jumping)). There was a significant difference in greater trochanter BMD between exercise group and controls.

3. A meta-analysis of exercise modalities and BMD highlighted that exercise programs that combine high-impact activity with high-magnitude resistance training appear effective in augmenting BMD in premenopausal women at the hip and spine. High-impact-alone protocols are effective only on hip BMD in this group.

One series of pilot studies highlighted the level of impact required that leads to this relationship b/w jumping impacts and BMD .

"Interestingly, vertical impacts >4g, though rare, largely accounted for the relationship between habitual levels of Physical Activity (PA) and BMD in adolescents. However, in a subsequent pilot study where we used the same method to record PA levels in older people, no >4g impacts were observed. Therefore, to the extent that vertical impacts need to exceed a certain threshold in order to be bone protective, such a threshold is likely to be considerably lower in older people as compared with adolescents."

Another way to look at this research is due to the lack of ~4g impacts with older women, their BMD continues to decrease until they begin to show symptoms of osteoporosis and all the negative side-effects of this degenerative process.

This brings up two questions:

1. *What does a 4g impact look like?*
2. *How to include appropriate vertical impacts up to 4G in a way that doesn't cause secondary issues such as joint pain or bone damage.*

Q. What does a 4G impact look like?

Some example Impact loads are shown in the table below:

Exercise Type	G-Force load (Multiple of Body Weight (BW))
Standing still	1BW = 1G
Walking	1.2-1.5BW
Jogging	2-3BW
Running	3-4BW
Jumping	5-9BW

From the above outputs you can see that walking creates little appropriate stress on the skeletal system that results in any bone formation. Jogging brings you closer to the desired impact levels but it is running and forms of jumping that need to be incorporate where possible into any exercise routine.

Q. How to include appropriate vertical impacts up to 4G in a way that doesn't cause secondary issues such as joint pain or bone damage.

There are two main ways in the gym that we can achieve this level of G-force loading upon the skeletal system:

1. Complete multiple box jumps/hurdle jumps.



The main issues here are:

- coordination of having to jump onto and down off a box
- Having to try to jump over a box, hurdle or equivalent
- Knees/ankles not having the sturdiness to handle rapid flexion/extension under these sorts of dynamic loads (the biggest issue).

Unless you have a background in this sort of training I would suggest you keep this to a minimum and focus on the second method of incorporating impact training into your training routines.

2. Perform low height, short contact time, high impact double leg jumps.



Biomechanically speaking – If you decrease the ground contact time (t), you increase the force (F) in the following impulse equation ($I=F*t$).

These jumps provide the following benefits:

- a. By keeping your knees/ankles stiff during the activity, you minimise the difficulty of having to rapidly resist your body weight as you land through a large joint range of motion that may cause pain through cartilage degeneration and other joint abnormalities typical with old age.
- b. By placing your knees/ankles at an angle that is largely pain free (if that is possible), you have a better chance of minimising joint pain when performing repeated jumps.
- c. due to the minimal shock absorption aspect of these jumps, your jump height doesn't have to be high to generate the 3-4G loads needed to maximise BMD throughout your skeletal system.

How do these jumps generate the required G-forces required?

(For the maths nerds amongst us!)

Using some good old fashioned work/energy equations, here is how to get to the required G-forces with minimal jump height required:

Work = Force*distance

Potential Energy = mass*gravity*height

Work = Potential Energy ($F*d = m*g*h$)

Therefore if we manipulate the above, we get

Force = mass*gravity*height/distance

Example – 80kg person, jumping up 10cm and collapsing only 3cm at impact.

Force = mass*gravity*height/distance

Force = $80 * 9.81 * .01 / 0.03$

Force = 2616N

1g = $80 * 9.81 = 785N$

$2616\text{N}/785\text{N} = 3.3\text{G}$

Therefore for an 80kg person, a 10cm vertical jump with only 3cm collapse at impact results in a 3.33G impact.

If you can reduce your "collapse" at ground contact to 2cm (by further resisting any joint collapse at ground contact) you can increase your Impact G-Force to ~5G.

How to perform this exercise:



1. Stand with hands on hips, core tight, knees slightly bent and a focus on being strong through your ankles, knees, hips, and stomach/core region.
2. Perform repeat stiff ankle jumps with a focus on height and minimal shock absorption throughout any part of your body (you will feel the force rush through your body at each ground contact).
3. Complete a small number (3-5), rest and repeat completing a total of 6-10 jumps (all that is required).

I will write more about this important training exercise and physiological response in a future article.

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POSTMENOPAUSAL BODY COMPOSITION CHANGES:

The second aspect that postmenopausal women need to be aware of is the rapid change in hormonal status post menopause and how this may effect your physical status.

All major anabolic hormones (testosterone, growth hormone, estradiol, IGF-I, and DHEA) were shown to be significantly reduced in postmenopausal women.

It is possible that the onset of menopause may augment the physiological decline associated with aging and inactivity. More so, a higher incidence of metabolic syndrome (an accumulation of cardiovascular disease risk factors including obesity, low-density lipoprotein cholesterol, high

blood pressure, and high fasting glucose) has been shown in middle-aged women during the postmenopausal period. This is due in part to the drastic changes in body composition but also a change in physical activity (PA) levels.

Total body lean mass and regional BMD decreased, while the percentage of body fat, trunk fat mass, and trunk–leg fat ratio increased with aging and after menopause.

Whilst this all sounds quite dire, the above research also found the following from this research:

Trunk fat mass, trunk–leg fat ratio, and percentage of body fat were positively correlated with age but not with menopausal status. Decrease in lean muscle mass and BMD are more menopause-related, while the shift toward upper body fat distribution and overall adiposity are more age-related.

These researchers were stating that menopause and associated hormonal changes are not the cause of increases in body fat, loss of muscle mass (and all the associated limitations that come with these two factors) it was in fact a lack of PHYSICAL ACTIVITY that was the cause of these once thought of as irreversible postmenopausal symptoms.

One comment from Copeland, et al that stuck a cord was:

"It is believed that a major portion of age-related changes are a result of lifestyle and environmental influences, which may explain why some individuals age more successfully than others."

So the good news is that we are back to the "use it or lose it" concept I introduced in an earlier article on strength/muscle and aging.

Another statement from a research paper on functional fitness indicated that the reduction in physical activity level and functional fitness was equal for both men and women and was due to the aging process. These differences between young and old elderly people were due to the reduction of muscle strength in both upper and lower limbs and changes in body-fat percentage, flexibility, agility, and endurance.

If you have been following my last ½ dozen articles on physical fitness and aging you will see that every one of these physical attributes that are expected to rapidly drop away with aging can indeed be slowed down and in some cases reversed through the appropriate exercise programming.

SUMMARY:

Postmenopausal women do have some challenges ahead of them when it comes to exercise and adaptation – BUT, there is no doubt that with the appropriate exercise routines, combined with dynamic resistance loading for the skeletal system that 50+ year old women can continue to maintain a high level of functional fitness well into their 60's and 70's.

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