Comparing Training Methods For Learning An Ergonomic Bed Making Tool

Abstract

Housekeeping is the most physically demanding job within the hospitality industry and this department experiences high rates of musculoskeletal disorders, low job satisfaction and labour shortages. This research investigates the effectiveness of different training methods for housekeepers using the Duvetlifter, an innovative ergonomic tool designed to reduce physical strain during bedmaking. The Duvetlifter was developed to support housekeepers in changing the duvet cover with minimal physical effort. However, this new tool initially increases the time to change a bed as housekeepers must learn how to operate it. This study compares three different methods to learn the bed making tool: On-the-job training, video training and a hybrid method. 24 hospitality students working in a housekeeping department participated in the study where they were asked to change a bed using the DuvetLifter anywhere between 2 and 6 times. Their learning curves were analyzed by recording the task completion time. Results point out that training that involves a human trainer provide better task completion times when learning new tools, but also that across 6 trials, completion times converge to a similar value.

Keywords: Ergonomic Technology, Housekeeping, Bed Making, Training, Learning Curve, Sustainable Employment

1. Introduction

Hotel companies are facing personnel shortages and turnover. This problem is most prevalent in housekeeping departments. Housekeepers working in hotels have a risk of developing musculoskeletal pain when working. Reducing occupational pain would therefore benefit housekeeping employees directly and hotel companies indirectly. Research has shown that bedmaking is the most physically demanding task performed by housekeepers (Harris-Adamson et al., 2019).

The DuvetLifter is a tool developed to reduce strain that housekeepers experience when changing duvet covers (Koerten et al., 2025). Despite the tool being effective in relieving pain, it takes time to set it up and it will take housekeepers some time to learn how to operate the tool before it can be deployed optimally. This study compares three different training methods to see which training would be most suitable when learning new tools. The study also aims to find out how long it would take for a housekeeper to change a duvet cover using the DuvetLifter.

This research paper is part of a Professional Doctorate (PD) in leisure tourism and hospitality at Hotelschool The Hague, which aims to contribute practical, research-informed solutions to the hospitality industry and bridge the gap between industry and education.

2. Literature Review

2.1. Employment issues in Housekeeping

The hospitality industry is experiencing urgent personnel shortages (Domonkos et al., 2024). This issue is especially prominent in housekeeping, which traditionally experiences higher-than-average employee turnover rates (Zhang et al., 2024). A recent survey by the American Hotel & Lodging Association shows that 65% of hotels report shortages. Housekeeping is the most understaffed department at 38% (American Hotel & Lodging Association, 2025). The industry is also dealing with demanding working conditions. This leads to difficulties in retaining existing employees and attracting new ones (Haywood and Singh, 2024). The labor shortages have not been resolved yet, due to these physical demanding conditions and a lack of effective training (Xue et al., 2022). It is important to keep improving the working conditions and training to avoid more labor shortages in housekeeping.

Housekeeping is one of the most physically demanding jobs in hospitality. Time and motion studies by the Government of Canada indicate that housekeepers change their body position every three seconds. With an average cleaning time of 25 minutes per room, this results in approximately 8000 different body postures within a single shift (Government of Canada, 2024). These repetitive movements contribute to the high prevalence of musculoskeletal disorders within the housekeeping department (Chela-Alvarez et al., 2022). In fact, housekeepers experience the highest rate of musculoskeletal disorders in the hospitality industry (Wami et al., 2019). Musculoskeletal health concerns the functioning of the muscles, bones, joints, and connective tissues. Such disorders are mainly characterized by pain and reduced mobility (World Health Organization, 2022). Musculoskeletal disorders are reflected in a recent study where nearly half of 2229 housekeepers experienced severe physical pain. The most affected locations were the lower back, shoulders, wrists, and hands (Sánchez-Rodríguez et al., 2024). An earlier study by Sánchez-Rodríguez involving 1043 housekeepers, found that 28,7% specifically reported lower back pain. More than half of these housekeepers admitted not to use risk prevention measures during work (Sánchez-Rodríguez et al., 2022).

Housekeepers also report the lowest job satisfaction in hospitality (Andrade et al., 2021).

