



Evaluating traffic informers: Testing the behavioral and social-cognitive effects of an adolescent bicycle safety education program



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ABSTRACT

In The Netherlands, 12–24 years old are over-represented in the total number of traffic fatalities and injuries. In this study, the traffic informer program – designed to promote safe traffic behavior in the pre-driver population – was experimentally evaluated, with a specific focus on bicycle use. Students were subjected to graphic videos of traffic accidents and listened to a first-person narrative provided by a traffic accident victim. The influence of the program on concepts derived from the theory of planned behavior and protection motivation theory (attitudes, norms, self-efficacy, risk-perception, intention and behavior) was assessed. Students from various schools ($N = 1593$; M age = 15 years, $SD = .84$) participated in a quasi-experimental study, either in an experimental or a control group, completing self-report questionnaires one week prior to the program implementation and approximately one month after the program implementation. Mixed regression analyses showed significant positive and negative time \times intervention interaction effects on attitude toward traffic violations, relative attitude toward traffic safety, and risk comparison, but not on intention and behavior. More research is needed to find effective behavioral change techniques (other than increasing risk awareness) for promoting safe traffic behavior in adolescents. Research is also needed to address how these can be translated into effective interventions and educational programs.

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1. Introduction

Teenagers are an identifiable risk group in traffic. Accident analyses have shown that adolescents (aged between 12 and 24 years) are particularly likely to be involved in traffic accidents. In The Netherlands, adolescents account for 12% of the population, and yet each year over 170 adolescents are killed in traffic, and 3000 are hospitalized, accounting for 21% and 19% of all traffic fatalities and injuries respectively (AVV, 2008). Adolescents in the pre-driver age category (i.e., under 18 years of age) are over-represented in the number of traffic fatalities and injuries (Wegman and Aarts, 2006). In this age category, adolescents travel mostly by bicycle (52%), on foot (18%), by moped (3%), are driven by a parent or a friend (17%), or by means of public transport (9%; Wegman and Aarts, 2006). Due to the lack of a protective

vehicle (i.e., a car or a bus), the first of these three modes of transport make the adolescent particularly vulnerable in traffic.

The bicycle is the most popular form of transport at any age in The Netherlands – an estimated 8 out of 10 inhabitants own one (Lynam et al., 2005). Adolescents aged between 12 and 17 years use the bicycle for over half of all their trips (Wegman and Aarts, 2006). Traffic safety programs mostly target (young) car drivers, but even though The Netherlands is ranked among the safest countries in Europe in terms of road safety, there is a need for traffic safety education programs targeting more vulnerable adolescent road users. In this study, we experimentally evaluated a traffic safety program (traffic informers) designed to promote safe traffic behavior in the pre-driver population, with a specific focus on bicycle use.

A large body of empirical evidence regarding risk behavior and adolescent decision-making has accumulated over the years, especially in the context of driving (Brijs et al., 2014; Reyna and Farley, 2006; Steinberg, 2007; Webb and Sheeran, 2006). Notwithstanding this large pool of information, when it comes to the pre-driver population, epidemiological data is scarce (Briem et al., 2004; Elliott and Baughan, 2004; Evans and Norman, 2003;

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Hasselberg et al., 2001; Nasar et al., 2008). This is mainly due to the continuous systematic underreporting of accidents and causes of accidents when there are no cars involved (Reason et al., 1990). The lack of research focus on the pre-driving population has resulted in a lack of knowledge about the underlying social cognitive factors that motivate risky traffic behavior, which in turn hinders the systematic evaluation of traffic education programs. Instead, knowledge about underlying social cognitive factors that mediate pre-driver risky traffic behavior is derived from the application of general explanatory models of health behavior (Armitage and Conner, 2000; Brewer et al., 2007; Cooper et al., 2003) and general traffic behavior theories (Rothengatter, 2005; Ulleberg, 2001; Ulleberg and Rundmo, 2003). Factors that have been identified as potential correlates of risky behavior in the pre-driver population include general risk perception (Chapman and Groeger, 2004), specific risk perception in traffic (Beullens and Van den Bulck, 2008; Bina et al., 2006; Bingham and Shope, 2004; Dahl, 2008; Harré, 2000; Keating and Halpern-Felsher, 2008; Kellermann and Martinez, 2008; Machin and Sankey, 2008; Nell, 2002; Rundmo and Iversen, 2004; Shope, 2006), parental influence (Simons Morton et al., 2008; Simons Morton and Hartos, 2003), and the influence of peers (Engstrom et al., 2008; Gardner and Steinberg, 2005; Grosbas et al., 2007; Steinberg and Monahan, 2007).

