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Adolescent road user behaviour: A survey of 11-16 year olds

Prepared for Road Safety Division, Department for Transport

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Executive Summary

In Britain, 130 children and adolescents are killed every year and more than 4,400 are seriously injured while walking and cycling. Remedial action based on a better understanding of what makes children and adolescents particularly vulnerable as road users is likely to lead to improvements in road safety for this group of road users. Remedial action may need to be targeted at drivers and riders of motor vehicles. However, it could also be argued that children in this age group have a large role to play with respect to their own road safety, and desirable improvements may also require changing their behaviour.

With this in mind, TRL has been commissioned by the Department for Transport (DfT) to carry out research into the road user attitudes and behaviour of older children and adolescents (11-16 years old). This report describes the main survey carried out in stage 1 of a two-stage research project. The aims of the study were to:

- Determine the frequency with which children in the target population carry out a number of safety related behaviours as road users.
- Determine how the commission of these road using behaviours vary as a function of demographic variables.
- Identify behaviours which may represent major concerns for road safety - i.e. behaviours which may require targeting in future research and/or government policy.

A total of 2,433 pupils from eleven secondary schools located within England completed questionnaires which were based on pilot research involving qualitative and quantitative elements. The questionnaire contained 43 items which required respondents to rate how often they carried out various behaviours as road users. The questionnaire also contained items to measure a number of demographic and exposure variables, and respondents' beliefs about the safety of their own behaviour as road users. Teachers within each school participating in the study administered the questionnaire to pupils from Year 7 (11-12 year olds), Year 9 (13-14 year olds) and Year 11 (15-16 year olds). The sample obtained was fairly evenly distributed across these three age groups. Similar proportions of respondents from rural, small urban and large urban areas were obtained and there were also similar proportions of male and female respondents in the sample. The sample achieved also included a good spread across different ethnic groups.

Factor analyses were carried out on respondents' scores on the 43 behaviour items in the questionnaire. Three easily interpretable factors emerged from the data indicating three distinct types of behaviour. Items loading on to factor 1 were all concerned with 'unsafe road crossing practices'. Items loading on to factor 2 were concerned with 'dangerous playing in the road' (e.g. 'playing chicken by deliberately running out in front of cars'). Factor 3 covered behaviours for which, unlike factors 1 and 2, frequent performance implied safety. Items loading on factor 3 seemed to encapsulate behaviour which

involved a self-protective nature and the need for a greater degree of preparation (or planning) than many of the other road using behaviours which loaded strongly on to factors 1 and 2. An example of a behaviour loading on factor 3 was 'wear a cycle helmet when riding a bike'.

Factor analyses were also conducted using the responses to the belief items in the questionnaire. These analyses indicated that there were two factors, one characterised by beliefs about taking responsibility for one's own safety and acting responsibly, and the other characterised by beliefs about deflecting responsibility for one's own safety (e.g. 'other people should be responsible for my safety').

Analysis of variance (ANOVA) showed that, in general, younger respondents (11-12 year olds) and female respondents reported carrying out desirable road safety behaviours more often than did older respondents (13-16 year olds) and male respondents - i.e. they reported carrying out unsafe road crossing and dangerous playing in the road behaviours less often, and planned protective behaviours more often. Dangerous playing in the road and planned protective behaviours were reported to be carried out more often by respondents from schools in rural areas than those from schools in urban areas. With respect to ethnic group, the results of this study suggest that this demographic variable is not a good discriminator for detecting differences between adolescents who report carrying out desirable road using behaviour and those who do not.

Multiple regression analyses, perhaps unsurprisingly, showed that the more often respondents reported going out as road users, the more often they reported carrying out all three types of road user behaviour. Also, the more often they reported going out with friends, and the less often they reported going out with adults, the more often they reported carrying out undesirable road user behaviour.

The results of the multiple regression analyses also showed that respondents' beliefs regarding the safety of their own road using behaviour were strongly associated with how frequently all three types of road using behaviour were reported to be carried out. The results showed that the more often respondents reported carrying out 'unsafe' road using behaviour, the more unsafe and irresponsible they believed their behaviour to be. This suggested that adolescent road users have an accurate perception about the safety of their own road using behaviour and thus interventions which attempt to discourage 'unsafe' behaviour by providing information about safety may be ineffective.

Changing many of the road using behaviours investigated in the present study is likely to require a much better understanding of why they are carried out. Social cognition models such as the theory of planned behaviour (Ajzen, 1985) offer particularly useful theoretical accounts of social behaviour, and their application to the behaviour of adolescent road users may be beneficial. The findings of this study may help to decide which specific behaviours are the most appropriate targets for further research applying social cognition models, and/or government policy.

