

EVIDENCE BRIEF

Effectiveness of Education, Training Programs and Awareness Campaigns on Road Safety



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Key Messages

- Education, training programs, and awareness campaigns are more feasible public health interventions for road traffic collision prevention compared to some policy, enforcement, and built environment interventions.
- The evidence of effectiveness for road safety education, awareness and training programs is unclear, and often variable, making it difficult to estimate the effectiveness of any single type of intervention across multiple studies.
- There is some evidence to suggest that occupational specific interventions with closed course or simulator training may be effective at reducing emergency medical service collisions; however, there was limited evidence to suggest this in the general population.

- In the general population, educational programs and awareness campaigns were also found to have mixed effectiveness, creating challenges to synthesize and discuss the results about the effectiveness of any single type of road safety intervention on any single outcome measure.
- It was additionally difficult to synthesize the results across studies, as some did not provide numerical effect estimates or confidence intervals, in addition to other methodological issues (e.g., small sample sizes).
- It is recommended that higher quality studies with comparable interventions and outcomes be conducted at the primary and review-level before drawing definitive conclusions about the effectiveness of education, training and awareness-based road safety interventions.

Issue and Research Question

In Ontario, there were 596 emergency department visits for injuries due to motor vehicle collisions (MVCs) per 100,000 population, with rates as high as 1,102 per 100,000 in some regions in 2018.¹ Education, training programs, and awareness campaigns are more feasible public health interventions for road traffic collision prevention compared to some policy, enforcement, and built environment interventions; however, their effectiveness is unclear and often variable. This evidence brief seeks to understand how effective education, training programs and awareness campaigns are in preventing negative road safety outcomes.

Methods

A rapid literature review was conducted to identify and synthesize the existing evidence on education-based road safety interventions, including training programs and awareness campaigns across all populations and any geographic region. Systematic searches were conducted in February 2020 in order to identify all relevant evidence. Public Health Ontario Library Services conducted a search in Medline, Embase, CINAHL, PsycINFO, Cochrane Database for Systematic Reviews, SocINDEX, Scopus, and TRID using relevant vocabulary and subject headings. All database results were integrated and duplicates were removed. The search strategy is available upon request.

English-language peer-reviewed review-level papers were eligible for inclusion if they: examined the effect of an education, training program or awareness raising strategy and were published within the last five years. Papers were excluded if they did not have MVC or collision pathway outcomes, scored weak on the quality appraisal, or did not include reproducible search methods. Additionally, we included sources from a previous review of review-level literature (unpublished report completed by the second reviewer (SR), available upon request) that examined the effectiveness of road safety interventions published between 2004 and 2014. This review used similar methods to this report, including systematically searching the literature, reviewing the same peer-reviewed data bases and using the same search terms and search strategies. Differences in methodology include a grey literature search in the review of reviews, which may have yielded additional results. As a result of including this review, our search covers the review-level literature on the effectiveness of road safety interventions from 2004 to February 2020.

One reviewer (AM) screened all of the titles and abstracts and a second reviewer screened a random selection of titles and abstracts (SR). Full-text versions of all papers for inclusion were reviewed by two reviewers. For selected papers, one PHO staff (AM) extracted relevant data and summarized content.

Quality appraisal was conducted for each included review using the HealthEvidence.org Quality Assessment Tools for Review Articles.² Two reviewers independently appraised each included paper and any discrepancies were resolved by discussion (AM, SR). Results are summarized below.

Main Findings

Occupational-Specific Interventions

Several reviews examined interventions in occupational-specific settings, including Emergency Medical Service (EMS) and firefighter populations.

