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Comfortable

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## HOW DOES ERGONOMIC DESIGN AFFECT COMFORT?

Ergonomics is the study of designing equipment and devices that fit the human body, its movements and its cognitive abilities. Proper ergonomic design is necessary to prevent injury and ensure a safe working and living environment. Wool carpets can play a key role in achieving this.

Walking comfort and safety are important ergonomic considerations in homes and work places, with particular emphasis on characteristics such as:

- *Slip resistance*
- *Walking comfort / ergonomics*
- *Impact resistance (from falls, dropped objects, etc)*
- *Flammability*
- *Acoustics*
- *Static resistance*
- *Pollutant absorption / accumulation*
- *Microbial resistance*

This fact sheet discusses two of these. The propensity for walking comfort/ergonomics and slips/falls on different flooring surfaces.

Carpets are a key determinant of comfort within a room inside; providing better support for the feet than hard flooring, irrespective of whether a person is walking or standing.

Resiliency (or the amount of 'spring back') is an important factor in the ergonomics of the underfoot feeling when walking on a flooring system. The flooring system needs to be resilient enough to return some of the energy of compression back to the foot to aid in lifting it to take the next step. Hard flooring surfaces (tiles, wood, Linoleum, etc) have poor resilience and this may contribute to the fatigue of the occupants (Redfern and Chaffin 1998).

It has also been shown that the effects of textile floor coverings on postural steadiness and locomotion stability are critical to safety and physical functions for the elderly (Pan et al., 2005).

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## WHY IS ERGONOMICS IMPORTANT IN FLOORING SYSTEMS?

40% of all injuries occur around the home, and falls are the most common cause of non-fatal injuries in under 5 year-olds. Whilst the potential benefits of carpet over hard flooring in terms of cushioning are poorly understood, rather more data exists to describe their benefits in terms of reducing falls in the first place.

Carpets provide cushioning and support for the feet, which can have benefits in both dynamic (walking) and static (standing) conditions. In addition, good correlations have been shown between subjective assessments of carpet comfort and measurements of maximum deceleration (a measure of impact intensity) (Norton et al 1995). As a human footfall generates a force around 1.3 times the body weight of the person, the ability of floor coverings to minimise this impact is critical to determining aspects such as user comfort, stability and ease of walking.

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## HOW DOES WOOL CARPET COMPARE TO HARD FLOORING WITH RESPECT TO SAFETY/ERGONOMICS?

Wool carpets have similar coefficients of friction (kinetic and static) to hard flooring when dry, but these are significantly higher when for wool carpets when the flooring surfaces are wet ( Figure 1). This is particularly so of kinetic friction – which is of greater relevance in dictating propensity for falls than static friction. Higher coefficients of friction are associated with a reduced propensity for slippage.

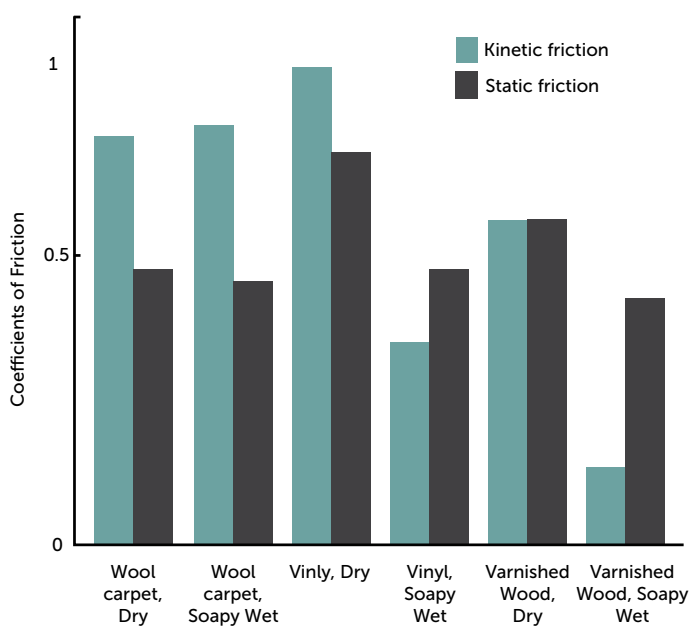


Figure 1. Coefficients of static and dynamic friction of differing wet and dry flooring surfaces, for a typical men's shoe (Metcalf 2003).

Wool carpet is slip-resistant and comfortable to walk and stand on. The texture of the wool pile produces a superior surface friction, which is important to maintaining good traction and grip as you walk.

Wool's unique structure and resilience provide the support and confidence necessary to maintain balance and coordination. These are particularly important for walking

stability and fall prevention for the elderly and toddlers ([www.woolnz.com/content/en-US/benefits/natural-health/safe.aspx](http://www.woolnz.com/content/en-US/benefits/natural-health/safe.aspx)). In addition to having non-slip properties, carpet has been shown to result in an improved gait (length and speed of step) in elderly people compared with vinyl floor covering (Wilmott 1986).

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## KEY POINTS

### Comfort and Ergonomics

- *Carpets are a key determinant of standing/walking comfort, providing better support for the feet than hard flooring, irrespective of whether a person is walking or stationary.*
- *Less muscle effort is required to walk across carpet than hard flooring.*
- *Improved stride length, speed and stability is achieved on carpets compared with hard flooring.*
- *Improved comfort and a lesser incidence of reported lower back/leg pain, is also reported when carpets are used as floor coverings*

### Non slip/impact resistance

- *Carpets provide a safe, comfortable living and workplace surface for people of all ages.*
- *Falls are the leading cause of non-fatal injuries in under-5-year olds, and cause injuries in the elderly*
- *Particularly when wet, wool carpets have a higher coefficient of kinetic friction than hard flooring surfaces, meaning the propensity for slips/falls is much reduced.*

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