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[Intervention Protocol]

# Interventions to promote the use of seat belts

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## ABSTRACT

This is the protocol for a review and there is no abstract. The objectives are as follows:

To assess the effects of interventions promoting the use of seat belts.

## BACKGROUND

### Description of the condition

At a time in the world's history when many of the health concerns of the past are showing some indication of improvement, traffic related health concerns are growing. Over 1.2 million people die each year as a result of traffic collisions and hundreds of thousands of others are permanently and seriously injured (WHO 2009). In 2002, road-traffic injuries ranked as the tenth leading cause of death in the world (WHO 2001). In 2004 that ranking rose to seventh, and it is expected that by 2030 road injuries will rank as the fifth leading cause of death (WHO 2009). The developing world bears the brunt of these injuries, over 90% of fatalities occur in low- and middle-income countries, where death rates can be up to twelve or thirteen times higher than in high-income countries (WHO 2009). Apart from the personal losses that these figures represent what is also clear is that these levels of injury represent huge cost burdens to countries with already lim-

ited resources (Nordberg 2000; Olukoga 2004; Chandran 2010; Juillard 2010; Mashreky 2010; Bhatti 2011). Work is needed to reduce the number of collisions that occur - through improved functionality of roads, vehicles and drivers themselves. Concurrently, we need to find cost-effective ways of reducing the severity of injuries sustained in the collisions that do occur (WHO 2004).

### Description of the intervention

Most injuries sustained by vehicle occupants during a collision are the result of the fact that occupants of vehicles will keep moving even after the vehicle itself has come to a stop (Nordhoff 2005a). Generally in a head-on collision, unless suitably restrained, the occupants will either be ejected through the windscreen or will collide with the dashboard, steering wheel or the seats in front of them, causing serious injury (Nordhoff 2005b). Seat belts are designed to accomplish two key functions - to prevent the occupant from being ejected from the vehicle by the force of impact, and to extend the time that the decelerating force is applied to

a person (Prevention Institute 2002). This is important because injury severity is inversely related to the time over which the body is brought to a stop (Nordhoff 2005a; Nordhoff 2005b). Seat belts also spread the area of impact to both a larger and less vulnerable part of the body. Abbas 2011 reported a clearly significant negative correlation between compliance of wearing seat belts and the rate of road traffic deaths ( $R = -0.77$ ,  $F = 65.5$ ,  $P \text{ value} < 0.00001$ ); countries with high levels of seat belt usage have experienced marked reductions in traffic deaths. Educational, enforcement based, incentive-based, engineering-based or a combination thereof, are types of interventions to encourage seat belt use (Table 1).

### How the intervention might work

Since the 1950s seat belts have been factory-fitted to most vehicles and today around 90% of the industrialised countries have adopted seat belt legislation making it mandatory for selected, if not all, vehicle occupants to wear seat belts. However, the simple passing of laws has not in itself been found to be sufficient to change seat belt use; since the 1970s various seat belt interventions have been rolled out across many developed countries (Prevention Institute 2002). These typically have included persuasive and coercive components: encouraging voluntary use of seat belts by educating the public about their benefits, and enforcing the use of seat belt wearing through primary or secondary enforcement (Dinh-Zarr 2001). Primary enforcement safety belt laws allow police to stop and ticket motorists solely for being unbelted (Dinh-Zarr 2001). Secondary laws only allow police to issue a safety belt citation if the vehicle has been stopped for another reason (e.g. speeding) (Dinh-Zarr 2001) (Table 1). Education and enforcement interventions have also been supported by technological (engineering) solutions, such as the use of seat belt reminder alarms in vehicles which have become common features of vehicle design. As a consequence of these three factors - education, enforcement and engineering - most countries of Europe now exhibit very high seat belt wearing rates, with variable levels being reported in the United States, reflecting mixed policies at the state level and the application of inconsistent campaigns across the country and poor levels of seat belt use in most developing countries (Prevention Institute 2002).

While it is accepted that seat belt wearing rates have been positively influenced by the type and extent of interventions used to encourage compliance, little research has been carried out to determine the factors which influence the effectiveness of individual interventions or to assess the impact of multiple intervention initiatives. There is little understanding of whether coercion or encouragement is more effective, and little appreciation of whether these are context specific. The research into the effects of specific interventions, while generally positive, suggests that increasing seat belt usage is not always a simple task, and that there may be other

factors at play such as risk compensation that undermine the effectiveness of seat belts by increasing exposure to risk (Streff 1989).

