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Creating Safer Communities for the Use of Active Transportation Modes in California: The Development of Effective Communication Message Strategy for Vulnerable Road Users

Samer Sarofim, PhD

Aly Tawfik, PhD, PTP

CSUTC California State University Transportation Consortium

CALIFORNIA STATE UNIVERSITY LONG BEACH

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Report 22-20

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July 2022

A publication of the
Mineta Transportation Institute
Created by Congress in 1991

College of Business
San José State University
San José, CA 95192-0219

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. 22-20	**2. Government Accession No.**	**3. Recipient's Catalog No.**	
4. Title and Subtitle Creating Safer Communities for the Use of Active Transportation Modes in California: The Development of Effective Communication Message Strategy for Vulnerable Road Users		**5. Report Date** July 2022 **6. Performing Organization Code**	
7. Authors Samer Sarofim, Ph.D. Aly Tawfik, Ph.D., PTP		**8. Performing Organization Report** CA-MTI-2030	
9. Performing Organization Name and Address Mineta Transportation Institute College of Business San José State University San José, CA 95192-0219		**10. Work Unit No.** **11. Contract or Grant No.** ZSB12017-SJAUX	
12. Sponsoring Agency Name and Address State of California SB1 2017/2018 Trustees of the California State University Sponsored Programs Administration 401 Golden Shore, 5th Long Beach, CA 90802		**13. Type of Report and Period Covered** **14. Sponsoring Agency Code**	
15. Supplemental Notes			
16. Abstract Despite increased efforts to improve safety in recent years (e.g., the Focus Cities Program in California), California continues to have a high rate of pedestrian and bicyclist fatalities. Currently, the state currently lacks a cohesive messaging strategy to improve behaviors related to pedestrian and cyclist traffic safety practices. To fulfill this need, this research showcases the differential effect of message framing on attitudes and intended behaviors related to pedestrian and cyclists traffic safety practices. This project investigated factors & risky behaviors contributing to accidents involving vulnerable road users, preventive measures to decrease accidents involving vulnerable road users, and more. The qualitative analysis presented a significant lack of coherent, long-term, evidence-based communication strategies that aimed at enhancing the safety of vulnerable road users in California. Quantitatively, this research also experimentally investigated various messages, employing different time horizons and regulatory focus message framings. Findings indicate that the messages with a limited time horizon tend to be associated with better safety perceptions and attitudes than messages with an expansive time horizon. California transportation authorities, professionals, and advocacy groups will be able to use this information to effectively allocate the communication effort and spending to induce attitudinal and behavioral change that can impact the safety of active transportation modes.			
17. Key Words Transportation Safety, Vulnerable Road Users, Transportation Modes, Communication, Personality	**18. Distribution Statement** No restrictions. This document is available to the public through The National Technical Information Service, Springfield, VA 22161.		
19. Security Classif. (of this report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 38	**22. Price**

Form DOT F 1700.7 (8-72)

DOI: 10.31979/mti.2022.2030

Mineta Transportation Institute
College of Business
San José State University
San José, CA 95192-0219

Tel: (408) 924-7560
Fax: (408) 924-7565

Email: mineta-institute@sjsu.edu

transweb.sjsu.edu/research/2030

ACKNOWLEDGMENTS

This study was funded by the California State University Transportation Consortium (CSUTC). Our team is particularly grateful for the timely and continuous support of Dr. Karen Philbrick and Dr. Hilary Nixon.

The team also acknowledges the support of the different professionals and constituents in the community who contributed to this work, either through personal interviews or by completing the study surveys.

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Executive Summary

Traffic crashes are among the biggest challenges related to our existing transportation systems. However, the effects of these crashes are not equally shared among the different types of road users. Vulnerable road users, mainly active travelers such as pedestrians and bicyclists, suffer the consequences of traffic crashes much more than users of motorized modes of travel. Accordingly, this work uses a message framing science approach to improve the safety outcomes of those vulnerable users.

This research employed mixed methods. First, it qualitatively investigate the factors and risky behaviors contributing to accidents involving vulnerable road users, the preventive measures to decrease accidents involving vulnerable road users, and the existing education and communication programs. Second, it quantitatively experiment with various messages, employing different time horizons and regulatory focus in the message framings. Findings indicates that the messages with a limited time horizon tend to be associated with better safety perceptions and attitudes than messages with an expansive time horizon. Also, perceived personal control has a significant correlation with various positive road safety attitudes, indicating that promoting an internal locus of control can be an effective strategy in framing safety messages.

This research is aligned with SB1, Objective 4 as it provides evidence-based and theory-driven messaging strategies that enhance the safe use of active transportation modes. This research also informs decision makers on transportation-safety-related issues, and it therefore aligns with SB 1, Objective 7.

1. Introduction

California, Florida and Texas accounted for the highest numbers of cyclists fatalities between years 2012 and 2018 (Hubbard, 2021) and California showed an 26% increase in pedestrians fatalities in 2018, compared to 2014 (California Health Traffic Safety). The safety of pedestrians and bicyclists has been a major challenge in California and throughout the nation. However, efficient message framing may be able to produce significant benefits for this issue.

Vulnerable road users (i.e., pedestrians, bicyclists, and motorcyclists) accounted for 12,125 traffic fatalities (33%) in the United States in 2018. With the goal of creating safer communities for the use of active transportation modes (i.e., biking and walking), safety-related behaviors and practices are crucial. Also, reducing road fatalities is a key objective of transportation authorities across the nation. To that end, positive behavioral changes geared to enhance traffic safety can be improved by effective messaging strategies.

As indicated by discussions with multiple city officials and transportation managers in California, there is a lack of cohesive messaging strategy that aims at enhancing the safety of vulnerable road users. The role of effective messaging in changing the public attitudes and behaviors to increase traffic safety seem to require more emphasis and attention. The variety of the communing habits of these users complicates the design and implementation of effective programs for communicating safe behavior practices. Current messages, and their framing, seem to be conducted on an ad-hoc basis in most cases, lacking effectiveness and missing the opportunity to build on the vast academic research on message strategy and framing.

