Can novice drivers be motivated to use a smartphone based app that monitors their behavior?

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ABSTRACT

Encouraging young drivers to use driving feedback systems (referred here as GreenBoxes) is a challenge. Prior research and experience indicated that mainly due to insufficient motivation, adoption of GreenBoxes is minimal. Research also demonstrated that once feedback from GreenBoxes is provided to young drivers and their parents, the frequency of risky driving behavior is reduced.

This study investigated the possible benefits of providing group incentives to encourage usage of GreenBoxes among young drivers. The specific GreenBox used in this study was a smartphone app that needed to be initiated at the beginning of each trip. Once initiated it monitors driving behavior in terms of G-force events, provides score and feedback, and shares the driving information with a pre-defined sponsor.

This study builds and expands on a previous study by making the duration of the experiment longer, and by allowing participants to recruit their friends in order to help the group win its rewards.

Despite of the more challenging scheme needed to gain rewards, the results obtained repeat the success of the previous study: all eligible participants downloaded the app and used it to win the rewards for the group. Additionally, friends were recruited by participants and used the app to help the group win rewards (without getting any personal rewards for themselves). However, once all the pre-specified rewards were achieved within the allotted time period, the young drivers stopped using the app.

This study confirms again that barriers to adoption of GreenBox app among young drivers can be overcome by choosing low-cost suitable group incentive schemes.

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1. Introduction

1.1. Young drivers, risks and countermeasures

Young drivers are at higher risk to be involved in car crashes, more than any other age group (Goodwin et al., 2013; SafetyNet, 2009). This risk is at its highest during the first months of driving (Mayhew, Simpson, & Pak, 2003; PACTS, 2013; Simons-Morton et al., 2011). The inflated risk was also demonstrated using information obtained by in-vehicle data

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recorders, particularly in the first months of driving (Boyce & Geller, 2002; Prato, Toledo, Lotan, & Taubman-Ben-Ari, 2010). Young drivers' risky driving is typically explained by a combination of factors including: insufficient experience, over-confidence, poor hazard perception skills, tendency toward sensation seeking and extended exposure to risky situations (Goodwin et al., 2013; Williams, 2003).

Various interventions were introduced to decrease young drivers' high involvement in road crashes. These include changes in the driving licensing process such as Graduated Driver Licensing (Zhu, Cummings, Zhao, Coben, & Smith, 2014) or Goals for Driver Education (Hatakka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002), driver training and educa-tion, increased parents' involvement and focused enforcement (Goodwin et al., 2013; SafetyNet, 2009). Employing these countermeasures has helped to reduce young drivers' exposure to risk and overall injury rates (PACTS, 2013). Nevertheless, young drivers' crash rates remained high, especially in the first few months after licensure (Brovold et al., 2007; Goodwin et al., 2013; Toledo, Lotan, Taubman-Ben-Ari, & Grimberg, 2012).

Promising countermeasures that have been considered in recent years belong to the family of advanced driver assistance systems (ADAS), which are aimed to improve driving performance and to increase safety. These advanced systems include technologies that provide assistance to the driving task (e.g., adaptive cruise control, ABS), help raise awareness to risk-related situations involving the vehicle immediate surroundings (e.g., forward collision warnings, lane deviation alert) and the state of the driver (e.g., fatigue detection systems), provide the driver with information (e.g., navigation systems, speed alerts), and even interfere with actual driving (e.g., emergency braking, intelligent speed adaptation). These systems hold great potential to promote young drivers' safe driving (Brovold et al., 2007; Lee, 2007). Particularly promising are mon-itoring technologies that provide a systematic record of actual driving indices and periodic reports of driving patterns (Brovold et al., 2007; Farah et al., 2013; Farmer, Kirley, & McCartt, 2010; Lee, 2007; PACTS, 2013; Toledo, Musicant, & Lotan, 2008).

1.2. The GreenBox technology

In this study we focus on the "GreenBox" technology. GreenBoxes measure and address aggressive driving as collected by accelerometers and speed sensors, coupled with processing algorithms to 'understand' the safety of the driver. Based on this 'understanding' and pre-determined parameters, feedback is provided (Horrey, Lesch, Dainoff, Robertson, & Noy, 2012). Unlike alerting systems, the GreenBox is not meant to prevent an immediate upcoming driving event, but rather to provide feedback on the occurrence of undesired events retrospectively. Drivers (or others authorized to receive data) can then get real-time online feedback. This feedback can help drivers become aware of their driving behavior and learn how to improve it.

In recent years, different versions of the GreenBox were examined – either for studying drivers' naturalistic behavior or for trying to modify their behavior. The information logged by a GreenBox type of technology was found to provide a useful index of driving behavior as it is statistically correlated with crashes and near-crashes (Brovold et al., 2007; Goodwin et al., 2013; Horrey et al., 2012). Additionally, many of the studies indicate great potential for improved safety, mainly among young drivers (Farah et al., 2013; McGehee, Raby, Carney, Lee, & Reyes, 2007; Musicant & Lampel, 2010; Shimshoni et al., 2014).

1.3. Barriers for implementation

Even though GreenBoxes have shown great potential for mitigating risky behavior of young drivers, it is quite difficult to persuade parents, and even more difficult to persuade young drivers to install and use them, which has resulted in a very low penetration rate. Moreover, at least for parents, there is a huge gap between declared willingness to install the GreenBox and actual installation even in a research setting.

The lack of adoption of GreenBoxes is attributed mainly to young drivers' and parents' motivations. Interviews and focus groups with young drivers and parents suggest that while there are mixed attitudes toward the technology; the dominant tone was somewhat negative. As expected, there are substantial differences between parents and young drivers' views (Gesser-Edelsburg & Guttman, 2013; Guttman & Gesser-Edelsburg, 2011; Guttman & Lotan, 2011).

While parents report that they wish to know the truth about their kids' driving (Guttman & Gesser-Edelsburg, 2011; Guttman & Lotan, 2011), and acknowledge the relevance and contribution of the GreenBox for effective supervision, they also express concerns regarding its usage, specifically regarding invading the young driver's privacy or creating tension and erosion of trust. Other concerns were about monetary costs, data security and internet dependency. Finally, parents expressed a sense of low self-efficacy with regard to their ability to influence the driving behavior of their kids (Guttman & Gesser-Edelsburg, 2011).

On the other hand, young drivers indicated some positive features of the GreenBox, such as being an "objective" indicator that would be accepted by both parents and young drivers (Gesser-Edelsburg & Guttman, 2013; Guttman & Gesser-Edelsburg, 2011). They also said that it could provide their parents with evidence that they are responsible drivers and can be trusted with the car. Additionally, since young drivers had mixed and contradictory views of their parents as role models for safe driving, it was favorably viewed that the GreenBox can provide evidence to their parents' driving as well. It was also viewed as a tool for self-monitoring and improving driving skills. Yet, the overall perceptions of the technology were negative and young drivers mostly disliked the idea that their parents obtain information about their driving. Similar