Beyond health, the strain endured by housekeepers also significantly impacts their productivity. A study conducted among 200 housekeepers in San Francisco revealed that 73% had to visit a doctor due to severe pain, and 53% needed time off work to recover. This resulted in an average of 14 days of absenteeism caused only by injuries (Hsieh and Chen, 2020). However, presenteeism (attending work while ill) is also a growing issue. This behavior harms both housekeepers' health and organizational productivity (Knani, 2022). It can lead to long-term consequences such as high medical expenses, reduced efficiency, and lower guest satisfaction. It is estimated that presenteeism is responsible for up to 90% of productivity losses (Yikilmaz and Surucu, 2025). Interviews with housekeepers confirm that many chose for presenteeism rather than absenteeism. The main reasons were their fear of being fired, solidarity for their colleagues, and a feeling of responsibility (Chela-Alvarez et al., 2022).

Housekeeping can be compared to kitchen work, where the tasks are executed in the back of house where no guest interaction is necessary. The difference however is that the work environment of kitchen staff is adapted to be comfortable for the employees. Countertops are at a proper working height, floors and walls are tiles to allow for easy cleaning. The work environment of housekeepers, however, is adapted to be comfortable for the hotel guests. To have beds be on working heights would make them less comfortable for guests to get in and

a hotel room with tiled floors and walls is perceived as less luxurious than a traditional floor with carpet and walls with wallpaper.

One way to reduce the pain and low job satisfaction experienced by housekeepers but also considering the guest preference for a comfortable room, would be to equip employees with tools that they can use to take the stress off their bodies. As the bed is the most painful task, Harris-Adamson et al. (2019) and Koerten et al. (2025) have developed tools to reduce the pain for housekeeping while changing beds.

2.2. Training in Housekeeping

As these tools change the way bed making work is organized and given the turnover rates in housekeeping, training employees to use these tools becomes a point of attention.

The Dreyfus five-stage model of adult skill acquisition offers an useful framework for understanding how individuals develop proficiency (Dreyfus, 2004). According to the model, learners progress through five different stages. Starting at novice to advanced beginner, competent, proficient and expert as they gain experience.
Reaching the proficiency stage means being able to perform tasks without consciously thinking through every step. At this level, individuals start to perform more intuitively. They develop a broader understanding of the task and adapt their actions as needed (Rousse and Dreyfus, 2021).

Despite the known benefits, trainings in the hospitality industry are often limited due to time pressure and staff shortages. Both managers and housekeepers have acknowledged the need for more structured trainings (Wijoyo et al., 2024). Training success also depends on ongoing implementation and evaluation. Continuous feedback help refine the training and boosts staff motivation (Hidajat and Mansur, 2024).

This study sets out to explore the learning curve of various training methods. We hypothesize that on-the-job training will result in better results than video training as it allows for housekeepers to ask questions and get help when first learning the bed making tool. We also expect the hybrid method to yield better performance as it provides participants with more means to learn the tool.

3. Methodology

3.1. Participants and Experiment

Participants were recruited from the 24-room hotel on the campus of a hospitality management school in the Netherlands. The hotel is meant for the school's students to learn the practical side of hotel operations. During their first year of the curriculum, a group of approximately 8 students spend one week in the housekeeping department where they are responsible for running operations. During three weeks in January 2025, the housekeeping students were approached to participate in the experiment. Participants were asked to come to an unused hotel room where they were asked to make a bed using the DuvetLifter. The Duvetlifter is a tool designed to help housekeepers lift up a duvet to take strain off the shoulders (Koerten et al., 2025). Figure [1] illustrates how the DuvetLifter works. Each week, the instructions on how to use the DuvetLifter were provided differently. During the first week, on-the-job training was used, where the researcher demonstrated the tool to the

participants before they were asked to use it themselves. During the second week, the participants were provided with a video explaining the DuvetLifter's working and had to figure out how to operate it themselves. During the third week, participants were provided with an on-the-job instruction as well as having the instruction video available. Demographics of the participants were measured, as well as completion time during each trial.

