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Towards operationalizing and measuring Traffic Safety Culture

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A b s t r a c t

The purpose of this study was to increase our understanding of Traffic Safety Culture (TSC) by identifying its constituent components. A review of existing safety culture literature was conducted. Next, 18 international experts participated in a Delphi Technique to rate candidate TSC components. Corresponding survey items were then developed and pretested. Our final survey instrument was mailed to a representative sample of 1700 U.S. households. Their data were used to conduct a Factor Analysis that yielded a 15 factor structure. The factors that explained the most variance in TSC were support for increased government attention to traffic safety, strict monitoring and control of alcohol-impaired drivers, disapproval of speeding, and avoidance of aggressive driving. Other factors included local engagement, desire for government & private sector accountability, more information, school involvement, teen restrictions, willingness to invest and seatbelt use. This work represents a first attempt to operationalize TSC. Future research will be needed to refine and extend the tentative structure that has been identified. Valid and reliable measurement of this construct should facilitate traffic safety advocates' efforts to overcome the social challenges they face.

Keywords: traffic safety culture measurement

1. Introduction

Children riding on motorcycles in New Hampshire are not required by law to wear helmets. Environmental supporters have been more successful than safety advocates in trying to impose speed limits on Germany's autobahn. Women are not allowed to drive cars or ride bicycles on public roads in Saudi Arabia. Violators of traffic laws in Russia can often escape prosecution by bribing the police. In Africa, road accidents are sometimes blamed on witchcraft. Drivers in Finland have a one in three chance of being stopped for random breath testing for alcohol each year. When U.S. adults are asked to name an experience that "makes them feel really free," their most common response involves driving (<http://www.norc.org/GSS+Website/>).

All of these observations reflect something about the cultures in question. Culture can be defined in hundreds of ways, but most definitions make reference to "shared ideas, meanings, and values that are socially learned" and "patterns of behavior that are guided by those shared ideas, meanings and values" (Institute of Medicine, 2002). One indication of the value that a society places on traffic safety might be its expenditures. From a public health perspective, road-related deaths fall under the heading of "Injuries," which are further divided into two categories: "Intentional" (e.g.,, homicides, suicides) and "Unintentional" (e.g., fires/burns, drownings, falls, poisonings, crash deaths). Even though motor vehicle crashes kill more Americans between the ages of 5 and 34 than *any* other cause (National Center for Health Statistics, 2009), our "premier public health agency" (i.e., the Centers for Disease Control and Prevention/CDC) spends less than one-half of 1% of its funds on *all types of unintentional injury combined*. Unintentional injuries rank 67th among the list of health problems funded by the United States' National Institutes of Health (Girasek, 2009). Similarly, although "road traffic accidents" are expected to be the fifth leading cause of death internationally by the year 2030 (World Health Organization,

2009), the World Health Organization devotes only 0.6% of its regular budget to injuries *generally* (including violence and disabilities) (Stuckler et al, 2008).

In recent years traffic safety advocates have begun to refer to “Traffic Safety Culture” (TSC), when discussing the social environment in which they do their work. They are extending the term “Safety Culture,” which gained prominence among occupational safety professionals after the International Atomic Energy Agency reported that “poor safety culture” had contributed to the Chernobyl nuclear accident (Zhang et al, 2002). The AAA Foundation for Traffic Safety has been a pioneer in trying to advance our understanding of TSC, having funded scientific research into the phenomenon since 2006. They seek to “ignite and sustain a serious dialogue about and demand for traffic safety at all levels of our society, elevating traffic safety on the national agenda to a place commensurate with its public health impact” (AAAFTS, 2007). In 2007, the National Cooperative Highway Research Program studied Iowa, Minnesota, Michigan and Washington because they were deemed to have created a successful TSC in their states, based upon their success in reducing fatalities and serious injuries over time. In 2008, an editorial in the Texas Transportation Institute’s research newsletter posited that future progress in traffic safety will depend on a “paradigm shift in the culture of driving behavior” (Brackett, 2008). One of the Institute’s senior scientists discussed how “political will” and “social conscience” will come into play when safety culture concepts from industry are applied to the nation’s highway system. Montana State University’s Transportation Institute co-hosted a national conference in June 2009 entitled, “National Rural Summit on Traffic Safety Culture.” The Socialist Republic of Vietnam has named TSC Development as one of the strategic measures it will pursue to in its Road Traffic Safety master Plan. The American Association of State Highway and Transportation

Officials is currently collaborating on the development of a National Strategy on Highway Safety for the United States, that includes among its key emphasis areas, “safety culture”

<http://safety.transportation.org/activities.aspx>

All of these initiatives are underpinned by the belief that the culture in which traffic safety advocacy is being carried out can greatly enhance or impede its success. The field has yet, however, to embrace a common definition for TSC. The objective of the work described in this article was to describe traffic safety culture’s constituent components. Our longterm goal is to develop a valid and reliable survey instrument for measuring national TSC, as reflected by self-reports of the general public. Such a tool would help us understand TSC’s determinants, and evaluate programs that are designed to improve TSC.

