Development of on-site poster to influence pedestrian jaywalking behavior

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Abstract

Jaywalking and distracted walking behaviors are traffic violations that contribute significantly to road traffic crashes, including crashes at intersections. Jaywalking blitzes by police after pedestrian crashes may not address many of the issues that cause the vast majority of these crashes. One common approach adopted to strengthen enforcement methods is a publicity and awareness campaign. Despite the prevalence of communication campaigns and road safety signage, relatively few studies have been conducted to examine their efficacies, with few messages having been designed using behavioral change theories, especially for pedestrian safety.

This study aims to design an intersection safety poster to influence jay walking behavior. The design applied several theoretical constructs from well-established behavioral change models. A questionnaire survey of the perceived efficacy of the poster was administered to a sample of 754 respondents in Melbourne. Preliminary results show that the poster had a positive effect on respondents' adaptive intentions. The results demonstrate the importance of using a well-established conceptual framework in the development and testing of road safety messages. In future, an evaluation study will be conducted to test effectiveness of the poster.

1. Introduction

Traffic incidents involving pedestrians contribute significantly to the total death count on Australian roads (Toranpour et al, 2017, 2018; Rifaat et al, 2012; Sarkar et al, 2011; Tay et al, 2011). Between 2006 and 2017, over 380 pedestrians were killed in Victoria alone (Transport Accident Commission, 2018), with distraction and jaywalking emerging as a major factor. Following a pedestrian fatality at Collins Street, Melbourne, a 19-day police operation targeting jaywalking in the Melbourne central business district (CBD), resulted in 561 penalties being issued for jaywalking violations (Herald Sun, 2015). Such penalties have led to an increased awareness of the dangers of jaywalking and walking while distracted, and the importance of reducing these behaviours.

Jaywalking or 'illegal crossing' refers to the pedestrian activity that involves ignoring or disobeying road rules near crossings (Shiwakoti et al., 2017; Jorgensen, 1988). A survey by VicRoads shows that 50 per cent of motorists responded that the habit most affecting their driving is pedestrians crossing the road without looking (Herald Sun, 2015). A further 30 per

cent of motorists reported being annoyed when pedestrians are distracted by mobile phones when crossing the road (Herald Sun, 2015). Furthermore, Li et al. (2014) linked reckless jaywalking to reduced traffic efficiency in urban areas, arguing that when both pedestrians and vehicles followed their respective traffic signals, all parties would experience a shorter travel time.

A summary of some of the recent studies on jaywalking and distracted walking behaviors can be found at Shiwakoti et al., (2017). The study shows that there are two main categories of factors that influence whether a pedestrian chooses to jaywalk or not: individual pedestrian characteristics and contextual characteristics. Both of these categories contain multiple factors, which, in their own right, can potentially influence a pedestrians' jaywalking propensity. The study also highlights a wide range of methods adopted in the literature to study jaywalking and distracted walking behavior (e.g., survey, field observation and simulation).

In order to reduce the road trauma at intersections, many jurisdictions around the world have implemented a variety of countermeasures (Moshahedi et al, 2018; Kattan et al, 2009). In addition to engineering and enforcement measures, education campaigns have also been utilised in some jurisdictions to improve intersection safety (Lee et al., 2010; Duperrex et al., 2005; Elliott, 2004; Tarawneh, et al. 1999). It should be noted that most of these measures are focussed on influencing driver behaviour. Although public education campaigns have been widely used in road safety, relatively little research has been conducted to understand the underlying process or mechanisms that influence their effectiveness for pedestrian safety, especially jaywalking behaviour. The literature suggests that the use of well-established scientific behavior change or persuasive communication models to design and evaluate the safety message is an exception rather than the norm (D'Souza & Tay, 2016; Tay, 2016, 2012; Tay & D'Souza, 2015).

Therefore, this study aims to develop, test and evaluate on-site communications (road safety message/poster) that are based on proven behavioral change approaches with demonstrated evidence to reduce jaywalking and distracted walking behaviors at intersections. At this stage, we have developed a safety message/poster based on proven behavioral change approaches and conducted a questionnaire survey to gather information on pedestrians' perceptions of the poster. The implemetation of the poster in the field (in Melbourne) and evaulation of the poster is currently underway. This paper will report on the design of the safety message of the poster and preliminary findings from the survey.

