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Google Glass and Highway Safety—Messy Choices

When Cecilia Abadie — a Google Glass "explorer" testing out the new device — received the first ever traffic ticket in October 2013 for using Glass while driving, many in the media wondered if a precedent had been set. When Abadie's charges were dismissed in January 2014 [7], again many wondered if this would set a meaningful standard.

But so far only one thing is clear: on this issue, the ice has been definitively broken. And the immediate concerns are coming into focus. Do head-mounted display devices like Glass pose a dangerous distraction to drivers? If so, what kind of a distraction is it? And what should be done to address this danger?

We don't have the answers yet. The newness of this technology means that we do not already have a body of scientific findings. And as the Abadie verdict dramatizes, current laws have failed to anticipate these developments.

But the good news is that there does exist a sprawling catalog of empirical data on an intimately related topic: cell phone driver distraction. We can infer many things from these findings, including the forms that Glass-induced distractions may take, the pitfalls ahead for regulation efforts, and even some new hazards these devices may bring to the road.

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Cell Phone Distraction

A consensus has emerged in the empirical literature on the sources of cell phone driver distraction. This kind of driving impairment can involve any of three factors: visual distraction (i.e., looking away from the road); manual distraction (i.e., taking a hand off the steering wheel); and cognitive distraction (i.e., taking your mind off the task of driving). This three-part understanding of driver distraction has become influential enough, for example, to find its way into official U.S. government literature (e.g., http://www.distraction.gov/content/get-the-facts/index.html). These three factors are also helpful for understanding the driving impairment associated with texting, one of the most distracting cell-phone-related activities [5], [9]. For normal handheld texting, all three factors of distraction may be involved. A texter takes a hand off the wheel to type out a message, takes eyes off the road to look down at the screen, and takes some mental effort away from the task of driving and puts it toward the tasks of reading and writing.

The central (and perhaps surprising) finding in this body of empirical research is that hands-free and handheld phone use are both associated with the same dangerous drop in driving performance. (For reviews of this preponderance of data, see [2], [6], [8]). This means that the impairment of phone calls is due mainly to only one of those three factors: cognitive distraction.

Since a driver using a hands-free phone keeps hands on the wheel and keeps eyes pointed forward toward the road, impairment must result from the mental distraction of the conversation itself. Talking with someone not there in the car [3], [4] drags a driver's attention toward that conversation, expending cognitive resources that should be focused on the task of driving.

The response to these findings in traffic law thus far has been inadequate. Seemingly guided by a conception of driver distraction that includes only the manual and visual forms, most laws worldwide address only handheld texting, and in some cases handheld calling (see: http://www.cellular-news.com/car_bans/). Cognitive distractions generally, and the cognitive distractions of hands-free calling and texting in particular, remain largely unregulated. As these still-legal practices become more and more engrained in drivers' personal and business routines, and as industry continues to invest in the integration of cell phones and dashboards [11], it becomes harder and harder to make the case for safety.

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Google Glass and Driving

This recent history of cell phones and driving has direct implications for research and policy on Google Glass and driving.

First, it seems a safe bet that the impending debate over the regulation of drivers' use of Glass will focus mainly on issues of the visual distraction posed by a head-mounted display. Since the device is operated mainly through voice command, and also through gestures such as winking, manual distraction should not be an issue. The novelty of the ability to project images into the user's visual field will naturally make visual distraction the central feature of concern. On the one side, those in favor of using Glass while driving will argue that since a driver's face is still pointed forward, visual distraction should not be a problem. They will point out that a slight glance to the display in the upper corner of the wearer's vision should be preferable to the visual distraction of looking down toward a smartphone screen. On the other side, safety advocates will raise concerns over the visual distraction of images and application readouts that Glass could project into the driver's field of vision. This dynamic can already be seen in the Abadie case. In addition to speeding, Abadie was charged with operating a video-display while driving.