A mixed methods review conducted by Bui et al. examined the effect of simulator training on EMS vehicle collisions. They found that simulator training in this group was associated with a 12% single-year reduction in EMS vehicle collisions and a 38% reduction in intersection collisions.³ In another study included in the review, a subset of trainees who were given simulator-based training, in addition to in-class training, performed a cone course faster, received fewer penalty points and required fewer attempts to complete the course compared to controls. No collision data was reported in this study.³

Bui et al. also examined the effects of training programs for emergency vehicle operators. The Seattle Fire Department provided a driver training program that consisted of classroom instruction and intensive hands-on, closed course vehicle training. The mean crash rate prior to the training program was 15.9 per 10,000 calls; the rate post intervention was 12.9 per 10,000, representing a 19% reduction.³ A similar program in Sacramento included four hours of lecture time and 20 hours of hands-on training during the regular fire academy program, plus an additional 28 hours of driving training prior to the end of the probationary period. This training also included an additional eight hours annually of refresher training consisting of cone course drills, high speed avoidance maneuvers and vehicle handling. The study reported a 26% drop in collision rates in the year after the program was implemented and a 2.8% reduction in annual collision rates since.³

Simulator Training in the General Population

Three studies examined the effects of simulator training on various road safety outcomes among the general population.⁴⁻⁶

A systematic review by Martin-delosReyes et al. found no differences between a simulator training intervention and control groups in several non-randomized studies examining various outcome measures, including knowledge of road safety concepts, collision rates, and commission of traffic infractions. One study did find noticeable, but not statistically significant, differences between intervention and control groups; however, the lack of statistical significance was thought to be a result of a small sample size.⁶

Classen et al. reviewed one randomized control trial (RCT) that examined the effect of simulator training on MVCs and driving infractions six to 12 months post-intervention in a sample of teen drivers. They found no differences between intervention and control groups.⁴

McDonald et al. examined the effect of simulator training on outcomes of an eye-tracking test that measured critical glance sequences and glance times for hazard anticipation. The review found that those who participated in the simulator training performed better on the eye-tracking test anticipation than controls (84% correct in the intervention group vs. 57% correct in controls).⁵ They also found in one

study that students in driver education programs who also completed a simulation training component had fewer speed exceedances (2.2 vs. 4.0), stopped at a hidden sign more often (73% vs. 41%) and had fewer collisions with an oncoming vehicle passing in the driver's lane (0% vs. 36%).⁵

Education Programs

ROAD SAFETY KNOWLEDGE, ATTITUDES AND BEHAVIOUR OUTCOMES

In the review by Classen et al., one study described observing a statistically significant decrease from baseline in teen and adult drivers' texting and driving after an educational intervention (13 vs. 12 participants); however, the difference of only one participant in texting and driving behaviour post-intervention should be interpreted cautiously. This intervention additionally increased students' knowledge of driving licensing laws and feelings of empowerment to take action with a teen driver who was texting; however, no effect size was reported for this outcome.⁴ Another study in this review compared the traffic recidivism rate between adolescents (who had previous traffic offences) who completed the Drive Alive education program and those who had not completed the program, finding that 26.4% of intervention participants compared to 32.3% of controls committed a traffic offence in the six months post-intervention.⁴

Lefio et al. examined five studies on the effect of educational interventions on MVCs. Only one out of those five was successful in reducing MVC rates and consisted of educational and punitive program components targeted at drivers with a history of driving offences. The review concluded that educational interventions alone were not effective in reducing rates of negative road safety outcomes.⁷

Salam et al. examined the effects of educational interventions on youth road safety outcomes and found no effect of educational interventions on helmet use, seatbelt use and injury incidence in several studies.⁸

A systematic review of road safety training programs for older drivers by Sangrar et al. found that compared to older drivers who only attended certain self-selected sessions, those who attended all classroom-based education sessions demonstrated an improvement in road safety knowledge. This was further improved when combined with in-vehicle feedback.⁹ It is important to note that participants selected the number of sessions they attended, rather than being randomly allocated to the number of sessions they attended, which may have biased the results; however, this was not discussed in the review. It is also unclear how road safety knowledge correlates with performance-based outcomes.¹⁰ Sangrar et al. also found that one-on-one education tailored to individual participants resulted in the adoption of self-regulatory driving practices.¹⁰ Collision outcomes were not collected.