2. Development and Design of Safety Message

2.1. Selecting the Target Behaviour and Audience, and Medium and Location

For any social marketing and persuasive communication campaign, it is important to identify the target behavior to change and the target subjects. In this project, the primary target for the safety message consists of pedestrians who jaywalk at intersections in Melbourne. In particular, we targeted younger people (below 25 years) who disobeyed pedestrian signals at the intersection. Also, jaywalking can be objectively quantified and measured using the

number of violations detected from video recordings. This ability to quantitatively measure the changes in the behavior is an essential part of any theory and evidence-based social marketing campaigns (Tay, 2016, 2012; Tay & D'Souza, 2015).

We chose to develop safety messages targeting vehicle-pedestrian crashes at intersections. Intersections are hazardous locations due to the large number of potential conflicts when different traffic streams converge (Tay, 2015; Barua et al., 2010; Kattan et al., 2009). In addition, our previous research has shown that jaywalking is prevalent at a particular intersection in the Melbourne CBD (Shiwakoti et al., 2017). Also, by deploying the safety message on-site at hazardous intersections, we can increase the immediacy and relevance of the message to the pedestrians.

The literature suggests that communication with road users may be through several devices, including dynamic displays such as digital screens, variable message signs, and static displays such as regular billboards or message boards. Static posters or signs have been widely used by both outdoor advertising companies for commercial purposes as well as by some transport authorities to communicate with road users (Tay, 2008, 2012, 2013). As compared to variable message signs, static posters have an advantage in their ability to incorporate both pictures and words, as well as being less distracting to drivers. Therefore, a static poster is the preferred choice in this study.

2.2 Design of Message

Our review of the literature shows that there are many behavioral change models that can be used to develop a successful road safety message and/or education campaign (Tay, 2008, 2013). Some of these models can be used to guide the design of the message, while others can be used to guide the development and implementation of the campaign or program. Several theoretical models focus on fear as an appeal or motivation to behavior change. These models assume that if the level of fear arousal and message efficacy are both high, then the targeted subject will engage in adaptive behavior i.e. will adopt the recommended behavior to deal with the health threat portrayed. In summary, the message should show that the danger or threat is likely to happen to the subject and that the consequence is severe. In addition, there should be a coping strategy that the subject is able to apply and, more importantly, is willing to do. Credibility and high degree of realism are also the key characteristics of the message (Tay, 2012, 2016).

Therefore, considering the targeted behavior (jaywalkers at intersections) and behavioral change model (fear appeal model), we determined that the main focus of the poster should be on increasing the perceived threat associated with jaywalking behavior and providing suitable coping strategies. The message length should be limited to no more than few short phrases to minimise the reading time. As a poster has the flexibility to include photograph, we have decided to use a picture to enhance the visual impact and depict the threat. Further, we have included short phrases to highlight the threat and coping strategy. As the objective is to influence jaywalking behavior at intersections, the relevant threats are punishment (monetary fine) for an illegal crossing and involvement in a vehicle collision. A monetary fine, which may be perceived as a revenue generating tool, has the tendency to distract from, and reduce the credibility of the safety message (Tay & D'Souza, 2015). Therefore, we decided that the safety message should focus on the threat and severity of pedestrian-vehicle collisions at intersections.

The deployed poster was designed to effectively portray the threat and severity of a collision. It included a photograph of a bloodied person lying on the pedestrian crossing and being attended to by emergency personnel (refer Figure 1). Such a photograph of the result of a real crash is often perceived to be a credible threat because of its prevalence, as reported in various news media (Herald Sun, 2015; Transport Accident Commission, 2018). It also conveys a high perceived likelihood of the threat happening to the targeted subject. The coping strategy is provided in text at the bottom of the poster: "Obey Pedestrian Lights". In order to highlight the perception of a hazardous location and to strengthen the course of persuasion, the phrase "High Crash Intersection" has been added to the top of the poster.

Figure 1: Pedestrian Safety Poster at Intersection

3. Concept Testing of Safety Message

A questionnaire survey was conducted to investigate pedestrians' perceptions of the poster developed. Relevant ethics clearance for the survey was obtained from the University Human Research Ethics Committee at RMIT University. The survey was conducted mostly with random participants at Melbourne CBD, particularly near RMIT University and Melbourne Central Station. Our previous study has shown that jaywalking was prevalent, predominantly among younger university students, at intersections near RMIT University and Melbourne Central Station. Eight research assistants were deployed for the survey for a week in March 2018. Participation in the survey was voluntary and the participants self-completed an anonymous questionnaire. If the participants had questions, the research assistants provided clarification to their queries.

