Distracted Pedestrians: A Public Health Challenge, and Some Possible Solutions

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Pedestrian Injuries - Background

Pedestrian Deaths in US, 2010-2017

- 2010: 4,000
- 2011: 5,000
- 2012: 5,000
- 2013: 5,000
- 2014: 5,000
- 2015: 6,000
- 2016: 6,000
- 2017: 7,000
Why the increase???

- More driving – lower cost gas
- More walking – health promotion
- More distraction – both drivers and pedestrians
Distraction while Crossing the Street

- Virtual reality allows us to study distraction without putting people at risk.
Children’s Distraction while Crossing the Virtual Street

- The question: How safe are 10- and 11-year-old children crossing the street while distracted by a cellphone conversation?
- 77 children (mean age = 10.88; 40% non-white)
- Crossed virtual road 6 times while distracted by a cell phone conversation
- Crossed virtual road 6 times while undistracted
Influence of Talking on the Cell Phone: 10- and 11-Year-Old Children

From Stavrinos et al., 2009, Pediatrics
And how about adults?

Virtual Collisions (1 or more collisions across 10 crossing trials, between-subjects design); N=128

From Schwebel et al., 2012, AAP
Moving from Simulator to Real World

- Observational data collection on 2 urban college campuses, UAB and Old Dominion
- Behavior coded continuously, weekdays 7:45 AM-5:45 PM
- 30 minute coding blocks from rotating single corner
- 3 sets of observations
  - 5 minutes, traffic count
  - 5 minutes, random selection of approaching pedestrian with observation for full crossing and detailed coding on individual differences, crossing behavior, and distraction
  - 15 minutes, coding of all approaching pedestrians as distracted or not distracted
  - (5 minutes rest/rotate)
Baseline Results: 33% of All Pedestrians were Distracted (N=9,523)
Baseline Results: Individualized Pedestrian Distraction (N=1,020)

From Schwebel et al., 2017, AAP; Wells et al., 2018, J Community Health
Baseline Results: Distracted Pedestrians Engaging in Safe Behaviors (N=1,020)

From Schwebel et al., 2017, AAP; Wells et al., 2018, J Community Health
Creating change

- It seems clear: Distracted pedestrian behavior is a problem
- How do we create change???
- Distracted pedestrian interventions are very few in number
- Health behavior theory – change is difficult
- Distracted pedestrian policy is extremely sparse – Honolulu may be the only major city in the world with law to make it illegal
Background: Study #1

- Goal: reduce distracted pedestrian behavior on urban college campuses
- Theory-driven behavioral intervention, among the first to reduce distracted pedestrian behavior
- Young adults have high rate of smartphone and technology use
- Urban college campuses have high rates of pedestrian activity
- How to accomplish behavior change?
Health Behavior Change Theory

- **Perceived Vulnerability**: Individuals must feel vulnerable or susceptible to a health risk in order to evoke behavior change.
- If one feels he/she may be harmed personally by a behavior, there is motivation and reason to change.
- We sought this through experiential exposure – walking while texting in a simulated environment.
Health Behavior Change Theory

- Change perceived/actual norms in the community – make it “normal” to behave in the safe way
- We worked to accomplish a change in norms at a university campus by creating social contagion: the spreading of ideas, behaviors, and practices via social networks
- We used both traditional face-to-face interaction and social media
Our approach

- Quasi-experimental pre-post design with control group
  - Baseline data collected at two campuses, UAB and Old Dominion University (ODU)
  - Intervention at UAB – exposure to distracted pedestrian risk in virtual reality
  - Survey data collected at UAB at baseline, post-intervention, and 5 months
  - Post-intervention and 2-month and 6-month follow-up observation at both campuses
The intervention

- Exposure to crossing the street while texting in a virtual pedestrian environment (*goal: increase perceived vulnerability among individuals*)
- Media and advertising on campus during “Distracted Pedestrian Week” (*goal: change norms in community*)
  - Local television coverage
  - Posters and signs around campus
  - “Buzz” of discussion on topic created
  - Virtual pedestrian environments open to public in two classroom buildings, M-F, 9-6, for “walking and texting” attempts
The intervention – yard signs
The intervention

- Social media
  - 18,000+ distributed
  - 7000+ video views

See:
https://www.youtube.com/watch?v=VF9s2Y-k0AY
Self-Report Survey Results

- 78% received flyer/brochure on pedestrian safety
- 83% felt VR experience made them think more carefully about distracted pedestrian behavior
- 61% self-report changed behavior since engaging in the VR
- 84% feel VR experience was worthwhile to improve their health/safety
- 95% would recommend others try the VR experience
Self-Report Survey Results: Distracted Walking Behavior

From Schwebel, McClure, & Porter, 2017, Accident Analysis & Prevention
Summary: Survey Results

- We accomplished our goal to change perceived vulnerability.
- Individuals reported greater intent to walk undistracted.
- Exposure to experience of walking while distracted in simulation may have influenced behavior.
Observational Results: Proportion of Individuals Walking while Texting

Note: Differences between campuses significant. Change over time not significant. Interaction significant but not behaviorally meaningful.

From Schwebel, McClure, & Porter, 2017, *Accident Analysis & Prevention*
Summary

○ Distracted pedestrian behavior is common
  • About 33% of observed pedestrians crossing a major street were distracted

○ Creating a “buzz” on campus, plus allowing pedestrians to try crossing a virtual street while distracted yielded:
  • Self-reported decrease in risky pedestrian behavior (change in perceived vulnerability)
  • Small and non-significant change in observed distracted pedestrian behavior (no significant change in perceived norms)
Study #2 (ongoing research)

- Identify an intrusive intervention
  - Mostly passive, user simply receives warnings
  - Like seat belt warnings – direct reminder at the moment
- Bluetooth beacons arranged at intersections to signal smartphone users
- Goal: change habits so that undistracted pedestrian behavior becomes automatic, like seat belts for many of us
Technical Details of Beacons

- Low cost (<$20/beacon)
- Low-energy (batteries last months to years)
- Small in size
- Possess small radio transmitter to broadcasts Bluetooth Low Energy (BLE) signals
- Supported by all mobile phones
Use Case Scenario for Distracted Pedestrians

1. We embed beacons at the corners of the intersection and also ahead of the intersections.
2. The StreetBit app on the user’s phone detects proximity to the beacons and the user’s precise location and direction of movement.
3. If the user is entering the intersection and is distracted by the phone, a warning is provided to warn the user.
StreetBit Beacon Placement
Alert Types

- Vibration
- Alert notification
- Audio warning
StreetBit Warnings!
Research Design – Ongoing Study

○ Within subjects comparisons
  ● 3 weeks baseline: app collects data but no alert warnings occur
  ● 3 weeks active: app collects data while alert warnings appear
  ● 4 weeks retention: app collects data, alert warnings stop
○ Short surveys at start and end of study (demographics, perceptions)
Hypothesized outcomes

Hypothesized Distracted Pedestrian Behavior, %

- Baseline
- Active Warnings
- Retention Period
Potential Extensions

- Distracted supervision – in swimming areas, playgrounds, other risky environments
- Bicycling
- Long-term, for safety with autonomous vehicles
Conclusions

1. Distracted pedestrian behavior is a public health concern.
2. We need to identify theory-driven interventions, evaluate them carefully, and then implement them.
3. Technology and innovation should be used, but wisely.
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Questions???

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