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An Assessment of Bicycle Detection Confirmation and Countdown Devices

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Bicycle Detection Confirmation Devices

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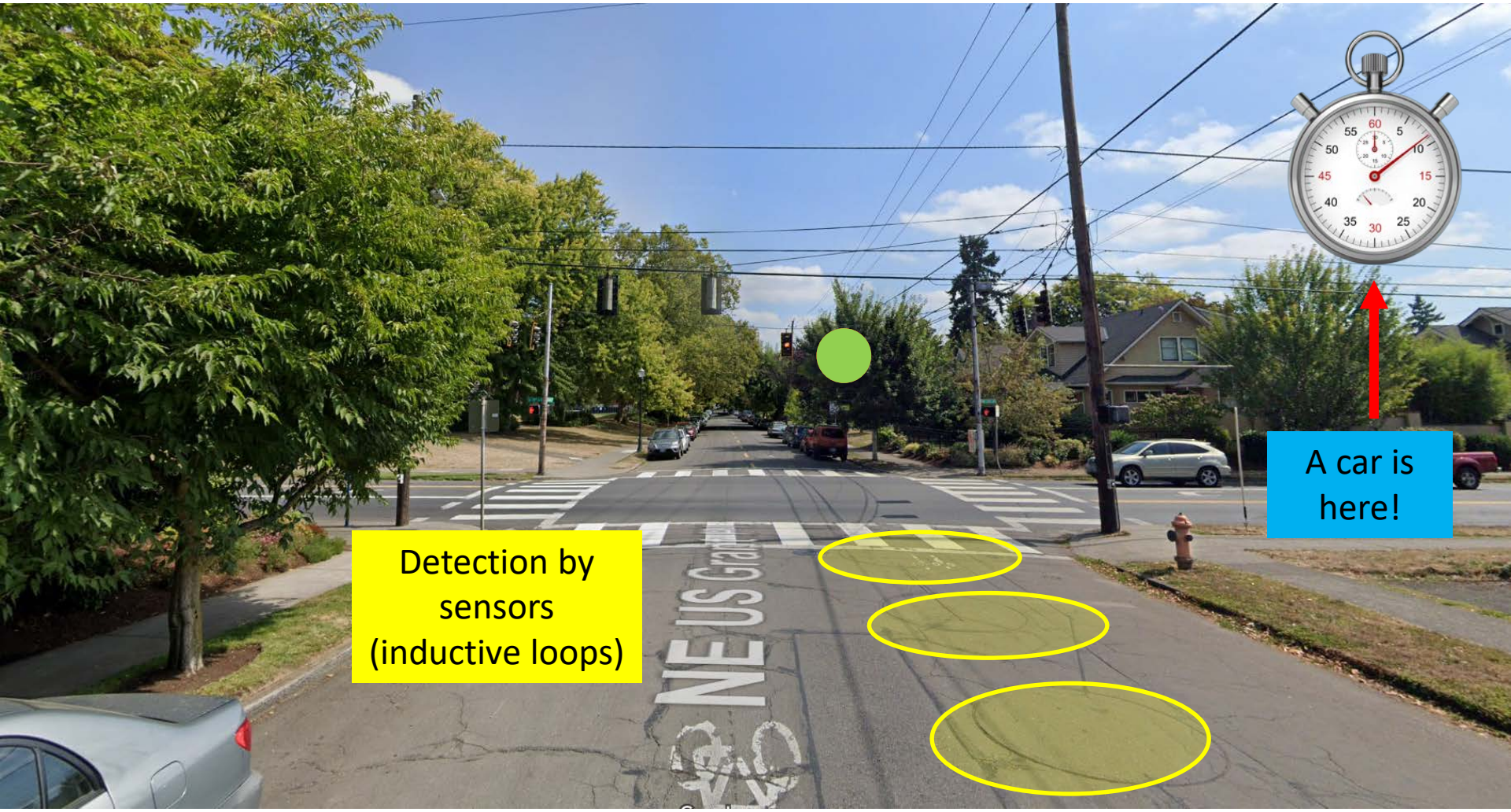
Introduction



Introduction

- Bicycle detection
  - Specific waiting location required
    - Loops, video zones usually with pavement marking stencil to indicate waiting location
    - Push buttons
  - Bicycles can wait at any location
    - “Smart” detection: thermal, video, connected infrastructure

9C-7 Marking

Source: P. Singleton

Thermal Video Detection (Source: FLIR)

Introduction

- How to communicate to person on bicycle that they have been “detected” by the traffic signal?
- Possible benefits of confirming detection
  - People learn where to wait to be detected
  - Less delay
  - Improved compliance
  - Better experience waiting for green

Detection Confirmation & Feedback

Iteris Bike Indicator

Countdown Timer in Copenhagen
(Source: Mikael Colville-Anderson)

"Wacht" Countdown Timer
(Source: Bicycle Dutch, 2016)

Nearside Confirmation System in Christchurch, NZ (Source: G. Koorey)

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Detection Confirmation: Blue Light

Blue Light in Portland, OR
(Source: J. Maus)

Blue Light and Explanatory Sign in Salem, OR (Source: ODOT)

Blue Light in Austin, TX
(Source: C. Monsere)

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Research Objectives

- Explore how well the alternate designs for detection confirmation devices with or without informational signs are understood by the general public.
- Establish quantitative information from the field review about the effect of the confirmation devices.
- Qualitatively study how the information provided by the confirmation device affect the overall cycling experience.
- Provide guidance to practitioners regarding the use of detection confirmation devices for bicycles.

METHODS

Methodology

Online Survey

- Test comprehension and attitudes/perceptions of
  - Blue Light Detection Confirmation Systems (*with and without sign*)
  - Countdown Timers
- View from bicycle and driver perspectives
- Postcard distribution
  - 10,003 sent
  - 529 responses
- Social media recruitment
  - 1,550 clicks
  - 535 responses

1,065 responses

Video Analysis

- Observe behaviors
- Farside Blue Light Detection Confirmation (*Embedded in Sign*, *Separate Sign*)
  - 6 approaches (Portland Eugene)
  - 1,986 observations
- Nearside Blue Light Detection Confirmation
  - 1 approach (Corvallis)
  - 104 observations
- Nearside Countdown Timer
  - 1 approach (Portland)
  - 338 observations

2,428 bicycles

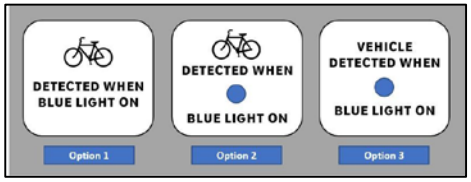
Intercept Survey

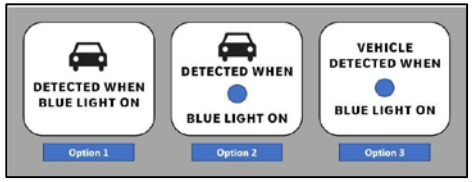
- Test comprehension and attitudes/perceptions
  - 517 invitations
- Farside Blue Light Detection Confirmation (*Embedded in Sign, Separate Sign*)
  - 6 approaches (Portland Eugene)
  - 151 responses
- Nearside Blue Light Detection Confirmation
  - 1 approach (Corvallis)
  - 54 responses
- Nearside Countdown Timer
  - 1 approach (Portland)
  - 29 responses

234 responses

Example Image - Survey Open Ended

Blue Light Detection Intersection Scenario (with sign)

