

Effective Utilization of Naturalistic Data for Driver Distraction Outreach Campaigns

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Abstract

Successful campaigns for combatting public health issues related to driving have focused on three fronts: legislation, enforcement, and public outreach. While considerable efforts have been made at crafting legislation and providing for enforcement to combat distracted driving by commercial vehicle operators, outreach efforts have not been as successful in gaining the population's attention. The United States Federal Motor Carrier Safety Administration hosts the Commercial Motor Vehicle Web-Based Driving Tips site. This public outreach site is oriented towards commercial drivers and covers several safe- and defensive-driving topics, including distraction. This project involved updating distraction information contained within the site in order to ensure that the results of recent naturalistic studies of commercial driving were included, and simplified the site text in order to better convey the information. Additionally, due to the increasing amount of cross-border traffic, the material was reproduced in the Spanish language. The result was site text produced at a more appropriate reading level for the population, updated with results from recently published studies that provided information on distraction risks not previously identified. The process that was followed can be utilized for other targeted outreach efforts for distracted driving campaigns as well as for other transportation-related outreach programs.

Introduction

Driver error is a primary contributing factor in many large-truck crashes (Hedlund & Blower, 2006; FMCSA, 2007). Although driving a commercial motor vehicle (CMV) requires special licensure, CMVs are fundamentally dissimilar to passenger vehicles and require special skills and knowledge for their safe operation. However, not all CMV drivers are able to practice skills on a regular basis. Because of this, it is important to provide practical information to CMV drivers on the safe operation of these vehicles.

The Federal Motor Carrier Safety Administration's (FMCSA) CMV Web-Based Driving Tips site (www.fmcsa.dot.gov/about/outreach/education/drivertips/index.htm) is a source of information on safety and practical driving tips for CMV drivers and safety managers. The site provides information on several factors related to safe driving, including: the importance of safety belts, driving too fast for conditions, understanding the risks of traveling on unfamiliar roads, inadequate surveillance, driver fatigue, driver distraction, following too closely, and not taking adequate evasive actions. Each of these areas provides information in the form of tips, many including video examples taken from naturalistic CMV driving studies performed by the Virginia Tech Transportation Institute (VTTI).

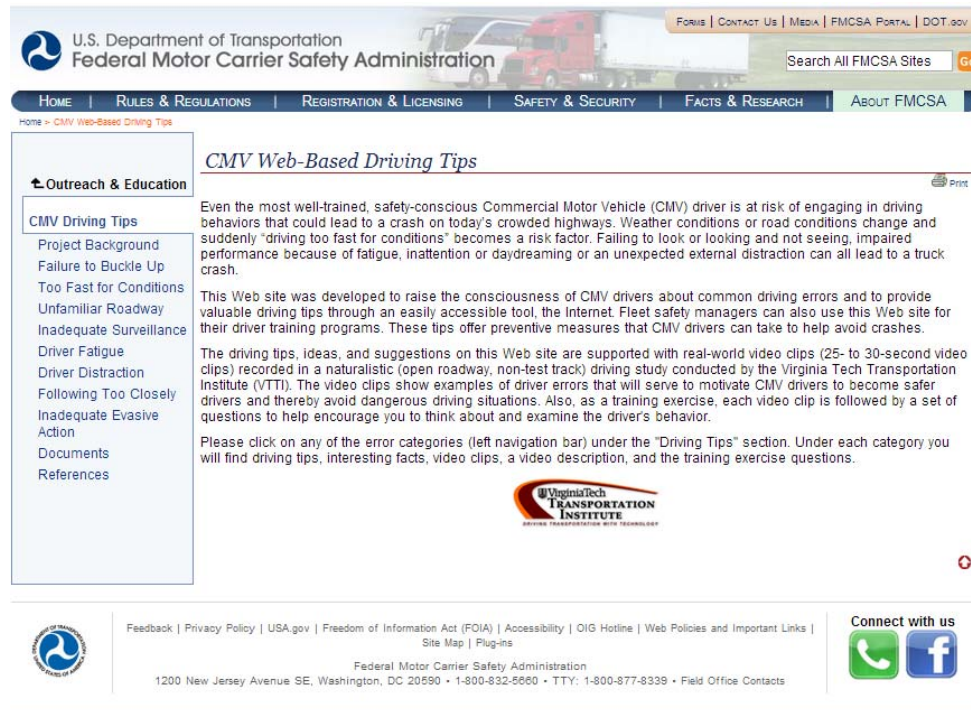


Figure 1 FMCSA's CMV Web-Based Driving Tips entry page

However, since the site was launched, there has been a rapid increase in both public attention to, and research investigating, driver distraction. This has included the publication of research specifically examining the risks associated with distracted driving on the part of CMV operators (Olson, Hanowski, Hickman, & Bocanegra, 2009). Further, the United States Department of Transportation (U.S. DOT) launched Distraction.gov, a website created to raise public awareness of the dangers of distracted driving. Because of the increased attention on distracted driving, as well as a need to provide anti-distracted-driving information to the CMV driving population, the current project was undertaken.

