

Analysis of lower limb movement to determine the effect of manipulating the appearance of stairs to improve safety: a linked series of laboratory-based, repeated measures studies

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Plain English summary

Analysis of gait kinematics

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Plain English summary

We investigated whether or not modifications to the appearance of steps and stairs could help make them safer for older people to negotiate. We found that adding a high-contrast, 5.5-cm highlighter along the step/stair edge improved stepping safety when going downstairs by reducing the number of very low heel clearances and heel scuffs. We also found that the position of edge highlighters was important and that they are best positioned along the tread edge rather than set 1–3 cm back.

A safety precaution that can be used by older people when going up stairs is to lift their foot up higher to avoid tripping. We found that a version of the horizontal–vertical (H–V) illusion, where a horizontal strip on the tread edge, plus a series of vertical stripes on the step/stair riser, is used (the simplest version of the illusion is a letter ‘T’ that has the same size horizontal and vertical limbs; the vertical limb of the ‘T’ looks bigger than the horizontal) increased foot clearance significantly, without causing any safety/balance concerns. This suggests that using this H–V illusion may be a useful modification to raised walkways (e.g. kerbs) and/or the first and last steps of stairways to help avoid trips and falls when negotiating walkways or walking up stairs. In future work, the effect of the modifications should be assessed in older people with visual impairment, and an assessment of falls rate on stairways with and without the edge highlighter and the H–V illusion would need to be performed.

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