3.1 Questionnaire and Measures

The questionnaire (Table 1) consisted of the picture of the poster (Figure 1) and 10 statements measuring the respondents' perceptions of the poster. The items were adapted from similar questionnaires used in previous studies for intersection safety for drivers (Tay, 2008, 2012, 2013, 2016). In those studies, the primary market segment targeted for the social marketing campaign consisted of drivers who committed red light running violations at intersections. Since jaywalking involves violations of pedestrians signals, similar statements were directly transferable to our present study. The first two items shown in Table 1 measured the perceived severity and likelihood of the threat. It was followed by 3 statements that measured the perceived message efficacy and self-efficacy. The perceived benefits of adopting the coping strategy and cost of not adopting the coping strategy were measured by 2 statements. The realism and credibility of the message was measured by one statement. Finally, 2 statements were used to measure adaptive intentions. Participants' responses were recorded using the standard 5-point Likert Scale: 'Strongly Disagree'=1; 'Disagree'=2; 'Neutral'=3; 'Agree'=4; 'Strongly Agree'=5. The age and gender of the respondents were also noted. We conducted a pilot survey with 30 participants. We did not notice any issues from the pilot survey and therefore, a full-fledged survey was conducted without any refinement to the questionnaires.

3.2 Participants

The questionnaire survey was administered to 821 respondents but only 754 surveys were complete and therefore could be used in our analysis. Of the 754 respondents, 59.3% were males and 39.4% females. A small proportion (1.3%) constituted those respondents who selected 'other' gender or did not respond. In terms of age distribution, the majority (67.5%) of the respondents were in age group 1 (18-25 years), followed by 19.9% in group 2 (26-35 years). A minor proportion of participants were in the other age groups: 6.0% in group 3 (36-45 years); 3.6% in group 4 (46-55 years); 2.3% in group 5 (56-65 years) and 0.8% in group 6 (above 65 years). This skewness in age distribution of participants could be due to the presence of several universities adjacent to Melbourne Central Station attracting a high volume of students. Since our targeted subjects were younger pedestrians under 25 years old, this age distribution is suitable for our study.

3.3 Data Analysis and Results

We present only the preliminary descriptive statistics from the survey; rigorous statistical analysis is currently underway. The means and standard deviations of the various theoretical constructs and the measures of adaptive intentions are summarized in Table 1 while the frequency distribution of 10 statements is presented in Table 2. It is to be noted that, except for two theoretical constructs of efficacy, all the other theoretical constructs had mean scores above the neutral score of 3, indicating that the respondents were generally able to perceive them in the message. More importantly, the mean score of adaptive intention statements were relatively high (3.71 and 3.85 respectively), indicating that the message had a significant effect in influencing pedestrians' adaptive intentions. These inferences were supported by t-tests of the equality of the mean against the neutral score of 3, with *p-value* < 0.001. More detailed statistical analysis of effect of gender and age differences, testing the importance of

the message characteristics adapted from the relevant theories on the self-reported changes in adaptive intentions etc. will be conducted in future.

Table 1: Summary of Variables

Characteristics	Statements	Mean	S. D.
Severity of Threat	(S1) The advertisement shows me that the threat associated with illegal crossing at intersections is very severe	4.33	0.92
Likelihood of Threat	(S2) The advertisement shows me that the threat associated with illegal crossing at intersections is likely to happen to me	3.10	1.12
Efficacy	(S3) The advertisement provides a clear strategy to cope with the dangers at intersections	2.85	1.19
	(S4) The advertisement shows me a way to cope with the dangers at intersections that is effective	2.78	1.15
	(S5) The advertisement shows me a way to cope with the dangers at the intersections that I am willing to do	3.07	1.18
Cost and Benefits	(S6) The benefits of adopting the strategy shown to avoid the dangers at intersections are very clear to me	3.45	1.16
	(S7) The costs of not adopting the strategy shown to avoid the dangers at intersections are very clear to me	3.99	1.09
Credibility and Realism	(S8) The illegal crossing situation and message in the advertisement shown is realistic and credible	3.72	1.04
Adaptive Intentions	(S9) The advertisement increases my intention to leave enough time to cross when approaching intersections	3.71	1.07
	(S10) The advertisement increases my intention to obey the traffic signals	3.85	1.08
Note: Mean and S.D. (standard deviation) calculated using 1 = Strongly Disagree to 5 = Strongly Agree.			