California continues to show a high rate of pedestrian and bicyclist fatalities, and many of California's cities (e.g., Fresno, Bakersfield, and others) are among the nation's most dangerous cities for pedestrians and bicyclists. In 2015, the Federal Highway Administration (FHWA) included many of California's cities in the list of cities with the highest bicycle and pedestrian fatalities. As a result, the Focus Cities Program in California was created with the support of the California Office of Traffic Safety (OTS). Its aim is to support community efforts geared towards the development of safe walking and biking communities and programs. Yet, today, California remains among the most unsafe states for pedestrians and cyclists.

Message framing has been increasingly attracting both scholars' and practitioners' attention because it influences various behaviors.[1] For instance, message framing has been found to affect consumers' decision making when buying, using, or recommending health care products. Specifically, positive and negative framing messages are more effective for prevention and detection products, respectively.[2] In a related vein, Wu et al.[3] illustrated the differential effect of message framing on the effectiveness of dietary supplement advertisements.

This project aims to capitalize on the message framing sciences, which have been highly successful and heavily utilized in consumer behavior in order to improve pedestrian and bicycle safety in California.

2. Qualitative Study

This qualitative study was designed to gain a greater breadth of understanding of the risky behaviors of vulnerable road users and motorists, identify the most helpful interventions in reducing accidents involving vulnerable road users, and assess the current practices related to communication strategies aimed at enhancing the safety of vulnerable road users.

2.1 Design

The qualitative study used semi-structured interviews in gain in-depth to better understand the ways advocacy groups and professionals identify and categorize the risky behaviors, including their antecedents and consequences, of each of the vulnerable segments of road users (e.g., pedestrians and cyclists). Interviews with various stakeholders—including leaders of advocacy groups for different vulnerable segments, transportation professionals and experts in California, and city officials—followed a semi-structured protocol. The interview questions were designed to capture the factors contributing to accidents and impairing road safety for vulnerable road users as well as exploring existing messaging and communication strategies that are aimed at enhancing road safety for those vulnerable users. For a sample of interview questions, see Appendix A.

2.2 Procedure

Due to the ongoing COVID-19 situation, all the semi-structured interviews were conducted virtually. First, invitation emails were sent to representatives from private-sector engineers and planners, advocacy groups, city officials, and researchers. The invitation emails included the purpose of the study and a brief description of the potential value of the research project. Second, virtual interviews were scheduled with participants who agreed to join the study. Third, virtual interviews were conducted using a semi-structured method, whereby participants were presented with prepared questions while leaving space for relevant elaborations and conversations to take place during the interviews.

2.3 Sample

Eight in-depth interviews were conducted with participants representing: (1) private-sector engineers and planners in San Francisco, San Jose, and Fresno; (2) advocacy groups in Fresno and San Diego; (3) city officials in San Jose and San Diego; and (4) a researcher from San Francisco. Details about participants can be found in Appendix B.

2.4 Qualitative Findings

2.4.1 Factors & Risky Behaviors Contributing to Accidents Involving Vulnerable Road Users

Attitudes and Perceptions were Cited as an Important Factor Contributing to Accidents Involving Vulnerable Road Users

As indicated by Participant 1:

> "Community **attitudes** are a huge contributor. People's perception of who owns space, and who belongs where are a huge part of what makes a place safer or less safe."

Participant 1 also emphasized the role of attitudes, stating,

> "Community **attitudes** and the permissiveness people have around the idea of speeding being a victimless crime, when actually it's the most likely to lead injury and death … The **attitude** motorists have towards bikes is so contemptuous that they actively don't want people to be in the road."

Distractions Emerged as a Common Theme that Contributes Accidents Involving Vulnerable Road Users

Participant 3 stated:

> "**Distracted** drivers—a lot of it is caused by design of our infrastructure, requiring drivers to be very, very attentive."

Participant 8 supported the notion that distraction is a leading cause of crashes, stating,

> "**Distraction** as well is a leading cause of crash crashes, anything again it's a mistake by the driver…[who is] not paying attention to the situation."

In a similar vein, Participant 4 indicated:

> "…they're receiving a text or they're watching something or, you know, there's a lot more things to **distract** from your attention."

Distractions was attributed not only to motorists but also to cyclists and pedestrians; for example, Participant 2 stated:

> "**Inattention** probably from all parties, that's a problem. And, you know, it all it all comes back to speed. But I think a lot of our brains are designed in a way that allows for **inattention**."

Speeding Was Found as a Main Risky Behavior that Contributes to Accidents Involving Vulnerable Road Users

Participant 1 stated:

> "**Speeding**. It increases the severity of the crash. When you're **speeding**, you are less able to react, and people are less able to react to you."

Participant 4 supported the same notion by stating:

> "**Speeding** is our biggest growing issue at the moment… wider streets definitely encouraged **speeding**."

Participant 8 supported the same notion:

> "Typically, most crashes are associated with **speed**."

Participant 5 emphasized that vulnerable road users are also practicing a special type of speeding:

> "Pedestrians or bicyclists thinking they can get across and beat the traffic to the other side."

2.4.2 Most Helpful Preventive Measures to Decrease Accidents Involving Vulnerable Road Users

Infrastructure and Road Design

Traffic signals, protected bike lanes, and other road design factors emerged as the most common interventions that are perceived to help reduce accidents involving vulnerable road users. Below are some quotes from different participants.

Participant 1:

> "**Traffic signal** is to introduce the leading pedestrian interval, that one's guaranteed to save on crashes."

> "Crash data is bad data. It's retrospective. It's small sample size, and it relies on self-reporting, which a lot of the time doesn't happen, especially in communities of color."

Participant 2:

> "**Creating a system** where it's not possible to have severe injury or fatal crashes. So it's not necessarily about you know, sort of personal responsibility for drivers, but having a roadway that's designed so that severe crashes can't occur."

Participant 3:

> "[A] **protected bike lane** slows down vehicles [and] creates a space for different types of users and allows for us to design better for pedestrians and through transit."