Staton et al. found that education programs for motorcyclists and bicyclists were associated with a 21% reduction in road traffic deaths, a 16% decrease in moderate trauma and a 51% decrease in severe trauma among all road users in studies in low and middle income countries. Additionally, education and training programs in health centres and school settings were associated with an 18% decrease in near miss collisions with cyclists and a 50% reduction in incidence (of collisions with cyclists).

Elder et al. conducted a systematic review to examine the effect of school-based programs for reducing drinking and driving and riding with a driver who had been drinking. They found inconsistent results across studies, and any positive effects dissipated over time.¹¹ Additionally, studies that demonstrated positive effects produced insignificant effect estimates, further contributing to the inability to draw conclusions from this review.

Finally, a systematic review by Koner-Bitensky et al. included three RCTs that examined the effectiveness of older driver retraining programs. They found strong evidence to support education combined with on-road training programs improved driving performance among older adult drivers (>55 years of age). There is additional evidence to support that education and retraining interventions were also effective in improving older driver driving awareness, knowledge and behaviour.¹²

SAFETY EQUIPMENT USE OUTCOMES

German et al. examined the effect of educational programs to increase motorcycle helmet use prevalence in Thailand. They found that helmet use initially increased in villages where educational programs were implemented, but this increase was not maintained long term.⁷

Ehiri et al. examined interventions for promoting booster seat use in 4- to 8-year-old children. They found that educational interventions alone, as well as educational campaigns paired with incentives or free booster seat provision were associated with an increase in booster seat use. Those who participated in an educational intervention and received an incentive were 32% more likely to use a booster seat (RR: 1.32, 95% CI: [1.12, 1.56]) compared to those who did not participate.¹³

Communication and Awareness Campaigns

Staton et al. conducted a systematic review on public awareness campaigns in low and middle income countries and found that communities that were given mass media campaigns plus road sign interventions saw a 23.3% decrease in road injury deaths compared to control communities among all road users.⁹

Yadav et al. conducted a systematic review of mass media campaigns for reducing alcohol-impaired driving and related collisions. They found that reductions in alcohol-related collision incidence was observed in some individual studies, but not in the pooled analysis (RR=1.00, 95% CI: [0.94, 1.06]), likely due to heterogeneity in study methodology. They concluded that there was insufficient evidence to determine the effect of mass media campaigns on the risk of alcohol-related collisions or mortality.¹⁴

Elder et al. conducted a systematic review on the effectiveness of mass media campaigns for reducing drinking and driving and alcohol impaired crashes.¹¹ They consistently found that mass media campaigns were associated with a reduction in fatal and nonfatal collisions, with reduction estimates ranging from 6-18%. The study examined both campaigns with legal deterrence and health consequence foci, but did not find marked differences between the two types.¹¹

Phillips et al. also conducted a review and meta-analysis of road safety campaigns on collisions. The authors used a random effects model to account for the heterogeneity in effect estimates and included 13 'artificial estimates' to account for publication bias. The meta-analysis of 119 individual estimates of the effect of road safety campaigns on collisions produced a pooled effect of a 9% reduction in collisions associated with road safety campaigns (95% CI: [-12%, -6%]).¹⁵ While specific estimates by method of delivery varied, road safety campaigns generally appeared to have a positive effect on MVCs.

Other Training Programs and Multicomponent Interventions

Several reviews examined studies of compulsory or optional training programs for motorcyclists and other road users.

