



OWLinks

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Using technology to prevent slips, trips and falls

Introduction

Slips, trips and falls (STF) are a leading cause of workplace injuries in many countries, including Singapore. Injuries caused by such accidents can range from minor injuries such as sprains and strains, to major or even life altering injuries such as fractures, head injuries and even deaths in more severe cases¹. Given the prevalence of STF which can occur anywhere, the prevention of STF remains a pressing challenge for occupational safety and public health.

The causes of STF are multi-factorial². Major risk factors identified¹ include:

Environmental

- ◆ Slippery floor (e.g., wet or oily floors due to spills / contaminants)
- ◆ Irregular surface (e.g., loose floor tiles, curled carpet)
- ◆ Poor workplace housekeeping
- ◆ Insufficient lighting
- ◆ Obstacles within a walkway (e.g., boxes, protruding objects, wires)

Design

- ◆ Lack of handrails on staircases and slopes
- ◆ Changes in floor elevation (e.g., steps, kerbs)

Behavioral

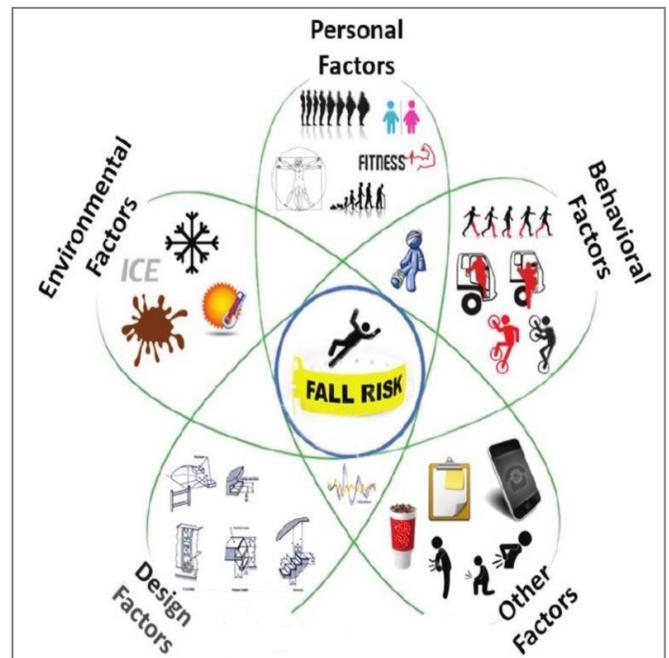
- ◆ Distractions (e.g., using a handphone while walking)
- ◆ Obstructed view (e.g., carrying bulky objects while walking)

Personal

- ◆ Lack of alertness / awareness of surroundings

Others

- ◆ Inadequate footwear (e.g., worn-out shoes)



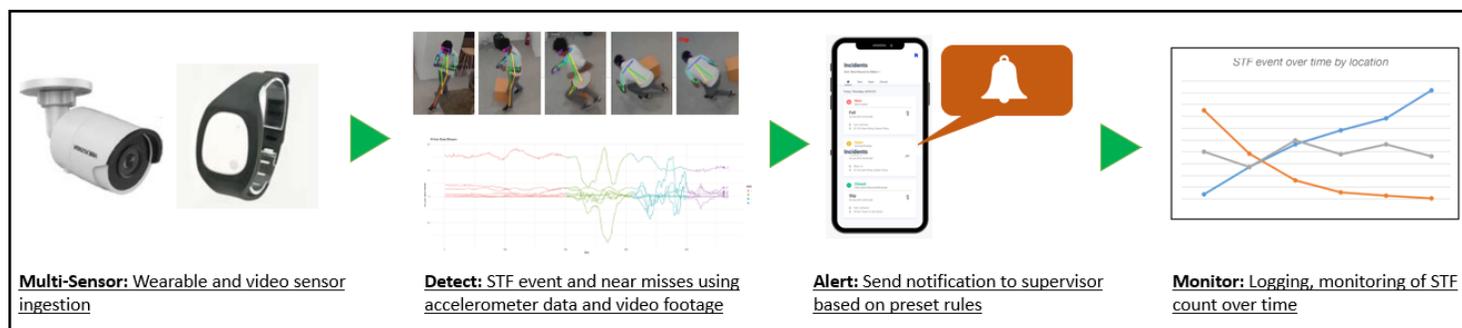
Source: Dr Andrew S. Merryweather, Director of the Ergonomics and Safety Program, University of Utah² (<https://www.coeh.berkeley.edu/21ew0915>)

