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A Study of Bicycle Signal Compliance Employing Video Footage

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A Study of Bicycle Signal Compliance Employing Video Footage

Institute of Transportation Engineers – Western District Annual Meeting
Session 7A: Planning and Modeling Our Communities
Tuesday, July 16th

Presenter:
Sam R. Thompson, E.I.T
Graduate Research Assistant
Portland State University
Civil & Environmental Engineering
Two data sources:

- **City of Portland**
  - Archived from previous research
  - 3 intersections
    - Portland
    - Bicycle-specific Signals
- **Portland State**
  - Project-specific
  - 4 intersections
    - Varying intersection characteristics/locations
Data Reduction

- Cyclists were eligible to become part of the study if they were observed to:
  - Arrive on the red indication
  - Utilize bicycle infrastructure (and bicycle signal where applicable) on both sides of the intersection
Data Reduction

- Three types of data collected:
  - Descriptive
  - Event
  - Compliance-specific
Compliance Indicators

- Compliant
- Non-compliant
  1. Illegal right turn on red (RTOR)
  2. Gap Accepted
  3. Signal Jump
Compliance Indicators

Illegal Right Turn on Red: RTOR
Compliance Indicators

Gap Accepted
Compliance Indicators

Signal Jump
Results

- Total of 2,617 cyclists
- Initial Compliance Rate of 69.1%
- Compliance Rate excluding RTOR: 89.7%

<table>
<thead>
<tr>
<th>Compliance Indicator</th>
<th>Percent</th>
<th>Number of Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliant</td>
<td>89.7</td>
<td>1809</td>
</tr>
<tr>
<td>Gap Accepted</td>
<td>5.9</td>
<td>118</td>
</tr>
<tr>
<td>Signal Jump</td>
<td>4.3</td>
<td>87</td>
</tr>
<tr>
<td>Other</td>
<td>0.1</td>
<td>3</td>
</tr>
</tbody>
</table>
Compliance at Bike-Specific Signals

![Bar chart showing compliance with bike signals]

- No Bike Signal:
  - 100% Compliant
  - 0%Gap Accepted
  - 0%Signal Jump
  - 0%Other

- Bike Signal:
  - 100% Compliant
  - 0%Gap Accepted
  - 0%Signal Jump
  - 0%Other

Legend:
- Blue: Compliant
- Light Green: Gap Accepted
- Green: Signal Jump
- Pink: Other
Compliance per Location

<table>
<thead>
<tr>
<th>Location</th>
<th>Compliant</th>
<th>Gap Accepted</th>
<th>Signal Jump</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaverton</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadway &amp; Lovejoy</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portland</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broadway &amp; Williams</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corvallis</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eugene 18th &amp; Pearl</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portland &amp; I-5</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clackamas Co. Johnson &amp; Bell</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Compliance by Presence of Cargo

The chart shows the compliance rates for different categories of cargo presence. The categories are:

- **Compliant**
- **Gap Accepted**
- **Signal Jump**
- **Other**

The percentages are as follows:

- **No Cargo**:
  - Compliant: 100%
  - Gap Accepted: 0%
  - Signal Jump: 0%
  - Other: 0%

- **Some Cargo**:
  - Compliant: 75%
  - Gap Accepted: 25%
  - Signal Jump: 0%
  - Other: 0%

The chart visually represents the compliance rates for both scenarios.
Compliance by Helmet Use

<table>
<thead>
<tr>
<th>Helmet</th>
<th>Compliant</th>
<th>Gap Accepted</th>
<th>Signal Jump</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>75%</td>
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<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Legend:**
- Compliant
- Gap Accepted
- Signal Jump
- Other
Compliance by Peak Period

<table>
<thead>
<tr>
<th>AM</th>
<th>PM</th>
<th>Off Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>75%</td>
<td>75%</td>
<td>75%</td>
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<tr>
<td>50%</td>
<td>50%</td>
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</tr>
<tr>
<td>25%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Compliance by Wait Time

- 100%
- 75%
- 50%
- 25%
- 0%

Wait Time (sec)

- Compliance by Wait Time
- Gap Accepted
- Signal Jump
- Other

Introduction
Methodology
Results
Discussion
Conclusions
Acknowledgements
Comparison to Other Modes

- Motorists do not come to a complete stop before completing a right turn 56.9% of the time\(^1\).
  - Cyclists in this study committed RTOR violations at a rate of 23%.

- The average non-compliance rate for pedestrians is 15.8%\(^2\).
  - Cyclists in this study had combined violation rate for signal jumps and accepted gaps of 7.8%.

- Motorists were found to run red indications at a rate of 1.3%\(^3\).
  - Cyclists in this study accepted gaps at a rate of 4.5%.
Conclusions

- Compliance at bicycle-specific signals is comparable to compliance at traditional signals
- Observed compliance nearly 90% excluding RTOR
- Risk-taking profile for non-compliant cyclists
  - More likely to not wear a helmet
  - Not influenced by wait time
  - Minimum gap accepted equal to or less than minimum crossing time (determined by AASHTO) for high volume intersections.
Acknowledgements

- Oregon DOT Research Project TAC
- TAC: Gary Obery (ODOT), Peter Koonce (PBOT), Scott Beaird (Kittelson, Inc.), Nick Fortey (FHWA), Mark Joerger (ODOT)
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- Dr. Christopher Monsere, Dr. Miguel Figliozzi, Kirk Paulsen
Questions?

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References for Discussion

