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Study And Improvement of Safety On Staircases Through Visual Reinforcement

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ABSTRACT

Ever since humans have started building multi-storied buildings, they have been using staircases frequently. Stairs of all types have been in use since ancient times, and because they are inherently hazardous, people have been falling on them, getting hurt or even killed in the process. An average staircase user is prone to ligament injury more than a man walking on plain ground. The risk increases with the many proportions when combined with a unhygienic steps, situations in which load is being carried, increase in age and when the handrails are not used. With the help of visual reinforcements on the stairs, people can be eventually taught to behave safely on staircase at home and office. It's a proven fact that visual cues are more effective to be recalled than auditory advises which gets reinforced in the memory every time when the displayed instructions are properly followed and thus helps to form a safe behavior by the process of operant/instrumental conditioning. By displaying safety messages on the riser of the steps and on the wall in front of the steps while coming down 1) To use the hand rails, 2) Not to use the mobile phones on the stairs and 3) Not to stair hop, which pursue the user to use the staircase by understanding the risks involved. The use of phosphorescence marking tapes helps the user to use stairs even in the event of light failure- a vital property needed for an escape route.

1. Introduction

Almost in every field of safety, there is a colossal room for improvement and hence the concept ALARP (as low as reasonably practical) has been derived, so that the improvement itself doesn't prove to be beneficial than if it wasn't improved. Even though that has been said, it depends entirely on the context in which the issue has been discussed. The improvement in staircase safety may not prove much beneficial for all the users of the same, but there are a fraction of users such as employees that move loads through staircases and elder citizens, for whom it may prove fatally important. This study and implementation is done in a tractor manufacturing facility where there is a constant use of staircases by a huge number of employees. The American national council on compensation insurance estimated in 2001-2002 that cost of such fall injuries was second only to those caused by motor vehicles. The vast majority of stairway falls result from a loss of balance, just as falls are on the level.

A very common contributing factor is neglecting to use handrails. The consequences can be quite nasty. Because stairway accidents can cause severe injury and even death, building codes for stairs and ramps are justifiably very rigorous. Good design can substantially reduce the

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potential for mis-stepping by providing us with the means to retrieve our balance, but even the best design cannot eliminate falling hazards entirely. The need for proper design also applies to ramps. The fact is that some incidents can be caused by inattention and unsafe behaviour.

The best approach to minimize the hazard of falling down stairs is to encourage the building of well-designed stairways, combined with constantly reminding system on raising our awareness of the potential of the risk of fall. The phosphorescence marking tapes helps the user to use escape route stairs even in the event of light failure.

Prelevance of Stair Hazards:

A recent study conducted by the Department of Design and Environmental Analysis at Cornell University examined stairs in 68 houses in 6 upstate New York counties. Professionals who study why people fall on or from stairs say health, environmental and behavioural reasons are contributing factors. Health factors include reduced vision, weakness, drowsiness, loss of balance and an inactive lifestyle. Environmental factors include poor design, construction and maintenance of stairs; non-existent or dysfunctional handrails; poor lighting; and other factors such as tread surfaces. Behavioural factors include lack of concentration, carrying something while using stairs, unsuitable footwear, unfamiliarity with the stairs (although most stair-related injuries occur on stairs with which the fall victim is familiar) and decisions whether or not — and how — to modify or maintain the stairway environment.

The study assessed stairs with respect to a variety of potentially hazardous characteristics, including articles left on the stairs, broken treads, loose or torn carpeting, badly eroded tread, absence of a handrail, and riser height irregularity at the bottom, top, or in the middle of a run of stairs. For example, eighty-one percent of the 68 staircases examined had at least one of these hazards; 55% exhibited two or more of these hazards. While hazards such as broken tread, loose or torn carpeting, and badly eroded tread were relatively uncommon, factors presenting a trip hazard such as articles left on the stairs and the absence or partial absence of handrails were relatively common-28% and 22% respectively. These data are summarized below in Table 1.