The purpose of this paper is to present an overview of a project aimed at reviewing the driver distraction material on the CMV Web-Based Driving Tips site and identifying recently published research that may be included in a potential site update. In order to better reach the intended audience for this important information, two additional aspects to this effort were undertaken. The first aspect was to simplify the text. While CMV drivers have a wide range of educational backgrounds (Blanco, Bocanegra, Morgan, Fitch, Medina, Olson, et al. 2009), providing text at a level requiring no greater than a high school education helps ensure that the message will be understood by the majority of drivers. The second aspect was to provide a Spanish-language translation of the information, as new agreements have allowed for increases in the amount of Mexico-U.S. CMV traffic (Applebaum, 2011). Following the initial translation, the text was reviewed by a number of native Spanish speakers from different countries in order to ensure that the effects of regional variations on the translated text were minimized. The goal of this project was to make the information on the CMV Web-Based Driving Tips site more easily understood by the target audience, more accessible to a wider audience, and more relevant with up-to-date information.

Public outreach campaigns

Driver distraction has received increasing attention over the past decade. Perhaps the culmination of this attention, in the United States, was the Distracted Driving Summit in 2009 and the launch of the distraction.gov website. Other efforts, such as the National Safety Council's Distracted Driving clearinghouse (NSC, 2013) provide a general audience with information, including videos, of the risks associated with distracted driving. However, with the exception of the FMCSA's rulemaking activities, information on distracted driving for CMV operators has not been widely promoted.

Strengths of using naturalistic data for outreach

Perhaps the greatest strength of naturalistic-type data is the ability to provide real-world examples of the risks and consequences associated with distracted driving. Naturalistic data collection efforts record CMV drivers in revenue-generating operations. Thus, the scenarios captured in the kinematic, vehicular, and video data reflect the actual roadway conditions and precipitating driver behaviour at that point in time.

This naturalistic approach provides one of the highest quality sources of information about safety-critical events that are available. By way of contrast, consider a standard source of epidemiological data that is typically used: police accident reports (PARs). The police officers and first responders who contribute to these reports receive specialized training in understanding the kinematics of crashes. However, these individuals are working from the unenviable position of attempting to understand a crash from a post-hoc perspective. Witnesses may report information that is in their own best interest (e.g., *the oncoming car was speeding*) while refraining from reporting information that may reveal illegal activities or reflect poorly upon themselves (e.g., *I was composing a text message while traveling through the intersection*). Time passing between the event and the completion of the PAR may include physical manipulation of vital evidence, such as moving vehicles to provide individuals with medical attention. Finally, some contributing factors – such as drowsiness and distraction – may be difficult for the officer or first responder to detect. Unlike intoxication, distraction and drowsiness are point-moment events that do not leave evidence that can be easily gathered by the officer at the scene. Finally, and perhaps most importantly for public outreach campaigns, PARs cannot capture the near-misses (near-crashes and crash-relevant conflicts) that are much more common than crashes (Hickman, Hanowski, & Bocanegra, 2010, and see Heinrich, 1931). Naturalistic studies have demonstrated that, in both automotive (Klauer, Dingus, Neale, Sudweeks, and Ramsey, 2006) and CMV operations, near-crashes are much more common than crashes. Using examples and information from both crashes and the less severe, yet very important, near-crashes, provides CMV drivers with relatable information and strengthens the key messages of an outreach campaign.

Challenges associated with using naturalistic data for outreach

While a powerful tool in outreach campaigns, naturalistic data also presents some challenges when attempting to use the collected data for public outreach. Key among these challenges are the lack of controlled conditions and obtaining permission to use video data. Both of these challenges are discussed herein.

Naturalistic data, by its very nature, is recorded in real-world operations and is not experimentally controlled (as would be the case in either laboratory or test-track

conditions). Therefore, capturing real-world instances of rare events is a rare event in and of itself. However, larger sample sizes allow for capturing near-crashes and crashes in a sufficient number not only for analysis, but also for helping to illustrate the risks associated with distracted driving.