### Why it is important to do this review

The aim of this systematic review is to assess the effects of interventions, either educational, enforcement based, incentive-based, engineering-based or a combination thereof, to encourage seat belt use (Table 1). This will contribute by informing future research, guide policy and practice, and facilitate the design of community-based prevention programs that are effective.

## OBJECTIVES

To assess the effects of interventions promoting the use of seat belts.

## METHODS

### Criteria for considering studies for this review

#### Types of studies

Randomised controlled trials (RCTs).

We will exclude studies that investigated booster seats or child restraints.

#### Types of participants

People travelling in passenger or commercial vehicles (both drivers and passengers).

#### Types of interventions

##### Interventions

- Educational
  - Interventions where drivers and passengers are educated about benefits of using seat belts
- Enforcement
  - Primary enforcement safety belt laws allow police to stop and ticket motorists solely for being unbelted
  - Secondary laws only allow police to issue a safety belt citation if the vehicle has been stopped for another reason (e.g. speeding)

- Engineering-based interventions such as seat belt alarms, being unable to start a car without a fastening a seat belt, or drive faster than a certain speed without fastening a seat belt
  - Incentives such as insurance
  - Combinations of the interventions listed above

### Comparison

- Another intervention or no intervention control group

### Types of outcome measures

#### Primary outcomes

- Frequency of wearing seat belts (i.e. the proportion of people in each group who wear a seat belt)
- Crash-related injury rates

#### Secondary outcomes

- Crash-related death rates

### Search methods for identification of studies

We will not restrict our search by language or publication status.

#### Electronic searches

The Cochrane Injuries Group Trials Search Co-ordinator will search:

1. Cochrane Injuries Group specialised register (present version);
2. Cochrane Central Register of Controlled Trials (CENTRAL, *The Cochrane Library*) (latest issue);
3. Ovid MEDLINE(R), Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid OLDMEDLINE(R) (1946 to present);
4. EMBASE Classic + EMBASE (OvidSP) (1947 to present);
5. CINAHL Plus (EBSCO) (1937 to present);
6. PsycINFO (OvidSP) (1896 to present);
7. ISI Web of Science: Science Citation Index Expanded (SCI-EXPANDED) (1970 to present);
8. ISI Web of Science: Conference Proceedings Citation Index-Science (CPCI-S) (1990 to present);
9. Clinicaltrials.gov (<http://clinicaltrials.gov/>);
10. World Health Organization (WHO) International Clinical Trials Registry Platform (ICTRP) search portal (<http://apps.who.int/trialsearch/>).

The authors will search:

1. Combined Health Information Database (CHID);
2. Compendex;

3. Scopus;
4. Educational Resources Information Center (ERIC);
5. Campbell Collaboration's Social, Psychological, Educational, and Criminological Trials Register (SPECTR);
6. European Conference Ministers of Transport (TRANSDOC);
7. National Technical Information Service (NTIS);
8. Transport Research Laboratory (TRL);
9. Transport Research Information Service (TRIS);
10. International Transport Research Documentation (ITRD);
11. TRANSPORT, which incorporates TRIS, ITRD, TRANSDOC, and NTIS;
12. Australian Transport Index (formerly ARRB and ATRI);
13. University of Michigan Transport Research Institute (UMTRI);
14. Society of Automotive Engineers (SAE);
15. The University of North Carolina Highway Safety Research Center (UNHSRC);
16. Institute of Transportation Engineers - University of California, Berkeley.

#### Searching other resources

We will contact road safety organisations and experts in the field to find unpublished reports. We will scan reference lists of included studies and also search relevant conference proceedings.

### Data collection and analysis

#### Selection of studies

Two authors (OU and BW) will independently screen titles, abstracts and descriptor terms of the search results for relevance based on the types of participants, interventions, outcome measures and study design. We will obtain full-text articles of all selected abstracts and use an eligibility form to determine study selection. We will resolve any differences in opinion by discussion or, if required, by consulting a third person (TY). We will summarise reasons for excluding studies in the 'Characteristics of excluded studies' table.

#### Data extraction and management

Two authors (OU and TY or BW or MS) will extract data independently using a standardised data extraction form. We will resolve any disagreements through discussion or, if required, by consulting a third person (TY).

We will collect the following information from each included study.

- Administrative details: identification; author(s); published or unpublished study report; year of publication; year in which study was conducted; details of other relevant papers cited.

- Details of the study: study design; method(s) of recruitment; inclusion and exclusion criteria; number of participants assessed for eligibility; the number of participants excluded, enrolled, and analysed; the nature of, duration, frequency and completeness of follow-up; country and location where the study took place; setting in which the study was performed (e.g. urban or rural); characteristics of the participants.
- Details of the intervention: type of intervention; how it was implemented.
- Details of the outcomes: primary and secondary outcomes; effects of the intervention studied.
- Details of study ethics: informed consent obtained for participation; approving institution(s).

