MARYLAND SCHOOL FOR THE BLIND/JHU

The Roundabout Study: Eye Gaze and Mental Effort
The Effects of Vehicle Speed and Pedestrian Behavior on Driver Yielding at Roundabouts

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The Law and The Pedestrian

The driver of a vehicle shall come to a stop when a pedestrian crossing the roadway in a crosswalk is; (i) On the half of the roadway on which the vehicle is traveling; or (ii) Approaching so closely from the other half of the roadway as to be in danger. 21-502(a2)
The Law and The Pedestrian

The driver of a vehicle shall yield the right-of-way to:

(1) A blind or partially sighted pedestrian using a guide dog or carrying a cane predominantly white or metallic in color (with or without a red tip)… 21-511
The Law and the Pedestrian

Intent of the law

- Pedestrian has the right of way in the crosswalk
- Specific identification of the blind pedestrian, *with or without traffic controls*
Questions

• At roundabouts are pedestrians granted the right of way?
• What conditions effect driver yields?
• At roundabouts are blind pedestrians granted the right of way?
• What conditions effect driver yields?
Hypotheses

• 2 primary vehicle factors that effect yield
  • Vehicle speed and entry/exit

• Pedestrian behavior effects yield
  • Position relative to the curb
  • Presence/absence of long cane
Method: The Roundabouts

Roundabout I
15.5 mph (0.73)

Roundabout II
20.0 mph (3.7)

Located in Annapolis < 2 miles apart
Speed Measure

Bushnell Speedster
- Exact speed
- 1.5% error < 10 degrees off center
Roundabout II
Procedures

• PEDESTRIAN BEHAVIORS

- 1 foot from curb - Neutral
- At the curb - Assertive
- In the crosswalk - Aggressive
- With and without long cane
One Foot From Curb
Standing At Curb
In Crosswalk
**Procedures**

- Roundabout I entry and exit
- Roundabout II entry and exit

2 Roundabouts X 2 locations X 3 Ped locations X w/wo cane X 40 trials per condition = 960 trials
Procedures

DRIVER CRITERIA

- Lead vehicle
- Cars, vans, 1/2 ton pickup truck
- No police/fire, buses, large trucks
- No queuing
- No tail-gaiting
Questions

At roundabouts are pedestrians granted the right of way (blind pedestrian)?

58% of the time
Without cane 52%
With cane 63% n.s.

FLIP OF THE COIN
Hypotheses

2 primary driver factors that effect yield

Driver’s speed and entry vs. exit
Vehicle Speed - Driver Yield

R² = 0.56
Vehicle Speed - Driver Yield

Entry (Decelerating)

Percent Yield

R\(^2\) = .52

Speed MPH
Vehicle Speed - Driver Yield

Exit Lane (Accelerating)

Percent Yield

Speed (MPH)

R² = .72
Vehicle Speed - Driver Yield

Exit Lane Red      Entry Lane Green

Percent Yield

Speed MPH

National Roundabout Conference 2005 DRAFT
Yield Percents Entry vs Exit

- Entry Lane 79%
- Exit Lane 37%
- Odds ratio 6.4
Hypotheses

Pedestrian Behavior and Yield

• Position relative to the curb
• Presence/absence of long cane
Pedestrian Behavior and Yield (no cane)

Percent Yield

One Foot  At Curb  In Crosswalk

1.89
1.2 - 3
Pedestrian Behavior and Yield (with cane)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yield Percentage</th>
<th>Error Range</th>
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<tbody>
<tr>
<td>One Foot</td>
<td>50</td>
<td>2.1</td>
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<tr>
<td>At Curb</td>
<td>60</td>
<td>1.3 - 3.4</td>
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<tr>
<td>In Crosswalk</td>
<td>70</td>
<td></td>
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</tbody>
</table>
Pedestrian Behavior and Yield
Cane (green)  No cane (red)

Percent Yield

- 1 Foot: 1.6, 1.01 - 2.6
- At Curb: 1.8, 1.1 - 3
- In Crosswalk: 1.6, 1.01 - 2.6
Conclusions

Driver Factors

- Overall drivers yield at the flip of a coin
- Vehicle speed is important
- Accelerate/decelerate is related to yield
Conclusions

Pedestrian Behavior

- Aggressive behavior can increase yield
- Increase odds ratio from neutral to aggressive

*We are not advocates for this type of behavior*
Conclusions

The Long Cane

• Overall, the cane does not significantly increase yield
• Under certain conditions the cane has some statistical effect and increases the odds
Conclusions

The Long Cane

• Specifically, the effect of cane occurs with vehicle speed at high speed entry (2X) and high speed exit (4X)
• Cane effect (2X) for cane and behavior (aggressive)