Fall Prevention Training Program

Identifying effective proactive intervention is key to preventing occupational fall accidents. In this presentation, we will discuss fall safety in light of fall prevention training programs adopted by UPS and Diageo. This training program is modifiable and allows safety team to target safety strategies that can mitigate recurring fall accidents.

Injuries associated with slip and fall accidents continue to pose a significant burden to industry, both in terms of human suffering and economic losses. In 1998, the U.S. Bureau of Labor Statistics reported that falls accounted for 16.8% of all non-fatal injuries involving days away from work and 11.9% of job-related deaths. The annual direct cost of occupational injuries due to slips and falls in the US has been estimated to be in excess of 6 billion US dollars, and a cause of serious public health problems with costs expected to exceed $43.8 billion by the year 2020 in the U.S.

A majority of occupational falls leading to injuries and deaths are a result of foot slippage. Although government, labor, and industry organizations have been working to reduce the risks of fall-related injuries, workers are still broadly exposed to risks associated with fall accidents. These findings warrant the need for better understanding of the accident mechanisms to provide more effective prevention strategies and design criteria for jobs and working environment to reduce occupational slips and falls.

In this presentation, recent studies conducted at Virginia Tech Locomotion Research Laboratory regarding the mechanisms associated with occupational fall accidents are reviewed in terms of epidemiology, tribology, biomechanics and psychophysics. Solution based research projects will be discussed further to identify research gaps and intervention approaches to reduce fall accidents in general population as well as the occupational settings.

Real World Applications

In the context of UPS driver safety and fall reduction efforts, a training program was develop to reduce gaps in knowledge and skills necessary to enhance driver's ability to recognize and take appropriate measures (actions) to various fall hazards. Utilizing the Adult Learning Theory (Knowles et al., 2005), Driver Fall Prevention Training Program entailed two components: the presentation of controlled information such as the nature and location of fall hazards (in-class setting), and practice (i.e., gait training course or Kinetic Learning Module - KLM) that result in better performance (in terms of reducing falls) according to standards which can be evaluated. Fall prevention curriculum included 1) knowledge of falls or common cause of falls, 2) tribology, psychophysics, and biomechanics of falling, 3) end result and consequences of falling, 4) gait modification techniques (i.e., KLM).

In-dept knowledge regarding fall accident characteristics such as fall locations, time of the day, and common causes of falls, etc. was first presented to enhance hazard awareness of the DSPs. Afterwards, information and illustration of fall mechanisms (computer simulation) were presented to enhance Gen Y learning via interactive computer simulation of fall accidents.

In terms of the gait modification techniques (i.e., KLM), the objective of the program was to improve the training effect which can lead directly to our central set - i.e., slip perturbation training can improve balance and reduce future fall accidents utilizing

various principles. Numerous studies have observed an increased ability to recover from a fall upon repeated exposure to a slip-perturbation (Bhatt et al., 2006; Pavol et al., 2002; and Lockhart et al., 2006). These investigators have suggested that adaptations to avoid falling can be modulated via both feedforward and feedback mechanisms (Cham and Redfern 2002; Horak and Nashner 1986). These adjustments to repeated perturbations during stance and gait reflect an individual's adaptability in stability control within the CNS. For example, the CNS can integrate afferent inputs to monitor and update the current state of the whole-body center-of-mass (COM) and compare it to a corresponding internal representation of the stability limits (Pai et al., 2003). A slip is initiated if the current state and the internal representation of the stability limits are miss-matched (Lockhart et al., 2002). As such, adaptive refinement of the internal representation of postural stability (to reduce miss-match) by perturbation training may improve the CNS's ability to prevent balance loss. This is because feedforward control requires prior experience and learning of the environmental constrains (e.g., slippery floor) as well as limitations of the controller (i.e., individual). An improved internal representation derived from repeated slip exposures could then improve slip-initiating characteristics (i.e., feedforward control) and modify post-slip reactive responses (i.e., feedback control) to reduce falls. In order to teach gait modification techniques and improve the understanding of slip resistance (e.g., slip resistance shoes, load carriage, work pace, etc.), a fall-arresting rig was composed at their training center (Figure 1). Method of ingress and egress was presented utilizing force transducers to illustrate the impact force alterations when using and not using the handrails – i.e., three-point-contact method was presented (Figure 2).

Further information regarding a modified KLM procedure used by Diageo will be discussed.