2. Methods

This paper will summarize the multiple methods used to define and measure the public component of Traffic Safety Culture. Those methods included a Literature Review, a Delphi Technique, cognitive interviews, a mail survey and a Factor Analysis. These procedures yielded a proposed breakdown of the components that constitute TSC.

Literature Review

In the first phase of the study, a review of the scientific and grey literatures, as well as the World Wide Web, was carried out to identify materials that might shed light on our understanding of

Traffic Safety Culture. The Psych Info and PubMed databases were utilized using search terms, “Safety Culture,” “Safety Culture” and “Measurement,” and “Traffic Safety Culture.” Those sources were searched for the periods ranging from the databases’ inception to early 2008 (Psych Info), and 1970-2008 (Pub Med). Retrieved materials were limited to studies that involved humans and were published in English. The internet browser Google was also used to search for the phrase, “Traffic Safety Culture.” The first 100 “hits” produced by Google were reviewed. The AAA Foundation for Traffic Safety (AAAFTS) also provided the study team with relevant materials from their own collection.

More than 150 of the materials identified in this process were screened, with 60 of those being reviewed in depth. Qualitative data analysis software was used to organize these resources and compile possible factors that could be included in our working model of Traffic Safety Culture. Unfortunately, since almost all of the previous research that had been conducted into safety culture took place in worksites, this process did not yield models or measurement instruments that could readily be applied to a nation’s population. For example, management structure and corporate procedures were cited as central to the safety culture of high risk industries. Employee surveys asked whether respondents were aware of worksite policies, whether they would report safety violations, whether they believed that management was committed to worker safety, etc. A lack of consensus about the measurement and significance of safety culture was also revealed, even when that concept was narrowly applied to industrial organizations.

Nevertheless, valuable insights that are likely generalizable to Traffic Safety Culture were gleaned from the literature review process:

- Cultures are complex systems that change slowly, but constantly.
- Safety culture is part of the larger organizational/national culture.
- No society reflects one, homogenous safety culture.
- Safety culture is multidimensional.

It also became evident that our attempt to measure public views could technically be construed as measuring Traffic Safety *Climate*, because we would not be taking contextual indicators into account (e.g. policies, funding levels, media portrayals). The literature on organizational safety climate derives from survey studies of employee's perceptions and attitudes. It has been noted, however, that safety culture experts do not agree upon how, or even whether, safety culture and safety climate differ (Guldenmund, 2000).

Since the instrument we would eventually develop was to be administered to members of the public, we could only measure their beliefs, attitudes and behavioral self-reports. Nevertheless, we were well aware that progress in traffic safety relies upon a myriad of factors, most of which operate beyond the level of the individual. For that reason we felt that our proposed Traffic Safety Culture breakdown should include respondents' views on issues that went beyond drivers' behavior (e.g., to include traffic safety law enforcement, funding levels, road maintenance, private sector accountability, evidence-based interventions, injury surveillance, policy-making, civic engagement). The unique contribution of the composite measure we envisioned is that it would gauge public support for evidence-based traffic safety broadly. When traffic safety advocates raise concerns about weak TSC, they use words like "complacency" and "a failure of political will." In developing a list of potential TSC components for our Delphi

Technique participants to react to, we considered the public beliefs, attitudes and behaviors that would be expected in a social environment that was strongly pro-Traffic Safety