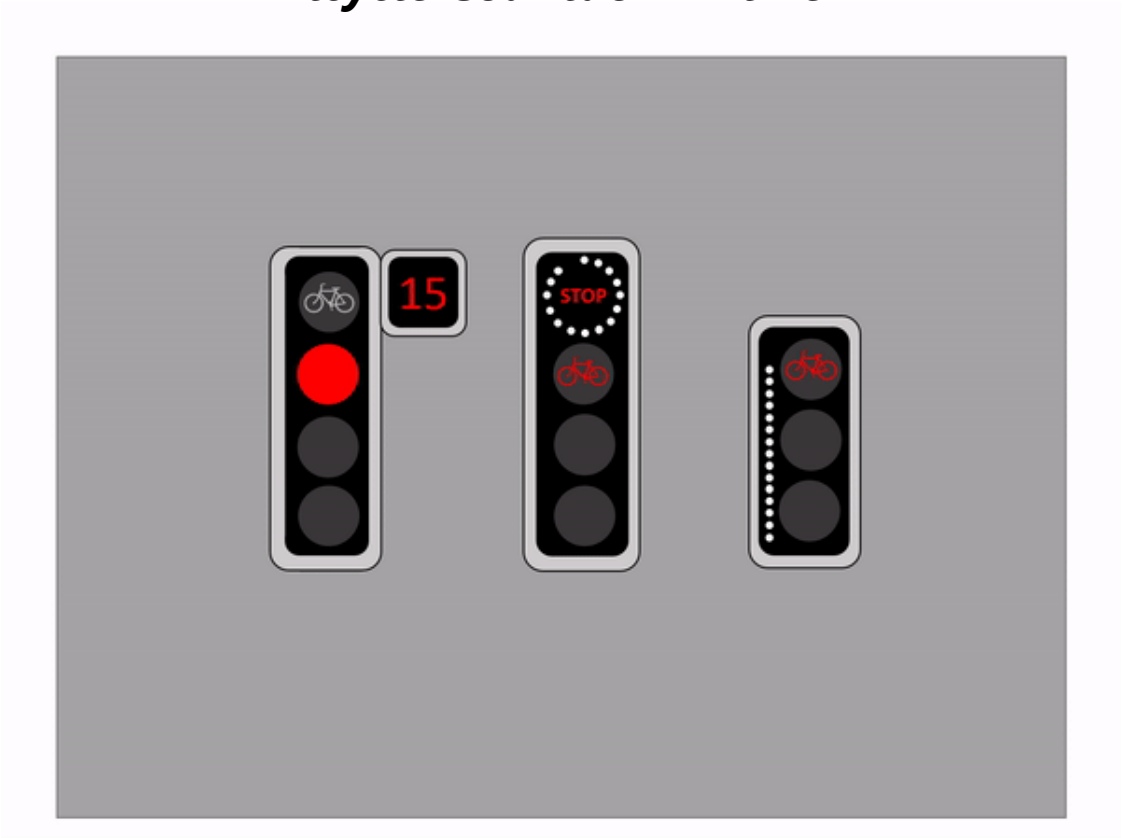




*There has been a sign added to the photo. Again, imagine that you are waiting at an intersection on a bicycle/vehicle. What does the **BLUE LIGHT** (to the left of the arrow) mean to you? Please type your response in the box below and be as descriptive as possible. Please type your response in the box below and be as descriptive as possible.*

Example - Survey Open Ended

Bicycle Countdown Timer

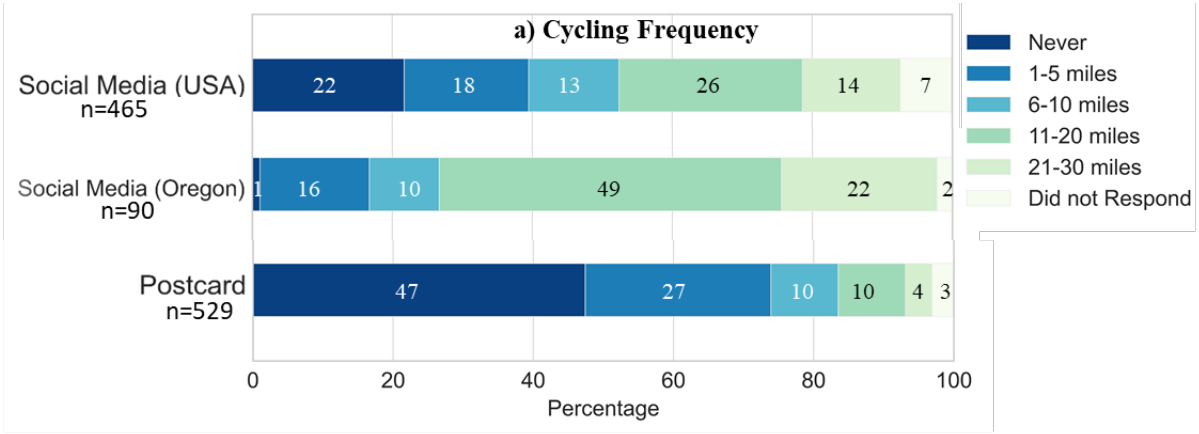


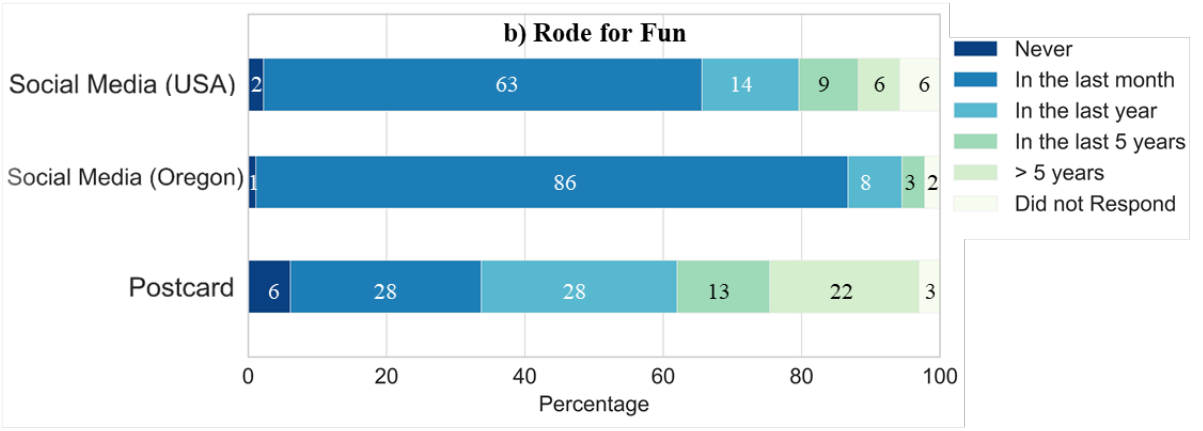
*Imagine that you are stopped at an intersection on a bicycle on a red signal indication and you see the signal head above. What does the **DISPLAY** mean to you as a person on a bicycle? Please type your response in the box below and be as descriptive as possible.*

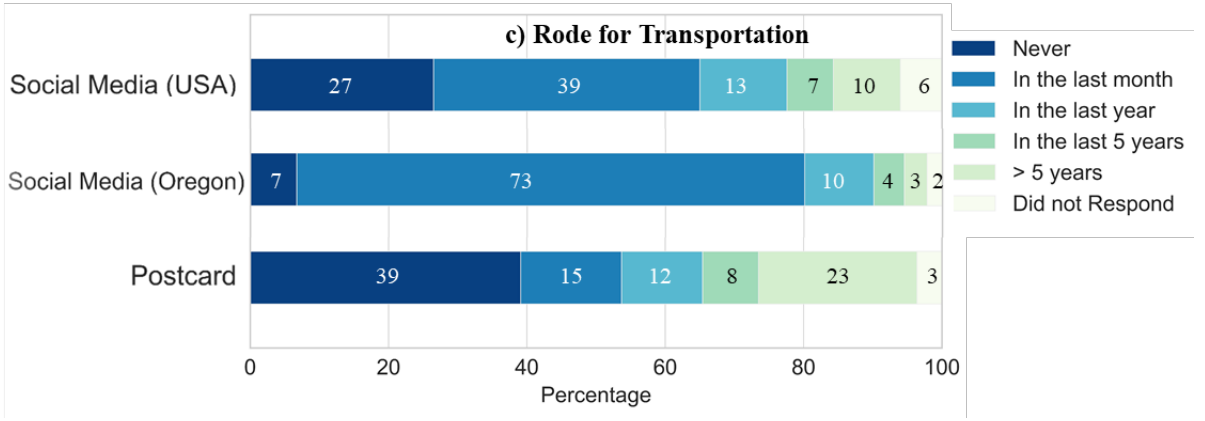
Online Survey Recruitment Methods

- Postcard
  - 10,003 mailed weighted random sample of Oregon cities
  - 271 postcards were returned as undeliverable
  - Incentive drawing for 1 of 3 $100 Amazon.com gift cards
  - 568 respondents accessed the survey
  - Response rate of 5.8%
- Social Media
  - Purchased ad/post on Facebook
  - Geographically targeted
  - Incentive drawing for 1 of 5 $100 Amazon.com gift cards
  - 1,550 respondents clicked the online link
  - 535 respondents completed the survey

- Postcard
  - Overrepresented in the 55–64 and 65+ year category, being male, and white
- Social media
  - Overrepresented in the 25-34-year category
  - Highest participation by underrepresented groups (still low)
- Significant differences in cycling frequency and trip types







Blue Light Embedded in Sign

Blue Light in Backplate w/ sign

Farside Portland Sites

N Ainsworth St. Westbound at N Interstate Ave.

