

Two New Tires Should be Mounted on the Rear

Jeffrey J. Smith, Jennifer A. Cowley, and Michael S. Wogalter
*Psychology Department, North Carolina State University
 Raleigh, NC 27695-7650 USA*

When the rear wheels of a vehicle lose grip on the road, a driver's ability to control the vehicle is dramatically reduced, a phenomenon called oversteer. Oversteer is an event that occurs in many rollovers and single vehicle loss-of-control accidents. Therefore, when replacing two tires, the two new tires (the tires with better tread) should always be mounted on the rear wheels. There are virtually no exceptions to this rule and it is clearly demonstrated in tests conducted by one major tire manufacturer (Michelin, 2008). The present studies examined whether people are aware of this rule by asking them where two new replacement tires should be installed on a vehicle. Results showed that approximately 75% of consumers did not know to install two new replacement tires in the two rear wheel positions. Warning systems are discussed with focus on making recommendations for improving safety communications to tire installer and consumers.

INTRODUCTION

Warnings are a form of safety communication intended to inform persons about risks and hazards and to minimize undesirable consequences, such as illness, injury, or property damage (e.g., Wogalter & Dingus, 1999; Wogalter & Laughery, 2006). Warnings are the third stage of the well-known hierarchy of hazard control: (1) design out the hazard, (2) guard against the hazard, and (3) provide adequate warnings for both proper use and reasonably foreseeable misuses (Sanders & McCormick, 1993). When hazards cannot be designed out or guarded against, manufacturers should use an effective warning system, which may involve information on the product itself, in the product manual, and other methods of communication (see, e.g., Wogalter & Laughery, 2006).

Manufacturers have a general – and often legal – responsibility to alert consumers and downstream entities of safety-related information or warnings (see, e.g., Cox & Wogalter, 2006). The communication-human information processing model describes how information is passed from the source to the receiver and allows responsible entities to identify where bottlenecks can occur in the communication process (see, e.g., Wogalter, DeJoy, & Laughery; 1999; Wogalter, 2006). It also helps to identify why certain communications do not produce appropriate precautionary behaviors. A communication flow between source and receiver that produces appropriate behaviors becomes important when hazards are not easily perceived or obvious.

In the modern era, technologies have brought with it hazards that are not necessarily obvious to consumers. Some of the newest (and often overlooked) automotive technological advances pertain to vehicle

tires. Although tires have become increasingly more reliable, when tire failure occurs it can result in catastrophic injury or death. Previous research shows that many people do not know many aspects of automotive maintenance, including those involving tires (Cowley, Kim & Wogalter, 2006; Kalsher, Wogalter, Lim, & Laughery, 2005; Mayer & Laux, 1990).

One potentially important fact about tires has been recently revealed in litigation and in systematic testing: when replacing two tires (rather than four) on a vehicle, the new tires should typically be placed on the two rear wheel positions to reduce the likelihood of *oversteer* which is sometimes also called fishtailing (Michelin's website, 2008). Oversteer is a phenomenon that occurs when the rear wheels of a vehicle lose grip with the road, which can drastically reduce the driver's ability to control their vehicle.

Oversteer has been identified as a causal factor in many vehicle rollovers and single vehicle loss-of-control accidents. The phenomenon is particularly pronounced in hydroplaning situations where water between the tire and the road surface reduces or eliminates the friction involved in tire traction. If the front wheels lose traction first, the driver is more likely to notice the event and make compensatory maneuvers to reduce likelihood of complete loss of control; this contrasts with the loss of traction in the rear, which makes compensatory maneuvers more difficult, if not impossible, to execute. That is, when the rear wheels lose traction first, there is complete loss of control that even experienced, professional test track drivers have difficulty maneuvering out of safely. Given these circumstances, when replacing just two tires, the new tires with the best tread should always be mounted in the rear because tires with more tread can potentially

displace more water than the same tires with less tread, resulting in more traction with the road surface. There are virtually no exceptions to this rule (e.g., tires are different sizes in the front and rear). The phenomenon of oversteer in a hydroplaning situation from reduced tread on the rear versus the front is demonstrated in tests conducted by one major tire manufacturer, Michelin, and shown on its website (Michelin, 2008).

Given its relevance to safety, it would seem important that people know about the 2-tire placement rule. However, information about it does not appear to be widely available, other than its mention in some manufacturer's technical materials and on the website mentioned above. For example, the authors have not been able to locate information on the 2-tire placement rule in any vehicle owner's manual. Given the apparent sparseness of available information, it would seem that information on the 2-tire placement rule has not been adequately disseminated. The present study examines people's knowledge about where two new tires should be installed on a vehicle.

METHOD

Participants

Two samples were collected approximately 5 months apart, involving participants from North Carolina State University and the surrounding community (total N = 230). Each participant completed a consent form, a demographics form and a large multi-sectioned questionnaire. The data described in this report are taken from a subsection of this questionnaire involving automotive safety.

The first group comprised 137 participants. Forty-two were non-student adults (mean age = 41.1 years, SD = 17.0) of which 23 were males and 19 were females). Ninety-five were undergraduate students from the North Carolina State University (mean age = 20.2 years, SD 1.95) of which 51 were males and 86 were females).

The second group comprised 93 participants. Forty seven non-student adults (mean age = 37.9 years, SD = 14.5) of which 25 were males and 22 were females. Forty six were undergraduate from the North Carolina State University (mean age = 21.7 years, SD = 3.35) with 30 males and 15 females.

