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Five road safety education programmes for young adolescent pedestrians and cyclists: A multi-programme evaluation in a field setting

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ABSTRACT

A practical approach was developed to assess and compare the effects of five short road safety education (RSE) programmes for young adolescents that does not rely on injury or crash data but uses self reported behaviour. Questionnaires were administered just before and about one month after participation in the RSE programmes, both to youngsters who had participated in a RSE programme, the intervention group, and to a comparable reference group of youngsters who had not, the reference group. For each RSE programme, the answers to the questionnaires in the pre- and post-test were checked for internal consistency and then condensed into a single safety score using categorical principal components analysis. Next, an analysis of covariance was performed on the obtained safety scores in order to compare the post-test scores of the intervention and reference groups, corrected for their corresponding pre-test scores. It was found that three out of five RSE programmes resulted in significantly improved self-reported safety behaviour. However, the proportions of participants that changed their behaviour relative to the reference group were small, ranging from 3% to 20%. Comparisons among programme types showed cognitive approaches not to differ in effect from programmes that used fear-appeal approaches. The method used provides a useful tool to assess and compare the effects of different education programmes on self-reported behaviour.

1. Introduction

Road safety education (RSE) programmes are frequently funded and implemented without evidence of their actual effects (Dragutinovic and Twisk, 2006; Williams, 2007). Because of a growing interest in evidence-based policy (OECD-ECMT, 2008), road safety outcome measures are now being requested as evidence of RSE effects (or lack thereof) on road casualties. These demands, however, raise some difficult methodological issues, such as whether road casualty reduction could serve as the only outcome criterion, and whether effects from different types of RSE programmes can be compared in terms of their relative effectiveness. This study aims to contribute to the evidence base of the effects of RSE by achieving the following objectives: (a) develop a feasible and practical method for evaluating RSE programmes that would also permit comparison among programmes, and (b) apply this method to assess and compare the effects of several education programmes for young adolescent cyclists and pedestrians. For objective (a) the study explores the possibility of using 'casualties' as an outcome criterion, assesses the strengths and weaknesses of 'road behaviour' and 'behaviour intentions' as surrogate measures, and evaluates the reliability of self-reported and observed behaviour. For objective (b) the evaluation method developed under (a) was used to evaluate and compare the effects of five school-based RSE programmes for adolescents 11–17 years of age. These programmes were similar in their aims to stimulate safe cyclist and pedestrian behaviour, but differed in their didactic content and delivery.

1.1. Issues regarding the evaluation of RSE programmes

1.1.1. Crash-related outcome and the need for surrogate measures

Several characteristics of crashes in combination with the objectives of RSE weaken their usefulness as outcome criteria in

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evaluations (see also Hauer, 2008, for a discussion on this topic). First, the relationship between risk behaviour and crashes is asymmetrical. Although about 95% of crashes can be attributed to risky behaviours or human failure (Sabey and Taylor, 1980), only an extremely small proportion of risky behaviour actually results in a crash. Therefore crashes and injuries remain rare events in the population of road users. For sufficient statistical power to demonstrate an effect on crash-related outcomes, a study would require that large numbers of participants (hundreds of thousands) be included in an education programme and that their crash and injury records be monitored over a long period of time (years) (Hauer, 2008). Given the emotional and economic burden of injury and death, and the scarce financial resources available for interventions, it is neither practical nor ethical (Chalmers, 2003) to expose a large number of road users to programmes of unknown quality, just for the purpose of evaluation. Thus, surrogate outcome criteria are needed that are still predictive of crashes, but that are reliable, easily obtainable, and available in a short period of time.

The theoretical basis for such a surrogate criterion may be found in two fields. In the field of road safety, it is the use of safety performance indicators (SPIs) as predictors of crashes (ETSC, 2001; OECD-ECMT, 2008). In the field of social sciences, it is the use of behaviour models (BMs) to predict behaviour from underlying psychological determinants (Bartholomew et al., 2006; Glanz et al., 2002). The relationship with RSE is as follows. RSE aims to modify risk behaviour that is known to increase crash risk (SPI), for instance drink-driving. This goal is achieved by changing one or more of the underlying psychological determinants, for instance the 'attitudes about drink-driving'.

1.1.2. Safety performance indicators and predictors of risk behaviour as surrogate measures

SPIs are variables that are causally related to crash-related outcomes, either as an empirically tested relationship or as a logical relationship (ETSC, 2001). For empirically-tested SPIs, the extent to which risk behaviour increases crash risk is known, and therefore the effect of the intervention can be quantified in terms of crash-related outcomes. For logical SPIs, this is not the case, so it can only be inferred that the risk behaviour will increase crash risk. Unfortunately, 'empirical' SPIs are mainly available for 'car driving' and not yet for other travel modes such as cycling, walking or moped riding (Hakkert and Gitelman, 2007). Thus, evaluation studies for these travel modes can only make use of logical SPIs.

