Will You Stop?

Roadway Design and Traffic Control Devices Influences on Driver Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacons

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FHWA Interim Approval

- Optional use of rectangular rapid flashing beacons (July 16, 2008)
- Several Official Interpretations (e.g. OK to place beacons above sign and revised flash pattern)

Source: Fitzpatrick et al.

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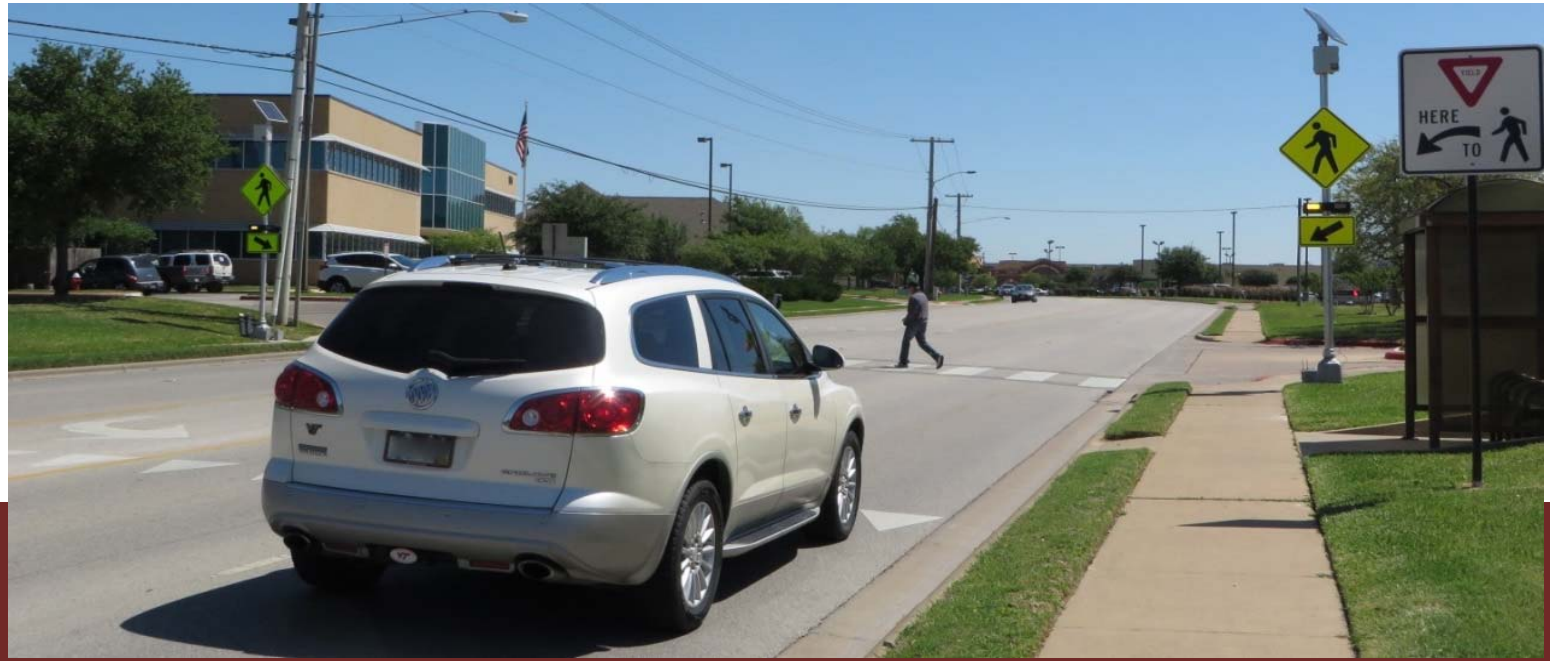
Staged Pedestrian Data Collection

- Typical clothing = jeans, grey t-shirt, cap
- Employees trained to approach in similar manner – foot placed on pavement
- 40 to 60 per site



Source: Fitzpatrick et al.

Overview

- Several research studies have documented the benefits of the RRFB

But…

- Range of 19 to 98 percent driver yielding

Why such a large range??