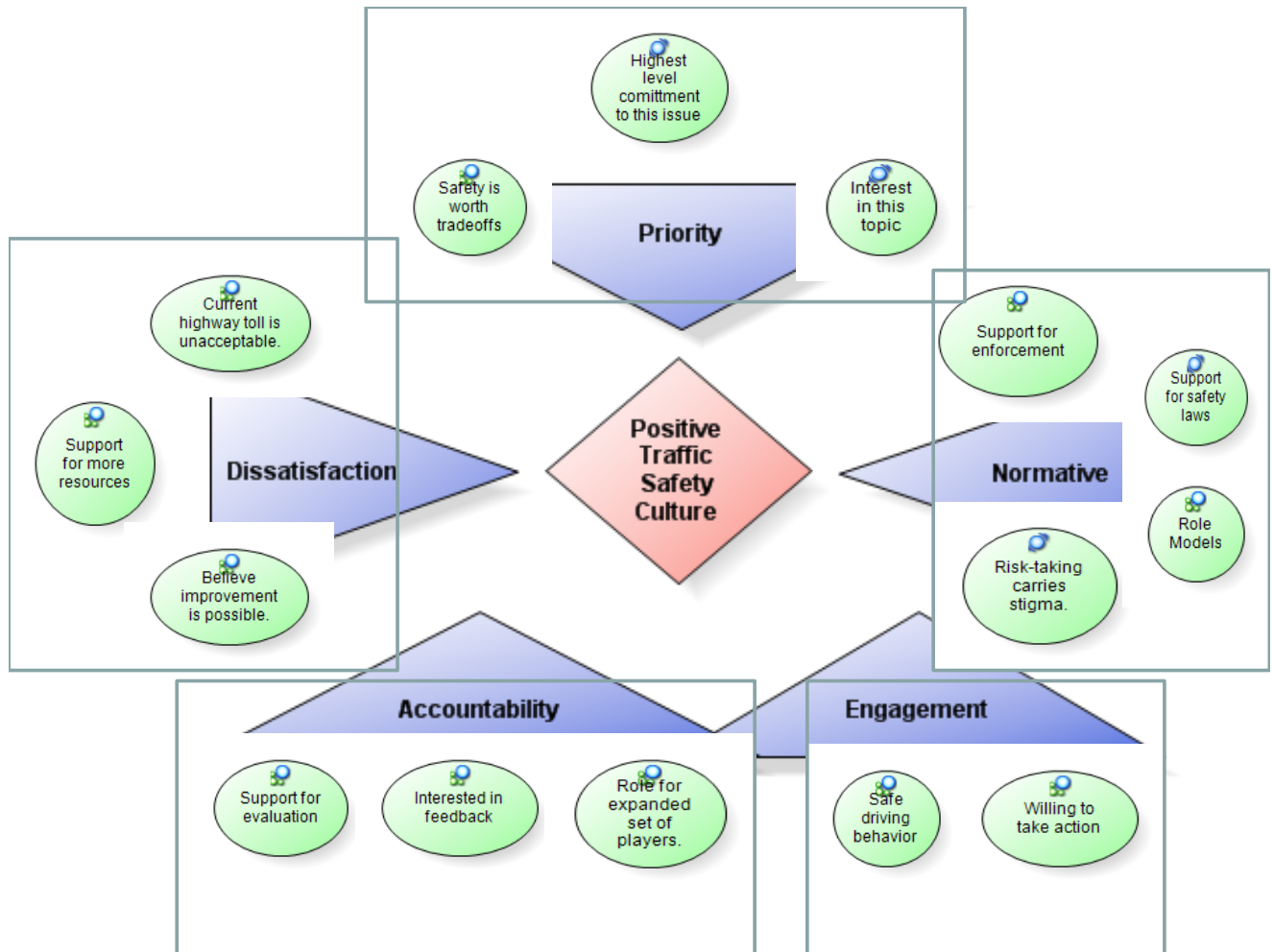
Delphi Technique

Our literature search also contributed to a potential list of professionals with expertise in traffic safety and/or culture who were considered for possible inclusion in our Delphi Technique process. A Delphi Technique is a process that generates group consensus through a series of questionnaires. It is typically used when respondents cannot meet in one place due to space and/or time constraints (Gilmore & Campbell, 1996). Our goal was to recruit a group of relevant experts who were diverse with regard to professional discipline, employer and geographic region.

In September of 2008 thirty-one renowned experts were invited to contribute to our Delphi Technique. Nineteen agreed to participate, and eighteen completed all phases of the process. Participants who were not U.S. government employees were paid \$600 for consulting on this project. The group included psychologists, sociologists, human factors specialists, civil engineers, an anthropologist and an injury control researcher. Their current or former employers included universities, national and state transportation safety agencies, private consulting firms, a public health agency and an association of automobile insurers. Our contributors were located in the Australia, Canada, the Netherlands, the United Kingdom and the United States.

Figure 1 illustrates the model of TSC that DT participants were asked to react to in Phase 1 of our Delphi Technique.

Figure 1. Original Traffic Safety Culture Model



Note that the subcomponents displayed in Figure 1 were further broken down into (50+) more specific elements in support documents provided to our expert-reviewers. Their instructions informed them that the purpose of this initiative was to define the components that constituted Traffic Safety Culture (TSC), with the ultimate goal of developing a survey instrument to

measure that construct. To facilitate their review we provided participants with this working definition of Positive TSC:

a social climate in which traffic safety is highly valued and rigorously pursued.

Delphi Technique participants were reminded that our charge was to focus on the aspects of safety culture that could be measured by a survey of the public (i.e., as opposed to a jurisdiction's traffic laws, highway safety funding levels). Public opinions about the structural elements of TSC were, however, considered "fair game." Our contributors were also asked to focus on TSC independent of its precursors. So, for example, while it is widely speculated that drivers' exaggerated views of their own abilities contribute to low levels of concern about road safety issues, that bias could be thought of as influencing rather than constituting TSC. Finally, international reviewers were reminded that our questionnaire would be used initially in the United States. Comments regarding how our proposed elements might "translate" to other settings were, however, welcomed.

