Evaluation of electrical screed leveling machines on physical work demands and productivity

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1. Introduction
Kneeling and trunk flexion frequently occur among screed floor layers and are associated with high prevalence and incidence rates of low back and knee complaints. In the Netherlands, ergonomic measures became available for floor layers to perform their work in a more upright working posture by means of electrical screed leveling machines. The research questions of this study are to determine differences between two types of electrical screed leveling machines on i) duration of kneeling, trunk flexion and pushing and pulling and ii) production time among floor layers.

2. Method
To answer both questions (Visser et al. submitted), a within-subjects (n=10) controlled field study was performed using a self-propelled and manual-propelled electrical screed leveling machine. Each floor layer was observed twice, once while installing a screed floor with the self-propelled machine and once while installing a screed floor with the manual-propelled machine. The duration of kneeling, trunk flexion, pushing and pulling and installing a screed floor were assessed by real-time observations (TRAC, Frings-Dresen & Kuijer, 1995) for each floor layer in two similar residences, i.e. a house or an apartment. Production time was defined as the time required to install a screed floor for each room (living room and bedrooms) in apartments or for each floor (ground floor, first floor and attic) in houses. The production time for a screed floor in an entire apartment or house was calculated by counting up the time per room or per floor.

3. Results
The duration of kneeling (p=0.003) and trunk flexion (p=0.000) were significant longer using the self-propelled machine compared with using the manual-propelled machine, 13 (SD 7) and 12 (SD 10) minutes per residence, respectively. Pushing and pulling occurred while working with the manual-propelled machine only: on average 39 (SD 12) minutes per residence. No difference in production time was found (p=0.323).

4. Discussion
Using the self-propelled machine results in longer duration of kneeling and trunk flexion compared with using the manual-propelled machine. Pushing and pulling only occur using the manual-propelled machine. Both electrical machines reduce the exposure towards kneeling and trunk flexion compared with the traditional manner of floor laying while no differences in production time are expected in residential houses and apartments. An estimated reduction of the exposure to kneeling and trunk flexion compared to the traditional manner – working without electrical screed leveling machines – of floor laying (Visser et al. 2013) is 21 and 27 minutes per day for the self-propelled machine and 60 and 61 minutes per day for the manual-propelled machine, respectively.
References

