Driving into danger: Perception and communication of flash flood risk from a cultural perspective

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Introduction

Flood risk managers educate the public on the dangers of driving through flooded roadways, yet losses to life and property continue to occur. This study integrates cultural psychology and risk perception theory to explore how culture, psychological processes, and behavior influence one another. Flood risk managers in Tucson, Arizona collaborated in the development of a questionnaire mailed to local residents. Questions regarding levels of trust, self-efficacy, social autonomy, social incorporation, time perspective, and situational factors were analyzed with respect to whether respondents stated that they have or have not driven through a flooded roadway. Respondents' decisions are influenced by the presence of signs and barricades, passengers, risk of personal injury or damage to the vehicle, and the availability of flood-related information. The most influential factor is the prior successful crossing of other vehicles. The results illuminate complex interrelations among the cultural factors and provide considerations for future risk perception research.

The role of culture in risk perception and behavior

•Culture is a way of life learned from and shared by social units, including – but not limited to – collectively produced attitudes, beliefs, values, and habits (Douglas, 1992)

•A complicated mix of identities not limited to nationality. Also "gender, ethnicity, religion, cohort or generation, historical period, profession, social class, and country of origin" (Kitayama & Markus, 1995, p. 368)

•Norms, values, and practices influence how individuals process information and make decisions. The results of those actions influence whether the behavior is rejected or accepted into cultural norms.

The Case Study: Tucson, AZ

•Frequent heavy downpours during the summer rainy season

•Many low water ("dip") crossings and streets designed to convey water

•Barricades, signs, and even laws meant to deter motorists often fail

•Flash floods are the deadliest natural hazard in the United States, responsible for around 100 deaths each year. Half of those deaths are individuals in vehicles or attempting to escape from vehicles.

One of the low water crossings with two signs and a barricade. The water is approximately 4-5 ft (1.2-1.5 m) deep.

Methods

Initial Workshop

Meeting with flood risk managers in Tucson to discuss:
•Background risk perception and cultural psychology theory
•Feasibility of using this theory and empirical results in actual implementation

Flood risk managers discuss locations that routinely flood when it rains during the first workshop.

Surveys

•1000 surveys mailed to residents in Tucson
•Questions elicit cultural factors, situational factors, and historical, typical, and hypothetical behavior
•Analysis conducted around the question "Have you ever driven through a flooded roadway?"
•Reliability analysis used to create scales, Pearson chi-square and one-way ANOVA used to compare groups within the sample

Survey demographics
- •n = 160
- •89% white
- •46% male, 53% female
- •63% with at least college degree
- •Mean age 56 years

Final Workshop

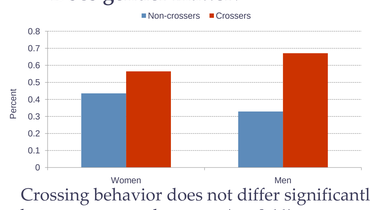
•Report survey findings
•Obtain feedback from flood risk managers
•Brainstorm possible mitigation strategies

Results: Cultural Factors

Have you ever driven through a flooded roadway?
61% Yes ("Crossers")
39% No ("Non-crossers")

A motorist waits to have his stalled vehicle towed. Some vehicles continued to pass through, others turned around

Does gender matter?



Crossing behavior does not differ significantly between men and women ($p = 0.11$).

Not in the way you would expect.

Gender alone does not explain crossing behavior, but combining gender with cultural and situational factors reveals more complex variation.