NE 53rd Ave Southbound at NE Glisan St.

NE US Grant Pl. Eastbound at NE 33rd Ave.

SW Terwilliger Blvd Southbound at SW Capitol Hwy

Farside Eugene Sites

W 5th Ave Eastbound at Blair Blvd

W 5th Ave Westbound at Blair Blvd

Monroe St. Northbound at W 6th Ave.

Monroe St. Southbound at W 6th Ave.

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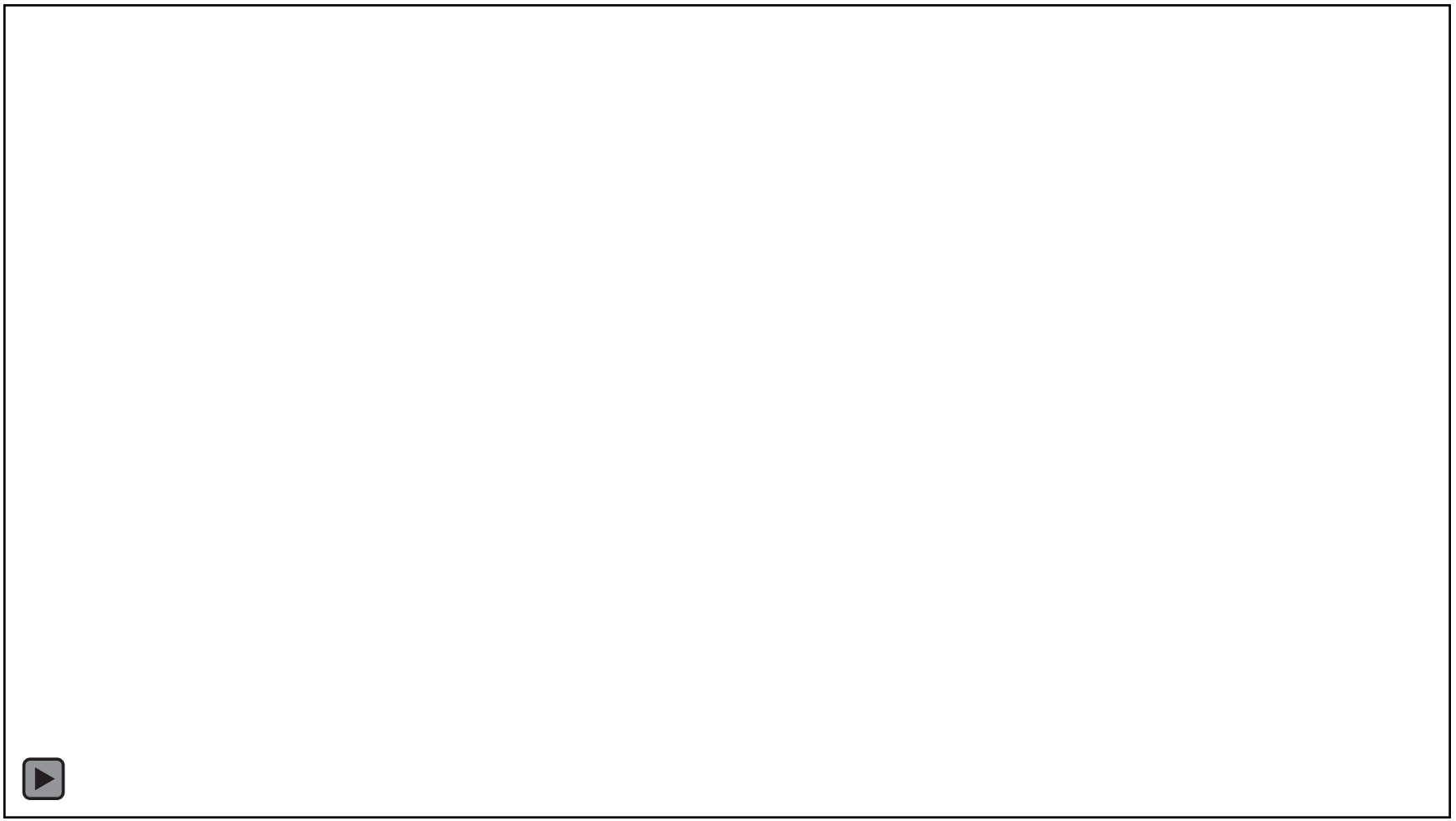
Sample Video



Video Analysis - Farside

Location	Installation	Date	EB/NB	WB/SB
N Interstate Ave. at N Ainsworth St.	**Before**	6/14/17	-	155
	Blue Light in Backplate	4/3/18	-	134
	Blue Light in Sign	10/10/19	-	109
NE 33rd Ave. at NE US Grant Pl.	**Before**	6/14/17	229	-
	Blue Light in Backplate	4/3/18	185	-
	Blue Light in Sign	10/10/19	192	-
NE Glisan St. at NE 53 Ave.	**Before**	6/14/17	-	105
	Blue Light in Backplate	4/3/18	-	62
	Blue Light in Backplate w/ Sign	10/10/19	-	65
SW Terwilliger Blvd. at SW Capitol Hwy	**Before**	6/4/17	-	112
	Before	4/3/18	-	75
	Blue Light in Backplate	4/24/18	-	140
	Blue Light in Backplate w/ Sign	10/10/19	-	76
Blair Blvd. at 5th Ave.	**Before**	9/24/19	32	67
	Blue Light in Sign	10/23/19	32	53
Monroe St at 6th Ave.	**Before**	9/24/19	50	39
	Blue Light in Sign	10/23/19	34	40