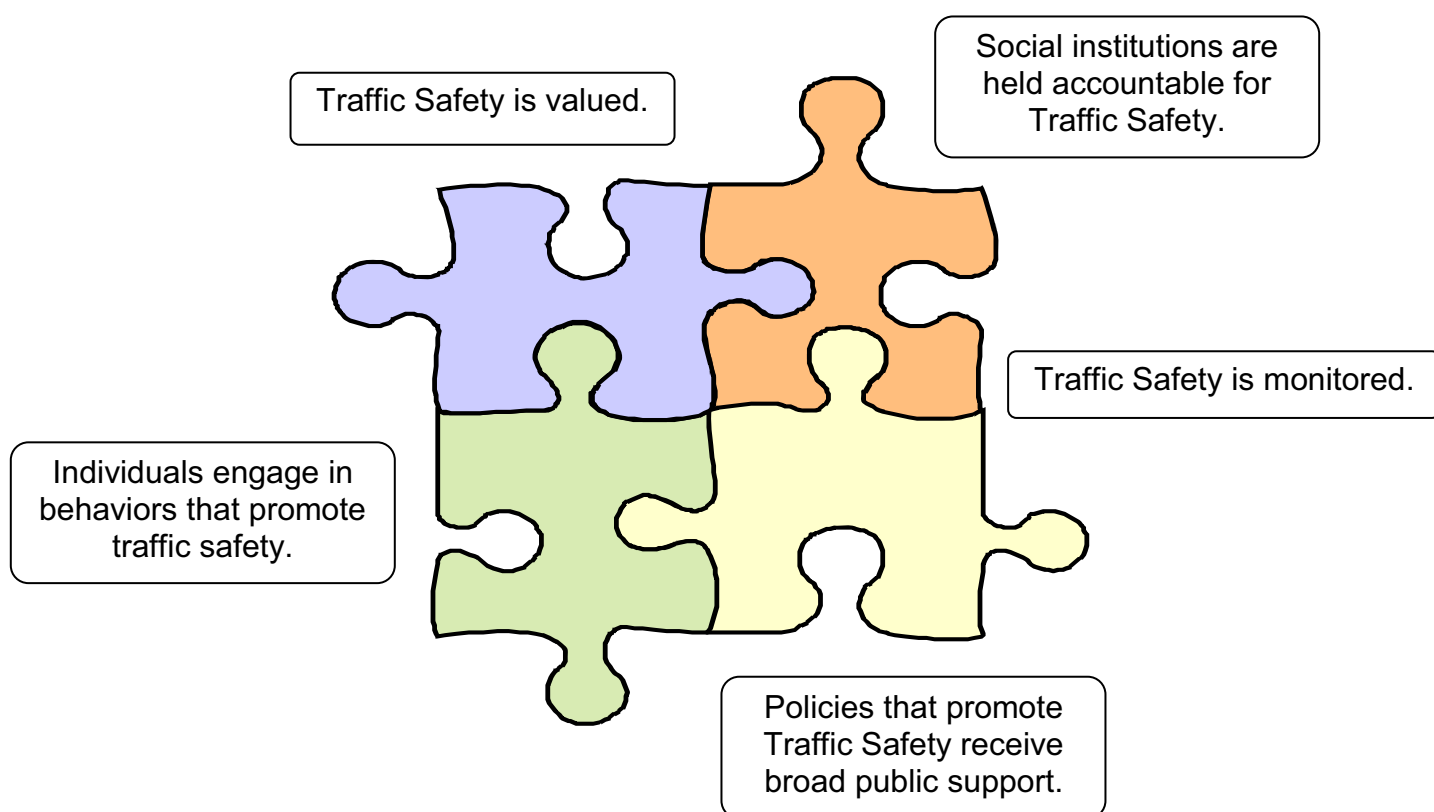
The feedback we received from Delphi Technique participants in Round 1 was entered into a Master Table so that it could be considered in aggregate form. Their 196 comments were sorted by model component and displayed on a flip chart so that the Principal Investigator (PI) could observe trends and explore different options for organizing the model. Table 1 below provides some examples of how expert input was managed. Two members of the study team contributed to this process, to ensure that it was consistent with the project's overall aims rather than idiosyncratic.

Table 1: Examples of Delphi Technique Feedback & Its Disposition

Comment	How comment was integrated into revised model
“Subcomponent style is inconsistent. Use all sentences or all phrases.”	Subcomponent format was standardized
“Add ‘Congress, State Legislators, major companies, chamber of commerce.’”	These examples were added for rating in Round 2.
<p>“[Normative] is academic jargon that may be confusing for practitioners.”</p> <p>“I’m not sure ‘Normative’ is the best description.”</p> <p>“This title [Normative] did not initially register with me. I needed to consult the dictionary.”</p>	Term was removed from model. Concept was integrated under other components.
<p>[Commenting on “Risk-taking is stigmatized”]</p> <p>“This is too general. All cultures valorize some risk taking and stigmatize others. I suggest ‘Breaking safety traffic laws is stigmatized.’”</p>	Social disapproval now linked to breaking of traffic safety laws, rather than general risk-taking.
<p>Several reviewers suggested that the components originally entitled, “Engagement” and “Accountability,” seemed to represent “<i>Individual</i> engagement” (or behaviors) and “<i>Institutional</i> accountability.”</p>	These qualifiers were added to the appropriate component titles in the revised model.
Comment	Rationale for not incorporating comment into revised model
<p>“I wonder if a comprehensive model needs some way to incorporate components that are above and beyond traffic specific factors (supra- or extra-traffic components?). I am thinking of broad cultural attributes, such as politeness, sense of responsibility for others.”</p>	Likely to yield interesting information, but there won’t be room in our survey for such precursors. They could be explored in follow-on studies.
<p>[Commenting on “Risk-taking is stigmatized”]</p> <p>“If it is related to aspects of personality, it might not be so easily changed.”</p>	Comment went beyond the scope of this project (i.e., to whether TSC is modifiable).
<p>“I think I would exclude ‘Financial contribution’ [under “Willing to take action”]. We already pay taxes.”</p>	Seemed to reflect the reviewer’s dislike of this action item rather than his assessment that it was not a valid indicator of positive TSC. We had also envisioned a broader interpretation of “financial contribution.”
<p>“This [institutional accountability] may be a little much for a regular person to contemplate.”</p>	These items will be challenging to develop, but to do justice to TSC, it seems like we should attempt include them. Cognitive interviews will indicate whether they are understood.
<p>[In reaction to “Current highway toll is unacceptable”] “I don’t think people know what the current highway toll is. That would be a good question in and of itself.”</p>	This question has been asked before. Also, it seems more likely to be a TSC prerequisite than indicator.