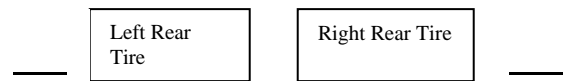
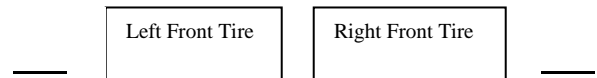
Questionnaire

All participants were presented the following information:

Suppose you were replacing only two worn tires rather than all four. Where would you mount

the **TWO** new tires? Please put a check mark next to the **TWO** places you would mount or request to mount 2 new tires (with the best tread) on a vehicle. Please check only two blanks. For this question ignore any involvement of a spare tire.

Front of Vehicle



Rear of Vehicle

Since there were some comments by the first group of participants that placement of the tires depended on the vehicle's drive train, an additional question was asked of the second group of participants. It should be noted, however, that the 2-tire rule is not affected by the kind drive train. The question was asked to determine in a more systematic way if this was a belief by participants. The specific question was:

Did you answer the above question based upon the vehicle's drive train (whether the vehicle was front-wheel drive, rear-wheel drive, four-wheel drive, etc.)?

If "yes", indicate which of the following you considered when marking your decision about the placement of two new tires.

- For a front-wheel drive vehicle
- For a rear-wheel drive vehicle
- For an all- (or 4-) wheel drive vehicle
- It does not matter what drive train it is
- I don't know

RESULTS

For the first group of participants, the data showed that only 31 of 131 (23.7%) participants correctly indicated that one of the tires should be placed on the right rear wheel and one on the left rear wheel.

For the second group of participants, only 23 of 93 (24.7%) participants correctly indicated that two tires should be placed on the two rear wheel positions.

Thus, out of all 230 participants in both groups, only 54 properly indicated that both tires would be placed in the rear; 146 participants indicated that both tires should be placed in the front. Thirty indicated various other combinations of placements.

The second group of participants was asked whether the placement of the two new tires depended on the drive train. Fifty-four of 93 (58.0%) of participants incorrectly believed that the vehicle's drive train influences the decision about where to place the 2 new replacement tires.

DISCUSSION

The present study concerned people's knowledge about the correct placement of two new tires on vehicles. The issue is important because incorrect placement could affect vehicle handling and the ability to control the vehicle in certain situations, such as hydroplaning. The results showed that most people believed the correct placement of two new tires was on the front wheels. This is incorrect. A much smaller percentage of individuals correctly stated that two new tires should be placed on the rear wheels. Thus, the location that most participants chose to place two new tires would increase the likelihood of oversteer or fishtailing, particularly during hydroplaning situations, compared to proper tire placement (Michelin, 2008).

In addition some participants indicated that the correct tire placement depends on drive train (e.g., front wheel, rear-wheel, etc.). However, the 2-tire placement principle does not, in fact, depend on the drive train. Rather the 2-tire placement rule almost always holds, virtually without exception (e.g., differences in tire sizes in the front and rear).

The finding of the large amount of incorrect responses has several implications with regard to safety. One is that people have not been provided adequate information about the 2-new tire placement rule by tire and vehicle manufacturers, writers of automotive writers in popular venues, and insurers. It is not clear why this is the case, but there is some precedent in the lack of communication of tire safety and maintenance. For example, several recent studies have demonstrated that many people do not know very much regarding tire aging (Cowley et al., 2006; Kalsher et al., 2005). Thus, entities that have (or should have) knowledge about tire-related hazards have not yet employed an adequate communication campaign regarding hazards associated with tire use, except perhaps with regard to tire pressure and amount of tread. Communication of these and other relevant facts are important to prevent tire failure and the potential consequences of serious injury or death.

While several entities could have been involved in communicating the 2-new tire placement rule, it is the manufacturer that has (or should have) superior knowledge about their product's characteristics and which have most responsibility to communicate the hazards. The manufacturer should strive to ensure that relevant entities receive appropriate warning information. This includes information communicated to purchasers directly through labels and product manuals and indirectly via the middle entities communicating the information to the receivers down the line.

Effective warnings related to tire replacement safety could also be distributed from the manufacturer through some or all of the following example channels:

- On the tires themselves
- Video, audio, pictorial, and text warnings on manufacturer's websites (e.g., Michelin, 2008)
- Posters and printable flyers to be placed in customer waiting rooms, behind service desks, etc., at tire seller and installer locations
- Safety bulletins distributed to tire seller and installer for multi-channel distribution (i.e., brick-and-mortar establishments as well as websites)
- Emails as warnings and reminders to end users who have purchased products, as well as sellers and installers
- Training information that could be incorporated into tire seller and installer training and orientation programs
- Safety articles for car enthusiast and related magazines and websites

The proliferation of the Internet and online media distribution would enable manufacturers to more widely distribute warning information to installers, end users, as well as other entities at relatively low cost. However, until the Internet access is truly ubiquitous, it cannot be assumed that this method is a primary way for people to acquire information. Nonetheless, it is a growing method that should increasingly be developed with regard to providing relevant safety information. On-product labeling and other accompanying information at the time of product purchase are still the primary ways of communicating product hazards. Additionally, entities installing tires should be provided some ways of giving persuasive information to tire purchasers so as to aid in proper decision-making about where to place two new tires on vehicles.

Additional research could involve (a) collection of data from tire sellers and installers regarding their awareness of the 2-tire placement rule, (b) asking actual purchasers of replacement tires where they plan on having them mounted, and (c) continued evaluation of the aforementioned information distribution channels

and methods to ascertain effectiveness for various information campaigns concerning the 2-tire placement rule.

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