Additionally, and this is especially true with CMV driver populations, there can be challenges associated with obtaining permission to use a participant's image in public outreach campaigns. Ethically, as well as legally in many cases, it is the researcher's responsibility to obtain permission from participants before using their data (video or otherwise) in any form of public release. While most participants will quite readily allow their image to be used in scientific reporting efforts, obtaining permission to use their image in outreach campaigns can be difficult. CMV drivers' careers are dependent on their history and reputation as a safe operator of a vehicle. Ultimately, some drivers that choose to release this type of information for outreach efforts do so in the interest of the greater good; by providing their own example to the public, they may benefit by warning others of the consequences or risks of certain behaviours.

Identifying recent CMV-relevant distraction studies

In order to ensure that the results of recent studies on driver distraction were captured and included in the updated site text, several databases (including EBSCOHost, Web of Knowledge/Science, Google Scholar, and specific transportation-related journals) were searched for keywords of distraction and commercial vehicles. While an effort was made to limit results to those dealing directly with CMVs, other studies closely related to particular aspects of CMV operations (such as interacting with dispatching/text entry devices) were included when needed. Although this search yielded multiple results, only the following references were used in the updated site text as they dealt directly with commercial vehicles or included information about distractions (such as text/dispatching devices) that have been identified as present in commercial vehicle operations:

- Federal Motor Carrier Safety Administration (FMCSA). (2011). Large truck crash causation study (LTCCS): crash statistics. Retrieved September 9, 2011 from: <http://ai.fmcsa.dot.gov/lccs/default.asp?page=reports>
- Hickman, J.S., Hanowski, R.J., & Bocanegra, J. (2010). Distraction in commercial trucks and buses: Assessing prevalence and risk in conjunction with crashes and near crashes (Technical Report No. FMCSA-RRR-10-049). Washington, DC: US Department of Transportation.
- Olson, R.L., Hanowski, R.J., Hickman, J.S., & Bocanegra, J. (2009). Driver distraction in commercial vehicle operations (Technical Report No. FMCSA-RRR-09-042). Washington, DC: US Department of Transportation.
- Owens, J.M., McLaughlin, S.B., & Sudweeks, J. (2011). Driver performance while text messaging using handheld and in-vehicle systems. *Accident Analysis and Prevention*, 43(3), 939-947.
- US Department of Transportation (US DOT). (2010). Limiting the use of wireless communications devices. *Federal Register*, 75(186), 59118-59136.
- US Department of Transportation (US DOT). (2011). Drivers of CMVs: Restricting the use of cellular phones. *Federal Register*, 76(232), 75470-75488.

Information from these articles and reports were used to update the risk information in the distraction information of the site. In some instances, newly-identified

distractions were not present in the existing text and were added (such as text messaging, which was not identified as a risk in the earlier research due to the more recent growth of text messaging as compared to telephone calling cell phone use). Video examples from naturalistic data collection efforts were surveyed to identify instances that could be used to illustrate the risks associated with different sources of distraction. When permission for use of the video could be obtained (and see the above section, challenges associated with using naturalistic data for outreach), these were included in the revised site.

Targeting audiences with appropriate language

One challenge that outreach campaigns face relates to presenting information at an appropriate readability level for the intended audience. In this sense, readability refers to the comprehension difficulty of text (Kincaid, Fishburne, Rogers, & Chissom, 1975), a concept that has important implications for the benefit that the audience will gain from the text. Simply put, the information must be presented at a level that the audience can both read and, more importantly, comprehend. This is partially dependent on the educational background of the audience. In the case of CMV drivers, typical samples of commercial goods-carrying drivers yield a mixture of educational backgrounds. One study (Blanco, Bocanegra, Morgan, Fitch, Medina, et al., 2009) identified a large percentage of CMV drivers with education beyond high school (49%); with 36% having a high school education as their highest obtained level of education, and 15% who did not receive a high school degree. Due to these types of variations in educational backgrounds, readability is critical to any outreach program.

Because of this, in addition to generating new text, the current outreach effort included revising existing text to a more appropriate readability level. A metric was chosen that allowed for sections of the text to be examined using a single, comparable, metric. The Flesch-Kincaid grade-level formula (Kincaid, Fishburne, Rogers, & Chissom, 1975) and the associated Flesch-Kincaid reading ease score provide a grade-level score for the readability of text and have become one of the most popular readability metrics. This metric takes into account the total number of syllables, words, and sentences within the text. The score produced by the metric can be interpreted as relating to U.S. grade levels ranging from 0 (Kindergarten) to 12, with higher scores representing additional years of education needed to understand the text. Due to the wide range of educational backgrounds in the CMV driving population, all new and revised text was targeted for a maximum of a 12th grade reading level.

