

STATIONARY VISUAL CUES REDUCED CENTRE OF PRESSURE DISPLACEMENT IN A DYNAMIC ENVIRONMENT FOR EXPERIENCED ROOFERS

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INTRODUCTION

A worker's postural stability can be compromised by the worksite, work experience and age. Roofers are chronically exposed to a challenging environment: dynamic visual fields, various roof pitch angles and frictional surfaces, gusting winds and handling loads. Recent research has shown that job-specific skills are maintained despite age [1, 2]. These observations might extend to enhanced balance control in roofers due to the challenging environment. Changes to the worksite may improve balance: visual references reduced centre of pressure (COP) displacement in a static lab environment, both at height and on a deformable surface [3].

The purpose of this research was to determine if stationary visual references would reduce COP displacement in a dynamic visual environment, and if the amount of reduction was dependent on work experience and age.

METHODS

Four groups (n = 10 in each group) were examined: younger (26.3 ± 3.1 yrs) and older roofers (50.6 ± 4.2 yrs), younger (26.2 ± 3.7 yrs) and older controls (55.1 ± 4.5 yrs). Roofers had a minimum of two years experience. All subjects were male, healthy and free from any neurologic or otologic disorder. Participants stood on a forceplate (AMTI), either outside (quiet standing) or inside a visual surround (1.2 x 1.2 x 2.3 m), which translated 13 cm in a sinusoidal manner at 0.24 Hz. Six conditions of visual stimuli were examined: (1) 'normal' visual field, (2) static visual field (quiet standing inside stationary surround); the remaining conditions were dynamic visual fields with the following stationary references, (3) no references, (4) two foreground references (inside the moving room), (5) two background references (outside the room) and (6) both foreground and background references. The COP was filtered at 10 Hz with a dual-pass zero-phase-shift fourth-order Butterworth digital filter and quantified by the root mean square (RMS). Statistical analyses were a three factor ANOVA (visual stimuli x age x work experience).

RESULTS AND DISCUSSION

The three way interaction was not significant (p=0.38). The effect of visual stimulus on COP RMS was dependent on work experience (p=0.035). Post hoc analyses revealed that the

RMS of the roofers was not different from the controls for four of the six conditions: the quiet standing conditions and the moving room conditions without references or with foreground references (Fig. 1). When background stationary references were present, the COP RMS of the roofers was significantly lower than the controls. When both foreground and background stationary references were present, the COP RMS was reduced compared to the no reference condition, but only for the roofer group. In fact, with both foreground and background references, the response was not different from quiet standing without references. The control group did not reduce the COP RMS with the visual references. Therefore, work experience in a challenging environment did not result in reduced COP RMS either during quiet standing or in a dynamic environment without stationary visual cues in the background. Stationary references in the background did reduce COP displacement, but only for experienced roofers.

The age effect was not dependent on work experience (p=0.17). The roofers had significantly lower COP RMS (p<0.001), and both groups showed similar increases in COP RMS with age (p<0.001). It was interesting to find that the COP RMS of the older roofer was not different from the younger control. Therefore, work experience did not mitigate the age-related changes on COP RMS, but the older roofer had similar postural stability as the younger control.

CONCLUSIONS

Stationary references at the dynamic worksite would only be beneficial for experienced roofers, and need to be in the background. Those at greatest risk of instability due to increased COP displacement, the older, inexperienced roofer, would not benefit from stationary references added to a dynamic worksite.

REFERENCES

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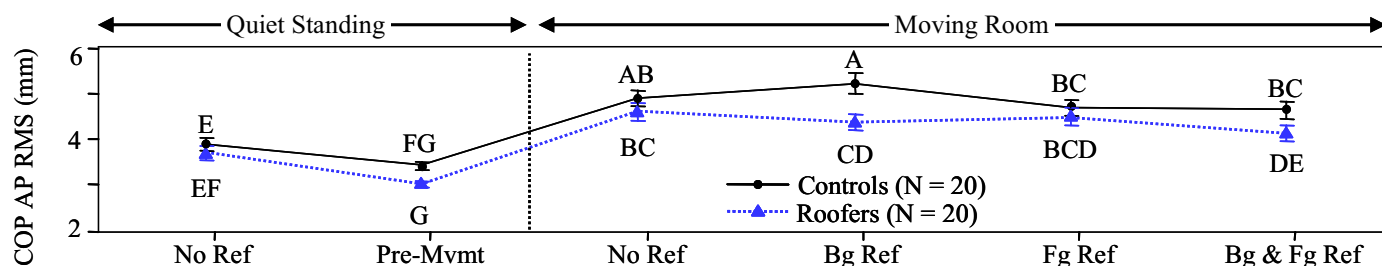


Figure 1: COP RMS compared across work experience and visual background. Bg and Fg = background and foreground references. Letters identify significantly different responses, when more than one letter is present, the response was not different from a response with the same letter (e.g. response with AB was not different from response with A or B).