

Misleading traffic lights – situational risk factors for pedestrian jaywalking

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Illegal pedestrian crossings constitute a high risk for traffic safety. In order to increase traffic safety at large intersections, signalized pedestrian crossings with a central traffic island and a traffic light control enabling pedestrians to cross in one attempt are widely in use.

Based on a detailed behavior analysis of pedestrians at intersections with such a traffic light control in which the behavior of the pedestrians was analyzed in dependence of several factors as traffic light, vehicles and other pedestrians, we propose a stimulus control model considering crossing behavior at signalized intersections as a reaction to discriminative stimuli. According to this model, red lights signal negative consequences for crossing (S-), whereas green lights signal a safe crossing without negative consequences (S+). It was shown that by implementing such a construction, contradictory stimulus configurations in terms of the stimulus control model emerge. Pedestrians arriving at a red light can be exposed to different contradictory stimulus patterns; the signal relevant for the first crossing can be red while the signal behind the center refuge island is green or it can be the case that oncoming pedestrians from the opposite side of the road cross legally.

In the first case, it can be deduced from the model that the consecutive green traffic light (excitatory S+ for the behavior “crossing”) interferes with the inhibitory property of the red signal (S-). Consequently, the number of pedestrians crossing although the relevant light shows red should increase in presence of a “consecutive green light”. In the second case, it is evident that oncoming pedestrians have been associated with protection and thus function as a safety

signal. Hence, they have become an S+ for the particular behavior “crossing”. Consequently, the number of pedestrians crossing although the relevant light shows red should increase in the presence of the S+ “oncoming pedestrians”.

Performing a detailed behavior analysis it was shown that illegal pedestrian crossings are promoted by contradictory stimulus patterns. The reactions to the stimuli are conflicting as the crossing behavior is inhibited and, simultaneously, this specific inhibition is weakened by the consecutive green signal as well as oncoming pedestrians.

In general, it is proposed that an increased risk for illegal crossings is caused by interfering excitatory stimuli weakening the inhibition induced by a red traffic light.

Empirical data show that the incongruent stimulus configurations described above multiply the risk of illegal crossings. In a situation where the relevant traffic light is red and the consecutive light is green the risk of an illegal crossing is 200 times higher than without the consecutive green light. A configuration with oncoming pedestrians reveals a 10 times higher risk for illegal crossings.

Time-delayed red phases of consecutive traffic lights and the resulting contradictory stimulus situations increase the risk of illegal crossings. Thus, an inspection and if necessary a modification of such traffic light controls is recommended.

Our study can be seen as an example that the development of activities for the prevention of fatalities by traffic planning based on behavioral theories is a fruitful approach and that what is already known about the control of behavior by stimuli should be taken into account.