Participant 4:

> "If you are going to try and fix a problem, such as speeding fatalities, your **road design** would be the number one thing to do."

Participant 8:

> "Re-evaluating **signal timing**, for if the crashes were occurring at [a] signalized intersection, you can also look again at them, the standard engineering factors, the markings that lead up to it, the signage, the sight distance that leads up to a particular location."

Participant 5:

> "**Bike lanes, designated bike facilities, and pedestrian facilities**."

Participant 7:

> "So, a pretty neat intervention is they do things called bulb-outs, they sort of expand the sidewalk into the street, it creates less room for cars … it forces cars to slow down when they're going to make a turn because they don't have as much room. And, and by slowing them down, it forces them to sort of be more aware."

> "…having more protected bicycle facilities, you know, **protected bike lanes**, those, I think, are very powerful."

Education and Communication

When compared to road design, education and communication were emphasized less by participants as a strong tool that helps reduce accidents involving vulnerable road users.

Some participants did indicate the importance of education and communication. For example, Participant 5 said:

> "It comes down to **education**, and it comes down to **marketing**, to be honest with you; the public needs to understand that … the motorist is not the only user of the facility."

Participant 6 also indicated:

> "**Signage and roadway marketing** are, I think, the two biggest things that we need to do."

Whereas, other participants deemphasized the role of education and communication and posited doubts on the impact messaging can be creating

Participant 4 stated:

> "Then there's education, which I do think matters. But it's kind of [a] soft[er] field. So, the degree to which you can study how **effective a transportation campaign** is, you know, a little debatable, so—or maybe a lot **debatable**, actually. So, I think I'm personally in favor of education and think it's a great idea. But it's also **not as well proven**, for example, as redesigning a roadway to be effective."

2.4.3 Messages and Messaging Strategies that were Found most Effective in Reducing Accidents Involving Vulnerable Road Users

Overall, a clear lack of messaging strategy was suggested in participants' response to questions related to communication plans, message framing, messaging strategy, and campaigns directed to reduce accidents involving vulnerable road users.

Participant 2 emphasized that the role of communication is to help people advocate for better road designs, rather than influencing road users' behaviors. Specifically, this participant stated:

> "The idea of messaging, having a big approach is not super consistent with safe system approach to traffic safety. So, it's more about I think it's more important to encourage people to advocate for changes to the road environment where they live. And that's going to be more effective at making change. So, you know, if, if you design your roadway network so that it's not possible to die on it or very difficult, then that's going to be much more effective if you want to allow for some imperfections in humans, which is really to be expected."

Also, there was either a lack of understanding or a misunderstanding of message framing. For instance, Participant 1 stated: *"Emotional things [messaging] are hard because people can't empathize with them … if they already believe it won't happen to me."*

This indicated a misunderstanding of the effects of the utilization of emotional appeal in effective messaging strategies.

There were also signals of a lack of expertise among those who attempt to develop safety-related campaigns. Participant 4 stated:

> "Things [safety messaging campaigns] that we did up to this point are really sort of—we who are not marketing professionals, and trying to figure it out."

Similarly, Participant 6 stated:

> "For the cycling club, it's been primarily our social media. We have a—we have some Facebook groups, you know, that we put things out on and our newsletter are probably the two primary ways that we get information out to the, to the club members."

> "…it's kind of less, less creative and more just, you know, that's the law sort of a thing, where a helmet, you know, three feet, that kind of, kind of information."

Also, Participant 7 indicated:

> "…do some earned media, we'll do press conferences, just talking about safely…"

These responses reflected a lack of clear, coherent, theory-driven, and evidence-based messaging strategies.

Further, the lack of dedicated budgets for developing strategic communication plans appeared to be an obstacle. As Participant 4 stated:

> "The budget devoted to safety messaging either is small or totally new."

Participants were in favor of positive message framing. Also, participants indicated the importance of avoiding the elicitation of a sense of guilt or shame among the targeted audience.

Participant 5 stated:

> "The more positive you can be and still get your point across, I think the better off you are. People turn off when all they hear is, you know, gloom stories, you know, doom and gloom."

Participant 1 also stated:

> "Shame puts people in a defensive position and they shut down."

3. Quantitative Study

3.1 Design

The quantitative survey employed a 2 × 2 between-subjects design (expansive vs. limited time horizon × promotion-focused vs. prevention-focused regulatory approach). The time horizon manipulation was adapted from Williams and Drolet.[4] Participants were randomly assigned to see one of the four messages (a sample of the complete message is included in Appendix C). The messages were slightly modified to suit the participants' indicated main mode of transportation (motorists vs. cyclists and pedestrians) in the earlier screening questions. The message was also designed in the light of the risky behaviors indicated in the qualitative study.

3.2 Procedure

For the quantitative survey, participants were randomly assigned one of the four messages. After presenting the message, participants completed various questionnaires about attitudinal and behavioral intentions. Questions tackled participants' perceptions about each message's effectiveness on their own and others' behavior on the road, the usefulness of the message's content, and its ability to reduce pedestrians' and cyclists' accidents. Worth noting is that the message content did not change among conditions, but rather, it was the framing that varied.

The effectiveness of the message to encourage others to reduce speed or drive within the speed limit was measured using a scale of 1–5 (anchored on 1 = "Strongly Disagree" and 5 = "Strongly Agree") that we adapted from Tay and De Barros.[5] The scale for a message's effectiveness in promoting cautiousness while crossing ranged from 1–7 (anchored on 1 = "Strongly Disagree" and 7 = "Strongly Agree") and was adapted from Glendon and Walker.[6]

A scale ranging from 1–7 was adapted from Lewis, Watson, and White to assess the perceived effectiveness of each message's recommended strategies for reducing accidents involving pedestrians and cyclists, the usefulness of the information in the message in reducing the risk of pedestrian and cycling accidents, and the effectiveness of adopting the message's recommendations in reducing accidents involving pedestrians and cyclists (anchored on 1 = "Strongly disagree" and 7 = "Strongly disagree").[7]

Perceptions regarding the message's effectiveness in reducing pedestrians' and cyclists' accidents in general were measured using a 1–5 scale (anchored on 1 = "Not at all effective" and 5 = "Very effective") that was adapted from Glendon and Cernecca.[8]

Participants then answered questions related to their preferred communication channels and social media platforms for receiving messages using a 1–5 scale (anchored on 1 = "Do not prefer" and 7 = "Prefer a great deal").

