travelling. A future where people can comfortably sleep inside a car while commuting or going on holidays might be possible with further developments in car seat designs and technology.

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A STUDY OF SMARTPHONE USE EFFECT ON GAIT PERFORMANCE WHILE WALKING UP AND DOWN STAIRS AND ESCALATORS

The increasing use of smartphones has affected the way people walk, with more people talking on their phones or looking down at them while walking. Smartphone use during walking has been reported to distract pedestrians, resulting in safety concerns. We analyzed data from the National Electronic Injury Surveillance System (NEISS) database on injuries in hospital emergency rooms from 2004 to 2010 and found an increase in the percentage of total phone-related pedestrian injuries in public places, with a higher rate of injuries among young adults. Previous studies have found that smartphone use during walking increases the reaction time to visual and auditory targets and reduces efficiency in perceiving and processing environmental stimuli. In addition, numerous studies have shown that the demand for this dual-task influences pedestrians' gait performance; for example, they might have a slower walking speed, shorter step length, increased step width and larger head flexion.

In addition to walking on flat ground, stairs are becoming potentially hazardous areas for distracted walking associated with smartphones, with a higher fall risk and slower walking speed. Compared to walking on a horizontal surface, the workload taken over by the muscles of a single leg is greater when walking on stairs, which results in different locomotion requirements and increases the risk of falls and injuries. Extracted phone-related injury cases from the NEISS database from 2011 to 2019 and found that most injuries occurred at home (21.8%), on stairs (20.6%), or in public places (14.7%). Additionally, questionnaires conducted by the researchers revealed that stairs were perceived as a minor-to-moderate risk distraction environment with high rates of smartphone engagement.

However, most prior studies of distracted walking with smartphone use focused on walking performance on flat ground, where participants were asked to walk on horizontal surfaces such as floors and treadmills, encountering various road events or obstacles. Only a handful of studies have investigated walking performance on stairs with smartphones through a step-deck obstacle in controlled laboratories or through real stair scenarios on a campus.

The participants were asked to wear sports shoes to participate in the experiment. During preparation, the participants wore a pocket near the lower back to place a smartphone for gait assessment. They then practiced normal walking on stairs and escalators and used a smartphone (Galaxy S8+, Samsung, South Korea) during walking for 1–2 trials until they were comfortable with the testing environment. Participants received the auditory information via the built-in speakers, including the voice prompts of the start and end of gait data collection, and the sound of videos and games in walk-video and

walk-game tasks. The smartphones used in the study were prepared by the experimenter, and each participant was asked to manipulate the Galaxy S8+ for approximately 5 min before the experiment.

Participants randomly performed the walk-base task without smartphone use and the three dual-walk tasks using a smartphone to eliminate the effect of experimental order. The experiment balanced the order of the walking tasks, walking environments and walking directions. All conditions were repeated twice. Thus, each participant randomly completed 32 walking trials (4 × 2 × 2 × 2). Subjective walking confidence was measured after each trial. Participants were asked to hold the Galaxy S8+ in portrait orientation with one hand (preferred hand) while walking naturally. The experimenter followed the participants in the nearby zones to ensure the safety of the experimental process. On average, the experiment lasted for approximately 60 min. Fig. 1 shows examples of the experimental scenario.