An example of this can be found by comparing the current text to the revised text. One passage from the current text reads:

When driving, keep your mind engaged with driving-related information and try to avoid focusing on external objects such as billboards or buildings or internal objects such as a cell phone or paperwork. Remember that all distractions can be dangerous. Paying attention to driving-related information will help you determine when and where there are vehicles around you and will also enable you to react more quickly to any unforeseen event.

This text is at a Flesch-Kincaid grade level score of 14 and presents information at a level requiring education beyond high school. The revised text (Flesch-Kincaid grade level 8.6) presents the same information, with the same meaning, at a much simpler level:

When driving, stay focused on the job of driving your truck. You should avoid focusing on things outside of your truck that aren't related to driving. This includes things like billboards, buildings, and people. Remember, anything taking your eyes away from driving is a distraction and can be dangerous. Paying attention only to things that are related to driving will help keep you aware of the road and cars around you, and will help make sure you are ready to react to anything unexpected.

Reaching an international audience

Another important aspect of this outreach effort was to provide distraction prevention information to the increasing number of native Spanish-speaking CMV drivers, as well as the increasing number of drivers coming from Mexico into the United States (Applebaum, 2011). Therefore, following the process of reviewing existing information, updating with new forms of distraction, and working to ensure the readability of the remaining existing text, a Spanish-language translation was performed.

As Spanish has many regional variations in phrasing, a multiple review approach was undertaken. First, the text was translated into the Spanish language. Following this, the text was independently reviewed by a number of native Spanish speakers from different countries in order to ensure that the effects of regional variations on the translated text were minimized.

In order to ensure that the Spanish-language translations performed as part of this project resulted in text with an appropriate level, a Spanish-language readability formula was used to assess the translation. The Fernandez-Huerta readability formula is an adaptation of the Flesch Reading Ease score that takes into account the differing number of syllables, words, and sentences found in Spanish texts as opposed to English-language texts (Fernández-Huerta, 1959). While the Flesch Reading Ease and Fernandez-Huerta scores are not directly comparable due to this adjustment for language variability, they operate on the same principle. For the Fernandez-Huerta, typical scores range from 30 to 100, with the higher scores indicating text that is easier to read. In a manner similar to that used for the English language version, the maximum level allowed was the 12th grade equivalent.

Conclusion

The FMCSA sponsored the creation of and hosts the CMV Web-Based Driving Tips site. A part of this site includes information specific to the dangers posed by distracted driving. However, in the years since the creation of the site's original material, several important studies have been published with new information or perspectives on distracted driving for CMV drivers. The primary goal of this project was to perform a literature review and update the site text with new information relevant to CMV drivers. As part of this literature review, six additional studies dealing with distractions common to CMV operations were identified and integrated into the text.

The readability of text influences how likely it is to be comprehended by the audience. The second goal for this project was to simplify the site text (i.e., increase the readability) in the interest of making the site more useful for CMV drivers. Although CMV drivers have a wide range of educational backgrounds, providing information at a level requiring no greater than a high school education is a way to ensure that the message will be understood by the majority of drivers.

The final goal of the project was to provide all site materials in the Spanish language. This is important as new agreements have allowed for increases in the amount

of Mexico-U.S. CMV traffic. A Spanish-language translation was performed on both the revised site text and the anti-distraction tip sheet. Following this initial translation, the text was reviewed by multiple native Spanish speakers from different countries in order to minimize effects of regional variations on the translation.

The ultimate goals of this project are to make the information on the CMV Web-Based Driving Tips site's distraction section more easily understood by the target audience, more accessible to a wider audience, and more relevant with up-to-date information. While this is an important step, it is critical that the dangers of distracted driving continue to be emphasized within the CMV stakeholder community through outreach and education. While this project was a single instance and not part of a continual process of updating the site information, future efforts should consider using the powerful information available in the naturalistically-collected data to enhance their outreach efforts. Likewise, assessments of how the audience is using the naturalistic information on the site (via metrics such as video views and time on site) will be helpful in shaping additional work. Further efforts at shaping outreach and education materials for the CMV community are likely to yield benefits in terms of increased awareness and fewer incidents of distracted driving.

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