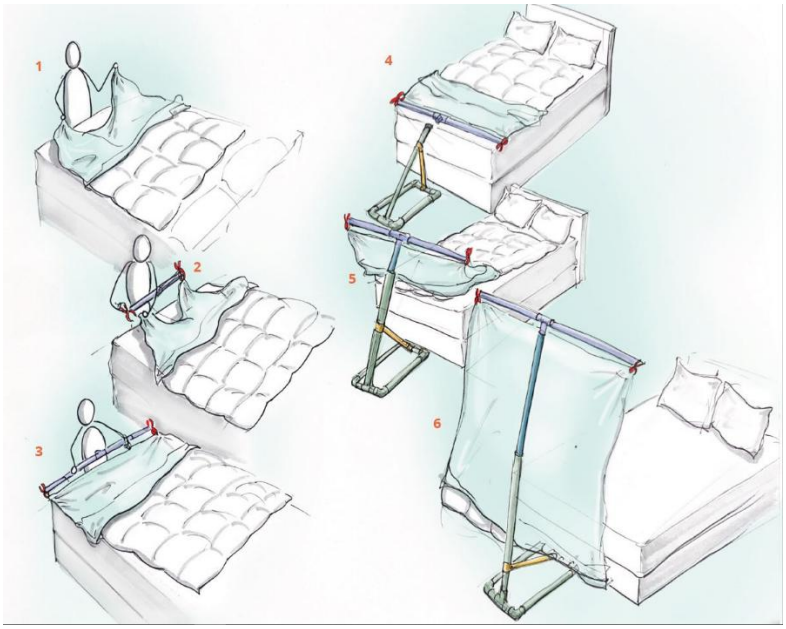

Figure 1: Illustration of the working of the DuvetLifter Tool

3.2. Training

Three different types of training are provided to the participants in a between subjects-study design: On-the-job training, video training and hybrid training.

According to (Kraiger and Ford, 2021), effective on-the-job training is grounded in five core principles. First, content should be organized and clear to minimize cognitive overload. Second, training materials are sequenced, progressing from foundational knowledge to more complex tasks. Third, learners are actively engaged by allowing them to ask questions. Fourth, effective training mirrors real-world conditions. Finally, overlearning is promoted through repetition and feedback. Based on these principles, the researcher created a standardized training script. This script was structured from assembly of the Duvetlifter to its effective use. The on-the-Job training occurred in a real hotel room and participants were encouraged to ask questions if anything was unclear.

The design of the instructional video is based on principles that align with the Cognitive Theory of Multimedia Learning. This theory explains how people learn more effectively from words and pictures, rather than from words alone. The theory is based on the idea that humans have two separate cognitive channels, one for processing visual information and another for auditory information. According to Cognitive Theory of Multimedia Learning, learning is enhanced when instructional materials make use of both channels in a complementary way. This could be done using visuals paired with narration or text (Irby et al., 2013). The theory also emphasizes the importance of managing cognitive load. Instructional video design should avoid overloading either channel with excessive or irrelevant information (Fyfield et al., 2022). Taking Cognitive Theory of Multimedia

Learning into consideration, a 2:53 minute instructional video was developed showcasing the use of the Duvetlifter. This was done through a combination of visual, audio, and text-based elements. The video is available in four languages: English, German, French, and Spanish to ensure usability for a diverse audience. During the experiment participants watched the video on a laptop that allowed them to pause, rewind, and fast-forward as needed.

The hybrid training combines the instructional video and on-the-job training. During the experiment participants first watched the instructional video to build foundational knowledge. The video was followed by an on-the-job training, where steps were clarified and question answered. This approach uses the flipped classroom model, ensuring the video provides preliminary instruction while on-the-job training focuses on application and problem- solving (Singh et al., 2021).

4. Results

4.1. Sample characteristics

Table 1, shows demographics of the participants, which participants were recruited for each group and how often they performed a duvet changing operation. 24 participants were recruited. 12 participants were female and 12 were male. The average age is 20. 8, 7 and 9 participants were recruited for the on-the-job training, video training and hybrid training respectively. 6 participants performed 2 operations (25%), 14 participants 4 (58%) and 4 participants 6 (17%).

Table 1: Demographics of participants

Participant	Gender	Age	Group	Trials
1	Female	20	On-the-job	4
2	Female	19	On-the-job	6
3	Male	19	On-the-job	4
4	Male	20	On-the-job	4
5	Male	20	On-the-job	6
6	Male	18	On-the-job	4
7	Male	22	On-the-job	2
8	Male	21	On-the-job	2
9	Female	20	Video	4
10	Female	21	Video	4
11	Male	20	Video	4
12	Female	18	Video	6
13	Male	20	Video	4
14	Female	18	Video	4
15	Male	18	Video	2
16	Female	20	Hybrid	2
17	Male	22	Hybrid	4
18	Female	18	Hybrid	4
19	Female	20	Hybrid	6
20	Female	19	Hybrid	4
21	Male	19	Hybrid	2
22	Female	19	Hybrid	4
23	Male	20	Hybrid	2
24	Female	19	Hybrid	4

4.2. Learning curves

Figure 2 displays the learning curves for the participants. The video training group on average needs more time to learn the tool initially. The hybrid group needs the least amount of time and has the flattest learning curves. All groups seem to converge to a completion time between 200 and 300 seconds.

