Effect of Pedestrian Countdown Timer on Safety and Efficiency of Operations at Signalized Intersection

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Objective of Research

• Evaluate the effects countdown timer on Safety, Efficiency of operations at an intersection and Public View.
Past Literature - Pedestrians

The image contains a box plot graph showing the percentage change in pedestrian incidents after interventions in different locations.

- Location 3: Peoria, IL (5)
- Location 1: Lk Buena Vista, FL (6)
- Location 20: Montgomery Co., MD (4)
- Location 4: Washington, DC (3)
- Location 4: San Jose, CA (7)

The graph indicates a range of percentage changes, with some locations showing a significant decrease, while others show no change or a slight increase.
Intersection Selection

• Two intersections chosen:
  – S 17\textsuperscript{th} & G St (Pedestrian And Drivers)
    • Northbound Approach
    • Speed Limit 35
  – N 27\textsuperscript{th} & Cornhusker Highway (Drivers)
    • Eastbound Approach
    • Speed Limit 40 mph
Pedestrian Data
Driver Data
Performance Measures

• Pedestrian Compliance

• Pedestrian Walking Speed

• Probability of Stopping

• Speed Gain at Stopbar during Yellow Phase

• Change in Queue Discharge
Pedestrian Analysis (only for 17 & G)

- 861 peds before installation (April-March) (Mean temp 56 F)

- 495 peds after installation (Oct end) (Mean temp 56 F)

- Clear weather conditions
Compliance Results
Arrive on DW

Probability of being present in crosswalk during DW

Right turning volume on 17th Street in 5 cycles

Before PCT S2N
After PCT S2N
Percent change in probability of being present in crosswalk during DW

Arrival during DW (South to North)

Right turning volume on 17th Street in 5 cycles

0% 10% 20% 30% 40% 50%

0 10 20 30 40 50
Performance Measures

- Pedestrian Compliance ↑
- Pedestrian Walking Speed
- Probability of Stopping
- Speed Gain at Stopbar during Yellow Phase
- Change in Queue Discharge
Performance Measures

• Pedestrian Compliance

• Pedestrian Walking Speed

• Probability of Stopping

• Speed Gain at Stopbar during Yellow Phase

• Change in Queue Discharge
Performance Measures

• Pedestrian Compliance

• Pedestrian Walking Speed (4.7 ft/s → 4.9 ft/s)

• Probability of Stopping

• Speed Gain at Stopbar during Yellow Phase

• Change in Queue Discharge
Probability of stopping 27 & Cornhusker

![Graph showing probability of stopping over time with curves labeled 'Before' and 'After'.](image-url)
Important result

- **RLR (17 & G):**
  - Before 10 of 429 vehicles ran the red light (2.3%)
  - After 3 of 422 vehicles ran the red light (0.7%)

- **RLR (27 & Cornhusker):**
  - Before 7 of 525 vehicles ran the red light (1.3%)
  - After 8 of 482 vehicles ran the red light (1.6%)
Performance Measures

- Pedestrian Compliance
- Pedestrian Walking Speed (4.7 ft/s → 4.9 ft/s)
- Probability of Stopping 17_G
- Speed Gain at Stopbar during Yellow Phase
- Change in Queue Discharge
Performance Measures

• Pedestrian Compliance  

• Pedestrian Walking Speed (4.7 ft/s → 4.9 ft/s)  

• Probability of Stopping  17_G  ↑  27_Chusker  ↔  

• Speed Gain at Stopbar during Yellow Phase  

• Change in Queue Discharge
27 & Cornhusker

Speed Gain Before PCT

Speed Gain After PCT

Speed Gain (mph)

Time to Stopbar (sec)

0-1 sec 1-2 sec 2-3 sec 3-4 sec 4-5 sec

0-1 sec 1-2 sec 2-3 sec 3-4 sec 4-5 sec
Performance Measures

• Pedestrian Compliance

• Pedestrian Walking Speed (4.7 ft/s $\rightarrow$ 4.9 ft/s)

• Probability of Stopping 17_G $\uparrow$ 27_Chusker

• Speed Gain at Stopbar during Yellow Phase

• Change in Queue Discharge
Performance Measures

- Pedestrian Compliance  

- Pedestrian Walking Speed (4.7 ft/s → 4.9 ft/s)

- Probability of Stopping 17_G  

- Speed Gain at Stopbar during Yellow Phase  

- Change in Queue Discharge
Queue Discharge – 27 & Cornhusker

Queue Discharge Headways

- Nos. Before = 372
- Nos. After = 399
- Median Before = 2
- Median After = 1.99
- K-S Test Results:
  - h = 0
  - p = 0.80745
Performance Measures

- Pedestrian Compliance
- Pedestrian Walking Speed (4.7 ft/s $\rightarrow$ 4.9 ft/s)
- Probability of Stopping 17_G $\uparrow$ 27_Chusker
- Speed Gain at Stopbar during Yellow Phase
- Change in Queue Discharge
1. Does the number displayed on the pedestrian countdown timer influence your walking speed and/or decision on whether or not to enter the crosswalk?
   - I never enter the crosswalk if the flashing "Don't walk" signal is displayed, no matter what number is displayed.
   - Yes, but I will only enter the crosswalk if I can cross at my normal walking speed.
   - Yes, the number displayed may increase my walking speed and decision on whether to enter the crosswalk.
   - I have never seen a pedestrian countdown timer.
   - Other, please specify: __________

2. When driving, how do pedestrian countdown timers influence you when approaching an intersection?
   - Pedestrian countdown timers do not affect my driving at all.
   - Depending on the number displayed, I may speed up in order to go through the intersection.
   - I have never seen a pedestrian countdown timer.
   - Other, please specify: __________

Survey- NASIS
- 2032 Responses collected
Driver Impact (2018)

- Don't Affect: 35%
- May speed up: 20%
- Never Seen PSCT: 30%
- Others: 5%
Conclusions

• The empirical evidence in this study support the use of PCT and have found no negative impact at the two sites.

• The impact of PCT on the two sites were different implying the interaction of site-specific parameter can influence the results.
QUESTIONS

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