An individual-differences four-item scale measuring perceived personal control ($\alpha = 0.86$, indicating the inter-scale reliability), adapted from Lachman and Weaver, was administered (see Appendix D).[9] Finally, demographics were collected and participants were thanked.

3.3 Sample

For the quantitative study, quota sampling was used to ensure equal gender distribution (50% males, 50% females) and maximize efforts to include participants from the 58 counties in California. Also, the sampling attempted to map on to the population proportions of the 58 counties. The sample is composed of 1,376 respondents from across California, recruited via a marketing research firm to complete the study. Detailed sample characteristics are shown in Table 1.

3.4 Quantitative Findings

One-way ANOVA testing showed that the time horizon manipulation of the message has a significant main effect on the message's effectiveness in encouraging others to reduce speed or drive within the speed limit (Figure 1), promoting cautiousness while crossing (Figure 2), providing a strategy (or strategies) to reduce pedestrians' and cyclists' accidents (Figure 3), effectiveness of adopting the message's recommendations in reducing accidents involving pedestrians and cyclists (Figure 4), usefulness of the message content to reduce risks of pedestrians and cyclists' accidents (Figure 5), and message effectiveness in reducing pedestrians' and cyclists' accidents in general (Figure 6). Specifically, limited time horizon manipulation showed more positive results than extensive time horizon manipulation.

The regulatory focus of the message did not show a differential significant main effect on perceptions of a message's ability to induce attitudinal or behavioral changes.

As for media channels, participants preferred to be reached via email and TV, followed by radio, SMS, and letters; for social media channels, Facebook and YouTube were at the top of the preference list, followed by Instagram and Twitter.

Perceived personal control significantly and positively correlated with perceived (a) message effectiveness in encouraging others to reduce speed or drive within the speed limit, (b) message's effectiveness in promoting cautiousness while crossing, (c) message's usefulness in providing a strategy (or strategies) to reduce pedestrians' and cyclists' accidents, (d) effectiveness of adopting the message's recommendations in reducing accidents involving pedestrians and cyclists, (e) usefulness of the message content in reducing risks of pedestrians' and cyclists' accidents, and (f) message's effectiveness in reducing pedestrians' and cyclists' accidents in general (see Table 3).

Table 1. Sample Characteristics

Characteristic	Percentage	Characteristic	Percentage
County		Ethnicity	
Alameda	4.0	American Indian or Alaska Native	1.2
Alpine	0.7	Hispanic/Latino	12.4
Amador	0.7	Black or African American	7.0
Butte	0.7	Native Hawaiian or Other Pacific Islander	0.9
Calaveras	0.7	White or Caucasian	65.8
Colusa	0.7	Asian	7.2
Contra Costa	2.6	Multiracial	2.2
Del Norte	0.2	Other	1.3
El Dorado	0.7	Prefer not to answer	2.1
Fresno	6.0		
Glenn	0.3		
Humboldt	0.7		
Imperial	0.7		
Inyo	0.1		
Kern	2.2		
Kings	0.5		
Lake	0.2		
Lassen	0.1		
Los Angeles	13.1		
Madera	0.5		
Marin	0.4		
Mariposa	0.3		
Mendocino	0.1		
Merced	0.7		
Modoc	0.1		
Mono	0.0		
Monterey	0.9		
Napa	0.3		
Nevada	0.4		
Orange	6.8		
Placer	0.8		
Plumas	0.1		
Riverside	5.7		
Sacramento	3.6		
San Benito	0.4		
San Bernardino	5.1		
San Diego	10.9		
San Francisco	7.1		

Characteristic	Percentage	Characteristic	Percentage
San Joaquin	1.8		
San Luis Obispo	0.7		
San Mateo	1.1		
Santa Barbara	1.1		
Santa Clara	6.3		
Santa Cruz	0.7		
Shasta	0.7		
Sierra	0.1		
Siskiyou	0.5		
Solano	1.1		
Sonoma	1.1		
Stanislaus	1.1		
Sutter	0.3		
Tehama	0.4		
Trinity	0.1		
Tulare	0.6		
Tuolumne	0.2		
Ventura	1.9		
Yolo	0.4		
Yuba	0.4		
Age		Education	
18 to 24	9.2	Less than high school	2.0
25 to 34	10.1	High school graduate (or GED)	14.1
35 to 44	22.4	Vocational or technical training	4.7
45 to 54	11.0	Some college (no degree)	21.4
55 to 64	15.6	2-year college degree (Associate's, etc.)	14.2
65 or older	31.7	Bachelor's degree	28.1
		Master's degree	11.6
		Doctoral Degree (PhD, JD, MD, etc.)	3.9
Gender		Total Annual Household Income	
Male	50.0	Less than $30,000	23.4
Female	50.0	$30,000 to $49,999	17.2
		$50,000 to $74,999	15.9
		$75,000 to $99,999	10.2
		$100,000 to $124,999	6.4
		$125,000 to $149,999	6.9
		$150,000 to $199,999	13.2
		$200,000 to $249,999	4.9
		$250,000 or more	1.8
Main Mode of Transportation		Employment	

Characteristic	Percentage	Characteristic	Percentage
Car	54.1	Working full-time	34.3
Walking	13.3	Working part-time	7.8
Bicycle	11.3	Self-employed	7.8
Public Transportation	20.9	Homemaker or stay-at-home parent	3.5
Motorcycle	0.3	Student	5.2
		Out of work, but looking for work	7.0
		Out of work, but not looking for work	2.4
		Unable to work (e.g., disability)	6.3
		Military	0.3
		Retired	28.2