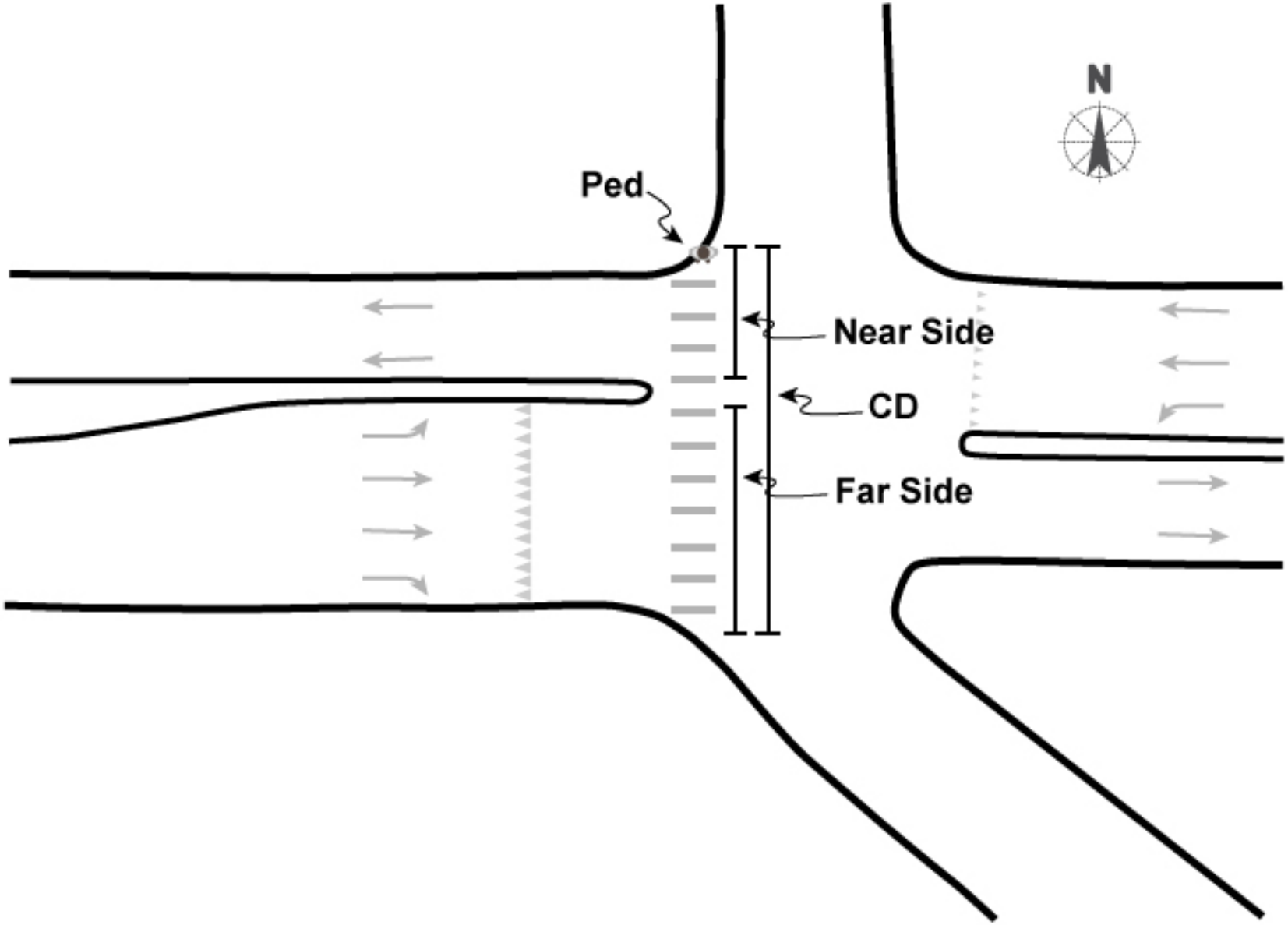
Will You Stop? Project

- Objective: identify variables associated with driver yielding at RRFBs
- Source of data:
  - FHWA = several research efforts
  - TxDOT = recent research project (0-6702)
  - TTI CTS = Texas A&M Transportation Institution Center for Transportation Safety (funded additional sites)