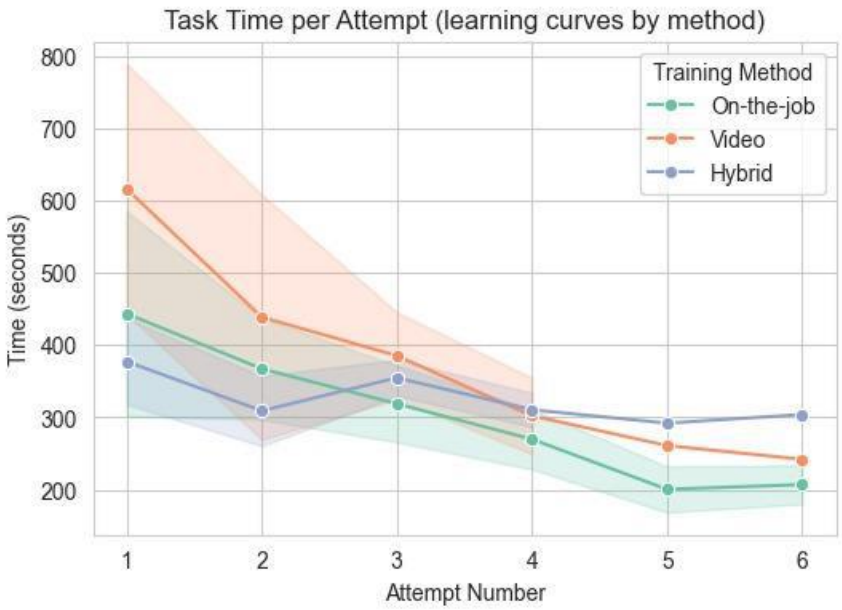

Figure 2: Learning curves for each training method

5. Discussion

5.1. Theoretical Implications

The results show that different training methods result in different learning curves. The hybrid method has the lowest initial completion time while the video method has the highest. All final completion times lie between 200 and 300 seconds. The fact that initially, there is a difference in completion time between methods is in line Kraigner and Ford (2021) as in the video method, there is no possibility for the housekeepers to ask questions and get feedback on their operation of the tool, which increases the initial completion time compared to the on-the-job training. Similarly, it makes sense that the hybrid method results in even lower initial completion times, as participants have more information available than in the on-the-job training. Interestingly, the average task completion time in trial six shows a different order where the hybrid method now takes the longest, followed by the video method and the on-the-job method results in the best final completion time of 200 seconds. However, only 4 participants performed the operation 6 times, so it might be more insightful to look at the completion times at trial 4, as 14 datapoints were used there. Here we see that the average completion times for the three groups lie in the same 50 second range between 260 and 310 seconds. These results can be related to Dreyfus et al. (2004), since the tool is easy to use, it can be assumed that the participants get proficient with it after a few trials and the initial training they received starts to matter less.

5.2. Practical Implications

The results point out that a hybrid method would be most effective in having housekeepers learn a new tool. The hybrid method, however, would also be the most expensive one to develop, as it requires a human trainer to be present as well as the manufacturing of an instruction video. As it can be argued that after 4 to 6 trials, participants get proficient enough with the tool, and the fact that housekeepers perform more than 6 bed changing operations per shift, the amount of time saved with using a more in depth personal training is marginal.

6. Limitations and recommendations

This research was limited by the real hotel work environment. Because of time limits, not every participant was available for the same number of trials. Because of this most participants used the tool 4 times instead of the desired 6 times. The sample also was young, balanced in terms of gender and inexperienced in housekeeping work. Because actual housekeepers have a bigger variety in age and experience and consists of more female than male employees, the sample is not the most representative. The DuvetLifter is a tool that is still in development. It takes some time to assemble the tool before it can be used, which boosts the absolute time needed for operation. Recommendations would be to test the training methods with housekeepers in commercial hotels. Also, the DuvetLifter tool could be improved to make it lighter and easier to setup. More longitudinal measurements could also provide more insight, as in the current experiment, the operation time seems to plateau around ~250 seconds. This could go down further, but there is also the risk of employees abandoning a tool if they don't feel like it serves them well enough.

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