Table 2. ANOVA: The Effect of Expansive vs. Limited Time Horizon Framing

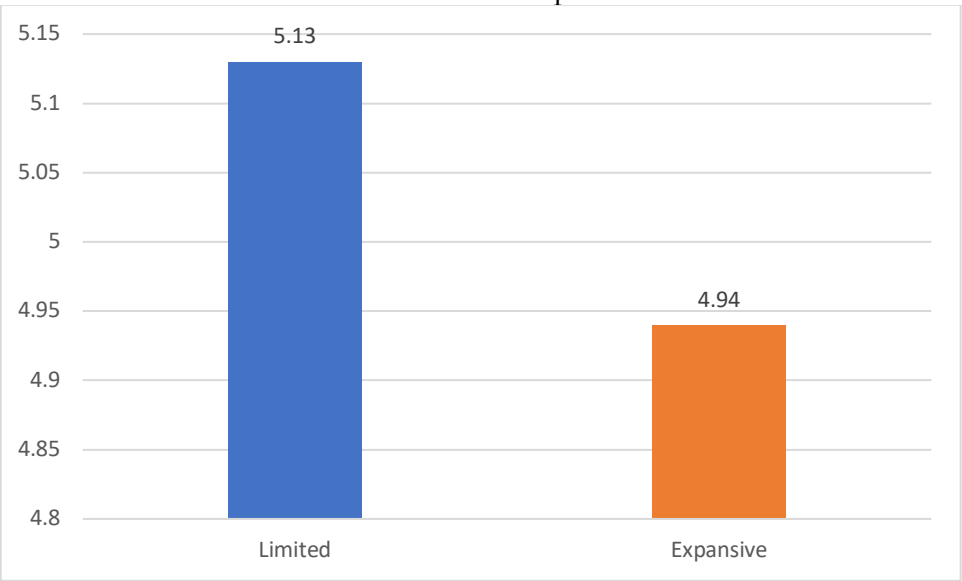
		Mean	Std. Deviation		Sum of Squares	df	Mean Square	F	Sig.
Message effectiveness in encouraging others to reduce speed or drive within the speed limit	Limited Time Horizon	5.13	1.409	Between Groups	12.715	1	12.715	6.339	0.012
	Expansive Time Horizon	4.94	1.424	Within Groups	2755.748	1374	2.006		
	Total	5.03	1.419	Total	2768.462	1375			
Message's effectiveness in promoting cautiousness while crossing	Limited Time Horizon	5.63	1.351	Between Groups	8.089	1	8.089	4.247	0.040
	Expansive Time Horizon	5.41	1.410	Within Groups	1190.326	625	1.905		
	Total	5.52	1.384	Total	1198.415	626			
Message usefulness in providing a strategy (or strategies) to reduce pedestrians' and cyclists' accidents.	Limited Time Horizon	5.07	1.497	Between Groups	8.621	1	8.621	3.873	.049
	Expansive Time Horizon	4.91	1.487	Within Groups	3058.216	1374	2.226		
	Total	4.99	1.493	Total	3066.836	1375			
Effectiveness of adopting the message's recommendations in reducing accidents involving pedestrians and cyclists	Limited Time Horizon	5.40	1.395	Between Groups	12.748	1	12.748	6.432	0.011
	Expansive Time Horizon	5.21	1.421	Within Groups	2723.054	1374	1.982		
	Total	5.31	1.411	Total	2735.802	1375			
Usefulness of the information in the message to reduce risks of pedestrians and cyclists' accidents.	Limited Time Horizon	5.40	1.430	Between Groups	9.540	1	9.540	4.586	0.032
	Expansive Time Horizon	5.24	1.454	Within Groups	2858.481	1374	2.080		

		Mean	Std. Deviation		Sum of Squares	df	Mean Square	F	Sig.
	Total	5.32	1.444	Total	2868.020	1375			
Message effectiveness in reducing pedestrians' and cyclists' accidents in general	Limited Time Horizon	3.60	1.075	Between Groups	6.595	1	6.595	5.375	0.021
	Expansive Time Horizon	3.46	1.139	Within Groups	1685.933	1374	1.227		
	Total	3.53	1.109	Total	1692.528	1375			

Table 3. Pearson Correlation: Perceived Personal Control

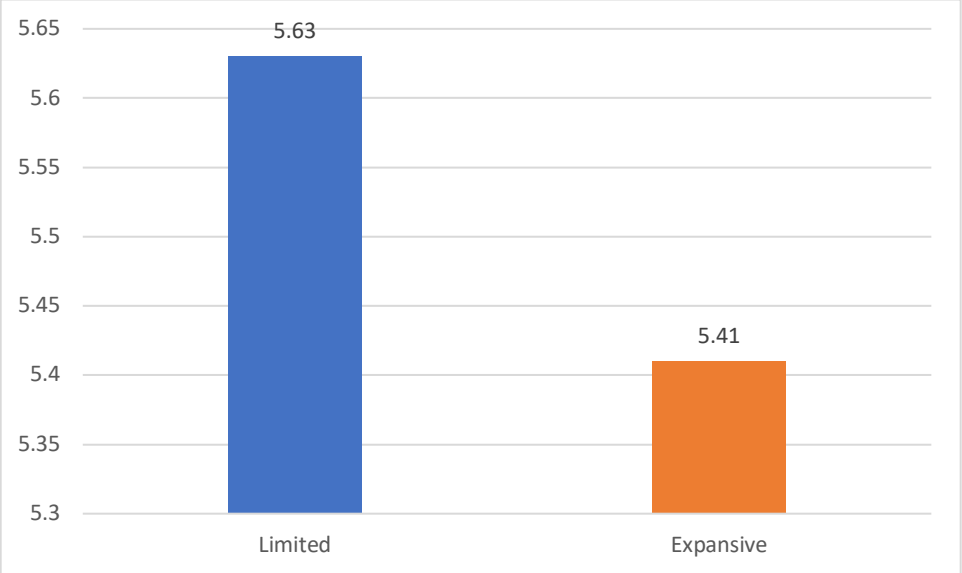
Correlations						
	Message effectiveness in encouraging others to reduce speed or drive within the speed limit	Message's effectiveness in promoting cautiousness while crossing	Message usefulness in providing a strategy (or strategies) to reduce pedestrians' and cyclists' accidents	Effectiveness of adopting the message's recommendations in reducing accidents involving pedestrians and cyclists	Usefulness of the information in the message to reduce risks of pedestrians and cyclists' accidents	Message effectiveness in reducing pedestrians' and cyclists' accidents in general
Perceived Personal Control	0.281**	0.407**	0.291**	0.282**	0.272**	0.245**
** = Correlation is significant at the 0.01 level (2-tailed).						

