Research Report Summary

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Determining the Effect of Smartphone Alerts and Warnings

on Older-Adult Street-Crossing Behavior

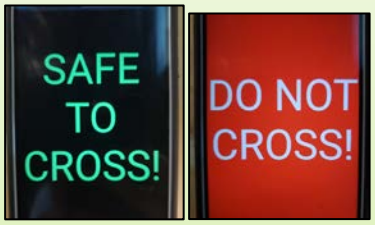
Pedestrian injuries and deaths caused by motor vehicles are a major concern worldwide. Older pedestrians represent a vulnerable population, as 20% of all pedestrian fatalities in 2017 were people 65 years and older [1].

In a virtual environment setting, research has shown that providing smartphone alerts that inform younger texting pedestrians whether it is safe or unsafe to cross can improve road-crossing behavior [2,3]. Smartphone alerts have the potential to inform older adults as well given that smartphone usage increased by 24% between 2013 and 2017 among older adults (ages 65+) [4].

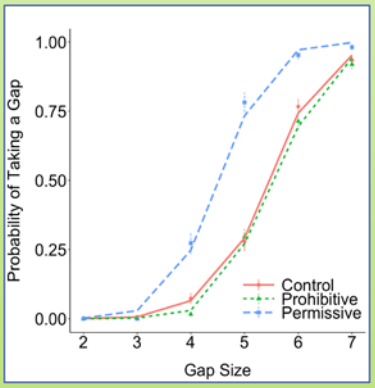
We conducted a between-subjects user study with 66 participants ages 65-84 to study the effect of smartphone alerts and warnings on their road-crossing decisions. We developed two types of systems that provided visual, haptic, and auditory alerts or warnings to older pedestrians as they decided when to cross a road in a virtual environment. Our systems were ability-based; we used each user's brisk walking speed to determine whether it was safe to cross the street in a stream of traffic.

We determined that participants in the control condition (who received no alerts or warnings) were

Alert Design and Results



We displayed permissive alerts (left) and prohibitive warnings (right) to older adults.



Participants were more likely to take smaller gaps in the permissive condition than the prohibitive or control conditions.

conservative in their gap choices and missed many opportunities to cross. Participants who received permissive alerts were more compliant with the alerts (Cohen's Kappa: .80) than participants who received prohibitive warnings (Kappa: .50)—see tables. Consequently, participants who received permissive alerts were more likely to take smaller gaps than participants who received prohibitive warnings or control participants.

"We found that participants were more likely to take smaller gaps with permissive alerts than the control and were more compliant with permissive alerts than prohibitive warnings. Further, 10 out of 22 prohibitive warning participants voluntarily reported the warnings as annoying (with 0 for permissive)."

	Crossed	Did not cross
Alert on	*Alert Heeded* = 437	*Alert Ignored* = 77
Alert off	*Lack of Alert Ignored* = 0	*Lack of Alert Heeded* = 287

Frequency that participants complied or did not follow the permissive alerts.

	Did not cross	Crossed
Warning on	*Warning Heeded* = 407	*Warning Ignored* = 1
Warning off	*Lack of Warning Ignored* = 302	*Lack of Warning Heeded* = 430

Frequency that participants complied or did not follow the prohibitive warnings.

Outcomes

Our project has the potential to inform the design of ubiquitous technologies that use smart and connected communities to deliver information to smartphones about whether it is safe to cross the street. Namely, we expect that designers will opt for permissive alerts, but caution should be expressed to ensure people do not follow risky crossings.

Impacts

Our research has the potential to impact street-crossing safety for older adults, or for others who are crossing at non-signaled intersections and cannot assess whether it is safe to cross. If users employ our permissive alert designs, we have the potential to decrease fatalities due to car-pedestrian collisions.

References

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