Total: 1,986

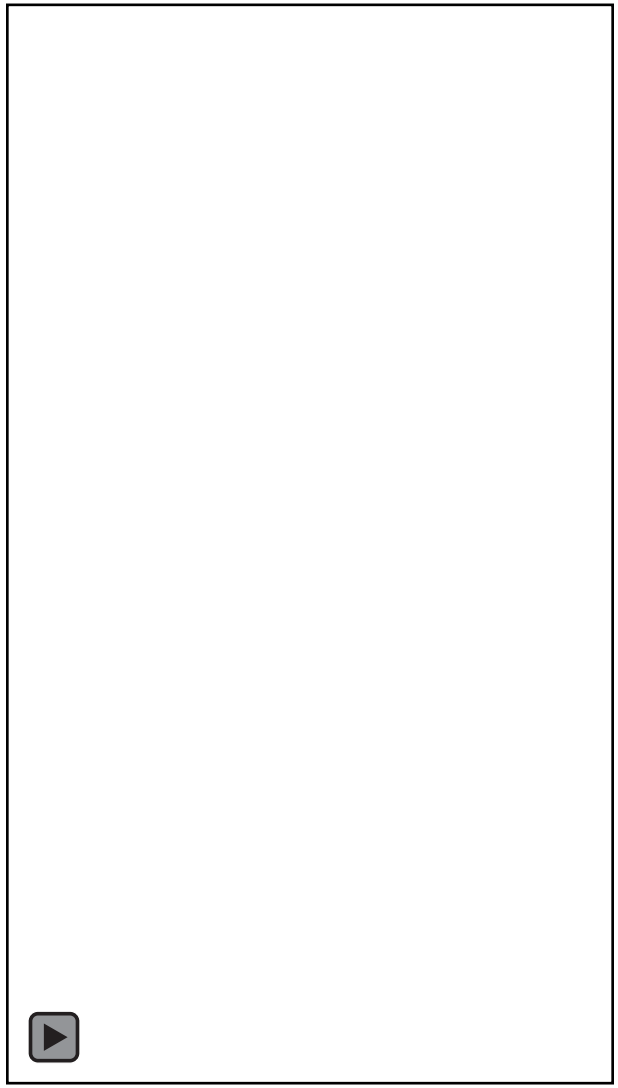
Nearside Blue Light Feedback System

Location	Installation	Date	On Street Arrivals
OR-34 at 26th St. at SW Brooklane Dr.	Before	Feb 2020	20
	With Stencil (2-wk)	July 2020	20
	With Stencil (4-wk)	August 2020	19
	With Stencil, Blue Light, and Sign (2-wk)	Sept 2020	23
	With Stencil, Blue Light, and Sign (5-wk)	Sept 2020	22

Nearside Countdown Timer

Location	Installation	Date	Total
NE Broadway St. at N Williams Ave.	Before	May 2020	138
	With Countdown	August 2020	200

Note:
No turn on red applies to bicycles
Pandemic data collection!



Summary of Intercept Surveys

Location	Dates of Intercept	Number Postcards Distributed	Responses	Response Rate
N Ainsworth St. and N Interstate Ave.	Sept/Oct 2019	67	27	40%
NE US Grant Pl. and NE 33rd Ave.	Sept/Oct 2019	107	53	50%
NE 53rd Ave. and NE Glisan St.	Sept/Oct 2019	44	23	52%
SW Terwilliger Blvd and SW Capitol Hwy	Sept/Oct 2019	13	9	69%
Monroe St. and W 6th Ave.	Sept/Oct 2019	51	22	43%
W 5th Ave. and Blair Blvd.	Sept/Oct 2019	55	17	31%
OR-34 at 26th St. at SW Brooklane Dr.	Sept/Oct 2020	93	54	58%
NE Broadway St. and N Williams Ave.	Sept/Oct 2020	87	29	33%
Totals		517	234	45%

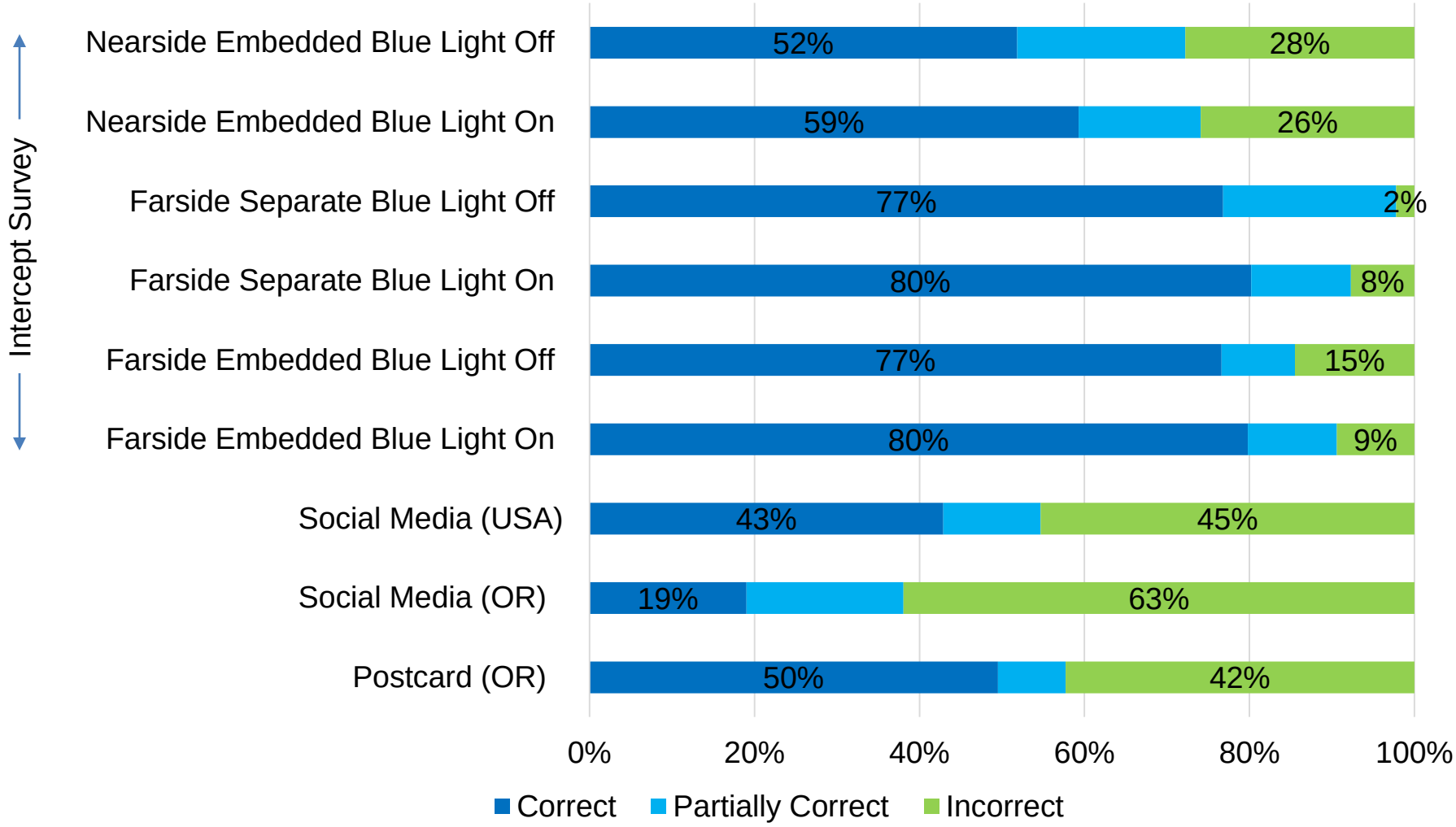
Error Coding

DISPLAY INDICATION	CORRECT	PARTIALLY CORRECT	INCORRECT
Blue Light Intersection Scenario (w/o signage) with car or bicycle	Blue light indicates that either the bicyclist or vehicle has been "detected" at the intersection	Blue light indicates that a car or bike has been "detected" nearby or that that traffic signal has been triggered.	Anything else
Blue Light Intersection Scenario (w/ signage) with car or bicycle	Blue light indicates that either the bicyclist or vehicle has been "detected" at the intersection	Blue light indicates that a car or bike has been "detected" nearby or that that traffic signal has been triggered.	Anything else