Figure 1. Message Effectiveness in Encouraging Others to Reduce Speed or Drive Within the Speed Limit



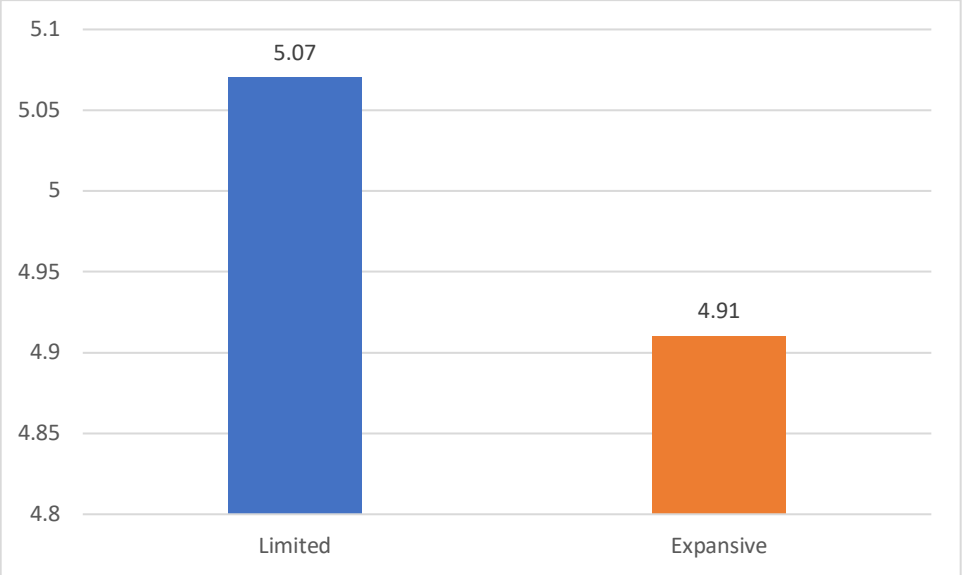
Note: P < .05

Figure 2. Message's Effectiveness in Promoting Cautiousness while Crossing



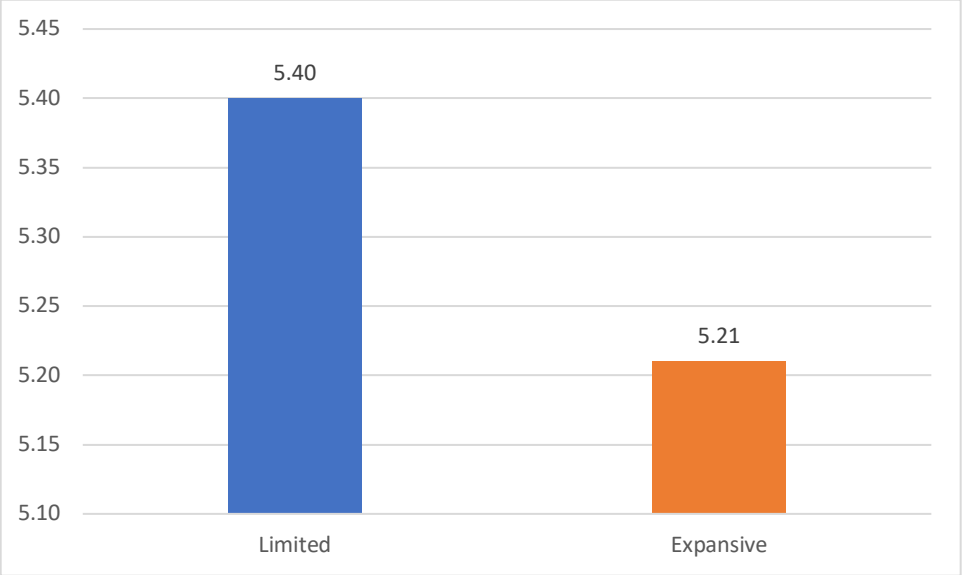
Note: P < .05

Figure 3. Message Usefulness in Providing a Strategy (or Strategies) to Reduce Pedestrians' and Cyclists' Accidents



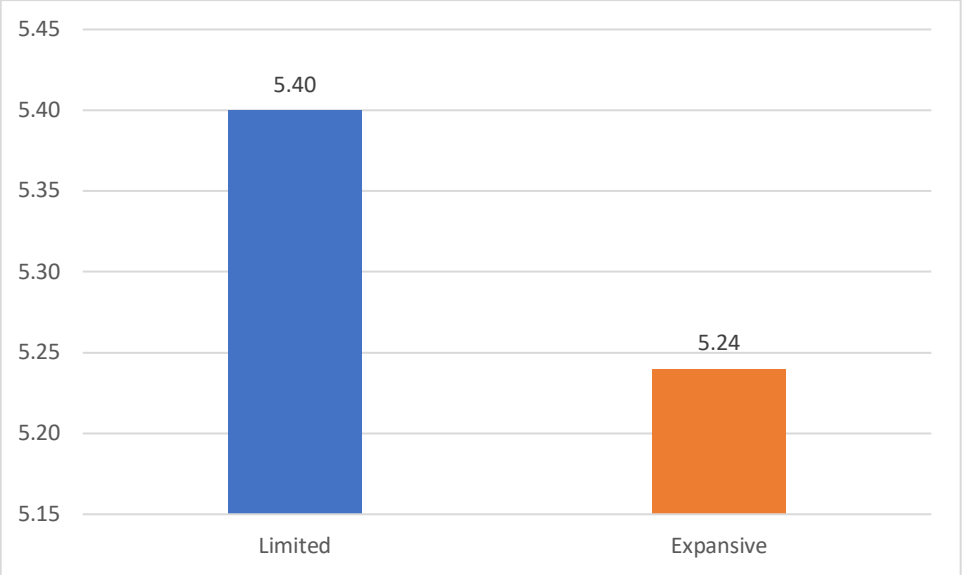
Note: P < .05

Figure 4. Effectiveness of adopting the Message's Recommendations in Reducing Accidents Involving Pedestrians and Cyclists