In November of 2008 a revised TSC model (see Figure 2) was distributed to Delphi Technique participants.

Figure 2. Revised Traffic Safety Culture Model



While they were welcome to comment on any aspect of TSC in Round 2, experts were now asked to provide *numeric* ratings of the possible components that could be represented on our measurement tool. The following scale was provided to them:

1=definitely should be included

2=probably should be included

3=possibly should be included

4=should not be included

Our collection of specific TSC elements was generally well received by Delphi Technique participants. Their mean ratings ranged from 1 to 2.8. The two most poorly rated items on the 136 item scale were rejected (i.e., rated 4) by only 28% of raters. Those data were used to prioritize the topics to be included in our TSC survey instrument.

Survey Development & Administration

Specific questions designed to measure TSC components and subcomponents were developed when a suitable item could not be identified from the pool that had been compiled during our Literature Search. Some items were purposely worded “negatively” (i.e., such that agreement indicated poor TSC). This was intended to soften the demand characteristics of the instrument and reduce the likelihood that respondents would fall into a response set (i.e., of just checking off the right or left side of the scale). By demand characteristics, we mean that we did not want subjects to detect predetermined expectations or bias on the part of the investigators. A draft version of the questionnaire was subsequently sent to study’s funder for review. According to our predetermined protocol, they invited two independent survey experts to provide feedback on the draft questionnaire. A slightly revised version of our instrument was then submitted to the PI’s institutional review board for approval.

To solicit qualitative input from subjects who were similar to our intended audience, five lay volunteers were recruited to pretest our survey instrument. We utilized cognitive interviewing techniques modeled after those developed at the National Center for Health Statistics' Questionnaire Design Research Laboratory (Willis, 1994). Cognitive interview subjects explain to the investigator how they would answer each question on a draft version of the questionnaire, and why they made that choice. This process often reveals interpretations that differ from what the developer had intended, and suggests wording changes that would improve the clarity of survey items. For example, probing revealed that subjects' willingness to speak up when they were a passenger in a vehicle that was being driven in an unsafe manner depended upon their relationship to the driver. In order to reduce this potential source of variance, we modified that question so that it presented a consistent scenario (i.e., a commercial driver).

The final version of our survey instrument included 55 Likert-type items designed to measure TSC-related attitudes and beliefs. The next 17 questions dealt with behavior, and included a screening question that allowed non-drivers to skip ahead in the survey. The end of the questionnaire contained nine demographic items.

Just prior to sending out our survey mailing, we purchased a list of 1700 nationally representative addresses from a commercial sampling company. Our survey mailing packets were assembled according a modified version of Dillman's (2007) Total Design Method. They included a five-dollar cash incentive and a cover letter that instructed the person who opened the envelope that it was intended for an adult member of the household who had had the most recent

birthday. Surveys were mailed from April 2, 2009 to April 6, 2009. On April 10th, reminder postcards were sent to all potential subjects.

3. Results

Seven hundred fifty completed surveys were returned by respondents. That represented a 46% return rate. After all of the data from our returned surveys were entered into an SPSS (Version 12.0.1) database, they were cleaned and checked for accuracy. For the 20 items that were written to reflect “negative” views of traffic safety, “flipped” versions were created so that smaller values always reflected “better” TSC.