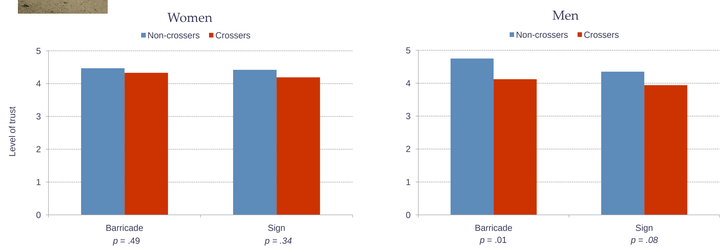
Trust in signs and barricades

Signs and barricades provide an ambiguous message to motorists

•They are not present at all intersections that flood, creating a false sense of safety

•They are continuously present, even when streets are dry
- •90% of respondents agree that presence of a sign or barricade indicates likelihood of flash flood danger

•Less than half agree that presence of a sign or barricade indicates degree of flash flood danger



Non-crossers report higher trust in signs and barricades, but all variation is within men.

Social Incorporation

Warnings from flood risk managers are not the only message that people receive.

•78% of respondents listed at least one person they would go to for advice during a flood

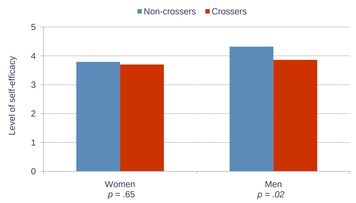
"Someone who might be familiar with the route I am taking."

•48% listed at least one person with whom they discuss flood-related information when it is not currently flooding

"I tell newcomers to pull off the road and have a cup of coffee during heavy rains."

Self-efficacy

A sense of control over one's own actions and outcomes can lead toward either risk-taking or risk-aversive behavior. In this case, high self-efficacy is associated with risk aversion.

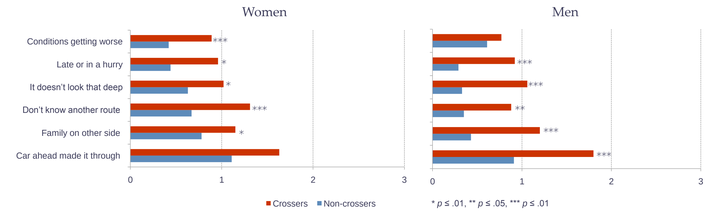


Non-crossers report higher levels of self-efficacy than crossers, but all variation is within men.

Results: Situational Factors

Situational factors have a different amount of influence on women and men, crossers and non-crossers.

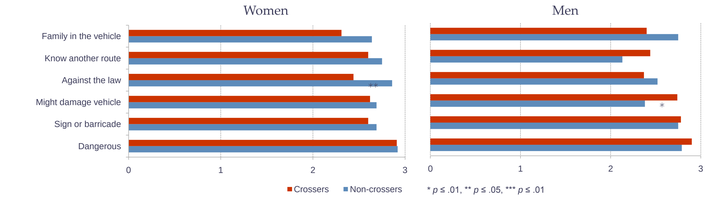
Situational Factors: Influence to Cross



The factor that has the most influence on a motorist's decision to cross is the successful crossing of another vehicle, especially if the other vehicle is seen as smaller in comparison.

Not knowing an alternate route is another important factor, especially for women.

Situational Factors: Influence NOT to Cross



The factor that has the most influence on a motorist's decision not to cross is the risk of injury or death.

Although the flood risk managers predicted that rescue fines and potential embarrassment would be strong deterrents, these factors were the least influential.

Discussion

•Culture acts as a set of filters through which hazard information passes. If attitudes, values, and beliefs developed through participation in various social groups have a strong influence on risk perception, then it is not likely that providing more information or simply rewording the message will lead to a decrease in risk-taking behavior.

•Gender alone does not explain crossing behavior, but variation in crossing behavior can be observed where gender intersects with cultural and situational factors.

•Although motorists may have high levels of trust in warnings from flood risk managers, they also consider the advice of others, environmental cues, and other signals before deciding whether to cross a flooded roadway. Contradictory or ambiguous messages such as signs and barricades add complexity to the decision-making process.

•The stereotypes associated with crossing behavior were not supported by this data. Therefore, understanding how culture influences risk perception and behavior is critical for effective risk management and communication. Future suggestions resulting from this study include alternate route maps and flashing light indicators at flooded intersections to communicate present danger.

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CLIMAS Climate Assessment for the Southwest