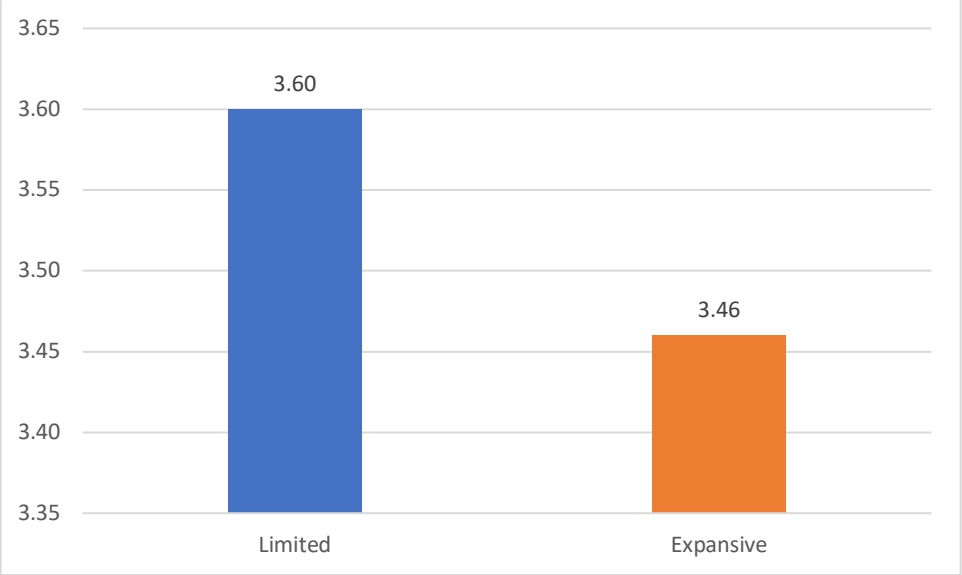
Note: P < .05

Figure 5. Usefulness of the information in the Message to Reduce Risks of Pedestrians' and Cyclists' Accidents



Note: P < .05

Figure 6. Message Effectiveness in Reducing Pedestrians' and Cyclists' Accidents in General



Note: P < .05

4. Summary & Conclusions

The findings of the qualitative study indicated that attitudes and perceptions are important factors that contribute to accidents involving vulnerable road users. Given that the main objective of communication messages is to change attitudes—and, consequently, behaviors—this qualitative study further emphasizes the need to dedicate resources (e.g., expertise, finances) to the development of effective and strategic communication messages that are theory-driven and evidence-based. Further, the qualitative study revealed a clear gap in participants' understanding of the importance of messaging strategy in altering behaviors as well as a lack of knowledge and expertise in the design of effective and coherent campaigns. The main focus of the transportation professionals who participated in the qualitative study was on interventions related to road design. However, while road designs create a significant impact on the reduction of accidents involving vulnerable road users, the behavior of the individual should not be overlooked.

Other important factors contributing to accidents involving vulnerable road users, such as speeding and inadequate attention at intersections, were revealed in the qualitative study and were then employed in designing the messages to test in the quantitative study. The results of the quantitative study showed that the messages framed with a limited time horizon, to prime the audience to focus on the moment, participants found the message to be more effective in encouraging drivers to reduce speed and pedestrians to exercise more caution while crossing. Also, the limited time horzon message made the audience perceive the information in the message as more useful in providing a strategy to reduce pedestrians' and cyclists' accidents. When it comes to the how the audience believe that adopting the message's recommendations will help in reducing pedestrians' and cyclists' accidents, the limited time horizon message was rated more effective by participants. This suggests that when targeting wider audiences across the state of California, it would be beneficial to frame messages to focus on a short time horizon.

Perceived personal control, where the individual actions (rather than external circumstances) affects the consequences, showed a significant positive correlation with perceptions of the safety messages. This suggests that messages framed to emphasize an internal locus of control can have a better impact than those designed to emphasize an external locus of control. This is in line with the current movement to change the language from "accidents" to "crashes" to emphasize that some parties are responsible for the crash.

Endnotes

[1] Mary A. Gerend and Margaret Cullen, "Effects of Message Framing and Temporal Context on College Student Drinking Behavior," *Journal of Experimental Social Psychology* 44 (2008): 1167–1173; Alexander J. Rothman, Roger D. Bartels, Jhon Wlaschin, and Peter Salovey, "The Strategic Use of Gain- and Loss-Framed Messages to Promote Healthy Behavior: How Theory Can Inform Practice," *Journal of Communication* 56 (2006): 202–220.

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[5] Richard Tay and Alex De Barros, "Effectiveness of Road Safety Messages on Variable Message Signs," *Journal of Transportation Systems Engineering and Information Technology* 10, no. 3 (2010): 18–23.

[6] A. Ian Glendon and Britta L. Walker, "Can Anti-speeding Messages Based on Protection Motivation Theory Influence Reported Speeding Intentions?" *Accident Analysis & Prevention* 57 (2013): 67–79.

[7] Ioni M. Lewis, Barry Watson, and Katherine M. White, "Response Efficacy: The Key to Minimizing Rejection and Maximizing Acceptance of Emotion-Based Anti-Speeding Messages," *Accident Analysis & Prevention* 42, no. 2 (2010): 459–467.