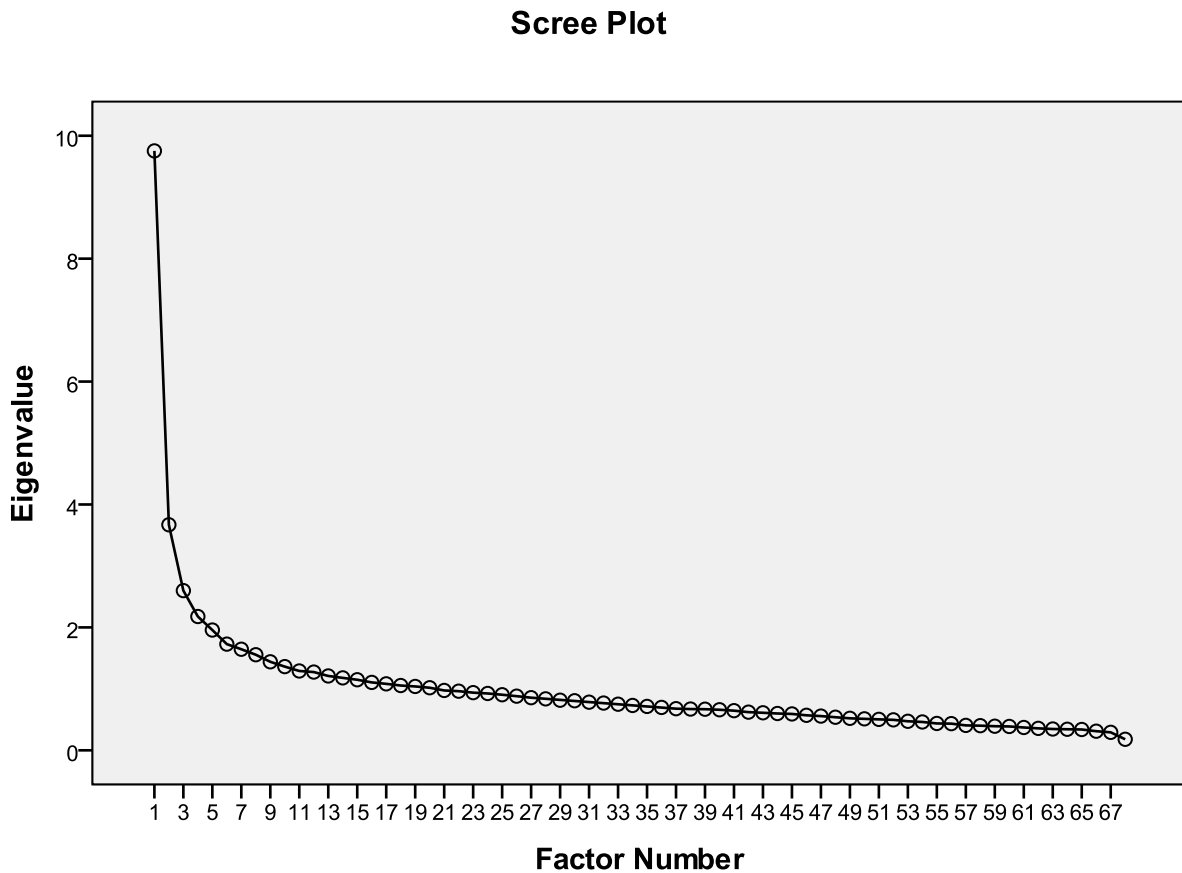
Factor Analysis

Factor Analysis involves the use of complex statistical techniques that are designed to reveal the underlying structure (i.e., factors) of an abstract construct; in this case TSC. This technique also enables us to describe a construct more simply, because we have reduced the number of variables that are required to measure it. Originally, we developed 68 survey items to measure TSC. They yielded data that were used to produce a correlation matrix. That matrix was reviewed to ensure that inter-item correlations were sufficient to support further analysis. Our Bartlett’s Test of Sphericity yielded a Chi Square of 10387.5 (df=2278, $p < .000$). This highly significant finding allows us to reject the null hypothesis that our correlation is an identity matrix (i.e. which is the type of matrix produced when there are no interrelationships exist between survey items). We also conducted a Kaiser-Meyer-Olkin (KMO) test. The KMO measures sampling adequacy, and

values that exceed .6 indicate that survey items are likely to share common factors. Our KMO test result was .859, which is considered by the test's developer to be a "meritorious" value (i.e. attributed to Kaiser in Pett et al, 2003). Taken together, these findings indicated that we were justified in proceeding with the more complex analyses we had proposed.

For our factor analysis, we used the Maximum Likelihood method of estimation. To identify the initial number of factors to extract, we applied the Kaiser-Guttman rule. This is also SPSS's default method, which extracts the number of factors that yield initial eigenvalues over 1.00. Eigenvalues represent the amount of explained variance associated with the factor in question. This method yielded 20 factors; a relatively high number which indicates that TSC is indeed a multidimensional construct. We wanted to reduce that number if possible, however, to make our description of TSC more manageable. To that end, we reviewed the cumulative percentage of variance explained by each factor. We found that a fifteen factor solution explained 50% of the variance (versus 57% explained by the 20 factor solution). We found additional support for a 15 factor model when we examined the scree plot (i.e., the slope of our eigenvalues) produced by our extracted factors (see Figure 3). In the interest of parsimony we also explored five and ten factor models. We were not, however, satisfied with the coherence of the factor groupings they produced. They also explained less variance--30 and 41% respectively—than our fifteen factor model. Fifty percent of variance has been proposed as a minimum threshold to be used by social scientists deciding how many factors to retain from the extraction process (Pett et al, 2003, p.118).

Figure 3.



We utilized the oblique method (Promax, kappa parameter=4) to rotate our 15 factor model. This method was selected because it allows dimensions of constructs to be correlated, which provides a more realistic representation of how they probably operate in the world. Instances of cross loadings present the analyst with the responsibility for assigning items to the factor that makes the most conceptual sense. We also utilized measures of internal consistency (i.e. Cronbach's alpha) to test the best placement of items that could be assigned to more than one factor. Table 2 lays out the fifteen TSC factors that we identified, and examples of items that were used to measure each factor. (Readers should note that in some instances, only two items loaded on a given factor. This precluded conceptualization of them as true scales. Prior to psychometric

testing of our instrument, more items will be needed for these factors.) Names were ascribed to factors based upon the underlying construct that seemed to tie together the items that loaded on that factor.