But I am afraid that what could get lost in this debate over the potential visual distraction of head-mounted displays is exactly the issue shown to be so important in the research on hands-free calling: cognitive distraction. The variety of applications that a wearer may access with Glass could pose a distraction not only because of what they ask us to look at, but also because of what they ask us to think about. We can think of our minds is as organs that can only perform a limited number of complex tasks at the same time. Under this conception, we should think of driving and using a Glass application as two separate tasks, each vying for a driver's limited stock of cognitive resources. An application that is too cognitively demanding could prove unsafe to access while driving. Consider the ability to take pictures and video with Glass. It is possible that performing these tasks (and related tasks such as scrolling through recently taken photos) will draw a driver's mind away from the road.

Going forward, both the policymakers and the empirical research community should keep in mind this potential for cognitive distraction, even as the novel and splashy visual distractions of Glass push to the center of the conversation. It is reasonable to expect some apps to be more cognitively demanding than others. And if it remains legal to use Glass while driving, then it will be important for drivers to know which kinds of apps generally, and which popular apps specifically, are causing the most distraction, be it of the cognitive or visual sort.

Texting with Glass

Second, with all of the novel things Glass will be able to do, it is essential not to forget that it will also enable already-contentious functions like calling and texting, if in new ways. Based on the data on cell phone calling and texting while driving, we can expect these new Glass-enabled forms to be dangerous when used behind the wheel. When paired with a cell phone, Glass will allow users to scroll through a visual list of contacts, and to place calls via voice command. Since we already know hands-free phone conversation to be just as dangerous as handheld calling, there is no reason to expect Glass-mediated calls to be any different.

The interesting case is texting. Glass provides users with the choice to read incoming texts aloud, or to project the words into the user's field of vision. It also enables users to draft text messages by voice, displaying the newly drafted text into the user's visual space. This represents a new form of texting, and one that will have a special capacity to distract drivers. As noted, we know that handheld texting is substantially distracting. And it can be argued that, based on the impairment we know to accompany hands-free calling, hands-free texting could also be a significant danger (for this argument, see [10]). This gives us reason to also expect that Glass-enabled texting could constitute a significant driver distraction. The same goes

for the use of Glass to write and read emails, or to write and read social media posts. A recent American Automobile Association (AAA) study provocatively reveals dashboard-enabled hands-free emailing to be even more distracting than handheld and hands-free calling [12]. So there's ample reason to be cautious about Glass-enabled writing while driving.

Again, it's not hard to guess how the debate over this issue will unfold. Defenders of using Glass for texting, emailing, and Facebooking will claim that it will at least be safer than the alternative of looking down and reading a smartphone screen and typing by hand; text projected into the driver's field of vision will enable a driver to continue to look forward toward the road. Critics (like me) will warn of the visual distraction of text appearing in front of the driver, and of the cognitive distraction of holding a text-mediated conversation with someone not present in the vehicle.

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Complicated Enforcement and Regulation

Third, an important lesson of the recent history of cell-phone-related driver distraction is that the job of regulating in-cab media and communication devices is becoming increasingly thorny. One disagreement is between banning the use of entire devices while driving, and the banning of only some functions of those devices. If only one of a device's functions is banned, then it can be difficult for law enforcement officers to know whether a driver is using that device for a banned purpose or a legal one. This is the case in texting-only bans. Police officers find it difficult to know whether a driver is illegally typing a text message, or is instead typing into the phone in a legal manner, such as dialing or using a navigation app. We already saw this issue at play in the Abadie case. While she was charged with using a video-projecting device while driving, the case against her was dismissed in part because it was not known whether the device was on.

The issue of regulating Glass is especially complicated because some of its applications could actually be safety-enhancing, such as navigation applications that do not require a driver to look down at a screen. Some will argue that at least these safety-enhancing apps should remain legal. And if Glass is physically attached to a driver's prescription eyeglasses [1], then a total Glass ban would seemingly ask a driver to remove her or his corrective lenses.

If Google Glass proves to be more than a fad, then we will soon face messy decisions on traffic safety. Both policymakers and researchers must wade into a rat's nest of intertwining issues, from interface design, to traffic law, to drivers' cognitive limitations, to user habits and preconceptions.

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