Many traffic safety interventions have been implemented in a school setting in order to educate the pre-driver population about traffic safety. However, only a very small number of these education programs have been systematically developed or evaluated. As a result, the effectiveness of school-based traffic safety education is largely unknown. The value of theory- and evidence-based development and evaluation of educational interventions has been described in detail by various researchers in the health psychology domain (Bartholomew et al., 2011; Fishbein and Cappella, 2006; Green and Kreuter, 2005; Michie and Abraham, 2004; Schaalma et al., 2004). For example Bartholomew et al. have developed the intervention mapping protocol, a planning framework for the development and evaluation of theory- and evidence-based health promotion programs (Bartholomew et al., 2011; Schaalma et al., 2004). In brief, intervention mapping requires interventionists to identify intervention change objectives, or change targets, and specify commonly-understood behavior change techniques that have been used to bring about these planned changes. By basing such decisions on previous evidence, and documenting the way in which intervention materials are designed, interventionists can communicate clearly about intervention content, thereby facilitating replication and subsequent intervention development (Abraham et al., 2010).

In the present study, the school-based traffic safety education program traffic informers was evaluated. Traffic informers was developed by the Regional Council on Traffic Safety in Limburg (no affiliation with the authors) in order to decrease the elevated risk of pre-drivers in traffic. The program consists of an eight-minute-long video of traffic accidents (in English with Dutch subtitles), and a 30-minute-long narrative by a traffic accident victim in the classroom. The concept of traffic informers was based on traffic education programs used in Denmark (these programs consist of traffic educators, including a person seriously injured in an accident, showing videos of tragic accidents, and playing out dramatic scenes in order to create awareness of risk in school children), and traffic safety videos from the UK. The traffic informer program is currently used in almost every school in the province of Limburg, The Netherlands. With approximately 600 sessions per year, about 80,000 students have participated in the traffic informer program since 2002.

The most defining feature of the traffic informer program is risk communication, whereby confrontation or fear appeals are used in order to motivate participants to adopt safer behaviors (Rogers,

1983). The use of fear arousal is widespread and popular among health education programs, for instance in anti-smoking and anti-drug abuse campaigns (Witte and Allen, 2000). The central persuasive argument that fuels these health campaigns is clear: graphically show people the negative health consequences of life-endangering behaviors and they will be motivated to moderate their current risk behavior and adopt safer alternative behaviors. However, there is a large body of evidence disputing the use of fear arousal as a means of motivating people to change their behavior (De Hoog et al., 2005, 2007; Lewis et al., 2007a,b; Ruiter et al., 2001; Taubman Ben-Ari et al., 2000; Witte and Allen, 2000). In fact, there are examples where interventions based on fear arousal have yielded defensive responses including avoidance of the health information at hand (Kessels et al., 2010, 2014), denial of the health risk (Lieberman and Chaiken, 1992), and increased risky behavior (Taubman Ben-Ari et al., 2000). To counter these defensive processes, and promote self-protective action, theoretical frameworks of fear appeals emphasize the need for information about coping mechanisms – specific behavioral instructions about how to effectively deal with the health threat in question (Peters et al., 2013; Rippetoe and Rogers, 1987; Rogers, 1983; Ruiter et al., 2014).

The traffic informer program, as utilized in The Netherlands, is popular with school managers, parents, politicians, and funding bodies. However, there is no empirical evidence for its effectiveness; indeed, the program may be ineffective or even counter-effective. Below, we provide a systematic evaluation of the traffic informer program as it was administered in its normal setting (i.e., in classrooms of secondary schools). A quasi-experimental design was used, in which an experimental group (intervention) was compared with a control group (no intervention, waiting list method) combined with a pretest–posttest design to control for possible differences at baseline. Since the traffic informer program lacked theory-based development, it was not apparent exactly which theoretical premises underlay the program, and therefore constructs from common theories of human behavior were used to evaluate its effectiveness, predominantly the theory of planned behavior (TPB; Ajzen, 1991) and protection motivation theory (PMT; Rogers, 1983). The TPB suggests that the intention to perform (protective) behaviors results from a positive evaluation of the pros and cons of that behavior (attitude), the perceived or estimated approval of peers when carrying out the behavior (or the idea that peers would perform that behavior in similar situations; social norms/influence), and a positive evaluation of the effectiveness or desired outcome of that behavior combined with the expected control one has over the performance of the behavior (perceived behavioral control; Ajzen, 1991). PMT suggests that people adopt protective behaviors after first assessing their risk by evaluating the personal chances of a negative outcome (vulnerability) combined with the severity of that outcome. This resulting risk-perception then creates a motivation for action. Before an action is performed, a positive evaluation of the perceived effectiveness of the recommended behavioral action, and the ability to perform that behavior, is needed (self-efficacy; Rogers, 1983). Self-efficacy, and the similar construct of perceived behavioral control, are thought to be necessary for effective behavior change, in that without them behavior is either not changed, or changed ineffectively (Carey et al., 2013).

The main behavioral outcome of interest in the present study was cycling behavior, which is the most common mode of transport among young adolescents. The expectation of those who developed and organized the traffic informers program was that it would be an effective way of raising risk perceptions through its use of fear arousal and the first-person narrative of a traffic accident victim. As students could be prompted or motivated to change their behavior as a result of the intervention, in the present study we examined the effectiveness of the program

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