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## Interventions to reduce the ergonomic exposures of drywall installation

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### Abstract

The study was conducted to assess the efficacy of an assistive tool to reduce the physical exposures of the ceiling installation task. Based on the idea of using a ‘deadman’ (long narrow piece of panel) to help hold the panels on the ceiling while installing them, a prototype tool was fabricated that could be placed on its own while supporting the ceiling. This tool, which was introduced to the drywall foremen and ceiling installers at a construction site, was implemented as an intervention for the ceiling installation process. To evaluate the efficacy of this tool for exposure reduction, the researcher collected quantitative exposure data (PATH) and qualitative data at the baseline and intervention phases. The data at the two time periods were compared to evaluate any change in the exposure with use of the tool. Results showed that physical exposures (such as overhead arm, postures, heavy load handling, load handling while holding the panels with arms raised while being on a ladder) were reduced while using the tool at the intervention phase. Reduction of physical ergonomic exposures by the use of the prototype tool is evident in the result while the tool itself was a better version of the ‘deadman’ regarding its easy usage and self-supporting structure i.e., the installers need not hold it under the ceiling.

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### 1. Introduction

Drywall carpentry has exposure to a number of risk factors that may lead to musculoskeletal injuries and illnesses [1,2,3,4]. These physical exposures include awkward body postures, heavy handling of drywall panels, and the necessity to lift drywall panels in overhead arm postures while being on a ladder [5,6]. The main concern about these exposures is their long term potential to result in musculoskeletal injuries or illnesses. The installers are

exposed to these risk factors in their daily work time especially while lifting and attaching the heavy drywall panels (>50 lbs) to the ceiling, which is one of the most demanding activities during the drywall installation task [7]. The installers are forced to maintain overhead arm postures to subsequently hold the panels against the ceiling while attaching them permanently.

The usual process of installation includes cutting the panels as necessary and carrying them to the ladder. The workers use a ladder to raise the panels to the ceiling and to attach them permanently. A screw gun is used to attach the panels to the framework primarily from the ladder but this can be performed from the floor too depending upon ceiling height [7].

In a pilot study carried out in 2010-2011 [8], the research team showed the reduction of the aforementioned exposures during the ceiling installation by the use of a ‘deadman.’ Although the ‘deadman’ was easy to fabricate and a reduction of the physical exposures of the ceiling installation task was shown, it was not permanent and had several disadvantages such as that it must be held with the hands requiring significant grip force and an upward force was applied to the ceiling drywall panels to keep them in place. Considering these premises, the researchers intended to fabricate a prototype tool based on the ‘deadman’ concept. The method of ceiling installation preferred by the installers was to stand on a ladder rather than on an electrical lift. The objective of this study was to implement this prototype tool as an intervention and to determine its efficacy in reducing awkward arm posture during ceiling installation.

The following criteria were looked for while transferring the idea of ‘deadman’ into a permanent structure:

- Should not be heavy to handle,
- Must support ceiling drywall by itself,
- Does not require upward force application to the ceiling, and
- Only minimal grip force should be required.

## 2. Methods

### 2.1. Fabrication of the tool

An adjustable pole designed for window-washing (8-13’ height) was found that satisfied these criteria. A tiltable head which was originally part of a paint pad was fitted to the pole with a threaded attachment. These two parts of the tool (figure 1) that functioned together, had the following ergonomic advantages to be used as a ceiling support during the installation process:

- The pole had a stable base.
- Once positioned, it did not need to be held in place.
- The head portion had a tilting mechanism, so it could be used at an angle (for upperwall installation) or at a zero degree angle (for ceiling installation).
- The rod was easy to grip.
- The tool does not occupy much space.
- The tool reduces the worker’s need to hold the drywall panel in an overhead arm posture.



Fig. 1. Use of the tool at a construction site.

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