**Table 2. Tentative Factor Structure of Traffic Safety Culture;
with Illustrative Survey Items, Eigen Values and Percent of Variance Explained**

Traffic Safety Culture Factors with Illustrative Survey Items	Eigen Values	Variance Explained
Support increased government attention to traffic safety. <i>I would like to see traffic safety included among the president's priorities.</i>	9.75	14.34%
Support strict monitoring and control of alcohol-impaired drivers, and other limits on freedom for the sake of traffic safety. <i>The legal blood alcohol limit for driving in the United States is too strict.*</i>	3.67	5.40%
Unlikely to drive aggressively. <i>In the last 12 months, how frequently have you cut in front of another car?</i>	2.60	3.82%
Do not condone speeding or distracted/fatigued driving. <i>In the last 12 months, how frequently have you gone over the speed limit by at least 10 miles per hour?</i>	2.18	3.20%
Engaged in advancing local traffic safety. <i>If I thought the roads that my family used everyday were unsafe, I would contact a public official about them.</i>	1.96	2.88%
Support photo enforcement of traffic safety laws. <i>Cameras should be installed in more places to enforce traffic safety laws.</i>	1.73	2.54%
Willing to invest in traffic safety. <i>I would support a \$3 increase in the car registration fee to allow my state to do a better job keeping track of where and how crashes occur.</i>	1.64	2.42%
Expect evidence-based traffic safety policies. <i>Before voting on laws that are supposed to make roads safer, politicians should find out what has worked in other places.</i>	1.56	2.29%
Support seatbelt use and seatbelt laws. <i>How often do you use a seatbelt while riding as a passenger in a motor vehicle?</i>	1.44	2.12%
Believe schools should promote road safety. <i>It would be odd for the local PTA to take on road safety as one of its causes*</i>	1.36	2.00%
Support restrictions on teenage drivers. <i>The legal driving age in the United States should be increased to 18.</i>	1.29	1.90%

Do not drive while alcohol-impaired and prevent others from doing so. <i>In the last 12 months, how frequently have you driven when you thought you might have had too much to drink?</i>	1.27	1.87%
Desire more public access to traffic safety information. <i>I would be interested to know how my state compares to others when it comes to the risk of dying in a car crash.</i>	1.21	1.78%
Support police enforcement and traffic calming measures. <i>Police officers who enforce traffic laws are performing a valuable public service.</i>	1.18	1.73%
Expect the corporate sector to do more about the traffic safety problem. <i>I am bothered by car ads that seem to encourage dangerous driving.</i>	1.15	1.69%

*These items were reverse-coded for the purposes of factor analysis.

4. Discussion

The bolded factors displayed in Table 2 represent our first attempt to break Traffic Safety Culture down into its constituent components. It is perhaps encouraging that government involvement emerged most prominently among TSC’s identified factors, since public policies are associated with our most effective injury prevention strategies (e.g., speed limits, vehicle standards, highway infrastructure). This emphasis is consistent with the Vision Zero approach, which holds the transportation system’s designers accountable for traffic safety (Tingvall & Haworth, 1999). The three factors that followed “increased government attention”—although somewhat distantly--focused on driver behavior; as have traditional traffic safety initiatives. Nevertheless, the totality of factors that emerged from this first attempt to break TSC down into constituent components is consistent with the *orchestration* of mixed preventive measures that Lund & Aarø (2004) cite as holding the greatest potential to advance injury prevention.

The approach taken to identify TSC’s underlying factors is subject to several limitations. The structure of TSC that was distributed on Round One of our Delphi Technique reflected the

perspective of the principal investigator. To compensate for this potential source of bias, a second study team member participated in our review and incorporation of Delphi participant feedback on that structure. Also, all proposed TSC elements were numerically rated by a panel of independent traffic safety experts. Readers are also reminded that Table 2 is the product of a factor analysis, which was based upon empirical data. It is sufficiently different from Figure 1 to suggest that the author was open to differences that emerged from our qualitative and quantitative data collection procedures.

Future studies will be needed to confirm whether the tentative TSC structure proposed in Table 2 holds up across populations. While the response rate achieved in this study is well within the acceptable range for a mail survey, we cannot know whether the inclusion of non-responders' data into our analyses would have changed the factor structure that was "revealed." The next administration of our survey instrument will be carried out with the intention of determining its psychometric properties (i.e., validity and reliability). Until that time, it would be premature for others to adopt the instrument we fielded. Our tool's language (e.g., President vs Prime Minister, state vs. province) and emphasis (i.e. vehicle occupants vs. vulnerable road users) would also require adaptation before it is administered in many parts of the world. Nevertheless, we thought journal readers would be interested in this systematic approach to characterizing TSC.