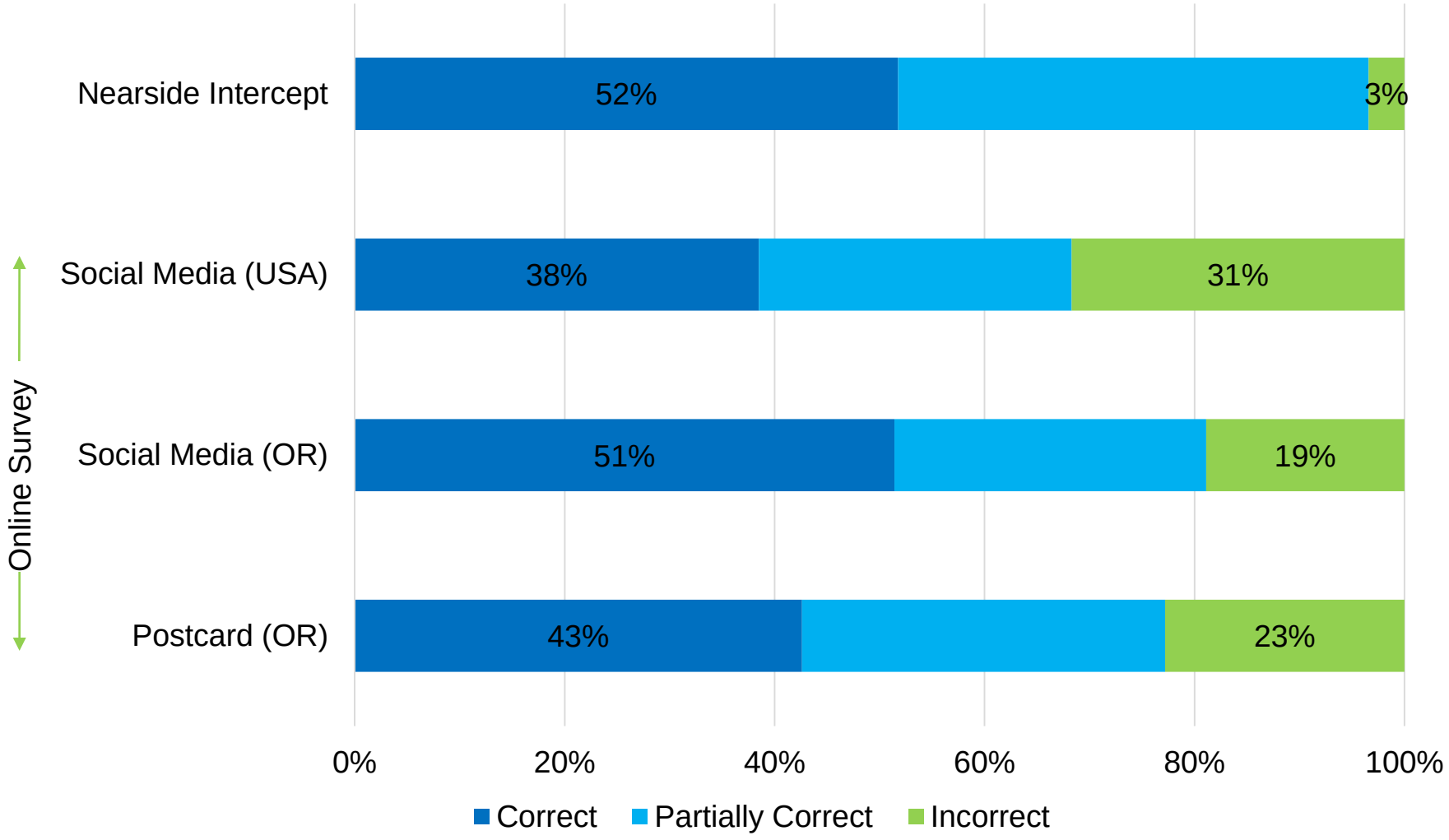
DISPLAY INDICATION	CORRECT	PARTIALLY CORRECT	INCORRECT
Bicycle Countdown Timer	That either the dots or the number indicates the amount of time left until the cyclist will be given the green signal.	That the system was used to instruct operations (e.g., "Stop" or "Go") for the bicyclist.	Anything else

