## Distracted Pedestrians: Using Technology to find Behavior Change Solutions

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#### Pedestrian Deaths in United States, 2010-2020

# Why the increase???



- More driving lower
  cost gas (until recently<sup>©</sup>)
- More walking health promotion
- More distraction –
  both drivers and pedestrians

#### **Observational Data**

- 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 <u>All</u> Pedestrians were Distracted (N=9,523)



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

# Baseline Results: Individualized Pedestrian Distraction (N=1,020)



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

# Not Just a Campus Problem: Data from Multiple Locations

	Campus (n = 272)	Downtown (n = 1283)	Schools (n = 169)	Entertainment (n = 1524)	χ <sup>2</sup>	p-value*
Any distraction (%)	144 (52.9)	457 (35.6)	66 (39.1)	247 (16.2)	235.50	< 0.0001
Talking (%)	60 (22.1)	210 (16.4)	23 (13.6)	88 (5.8)	107.46	< 0.0001
Texting (%)	35 (12.9)	99 (7.7)	16 (9.5)	51 (3.3)	50.39	< 0.0001
Headphones (%)	46 (16.9)	84 (6.5)	16 (9.5)	11 (0.7)	158.35	< 0.0001
Eating (%)	2 (0.7)	6 (0.5)	5 (3.0)	4 (0.3)	21.55	< 0.0001
Reading (%)	1 (0.4)	. 12 (0.9)	2 (1.2)	7 (0.5)	3.38	0.3371
Other (%)	8 (2.9)	77 (6.0)	15 (8.9)	90 (5.9)	7.05	0.0703

Table 1. Comparison of distraction type among pedestrians by type of location.

\*Estimated from a chi-square test.

- 53% distraction on campus, but:
  - 36% in downtown locations
  - 39% near middle and high schools
  - 16% in entertainment districts
- o 2021-2022 data

# **Creating Behavior Change**

# Distracted pedestrian behavior is a problem

- How do we create change???
- Health behavior theory change is difficult
- Distracted pedestrian policy efforts are rare
- Will present 2 studies we conducted to enact reduced distracted pedestrian behavior while crossing the street

# Background: Intervention Study #1

- Goal: Reduce distracted pedestrian behavior on urban college campuses
- Theory-driven behavioral intervention

# Health Behavior Change Theory



- <u>Perceived Vulnerability:</u> 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



- <u>Change perceived/actual</u> <u>norms in the community</u> – 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 and campus-wide social and traditional media
  - Survey data collected at UAB at baseline, postintervention, and 5 months
  - Post-intervention and 2-month and 6-month follow-up observation of pedestrian behavior 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

## Yard signs





#### Social Media

#### $\circ$ 18,000+ distributed, 7000+ video views



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.

# Summary, Intervention Study #1

- Distracted pedestrian behavior is common
  - ~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)

# Background: Intervention Study #2

- Returned to college campus, same busy intersection
- New behavior change approach: an intrusive intervention
  - Mostly passive, user simply receives warnings
  - Like seat belt warnings direct reminder, at the moment. Force change.
  - Should also change community norms
- Goal: change habits so that undistracted pedestrian behavior becomes automatic, like seat belts for many of us
- Strategy: Bluetooth beacons arranged at intersections to signal smartphone users

## **Technical Details of Beacons**

- Low cost (<\$20/beacon)</li>
- Low-energy (batteries last 1-2 years and easily replaced)
- o Small in size
- Possess small radio transmitter to broadcasts Bluetooth Low Energy (BLE) signals
- Supported by all mobile phones





# StreetBit: Scenario for Distracted Pedestrians

- Beacons placed at intersection corners and also ahead of the intersections
- StreetBit app on pedestrian's phone detects proximity to the beacons, the pedestrian's precise location, and direction of movement
- If pedestrian is entering the intersection while distracted, a warning is provided

#### StreetBit Beacon Placement





## StreetBit Alert Types

Vibration

Alert notification

o Audio warning



#### StreetBit Warnings





iPhone

# **Research Design**

- 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

#### **Overall outcomes**



From Schwebel et al., 2021, Accident Analysis & Prevention

# Null Results??

- A few issues...
  - Android vs. iPhone warnings are different
  - Novelty and curiosity pedestrians were checking to see if the app worked
- New analyses, separated by phone type and baseline distraction levels

#### **Detailed outcomes**



From Schwebel et al., 2021, Accident Analysis & Prevention

# Summary of Results

- Android users had more effect warning blocked phone screen. Intrusion may have worked
- Most distracted pedestrians had most effect. They were not influenced by curiosity of app.

Thus...

- More research is needed
- More app development is needed, especially for iPhones

#### Potential Extensions of StreetBit

- O Beyond college campus locations
- O Distracted supervision of children in swimming areas, playgrounds, other risky environments
- O Distracted Bicycling
- O Long-term, for safety with autonomous vehicles







#### Conclusions

- 1. Distracted pedestrian behavior is a public health concern, just like distracted driving.
- 2. We need to identify theory-driven interventions, evaluate them carefully, and then implement them.
- 3. Theory-driven interventions CAN change behavior. But it's not easy.
- 4. Technology and innovation should be used, but wisely.

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## Questions???

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