Sources of Data

Study	Sponsor	Sites	Characteristic
Texas 2012	TxDOT	22 (most in Garland, TX)	Trend: driver yielding increases over time
A/B 2014-2015	FHWA	13 (Arizona, Colorado, Illinois, Texas)	Example placement of beacons (above or below warning sign)
CvR 2013-2014	FHWA	12 (Arizona, Texas, Wisconsin)	Examine shape of beacon (circular or rectangular)
FP 2014	FHWA	8 (Garland or College Station, TX)	Examined three flash patterns
CTS 2015	TTI CTS	25 (Washington or North Carolina)	Priority characteristics: intersection configuration, crossing distance, posted speed limit
	TOTAL	73 unique sites, 128 site-periods	

Near Side or Far Side



Statistical Analysis

- Negative binomial mixed-effects model
  - Random effects – account for correlations in clustered data (e.g., all the crossings from a site)
  - Fixed effects – variables of interest to this project
- Evaluate the number of drivers who did not yield to crossing pedestrian
- Evaluations:
  1. All data
  2. Subset of data (when 1-min count was available)

All Data Model (pg 1)

- Fixed effect variables with at least one level significant at 0.10 level
  - **Intersection configuration** – better yielding at midblock sites as compared to 4-leg intersections
  - **Refuge presence** – better yielding when median refuge (raised or short island) was present
  - **Approach (near or far)** – better yielding on far side
  - **Crossing distance** – as distance being crossed increases, drivers are less likely to stop
  - **One-way or two-way** – more driver do not yield on two-way street as compared to one-way

All Data Model (pg 2)

- Fixed effect variables not significant (but we thought they might have been):
  - Posted speed limit
  - Traffic control devices
  - Transit stop within 200 ft
  - Presence of school within 0.5 mi
  - Location of beacon
  - Sign face

All Data Model (pg 3)

- Random effects
- Nested structure:
  - State
  - City
  - Site
  - Period
  - Crossing
- Contribute most = crossing and city

Set of Data w/ Vol Model (pg 1)

- Fixed effect variables with at least one level significant at 0.10 level
  - **One-minute per lane count** – less yielding for higher volumes, and then flattens (concave curve)
  - **Intersection configuration** – Better yielding at midblock sites as compared to 4-leg intersections
  - **Approach (near or far)** – better yielding on far side
  - **Crossing distance** – as distance being crossed increases, drivers are less likely to stop

Set of Data w/ Vol Model (pg 2)

- Fixed effect variables with at least one level significant at 0.10 level (continued)
  - **Transit within 200 feet** – As expected
  - **School within 0.5 miles** – As expected
  - **Sign face** – More drivers not yielding at bike or bike/ped sign
  - **Beacon location** – More drivers not yielding at sites with beacons on one side of roadway compared to both sides of roadway

Set of Data w/ Vol Model (pg 3)

- Fixed effect variables with at least one level significant at 0.10 level (continued)
  - **Advance yield or stop lines** – But counterintuitive
  - **Posted speed limit** – May be counterintuitive

Posted Speed Limit (mph)	Average Driver Yielding (%)	Count of Crossings	Near Not Yielding	Near Yielding	Far Not Yielding	Far Yielding
45	65%	539	317	440	122	376
40 (more yielding)	66%	572	442	684	246	660
35 REFERENCE	67%	2493	1444	2714	1069	2451
30 (less yielding)	58%	781	513	601	172	327
22	85%	285	42	324	64	300
Grand Total	67%	4670	2758	4763	1673	4114

Set of Data w/ Vol Model (pg 4)

- Fixed effect variables not significant (but we thought they might have been):
  - One-way or two-way traffic
  - Presence of refuge (but just barely not significant)

Set of Data w/ Vol Model (pg 5)

- Random effects – nominal contribution to model
- Theory: one-minute counts capture much of variability attributed to random effect of full model
- Contributes most = site

Influential Variables on Driver Yielding at Crosswalks w/ RRFBs

- City, site, or crossing random variable
- Intersection configuration
- Refuge presence
- Near or far approach
- Crossing distance
- One-way or two-way
- 1-minute vehicle volume
- Transit within 200 feet
- School within 0.5 mile
- Sign face
- Beacon location
- Advance yield or stop lines (counterintuitive)
- Posted speed limit (complex)

DISCUSSION AND QUESTIONS

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