Should there be missing or inadequate data, we will attempt to obtain the data by contacting the study authors. We will summarise study information in the 'Characteristics of included studies' table.

### Assessment of risk of bias in included studies

Two authors (OU, MS) will independently assess each included study for risk of bias using the Cochrane Collaboration's tool for assessing the risk of bias (Higgins 2011). The domains that will be assessed are sequence generation, allocation concealment, blinding, incomplete outcome data, selective reporting and other potential sources of bias. We will rate each domain as "low risk of bias", "high risk of bias" or "unclear risk of bias" according to guidelines described in Chapter 8 of *the Cochrane Handbook* (Higgins 2011). We will resolve any disagreement by discussion or, if required, by consulting a third author (TY). We will present data in the 'Risk of bias' tables and present a 'Risk of bias graph' as well as a 'Risk of bias summary'.

### Measures of treatment effect

We will use the Cochrane Collaboration statistical software, *Review Manager 2014*, to manage the data and to conduct the analysis. We will report dichotomous outcomes (i.e. seat belt use) as relative risks (RRs) with 95% confidence intervals (CIs). For continuous outcomes, we will use mean differences (MDs) with 95% CIs when the studies use the same scale, and standardised mean differences (SMDs) with 95% CIs when studies used different scales.

### Unit of analysis issues

We will include all cluster-randomised trials that meet the inclusion criteria in the meta-analysis after adjusting for the design effect using the variation inflation method (Rao 1992; Higgins 2011): design effect =  $1 + (M - 1)ICC$ , where M is the average cluster size and ICC is the intracluster correlation coefficient. If

the authors did not report the ICC, we will use ICC from a similar published trial. For estimated values of ICC, we will conduct sensitivity analyses using larger and smaller ICCs to determine if the result is robust. For dichotomous outcomes the number experiencing the event and the number of participants will be divided by the design effect. For continuous outcomes we will divide the number of participants by the design effect.

### Dealing with missing data

We will analyse data on an intention-to-treat basis as far as possible and will attempt to obtain missing data from the original corresponding authors. If we are unable to obtain the data, imputation of individual values will be undertaken for the primary outcomes only. For other outcomes, we will analyse only the available data. Any imputation undertaken will be subjected to sensitivity analysis. If studies report sufficient detail to calculate mean differences but no information on associated standard deviation (SD), the outcome will be assumed to have standard deviation equal to the highest SD from other studies within the same analysis.

### Assessment of heterogeneity

If there are three or more studies describing the same type of intervention, we will stratify our analyses by type of intervention. For studies that have been combined in a meta analyses, we will assess the heterogeneity of studies by inspection of the forest plot and, in particular, the confidence intervals of the individual studies. Statistical tests of heterogeneity will be undertaken using the Chi<sup>2</sup> test, with significance defined as a P value of < 0.1, and the I<sup>2</sup> statistic. I<sup>2</sup> values above 30% suggest that moderate heterogeneity exists. In such cases, we will interpret our findings with caution (Higgins 2011).

### Assessment of reporting biases

We will assess funnel plots to explore the possibility of small study bias when there are 10 or more included studies. We will consider different explanations for funnel plot asymmetry such as publication bias, the effect of different study sizes and poor study design.

### Data synthesis

We will perform the statistical analysis using *Review Manager 2014*. Two authors (OU, MS) will extract the data, with the first author entering all data and the second author re-checking all entries. Disagreements will be resolved by discussion or, if required, by consulting a third author (TY). We will use a fixed-effect meta-analysis for combining data where it is reasonable to assume that studies are estimating the same underlying treatment effect. If there is clinical heterogeneity sufficient to expect that the underlying treatment effects differed between trials, or if substantial statistical

heterogeneity is detected, we will use a random-effects meta-analysis to produce an overall summary. We will express study results for dichotomous data as relative risks (RRs) with 95% confidence intervals (CIs).

Where studies cannot be combined for meta-analysis due to the diversity of interventions, we will conduct narrative syntheses and display results of individual studies graphically to enable more succinct summary of evidence.

### Subgroup analysis and investigation of heterogeneity

To interpret the heterogeneity between studies, we will conduct subgroup analysis if there are at least two studies in each subgroup category. We have pre-specified the following subgroups and their characteristics:

- driver versus passenger (front seat);
- passenger (front seat) versus passenger (back seat);
- commercial versus passenger (personal) vehicles;
- adults versus children;
- males versus females;
- low- and middle-income versus high-income countries;
- duration of follow-up (less than six months, six months up to one year, longer than one year).