[8] A. Ian Glendon and Lorenzo Cernecca, "Young Drivers' Responses to Anti-Speeding and Anti-Drink-Driving Messages," *Transportation Research Part F: Traffic Psychology and Behaviour* 6, no. 3 (2003): 197–216.

[9] Margie E. Lachman and Suzanne L. Weaver, "The Sense of Control as a Moderator of Social Class Differences in Health and Well-Being," *Journal of Personality and Social Psychology* 74, no. 3 (1998): 763–773.

Appendix A: Sample of Interview Questions

What contributes to road accidents? Involving pedestrians? Involving cyclists? Involving motorists?

What are the differences in the incidents surrounding traffic accidents between pedestrians and cyclists?

What preventive measures do you believe help the most?

What types of risky behaviors do you see happening that cause the most accidents? With pedestrians? With cyclists?

Do different demographics have different behaviors when they're driving? Cycling? Walking?

What kind of messaging has helped combat accidents for each segment? (e.g., emotional appeals, enforcement messages, self-efficacy, gain-framed, physical threat, legal threats, short-term, long-term effects, etc.?)

What messaging strategies have been most effective? For cyclists? For pedestrians? For motorists?

What kind of messaging helps different groups of people? Age? Gender?

Could you give examples of specific messages?

What channels do you use to reach these segments?

What education is taught to the community that helps prevent the most accidents for each segment?

Appendix B: In-Depth Interview Participants

Participant Number	Region	Type of Stakeholder
1	San Francisco	Private-Sector Engineers and Planners
2	San Francisco	Researchers/Scholars
3	San Jose	Private-Sector Engineers and Planners
4	San Jose	City Officials (e.g., Board/Mayors)
5	Fresno	Private-Sector Engineers and Planners
6	Fresno	Advocacy Groups
7	San Diego	Advocacy Groups
8	San Diego	City Officials (e.g., Board/Mayors)

Appendix C: Messages

<table>
<tr><td colspan="3">Time Horizon Manipulation (adapted from Williams and Drolet 2005)</td></tr>
<tr><td>Expansive</td><td>Because Life is Longer than You Think, Focus on what's Yet to Come</td><td rowspan="2">Each message randomly presents one of the time horizon manipulations at the beginning</td></tr>
<tr><td>Limited</td><td>Because Life is Shorter than You Think, Focus on the Moment</td></tr>
<tr><td colspan="3">Body of the Message</td></tr>
<tr><td>Motorists</td><td>Pedestrians and Cyclists who run into the street without first looking for oncoming vehicles do not give drivers adequate time to see them and have difficulty performing an adequate search.

Furthermore, by running before they know it is safe, they reduce the time they have to react to an unexpected car in their path.

Slow Down and Look for Pedestrians & Cyclists</td><td rowspan="2">The body of the message was selected based on each participant's indicated main mode of transportation in the screening questions in the beginning of the study</td></tr>
<tr><td>Pedestrians and Cyclists</td><td>Pedestrians and Cyclists who run into the street without first looking for oncoming vehicles do not give drivers adequate time to see them and have difficulty performing an adequate search.

Furthermore, by running before they know it is safe, they reduce the time they have to react to an unexpected car in their path.

Cross Safely</td></tr>
<tr><td colspan="3">Regulatory Focus Manipulation</td></tr>
<tr><td>Promotion</td><td>Save A Life</td><td rowspan="2">Each message randomly presents one of the regulatory focus manipulation</td></tr>
<tr><td>Prevention</td><td>Do Not Waste A Life</td></tr>
</table>

Example of a Complete Message for Pedestrians Adopting Limited Time Horizon Manipulation and Promotion Focus

Because Life is Shorter than You Think, Focus on the Moment (Limited time horizon manipulation)

Pedestrians who run into the street without first looking for oncoming vehicles do not give drivers adequate time to see them and have difficulty performing an adequate search.

Furthermore, by running before they know it is safe, they reduce the time they have to react to an unexpected car in their path. When crossing a street, do not run until you have looked left, then right, then left again and you are sure no cars are close enough to endanger you.

Take the Time to Cross Safely (Pedestrian)

Save A Life (Promotion Focus)

Appendix D: Personal Control Scale, Adopted from Lachman and Weaver (1998)

I can do just about anything that I really set my mind to.

Whatever happens in the future mostly depends on me.

When I really want to do something, I usually find a way to succeed at it.

Whether or not I am able to get what I want is in my own hands.

All items are measured on a 7-point scale (from 1 = “Strongly Disagree” to 7 = “Strongly Agree”).

About the Authors

Samer Sarofim, Ph.D.

Dr. Samer Sarofim is an award-winning marketing scholar and educator. He served as a Faculty Fellow at Fresno State Transportation Institute and is an Assistant Professor of Marketing at the Craig School of Business, California State University, Fresno. His research was honored by the Best Paper Award in the Consumer Behavior Track at the American Marketing Association summer conference. Sarofim is also the recipient of Pearson Education Michael Solomon Consumer Behavior Best Paper Award and the Society for Marketing Advances Conference, Retailing Track Best Paper Award. Dr. Sarofim's research has appeared in multiple prestigious academic journals, including the *Journal of Consumer Affairs*, *Journal of Business Research*, and *Marketing Letters*.

Aly M. Tawfik, Ph.D., PTP

Dr. Tawfik is an Associate Professor of Transportation Systems Engineering and the Founding Director of the Transportation Institute at California State University, Fresno. While his area of expertise includes modeling, simulation, and optimization of individual travel behavior and of transportation systems, he has a particular passion for transportation sustainability and the future of transportation. He is active on research projects and grants focusing on travel data innovation, GIS applications in transportation, and using technology to minimize commute footprints. His other research projects focus on automated transportation systems, particularly shared autonomous vehicles (SAVs). He serves on local, national, and international transportation boards and committees. He is the author of many peer-reviewed publications and has given keynote presentations at local, national, and international conferences.

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