STF hazards can be challenging to address as they are commonly found and can be hard to detect (e.g., slippery floors). There is also a large human and behavioral element involved in STF incidents, in terms of situational awareness and attention to surroundings, that is harder to address. A STF near miss (referring to slip and trip that did not lead to a fall) that did not result in injury is often not reported and hence, corrective action could not be taken.

In addition to existing measures aimed at minimizing or eliminating common STF hazards, organizations can adopt technology to detect and prevent falls. Technology also helps to shape workers' behavior over time, in improving their awareness of the surroundings, as well as to detect falls and facilitate reporting of near misses for prompt intervention.

Wearables and Video Analytics for Fall Detection

The Workplace Safety and Health Institute (WSHI) launched an innovation challenge in April 2020 on the **Open Innovation Platform (OIP)** to seek innovative technology solutions to detect STF near misses and hazards³. Through video analytics and wearables, the technology that was developed can detect STF incidents and near misses in real-time. Supervisor will receive a real-time alert via a mobile app to enable prompt intervention. It also allows STF hot spots to be identified for hazard removal or increased frequency of housekeeping.



To facilitate the development of more STF prevention solutions that has the ability to detect STF near misses, WSHI has launched other tech challenges on **PIER71 Smart Port Challenge**⁴ and OIP⁵ to:

- ♦ Detect and prevent workplace fall injuries in Marine, in collaboration with the Association of Singapore Marine Industries (ASMI)
- ♦ Prevent STF and falls from height (FFH) in Construction, in collaboration with the Singapore Contractors Association Limited (SCAL)

Virtual Reality

There have been international studies using virtual reality in the development of training programs to raise employees' awareness of hazards and workplace surroundings⁶. In virtual reality, advanced technologies are used to produce simulated, interactive and multi-dimensional environments on a desktop monitor or on a head mounted display⁷. A major advantage of using virtual reality is that individuals can be presented with almost real-world experience in a harmless environment.

A case in point is Savannah River Remediation, a liquid waste contractor, owned by the US Department of Energy, in the state of South Carolina. Savannah River Remediation uses a virtual reality software to help new employees get a feel for walking in unfamiliar and unusual environments where tripping hazards can be common⁸.



Source: https://srremediation.com/vr_training.html

Positive findings on the use of virtual reality in STF prevention have been reported. Results from a study involving a control group and a virtual reality training group indicated beneficial effect of virtual reality training in reducing slip severity and recovery kinematics in healthy older adults⁷. Likewise, another study using randomized controlled trial at five clinical centers across five countries (Belgium, Israel, Italy, the Netherlands, and the UK) found that treadmill training plus virtual reality led to reduced fall rates compared with treadmill training alone⁹.

Robotics

Through robotics, walking can be reduced for occupations like cleaning, security, and waitstaff, hence reducing fatigue and risks of STF. For example, cleaning and disinfection robots can help the cleaning workforce keep up with increased duties for disinfection and sanitation. The robots enable higher frequency of cleaning and ensure floors are kept dry after cleaning. Many cleaning robots are operated by cleaners themselves, and this creates opportunities to upskill the cleaning workforce. As robots are unable to access corners, steps or other hard to reach areas, manual cleaning and touch-up by cleaners is still required.

Technology-Enabled WSH

In line with the WSH 2028¹⁰ strategies, the adoption of technology can be a key enabler to improve WSH in an organization. Companies that are keen to adopt or trial technological solutions to prevent STF can [contact WSH Institute](#) for more information.

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