Stair Hazards	Frequency	%
Articles left on stairs	19	28.4
Broken tread	2	2.9
Loose/torn carpeting	3	4.5
Tread badly eroded	3	4.5
Absence of handrail	15	22.4
Riser irregularity >1 inch in middle of run	12	20.0
Bottom-riser irregularity >1 inch	35	56.6
Top-riser irregularity> 1 inch	31	49.0

Table 1

Anatomy of an Accident:

It more likely they are distracted. They are rushing or are in a hurry. They are not watching their footing. Or it may be all the above. As harmless as they may seem, stairways present many opportunities for people to injure themselves. It is because we do not “perceive” going up or down a stairway to be a risky venture. We view the use of stairways as simply apart of our daily routine. “Perception of Risk” can lead to poor decision-making which can result in accidents or injury. When we engage in “at risk” Behavior and suffer no consequences, it reinforces more risky behaviour. The safer we feel doing it, the more we ignore the risks associated with the activity. Most people do not approach a stairway and think, “There is potential risk here for me if I am not careful.” You don’t have to think about using stairs and most people don’t. The “every day” aspect of the activity leads to our unsafe behaviour. The rule applied to the Law of Gravity tells us that it is more hazardous to descend a stairway than to ascend it. Though accidents may occur ascending the stairs, there is a greater chance of falling down stairs. The forces of gravity may force you down multiple steps causing serious injury. Being distracted is a common unsafe behaviour that can lead to an accident. Some common distractions include: The use of cell phones or radios while on the stairway can prove to be a distraction whether you are talking or texting, Checking your wristwatch or even your phone for time takes your eyes away from your footing, Reading as you descend stairs not only takes your attention away from your footing but also blocks your vision, talking with a colleague is a distraction and now there are two people engaging in “at risk” behaviour. Perhaps the most “at risk” behaviour is that of

carrying a load while using stairs. Carrying a load is most distracting because your attention is focused on balancing the load, your vision is blocked, your eyes are away from your footing, and your hands are too full to grip a handrail. The concept of the handrail is basic, if you slip, trip or begin to fall while descending a staircase, grabbing the handrail can break your fall and save you from serious injury. Yet, most people ignore the use of it.

Observing Unsafe Conditions:

Unsafe conditions also contribute to accidents, so it is important to be able to recognize them. Take extra precaution when using wet stairs caused by rain or spills. When we are alert we are more likely to observe unsafe conditions. If you observe unsafe conditions on stairways, do not assume that someone else will report it. Inform your supervisor or maintenance personnel immediately so that a repair or clean up can be carried out as quickly as possible.

Unsafe Practices:

Many slips and falls on stairways are caused by the way we approach going up and down a stairway. For example, always make use of the full width of the stair tread. Walking on the very end of the tread invites a slip and fall. Be sure to make use of the full tread when walking stairs. Avoid stepping to the very end of the tread as it interrupts balance. A common cause of falls while ascending or descending stairs is "stair hopping." Stairs should be ascended or descended one tread at a time and only while using the handrail.

Clothing Hazards:

Your clothing can also present a hazard when using stairs. Loose clothing can cause a tripping hazard especially when going down stairs. Untied shoe laces or pants that are too long can create tripping hazards that can be especially dangerous.

Change Your Perception:

Stairways are all around us and we use them daily. Just a small change in our perception of the risks can save you from being another accident statistic. Using stairway safety takes only a slight shift in our behaviour.

2. Method

The most effective way, for humans, to store and recollect information is to make a meaning out of the content which is followed by visual cues, as the second best and auditory memory as the last resort to memorization. The availability heuristics noted by Daniel kanheman in his book Thinking fast and slow explains we are more prone to recollect information which we are constantly exposed to, which is exactly the same reason positive reinforcement is very important in behavioral based safety. When the staircase user is continuously bombarded with the safe way to proceed on the stairs, they are more likely to follow the same at home, office or wherever stairs are used. Thus the effect on the worker's behavior comes intrinsically, to move safely on stairs. The visual reinforcement is achieved through posting safety stickers on the risers of the staircases, which is not aesthetically appealing on household stairs. So this method is more applicable for office and commercial buildings with a significant usage of stairs, especially for the ones without lifts. The safety messages on the riser of conveys the following messages -1) Always use handrail 2) Do not use mobile phones on stairs 3) Do not stair hop .The use of phosphorescence tapes which glow in the absence of light source on the emergency exit stair cases provides an extra edge towards making the staircase safer even in the worst situations.

3. Results

The study that was conducted in an agri-machinery manufacturing plant where risk associated with frequent use of stairs are identified and necessary steps to avoid them have been recognized and implemented by reinforcing the users with cautionary messages on stairs to not use mobile phones, to use handrails and not to stair hop. Employees are now more aware of the risks and behave safely while using staircases.

4. Conclusion

This paper is on reducing the slips and falls on staircases, which is not the most important safety improvement area, but could have been a vital one for the one who have had ligament tears and backbone plate slips previously. By reducing falls and slips on stairs the insurance charges can be saved, lost man hours can be reduced, an improved safety culture can be built. Here, it explains how the area is being studied and how the procedure of visual reinforcement was decided to be the solution along with the use of phosphorescence marking tapes.

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