Araujo et al. specifically examined motorcycle training programs including compulsory and non-compulsory training before licensing.¹⁶ Compulsory training in one case-control study was associated

with a 14% reduction in frequency of collisions at six months, 21% reduction at 12 months and a 13% reduction at 24 months training; another case-control study demonstrated inconclusive results.¹⁶

One RCT in the review by Araujo et al. examined the effect of non-compulsory training prior to obtaining a motorcycle licence and found that the rate of injuries at one year were reduced by 40% (RR=0.6), but no confidence intervals for this estimate were provided. Injuries at two years and mortality were not significantly affected. Additionally, non-compulsory training interventions in observational studies were found to have inconclusive results.¹⁶

McDonald et al. specifically examined various hazard anticipation-focused programs.⁵ One study examined a program that involved a five-day training, with one group receiving multiple components, including video-based training, on-road self-evaluation training, focus group discussions to improve situational awareness and hazard anticipation. The second group received vehicle handling skill training by a professional instructor and the third group received no training. Outcome measures were on-road assessments, a video commentary hazard perception test and a self-report questionnaire. The group that received the multi-component training showed improvements in visual search and driving measures from the on-road assessments, as well as an improvement in the proportion of hazards detected on the hazard perception test. No effect estimates were provided and no driving or injury outcomes were assessed.⁵

Shults et al. conducted a systematic review of multicomponent interventions that all included a community mobilization aspect for reducing alcohol-impaired driving. As there was great variability in the types of interventions examined, it was not possible to draw a conclusion on the effectiveness of multicomponent interventions with community mobilization on-road safety outcomes.¹⁷

Discussion and Conclusions

This evidence brief sought to summarize the scientific literature on the effectiveness of education, training programs and awareness campaigns on reducing negative road safety outcomes. We found great variability in the types of interventions that were examined in the included studies, making it difficult to estimate the effectiveness of any single type of intervention across multiple studies.

In occupational-specific settings, training programs and driving simulators were found to reduce collisions among firefighters and emergency medical services groups, respectively; however, in the general population, evidence on the effectiveness of driving simulators were mixed, with some studies reporting a positive effect and others reporting no effect.

In the general population, educational programs and awareness campaigns were also found to have mixed effectiveness, and in some cases positive effects were demonstrated initially, but were not maintained over time. As the included studies examined a wide and variable range of outcome measures, such as collision rates, use of safety devices (booster seats, helmets, etc.), and road safety concept knowledge, it was challenging to synthesize and discuss the results as a whole and draw conclusions about the effectiveness of any single type of road safety intervention on any single outcome measure.

It was difficult to synthesize the results across studies, as some did not provide numerical effect estimates or confidence intervals. Some additionally reported “statistically significant” results in studies with small sample sizes and minimal changes in the outcome measure before and after intervention implementation, and others did not address potential biases to results, such as participants self-

selecting driving class attendance rather than being randomly allocated to the intervention. As a result, it is recommended that higher quality studies with comparable interventions and outcomes be conducted at the primary and review-level before drawing definitive conclusions about the effectiveness of education, training and awareness-based road safety interventions.

Implications for Practice

This evidence brief aims to inform road safety intervention planning, identify gaps, and guide future research priorities. It is imperative that road safety interventions be evidence-informed to ensure effectiveness and efficient use of resources; however, the review-level literature on road safety education interventions must first be of sufficient quality and consistency to effectively inform practice. Future research should aim to examine comparable interventions and outcome measures in order to reproduce results in multiple populations and settings to be able to draw stronger conclusions about intervention effectiveness. Additionally, primary studies should ensure robust methodology with sufficient sample sizes and randomized intervention allocation where possible to further strengthen the body of literature.

The current state of the scientific literature on education, training and awareness-based road safety interventions is largely insufficient to support the widespread implementation of any single type of intervention in these categories. More research is needed prior to using the current literature as sufficient justification for the implementation of education-based road safety interventions.

Specifications and Limitations of Evidence Brief

The purpose of this evidence brief is to investigate a research question in a timely manner to help inform decision making. The evidence brief presents key findings, based on a systematic search of the best available evidence near the time of publication, as well as systematic screening and extraction of the data from that evidence. It does not report the same level of detail as a full systematic review. Every attempt has been made to incorporate the highest level of evidence on the topic. There may be relevant individual studies that are not included; however, it is important to consider at the time of use of this brief whether individual studies would alter the conclusions drawn from the document.

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