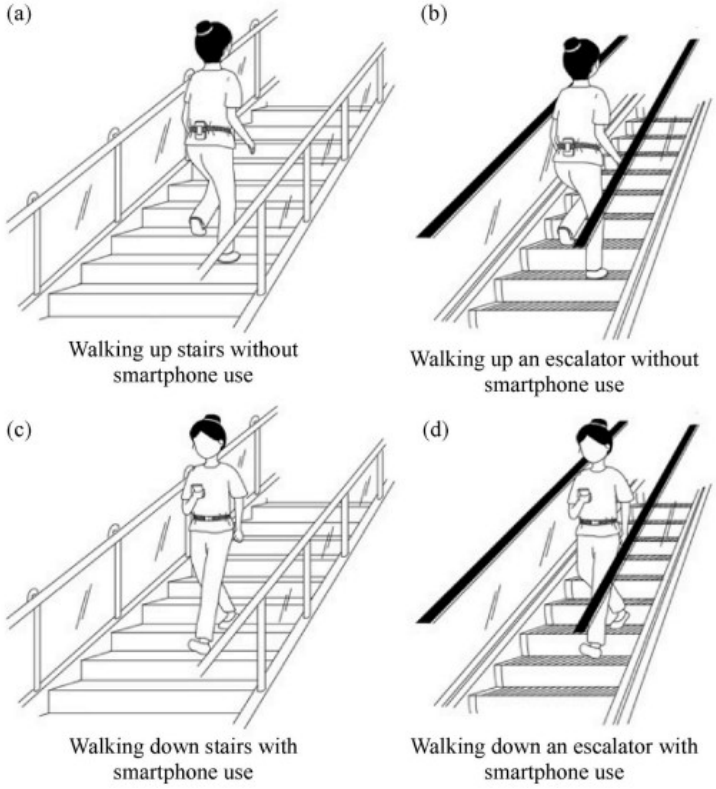

Fig. 1. Examples of data collection scenarios.

The results indicated that the main effects and two-way interactions of the three independent variables had significant impacts (all p-values of Pillai's traces < 0.001) on the six responses (step frequency, acceleration root mean square, step variability, step regularity, step symmetry, and walking confidence). Post-hoc tests showed that walking down stairs without smartphone use resulted in the significantly greatest combination of gait parameters and walking confidence (all ps < 0.001), whereas walking down or up escalators while texting messages almost caused the greatest significant decreases in the combination of gait parameters and walking confidence (ps < 0.05).

Findings indicate that smartphone use during walking on stairs or escalators had a negative impact on gait performance and walking confidence, especially while texting messages or playing games: participants had slower step frequency; reduced RMS; decreased step regularity and step symmetry; increased step variability; and lower walking confidence. Additionally, gait performance and walking confidence decreased when walking on escalators than stairs, as so did except RMS when walking down than walking up. Overall, texting or gaming when walking down escalators resulted in the largest gait performance decrement and the lowest walking confidence. Educational activities are necessary where this behavior is prevalent, from an intervention and prevention perspective. In addition, mobile application developers can incorporate the detection of distracted walking on stairs and escalators to warn smartphone users of the real dangers of their behavior.

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SAFETY RISCOLOGY

The rapid expansion of the technosphere, imbalanced geopolitical, ecological, and biological processes of modern times demand from us a complete reconsideration and deep understanding and study of risk in all spheres of human life and activity. War, non-trivial actions of aggressors force us back to the necessity of risk management on a reactive principle, while not excluding the need for the application of proactive management principles, which complicates the determination of the priority of preventive measures at each stage of activity of subjects and objects of risk, requiring the combination of these principles and again and again rethinking risks in order to develop effective measures of positive-compensatory influence. The actual state of human (humanity's) protection indicates that without creating a "risk science," without creating a corresponding educational discipline, further effective and rational risk management is already impossible.

Wherever there is a human, there is risk. There is no such branch of the economy where risk is absent. To date, the concepts of "risk" and "acceptable risk level" are enshrined and/or interpreted and applied in the Law of Ukraine "On Objects of Increased Danger" [2245-14], in the Civil Protection Code of Ukraine [5403-17], in the "Agreement between the Government of Ukraine and the Government of the United States of America on increasing operational safety, reducing the risk of operation, and strengthening the regulatory systems of civil nuclear facilities in Ukraine" [1198-2023-r], in the "Procedure for risk management of emergencies of a technogenic nature and fires" [z1397-23], as well as in over 30,000 laws, codes, state standards, regulatory and legal acts, orders, and other official documents of the state. One of the first methodological documents in the field of determining technospheric risk is the "Methodology for determining risks and their acceptable levels for declaring the safety of objects of increased danger" [v0637203-02]. Since 2002, this methodology remains the basis for the development of departmental and industry-specific guiding documents for risk analysis of objects of increased danger according to their specificity.

Starting from 2003, Ukrainian legislation in the field of labor protection and hygiene is being reformed to ensure the implementation of European occupational safety standards. The legislature believes that the introduction of a risk-oriented approach into national practice will enable Ukraine to ratify International Labour Organization conventions, which, according to the legislator, provide more rights and guarantees for workers compared to the current national legislation. This includes the "Convention concerning the Promotion of Occupational Safety and Health" under No. 187, signed on June 15, 2006.

In the "Concept of reforming the occupational safety management system in Ukraine" [1], the Cabinet of Ministers of Ukraine declares the problematic issues that have accumulated over the years due to the application of morally outdated non-risk-oriented approach to the occupational safety and hygiene management system, and proposes a way to address them.