RESULTS

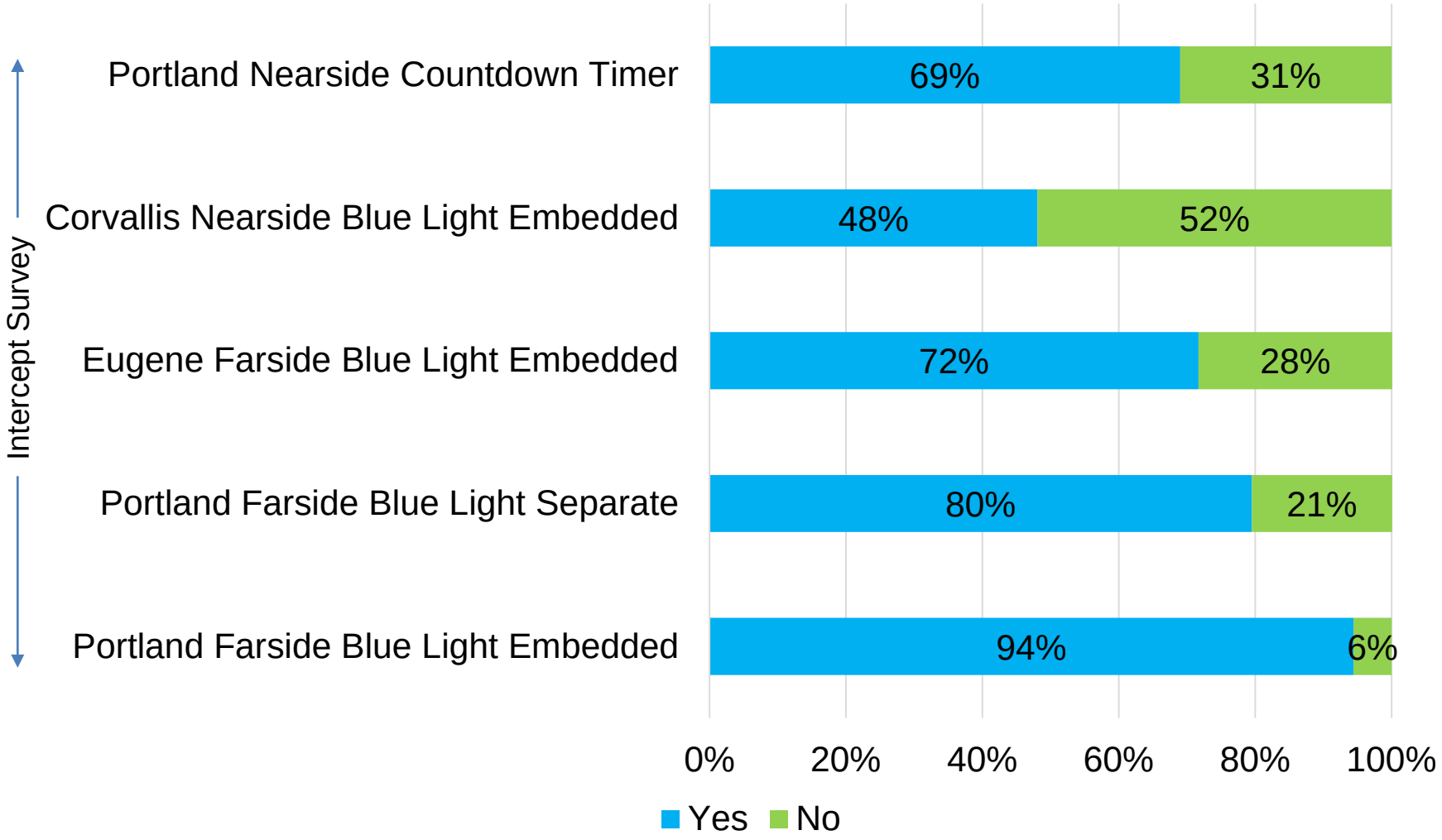
Comprehension: Blue Light With Sign



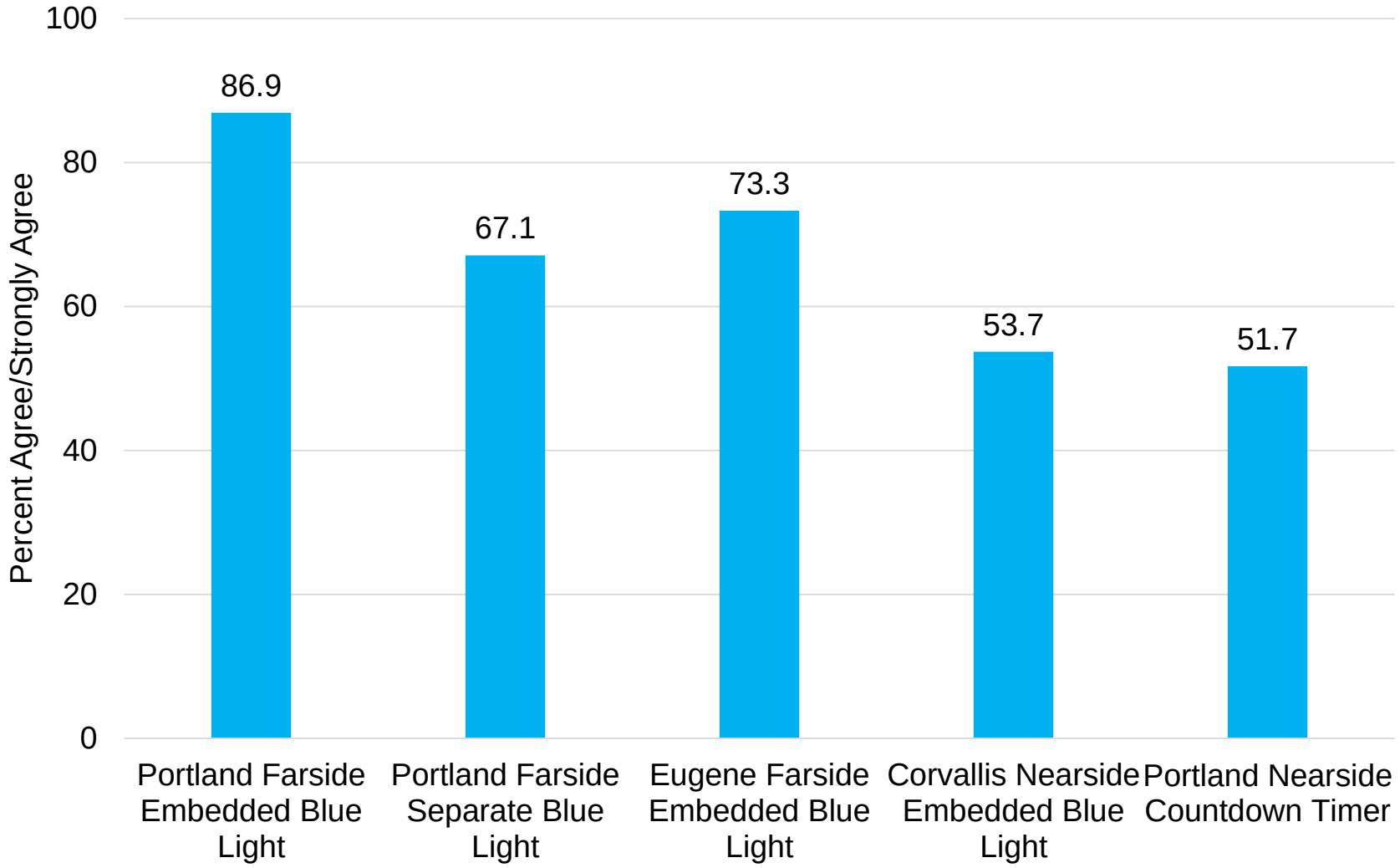
Comprehension: Countdown Timer



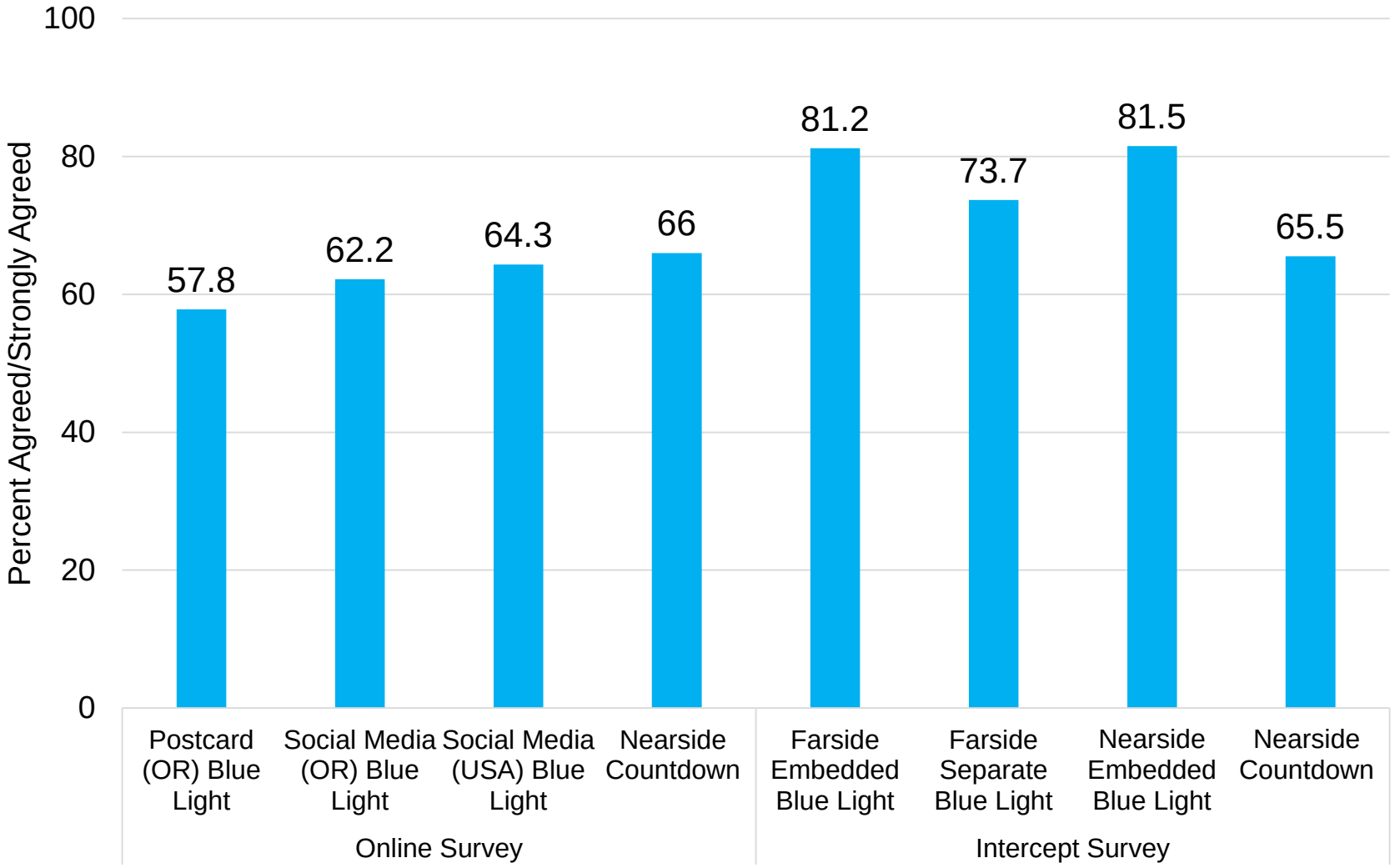
Was Blue Light/Countdown Timer Observed?