Table 2: Frequency distribution of 10 statements

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
Score	%	%	%	%	%	%	%	%	%	%
1	1.5	7.3	14.5	14.8	11.3	6.5	4.4	3.3	4.0	4.1
2	5.5	24.2	27.5	29.5	22.1	16.0	7.2	10.2	10.1	8.4
3	7.0	32.0	25.3	25.8	25.5	23.9	13.3	21.8	21.8	16.8
4	30.5	23.9	24.1	23.9	31.1	33.9	35.9	39.8	38.7	39.5
5	55.3	12.1	8.2	5.6	9.6	19.1	38.7	24.3	25.0	30.9

To confirm the importance of the various theoretical constructs or key message characteristics, their correlations with adaptive intention were computed. As shown in Table 3, all key message characteristics were positively and significantly correlated with adaptive intention, indicating that the more the audience perceived these characteristics in the message, the more likely they would be to adopt the recommended safe actions.

Table 3: Correlations between Message Attributes and Adaptive Intentions

Key Message Characteristics	Enough Time	Obey Signal
Threat is severe	0.438	0.452
Threat is likely to happen to me	0.334	0.393
Clear strategy to cope with threat	0.279	0.297
Coping strategy is effective	0.314	0.365
Coping strategy is something I am willing to do	0.318	0.380
Benefits of preventive action is clear	0.383	0.315
Costs of not adopting strategy is clear	0.438	0.444
Situation shown is realistic and credible	0.524	0.505
All correlation coefficients are statistically significant at 99% confidence level.		

4. Discussion and Conclusion

Jaywalking and distracted walking behaviors are traffic violations that contribute significantly to road traffic crashes, including crashes at intersections. Jaywalking blitzes by police after pedestrian crashes may not address many of the issues that cause the vast majority of vehicle-pedestrian crashes. One common approach adopted to strengthen enforcement methods is to supplement them with publicity and awareness campaigns. However, most of these publicity campaigns utilize the mass media, and their effectiveness has also been a topic of constant debate. To increase efficacy, the communications should be more focused and targeted, especially with respect to the locations, behaviours and risks involved.

This study attempted to address those issues by developing an on-site communications tool (pedestrian safety poster) to target jaywalking at high risk intersections. The on-site communications approach is classified as a 'soft' approach to persuade people to adopt appropriate behavior because it does not place external constraints on people (unlike enforcement and engineering interventions). As such, communication tools to promote desirable pedestrian behavior have been suggested by some road safety professionals.

The on-site communications in this project was developed using established behavioral change approaches and demonstrated evidence of effectiveness. Although these communication tools were initially designed to prevent motorists from speeding and running red lights, the theory applied directly and the message design process was modified to target pedestrians' behaviors at intersections. Moreover, the safety message was tested using scientific theories and models of behavioral change in the questionnaire survey.

A questionnaire survey was administered to a sample of 754 respondents in Melbourne and their perceptions were recorded. Preliminary results show that the communication had a positive effect on respondents' adaptive intentions. The preliminary results demonstrate the importance of using a well-established conceptual framework in the development and testing of road safety messages.

In designing a road safety message, transportation authorities and other policy makers should focus on ensuring that the message shows:

- that the danger or threat is likely to happen to the subject (threat characteristics);
- that the danger or threat to the subjects is severe (threat characteristics);
- a coping strategy that the subjects are able to do (efficacy characteristics);
- a coping strategy that the subjects are willing to do (efficacy characteristics);
- the link between subjects' behaviors (taking and not taking preventive actions) and their consequences (safe and unsafe outcomes) (cost-benefit characteristics); and
- a high degree of realism and credibility (extrinsic quality characteristics).

In future, the poster will be deployed at selected intersections, and video recording will be done to capture pedestrians' jaywalking and distracted walking behaviors to provide the 'before' and 'after' data for both treatment and comparison sites. These data will be used to estimate the effectiveness of the on-site communication in changing pedestrians' behaviors.

Acknowledgement

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