The factors listed in Table 2 are consistent with TSC descriptions that have been proposed by other traffic safety professionals. In a recent survey study, Rakauskas (2009) set out to explore safety culture differences between rural and urban samples. Their instrument included measures of driving behaviors and perceptions of policies, as well as enforcement, engineering and educational

interventions. Moeckli & Lee (2007) have stated that any approach to shifting TSC must move beyond a singular focus on the driving public, reinforcing the shared responsibility of other sectors (e.g., law enforcement, policy makers, educators, engineers). Williams and Haworth (2007) have described an effective highway safety culture as an environment in which an appropriate level of public and political attention is paid to motor vehicle injuries, and a balanced, evidence-based approach-- that incorporates behavioral, environmental and vehicle factors—is applied to reducing the problem. Finally, Hauer (2007) underscores the importance of encouraging a “road-safety culture” in which intuition-based road safety delivery is socially unacceptable.

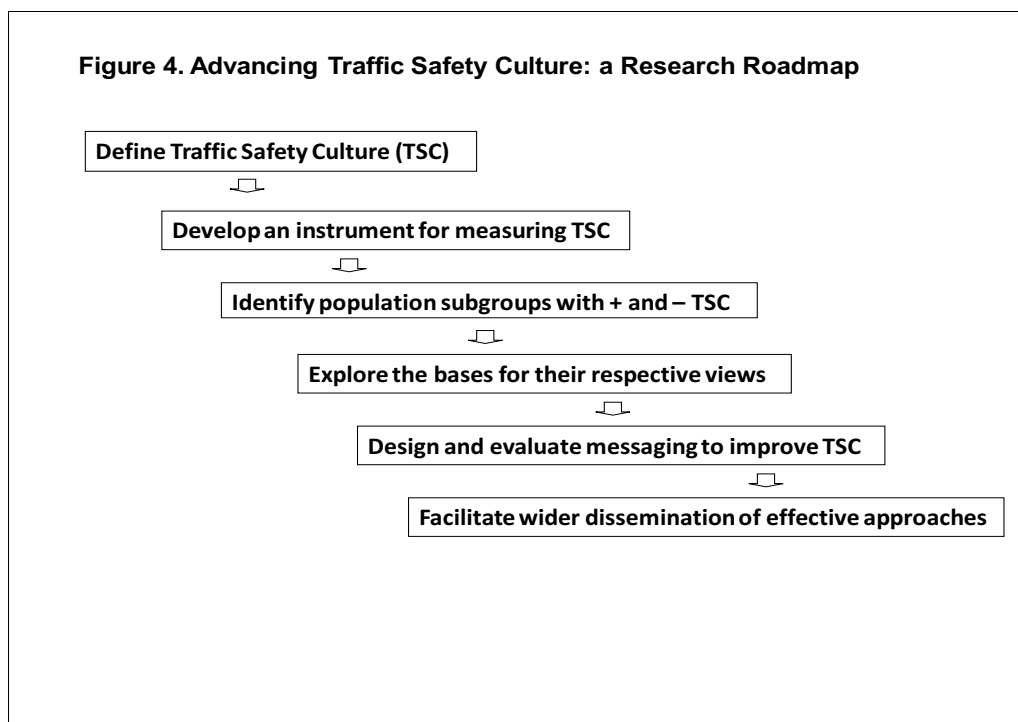
While the tentative structure that emerged from our data incorporates many of the elements that have been described by safety professionals, they were organized in ways that we may not have expected. Our respondents, for example, did not appear to think about “safe driving” as one entity. They responded differently to questions about aggressive driving and “speeding/distracted/fatigued” driving, as well as to drunk driving items. While our hypothesized model’s components were categorized by strategy (e.g., public policy, surveillance), our sample seemed to think about TSC by hazard (e.g., alcohol, non-use of restraints). It is perhaps surprising that they made single factors of behaviors that involved protecting themselves and behaviors that were aimed at protecting other people. Conversely, they separated police and photo enforcement of traffic safety laws. These insights could prove to be important to those trying to change citizen behavior and/or attitudes.

The fact that government figured most prominently into TSC suggests that the public sees themselves as consumers and not just producers of traffic safety. Again, this perspective is consistent with the more progressive systems approach that has proven so successful in Sweden. Survey

researchers should include items that focus on the behavior of policy makers and other public servants on their questionnaires, instead of implying that drivers are the only parties with the power and responsibility for reducing road-related deaths and injuries.

Once a valid and reliable measure of TSC becomes available, it could be used to identify beliefs that feed into poor TSC and subgroups that are at higher risk for weak TSC. Such findings could inform future interventions and enable their evaluation.. TSC trends could be tracked over time, so that advocacy efforts could be synchronized with public support.

Figure 4 summarizes our longterm approach to improving the public’s TSC. Complementary investigations should extend to structural indicators of whether traffic safety is valued and being rigorously pursued. These could include audits of evidence-based policy, funding, staffing, research investment, surveillance systems, enforcement levels, media portrayals/coverage, etc.



More than 1.2 million people die of traffic injuries each year, and in most regions of the world, that death toll is increasing. Road-related injuries are already the leading cause of death for those aged 15 to 29 worldwide, and the second leading cause of death for children aged 5 to 14 (World Health Organization, 2009). It is unclear why this public health problem has failed to garner more attention and resources, but that question is worthy of more than speculation and lamentation. . Just as the field calls for scientific evidence before endorsing an engineering countermeasure, we must take an evidence-based approach to creating environments in which traffic safety is “highly valued and rigorously pursued.”

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