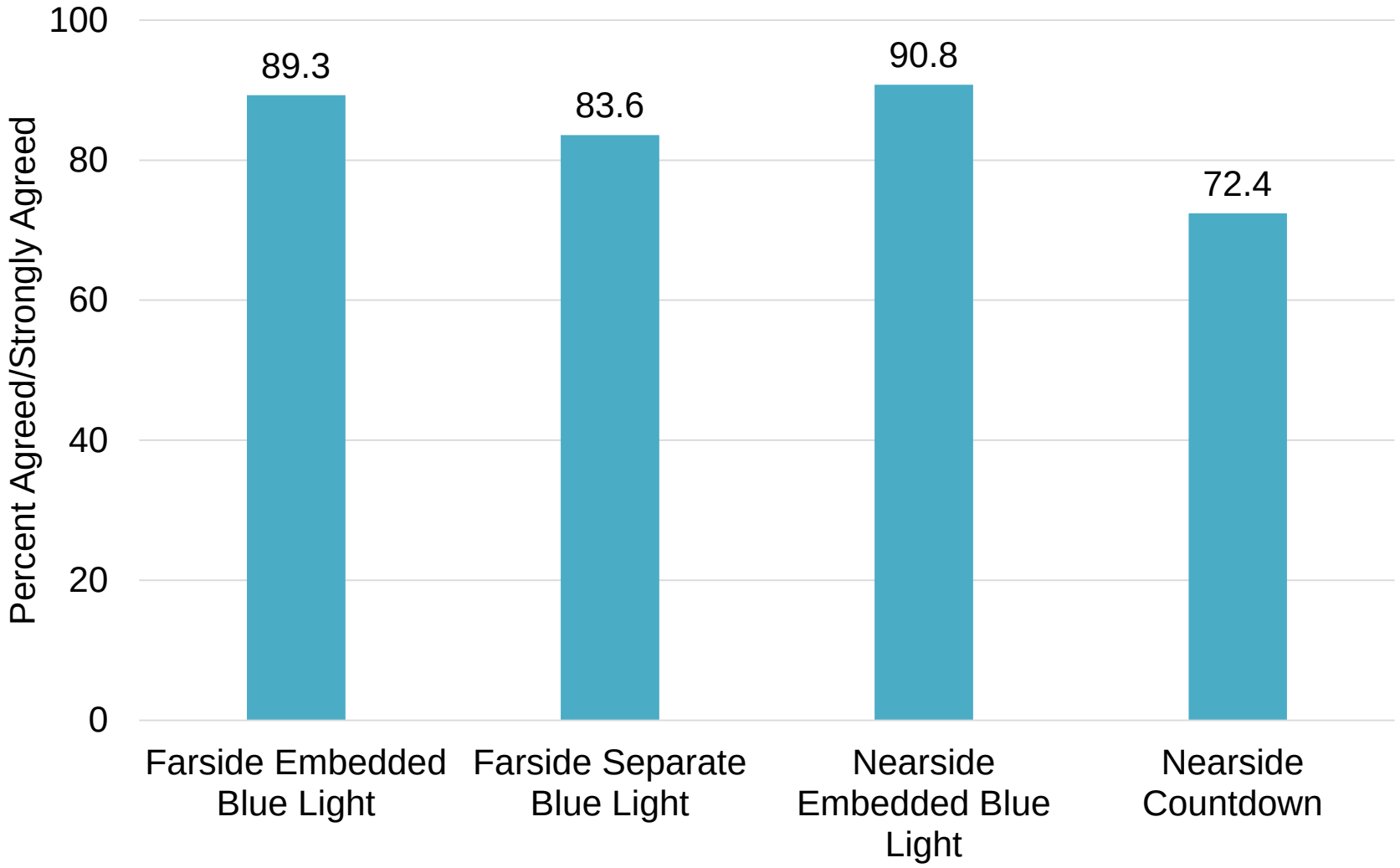
Blue Light/Countdown Timer Visible?



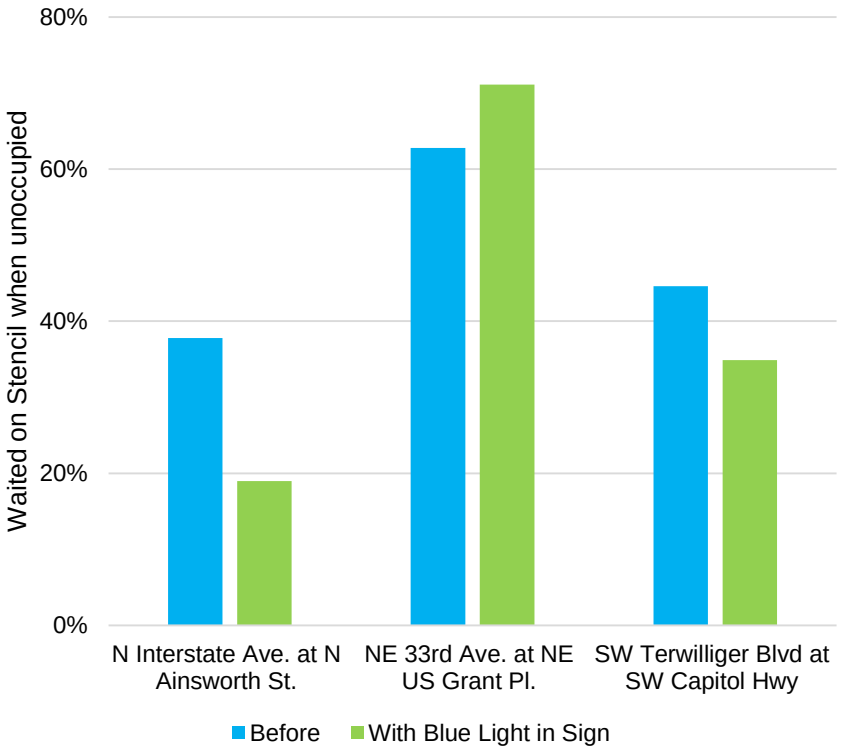
Improved Waiting Experience?



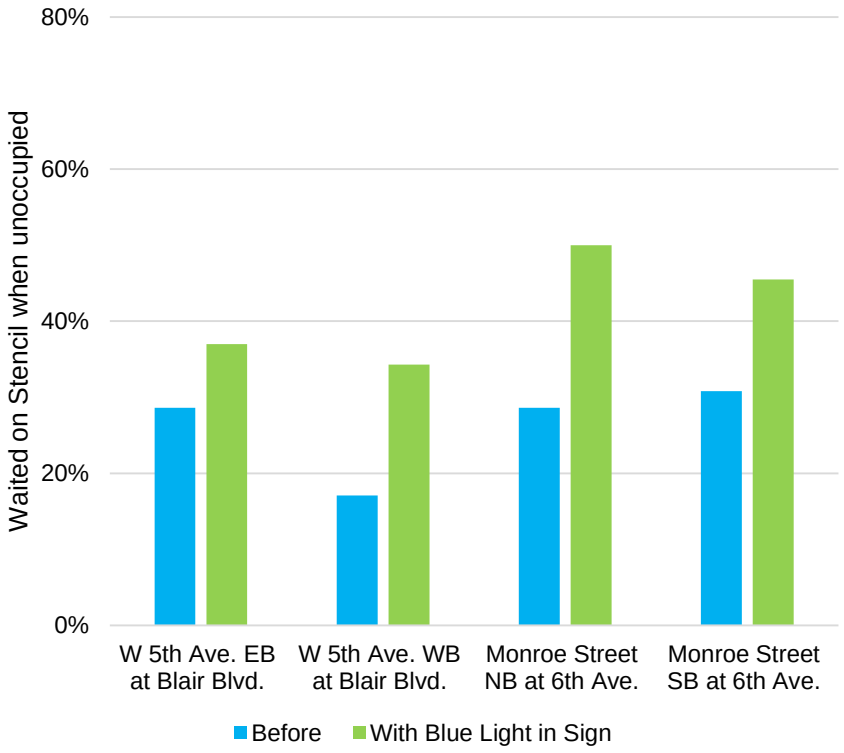
Detection Confirmation Provides Useful Information