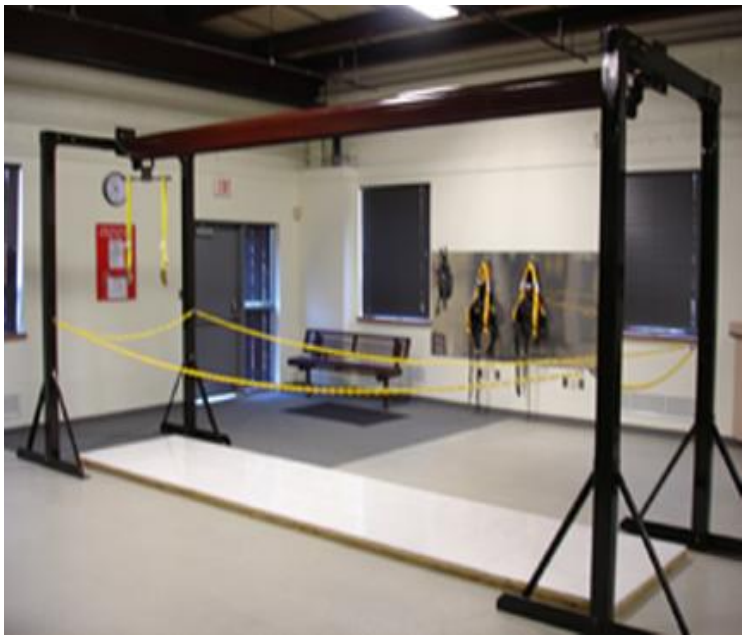


Figure 1. Fall-arresting system at the training center.

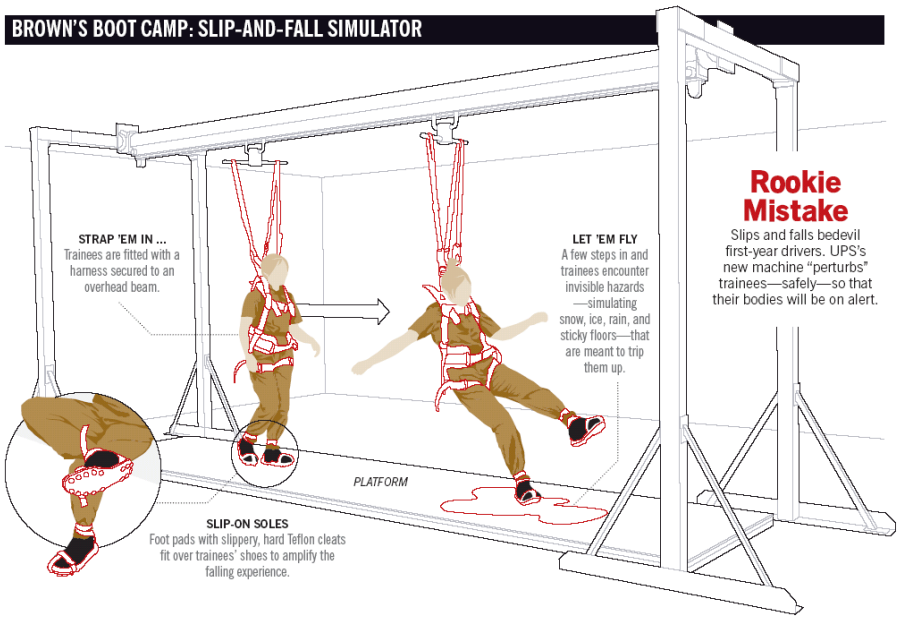
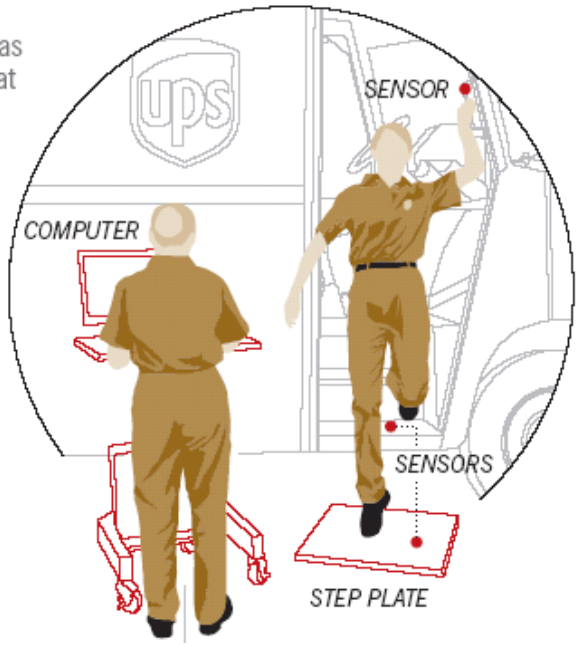


Figure 2. Ingress/egress station at the UPS Training Center.

STEP OFF
The average driver has to step off the truck at least 120 times on a daily route. That's a lot of stress on the ankles, and trainees learn it first-hand in this simulator, which measures and graphs the force on the body as they try proper and improper exits.



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