EFFECT OF ROAD GEOMETRY, SIDE WALK CONDITION, TRAFFIC FLOW VOLUME NEAR PEDESTRIAN CROSSINGS ON ILLEGAL ROAD CROSSING BEHAVIOUR OF PEDESTRIANS

A. Priyankara, G.W.S.K. Gintota, N.B.H.P. Rathnayake and V. Wickramasinghe

Department of Civil Engineering, Faculty of Engineering, University of Peradeniya

Introduction

Most city centers have heavy pedestrian flows both in and out of peak hours. Despite sufficient pedestrian road crossing facilities are provided, pedestrians follow illegal road crossing patterns creating life threats and disturbing the smooth traffic flow. This paper attempts to find the most contributing physical environmental attributes influencing the illegal road crossing behavior of pedestrians using an innovative methodology.

Methodology

Since humans are heterogeneous, an unbiased method is necessary to find the most influencing physical environmental attributes that influence make illegal road crossings. Conjoint Analysis (CA) is a multivariate technique used to understand how people develop preferences by trading-off between attributes or attribute levels that make up an individual product or service (Green and Srinivansan, 1990). It needs deeper concern on selecting attributes for CA. Thus attributes have to be selected very carefully giving more concern on pedestrian safety issues. In addition, defining mutually independent levels for selected attributes is the foundation of the CA. But a large number of attributes create methodological challenge for CA; hence with pedestrians' interviews and experts ideas, four attributes and levels were selected for the CA method. Fig. 1 shows the selected attributes and the levels with definitions.

Traffic condition:	*Level 1*	Low	→ less than 20 veh/min
	Level 2	Medium	→ 20-40 veh/min
	Level 3	High	→ more than 40veh/min (not jammed)
Road type:	*Level 1*	One way	
	Level 2	Two way	
	Level 3	Two way with centre median	
Side walk condition:	*Level 1*	Easy	→ less than 20 people/min/metre
	Level 2	Average	→ 20-45 people/min/metre
	Level 3	Worse	→ more than 45 people/min/metre with more disturbances
Road geometry:	*Level 1*	Straight road section immediate before the road cross	
	Level 2	Curve road section immediate before the road cross	
	Level 3	Junction	

Fig. 1. Selected attributes and levels

Generating conjoint profiles

The research issue is to assess the relative importance (RI) of selected attributes and individual part-worth utility value (PUV) of attribute levels. For this to happen, hypothetical location profiles are to be specified with various combinations of attribute levels. Since conventional CA use the 'full profile' design (i.e., one which included all possible combinations of levels and attributes), a large number (3X3X3X3=81) of possible hypothetical location profiles would be generated. Thus, orthogonal fractional factorial design was used to define the conjoint profiles. Fig 2 shows the obtained nine profiles. Fig 3 shows a sample conjoint profile (card id 7) expressing a hypothetical place which is curved two way road segment with high traffic condition and easy accessibility to cross walk (side walk with high level of service).

Data Collection

Data collection was done by using a self-administrated questionnaire. 196 respondents representing almost all the categories of gender, age, profession and familiarity of the study area responded to the questionnaire. The ranking conjoint technique (ordering the 9 profiles from most to least preferred) was used by the respondents in the research. By assuming respondent has to cross hypothetical locations shown in 9 profiles, respondent is asked to rank the profiles according to his/ her preference to follow an illegal road cross.

Card ID	Traffic Condition	Road Type	Side Walk Condition	Road Geometry
1	high	two way with center median	worse	curve
2	low	one way	easy	junction
3	average	two way	worse	junction
4	average	one way	average	curve
5	average	two way with center median	easy	straight
6	low	one way	worse	straight
7	high	two way	easy	curve
8	low	two way	average	straight
9	high	two way with center median	average	junction

Fig. 2. Selected hypothetical profiles

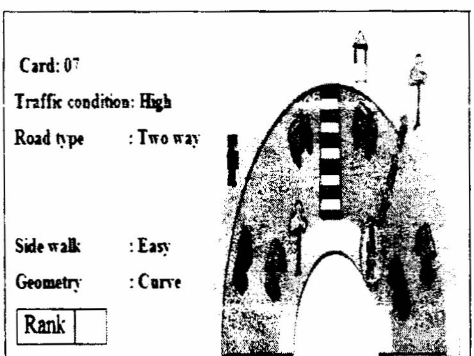

Fig. 3. A sample conjoint profile

Result

Using the ranking data, RI (i.e. importance of attributes when following illegal road crosses) of the selected attributes and PUV (i.e. mathematical importance of each levels of an attribute) (Xu *et al.*2008) for each attribute levels were calculated using the Statistical Package for Social Studies (SPSS) software. Results of the CA technique RI and

PUV is shown in Fig 4 and Fig 5 respectively.

Discussion

According to the outcome from the conjoint results the most contibutary physical factor to perform an illegal road cross is the traffic condition (41%). The range between the maximum and minimum PUV of this attribute is found to be the widest. It means when pedestrians have high potential to perform an illegal road cross when the traffic condition in level 1:less than 20veh/min. And also the least touching physical factor to perform an illegal road cross is the side walk condition (13.5%). pedestrians attempt to do an illegal road cross when the side walk condition is worse (more than 45 people/min/metre with more disturbances).

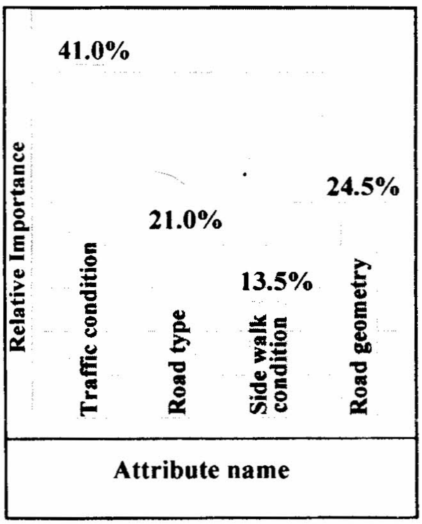

Fig. 4. Relative importance of attributes

Also road type (21%) and road geometry (24.5%) are having moderate effect on pedestrians' road crossing behavior. By considering the importance of each attribute and its levels it can be proposed some improvement measures by changing above attribute levels to reduce the amount of illegal road crossings in actual locations.

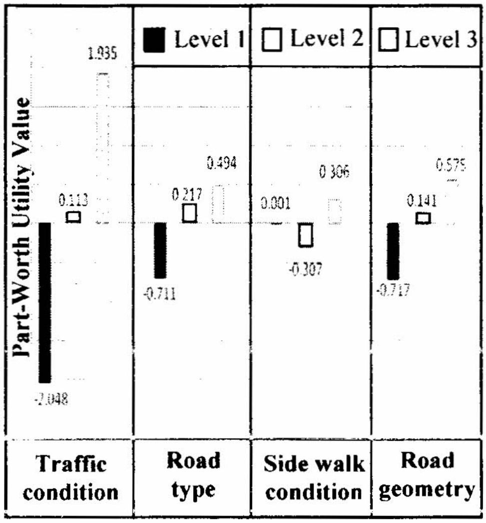

Fig. 5. Part-Worth utility values of each attribute levels

References

P. Green, V. Srinivansan (1990). Conjoint Analysis in Marketing: new development and implications for research and practice, Journal of Marketing, Vol. 54 (October), 3-19.

Xu Hao, Sonal Ahuja, Majid Adeeb, Tom van Vuren, Michael G. H. Bell (2008). Pedestrian crossing behavior at signalized crossings, Association for European Transport and contributors, 9-16