Similarly, behaviour models (BMs) are used to assess expected effects on (road) behaviour. BMs, such as the Health Belief Model or the Theory of Planned Behaviour, provide theories regarding how behaviour can be predicted from underlying psychological determinants (see Glanz et al., 2002, for an overview). If it were possible to predict behavioural change from changes in underlying determinants, variables from a particular BM could be used as outcome criteria in evaluation studies of RSE. Of all determinants, behavioural intention is the strongest determinant of behaviour (e.g., Glanz et al., 2002). Intention mediates the influence of other predictors, such as attitudes and knowledge, on behaviour and indicates "...how hard one is prepared to try, or how much effort one will exert, in order to achieve desired outcomes" (Webb and Sheeran, 2006, p. 249). To assess the actual strength of the intention-behaviour relationship after an intervention, Webb and Sheeran (2006) conducted a meta-analysis of randomized controlled trials, and concluded that a large change in intention only resulted in a medium-to-small change in behaviour. This finding confirmed again the intention-behaviour gap, but further analyses also showed the conditions under which this gap was greatest, namely: (a) when participants lacked control over the behaviour, (b) when the behaviour was performed in a social context, for instance smoking and drinking with friends, and (c) when the intention involved behaviour that had become a habit. Although these conclusions were not differentiated by age group, some of these characteristics may have an even greater impact on young adolescents. Lack of control especially may play a stronger role among adolescents than among adults, because of adolescents' greater impulsiveness (e.g., Gerrard et al., 2008; Gibbons et al., 2009; Gibbons et al., 2002; Reyna and Farley, 2006), their still-developing cognitive and executive skills (e.g., Blakemore et al., 2007; Blakemore and Choudhury, 2006), and their inexperience as road users (Twisk and Stacey, 2007; Vlakveld, 2011). In addition, the influence of the social context may differ between adolescents and adults, because of peer pressure that leads to adolescents taking greater risks in the presence of peers than when being on their own (e.g., Brown, 2004; Gardner and Steinberg, 2005; Sumter et al., 2009). In studies of young adolescents, changes in behaviour intentions may be a less reliable proxy for actual behaviour changes than for adults. Behaviour change, rather than change in intention, is thus the preferred criterion for evaluation studies involving this age group.

1.1.3. Observation of behaviour versus self-report

For the measurement of behaviour, two methods are at a researcher's disposal: observations of road behaviour and self-reports by means of questionnaires and diaries. Observations generate rich and reliable data but, because of the high financial costs, often include a relatively small and/or unrepresentative sample of participants, and are restricted to only a few behaviours and traffic situations. Self-report surveys, on the other hand, are less costly and therefore can include large numbers of participants, and focus on a wide range of behaviours and situations. This feature improves the generalisability of the data, but the accuracy of the reports may be questioned (Wåhlberg, 2009). It is beyond the scope of this article to provide a full account of all the evidence, but from these general characteristics of the two methods, one could conclude that when road behaviour strongly varies among subgroups (age, gender, social economic status), trip circumstances (e.g., trips to school versus trips to a party), and social situations (e.g., the presence of friends), self-reports may provide a more complete picture than observation. To study the validity of such self-reports among young adolescents, Elliott & Baughan (2004) reviewed the literature and concluded, based on the few studies that had actually assessed the strength of the relationship, that 'there is little reason to assume that self-reported behaviour will not serve as a good proxy for more objectively measured behaviour'. Further, Twisk et al., 2014 (forthcoming) analysed the relationship between self-reported risk behaviour and self-reported crash involvement among young adolescent cyclists and pedestrians, and found that self-reported risk behaviour explained 6% to 11% of the variance in self-reported crash involvement. Given the low frequency of crashes and the asymmetrical relationship with risk behaviour (Hauer, 2008), this predictive power is rather strong, and supports the validity of self-reported risk behaviours as surrogate criteria for RSE programme outcomes, especially for those risk behaviours that strongly vary by subpopulations and by contextual factors such as the presence of peers and trip conditions. In contrast, if an RSE programme focuses on specific competencies and skills, such as road crossing (Duperrex et al., 2009) or interactions with trucks (Twisk et al., 2013), observation of small samples of participants performing strictly defined tasks may provide reliable estimates of skill acquisition.

1.2. Design of study, recruitment of programmes and programme types

Five RSE programmes were evaluated in their field settings. All five programmes aimed to improve safe behaviour by raising