## ACKNOWLEDGEMENTS

We thank the Trials Search Co-ordinator of the Cochrane Injuries Group for guidance on the search strategy.

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[www.who.int/violence\\_injury\\_prevention/publications/road\\_traffic/5yearstrat/en/](http://www.who.int/violence_injury_prevention/publications/road_traffic/5yearstrat/en/).

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**WHO 2009**

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\* Indicates the major publication for the study

**ADDITIONAL TABLES**

**Table 1. Types of interventions with examples**

<b>Education</b>	<b>Enforcement</b>	<b>Engineering</b>
Including a specific intervention as part of driving lessons and acquiring a license	Random road blocks	Seat belt alarm
Advertisement / awareness campaigns	Traffic fines for not wearing a seat belt <ul style="list-style-type: none"> <li>● At roadblocks</li> <li>● From camera/video evidence</li> <li>● Co-road user reports</li> </ul>	Unable to start a car without a fastened seat belt, or drive faster than a certain speed without a fastened seat belt
Specific extra education for previous offenders	Suspension/banning of previous offenders	
Offering education class as an alternative to prosecution for seat belt offences	Putting the responsibility on the passenger <hr/> Point systems (increasing points for repeating offenders)	



## APPENDICES

### Appendix I. Search strategies

#### MEDLINE

1. Seat Belts/
2. Seat Belts/ut [Utilization]
3. (seatbelt\* or seat-belts).ab,ti.
4. seatbelt-wearing.ab,ti.
5. (seatbelt adj1 usage).ab,ti.
6. (lap-restraint\* or lap?restraint\*).ab,ti.
7. "seat belt use".ab,ti.
8. 1 or 2 or 3 or 4 or 5 or 6 or 7
9. \*Health Promotion/
10. education.fs.
11. Social Media/
12. media.ab,ti.
13. (education or educate).ab,ti.
14. "social media".ab,ti.
15. Health Behavior/
16. (promotion or advertisement).ab,ti.
17. (fine\* or ban\* or enforcement).ab,ti.
18. "safety belt law\*".ab,ti.
19. (driving adj1 (lesson\* or class\* or school\*)).ab,ti.
20. (preventive adj3 (behaviour or behavior)).ab,ti.
21. 9 or 10 or 15 or 16 or 17 or 19 or 20
22. randomi?ed.ab,ti.
23. randomized controlled trial.pt.
24. controlled clinical trial.pt.
25. placebo.ab.
26. clinical trials as topic.sh.
27. randomly.ab.
28. trial.ti.
29. Comparative Study/
30. 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31. (animals not (humans and animals)).sh.
32. 30 not 31
33. 8 and 21 and 32

#### EMBASE

1. Seat Belts/
2. (seatbelt\* or seat-belts).ab,ti.
3. seatbelt-wearing.ab,ti.
4. (seatbelt adj1 usage).ab,ti.
5. (lap-restraint\* or lap?restraint\*).ab,ti.
6. "seat belt use".ab,ti.
7. 1 or 2 or 3 or 4 or 5 or 6
8. \*Health Promotion/
9. Social Media/

10. (education or educate).ab,ti.
11. media.ab,ti.
12. "social media".ab,ti.
13. Health Behavior/
14. (promotion or advertisement).ab,ti.
15. (fine\* or ban\* or enforcement).ab,ti.
16. "safety belt law\*".ab,ti.
17. (driving adj1 (lesson\* or class\* or school\*)).ab,ti.
18. (preventive adj3 (behaviour or behavior)).ab,ti.
19. 8 or 10 or 13 or 14 or 15 or 16 or 17 or 18
20. exp Randomized Controlled Trial/
21. exp controlled clinical trial/
22. exp controlled study/
23. comparative study/
24. randomi?ed.ab,ti.
25. placebo.ab.
26. \*Clinical Trial/
27. exp major clinical study/
28. randomly.ab.
29. (trial or study).ti.
30. 20 or 21 or 22 or 24 or 25 or 26 or 27 or 28 or 29
31. exp animal/ not (exp human/ and exp animal/)
32. 30 not 31
33. 7 and 19 and 32

## **CONTRIBUTIONS OF AUTHORS**

TY drafted the protocol. OU, MS and BW edited versions of the protocol. All authors approved the final version of the protocol.

## **DECLARATIONS OF INTEREST**

OAU: None known.

MS: None known.

BW: None known.

TY: None known.

## **SOURCES OF SUPPORT**

**Internal sources**

- Stellenbosch University, South Africa.

**External sources**

- Effective Health Care Research Consortium, Other.