Blue light Sites Waiting Location



Portland Sites



Eugene Sites

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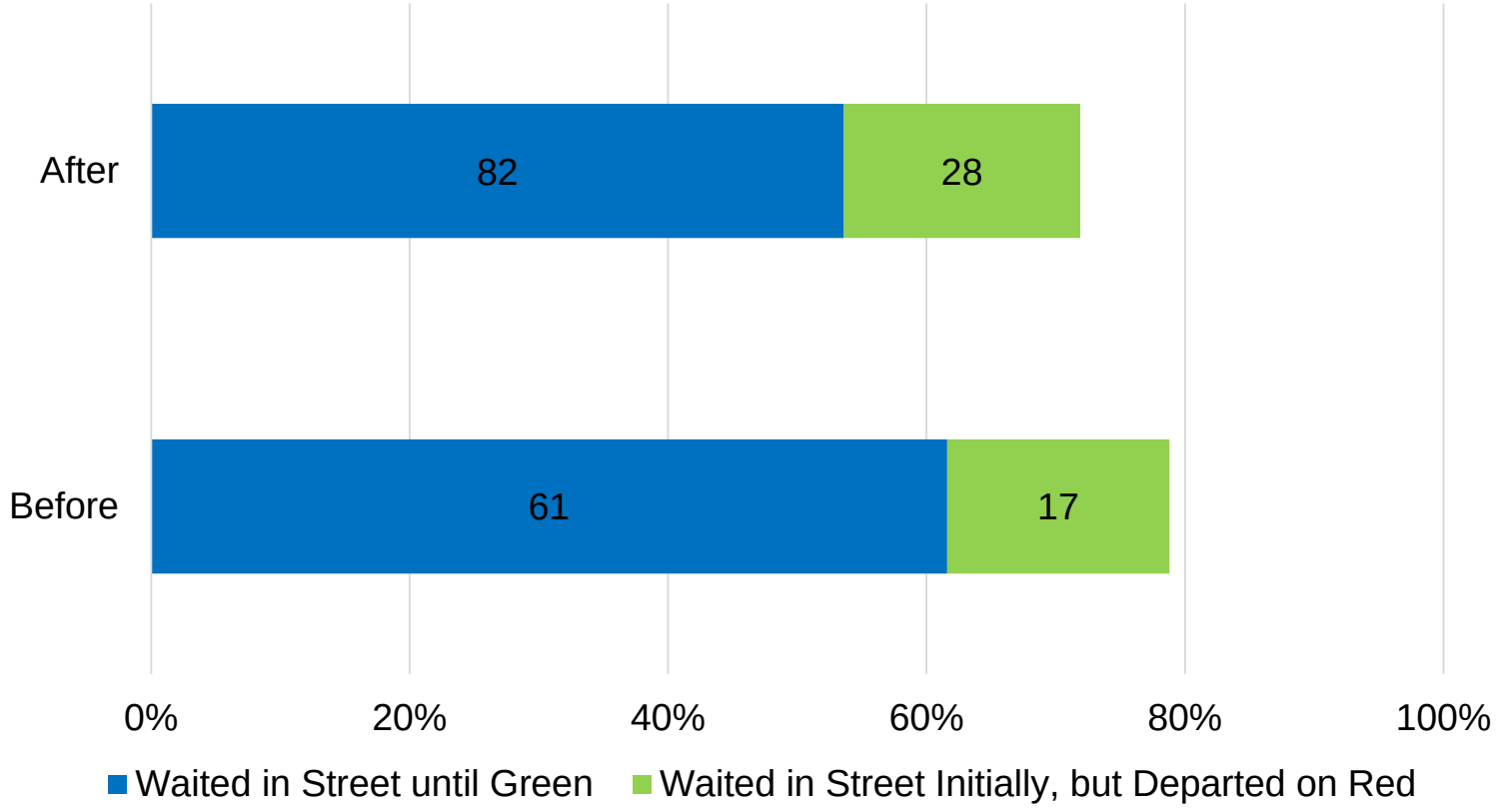
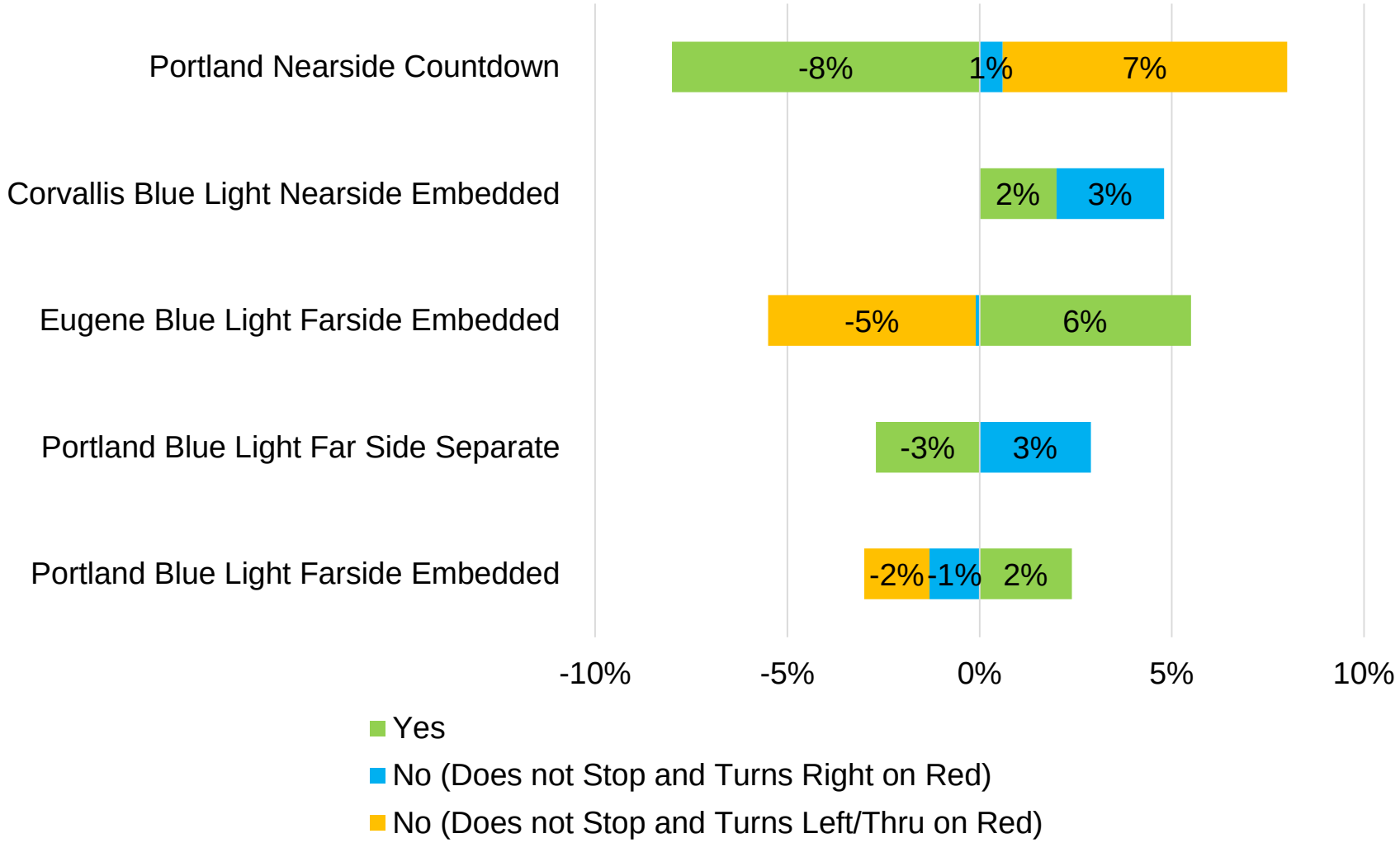
Countdown Timer: Waiting Location



Note: Bars are percentage, data labels are number of observations

Change in Compliance with Signal



CONCLUSION

Conclusions

- Blue Light
  - Provides useful information for cyclists
  - Sign is required for comprehension
  - Light in sign is recommended
  - Use separate detection for bicycles
  - Phrase “detected” is not completely understood
- Countdown Timer
  - Highest comprehension rates in the intercept survey, easily understood
- Minimal behavior changes (compliance, waiting locations)
- Persons on bicycle accustomed to looking at farside for signal information, nearside placement needs to be good

Limitations

- Surveys were conducted in a stated-preference format
- Online survey sample was biased towards white, high-income, male respondents
- Intercept survey sample for countdown timer survey was small
- Some data comparison periods include pre and post COVID-19 pandemic

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  - Douglas Cobb, Graduate Research Assistant, OSU
  - Frank Boateng Appiah, Graduate Research Assistant, PSU

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