Measurement strategies in the application of guidelines for manual materials handling in scaffolding

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Introduction

Workers in the building and construction industry have a high risk for the occurrence of musculoskeletal disorders. Scaffolders are among the workers within this branche of industry with the highest risks. Prevalences of complaints of lower back, upper and lower extremities are high among scaffolders. In particular, complaints of the shoulder and wrist are more often reported than among most other construction workers.

During the principal tasks of scaffolders, i.e. erecting and taking down scaffolds, manual materials handling is one of the most dominant activities. It is widely accepted that the relatively high prevalences of musculoskeletal disorders in this profession can partly be attributed to the high exposures to manual lifting, lowering and carrying of heavy materials. In reducing exposure to manual handling of materials it can be helpful to apply guidelines for manual materials handling. However, scaffolders handle many different materials, mostly without but sometimes with the help of aids, and in largely varying circumstances. In particular, differences in type and weight of scaffolding-poles and -boards result in tremendous variance in the handled loads. Furthermore, numerous other materials are repeatedly handled, ranging from baseplates and standards, guard rails and toe boards up to different ties to securely fix the whole scaffold structure. Hence, variance in the handled loads and other sources of variation in the job hampers straightforward application of guidelines. The aim of this study was to explore an optimum measurement strategy for the application of manual materials handling guidelines in scaffolding.

Methods

Self-administered checklists were used to apply the 1991 NIOSH lifting equation and the guidelines for carrying, pushing and pulling as described by Mital and colleagues. For each different manual handling situation all items of the checklist had to be completed. The first measurement strategy aimed at teams of workers and resulted in application of guidelines for 26 scaffolders (4 teams of 3 workers, 7 teams of 2 workers). Each team was observed for a couple of hours and required measurements were performed. The frequency of each manual handling situation was assessed during the observation period and derived for a full working day using team productivity data. In the second measurement strategy another 61 scaffolders were systematically observed using OWAS. Each worker was observed during two periods of 30 min, and every 30 s his task, activity, handled load, and working posture was registered.

Results

Table 1 illustrates that on average 32 checklists were obtained for each of 26 scaffolders, resulting in a total of 833 checklists. The number of checklists per worker ranged from 12 to 71. By far the majority of the checklists concerned application of the 1991 NIOSH lifting guideline (the mean number of checklists for lifting was 22), while for pushing and pulling

hardly ever more than one checklist was necessary. For carrying the large variation in the number of checklists is noteworthy; for one worker no checklist had to be filled out while for another 39 were necessary.

Table 1. Mean, standard deviation (SD) and range of the number of checklists completed to obtain information needed to apply guidelines for manual materials handling (n = 26).

Activity	Mean	(SD)	Range
lifting	22.00	(7.84)	8-37
carrying	8.85	(8.03)	0-39
pushing	1.00	(1.17)	0-4
pulling	0.19	(0.40)	0-1
Total	32.04	(12.50)	12-71

The systematic observations among 61 scaffolders revealed that 36% of the time was spent on lifting and 9% on carrying, while pushing and pulling were hardly observed (together only 0.4%).

The checklist strategy enabled proper application of guidelines for many individual material handling activities. However, exposure to these activities over the working day is difficult to estimate in non-repetitive work such as scaffolding. Even the use of productivity data did not solve this problem completely. Systematic observation, on the other hand, gave fair insight into daily exposure of the average worker, but hardly any of the information needed to apply guidelines for manual materials handling was obtained. To advance insight into the optimum approach, the strategy using checklists and productivity data and the approach using systematic observations will be combined in further analyses. The use of task and activity durations from systematic observations as complementary data for the application of guidelines by the checklist appraoch will be explored. At this stage, however, it can already be concluded that a simple application of guidelines for manual materials handling is difficult among scaffolders due to the large variation in their work.