1 Introduction

In Britain, 130 children and adolescents are killed every year and more than 4,400 are seriously injured while walking and cycling. The rate of decline in the numbers of pedestrian deaths and serious injuries is slowest in the 11-15 year old age group, and the three ages when most child pedestrians are killed and seriously injured are 11, 12 and 13. For male cyclists, the ages when most children are killed or seriously injured are 12, 13 and 14, and for female cyclists it is between 10 and 14 years old.

In March 2000 the Government issued its road safety and casualty reduction strategy for the next 10 years - 'Tomorrow's Roads - Safer for Everyone' (DETR, 2000). This document set a target for halving the number of children killed and injured on Britain's roads by the year 2010.

A better understanding of what makes children and adolescent road users particularly vulnerable is required to develop remedial action and achieve this target. Remedial action may need to take place within a legislation, enforcement or engineering context (e.g. more 20mph speed limits in areas where there are often children playing, or the development of vehicles that are more 'pedestrian friendly'). However, changing 'unsafe' behaviour via training, education and publicity may also have highly beneficial results. To improve the safety of adolescent road users these interventions may need to be targeted at drivers and riders of motor vehicles in an attempt to change their behaviour (e.g. to make them more aware of child pedestrians and to adopt appropriate behaviour). However, it could also be argued that children in this age group have a large role to play with respect to their own road safety, and desirable improvements may also require changing their behaviour. The question then arises, 'what specific behaviours do adolescents carry out which makes them a particularly vulnerable group of road users?' In other words, 'what specific road using behaviours require changing?'

With respect to this question, previous research studies have found that a number of road using behaviours which can be regarded as being 'unsafe' are often carried out by children and adolescent road users, and it is likely that this behaviour contributes to their accidents as road users. In a qualitative research project into younger teenagers and road safety, for example, the Scottish Office Central Research Unit (1998) distinguished between two types of risky road user behaviour. First, behaviours such as running across the road and walking between parked cars were termed 'common risk' behaviours. These were thought to account for the vast majority of pedestrian and road casualties because of the high numbers of people engaging in them. The second type of behaviour was 'extreme risk' behaviour. This category included potentially more dangerous activities such as 'playing chicken' (the practice of deliberately running out in front of cars) and holding onto other vehicles when roller-blading.

In another qualitative research project by Campbell and Keegan (2000), the risk-taking activities of 14-16 year old adolescents were explored. Activities such as playing chicken and playing football in the street were identified

along with other behavioural trends for people of different ages (e.g. the use of mobile phones, bikes and skateboards).

These previous research studies have provided useful insights into the kinds of behaviour that may influence adolescents' safety as road users. However, there is a need for large-scale research studies to comprehensively investigate the potentially wide range of safety related behaviours carried out by this population of road users. Knowledge about the prevalence of these behaviours and how their commission differs as a function of demographic characteristics (e.g. age, sex, ethnic group) is needed to aid the targeting of countermeasures to discourage 'unsafe' road using behaviour within this age group.

Although descriptive information about adolescents' behaviour as road users is important for targeting remedial action, there is also a need to acquire explanatory information about this behaviour to decide upon the content of the countermeasures. In other words, once knowledge has been acquired about the behaviours that contribute towards making adolescents a particularly vulnerable group of road users, the question of *why* these behaviours are carried out becomes important.

One approach to understanding why people carry out (or do not carry out) certain behaviours is provided by social cognition models such as the theory of planned behaviour (TPB; Ajzen, 1985) and the health belief model (HBM; Rosenstock, 1966). These theoretical models of behaviour postulate that people behave in accordance with their attitudes¹. Many studies conducted across a variety of behavioural domains have provided support for these models (for reviews see Ajzen, 1988, 1991; Ajzen & Fishbein, 1977, 1980; Armitage & Conner, 2001; Eagly & Chaiken, 1993). Within the domain of traffic psychology similar results have also been found for a number of car driving behaviours (e.g. Manstead & Parker, 1996; Parker, Manstead, Stradling, Reason, & Baxter, 1992; Parker, Manstead, & Stradling, 1995), motorcycle riding behaviours (e.g. Rutter, Quine, & Chesham, 1995), and modal choices (e.g. Verplanken, Aarts, van Knippenberg, & Moonen, 1998; Verplanken, Aarts, van Knippenberg, & van Knippenberg, 1994). However, there are fewer examples of this type of research with respect to adolescents' road safety behaviour². Such research may provide useful information about why this group of road users might carry out the behaviours which contributes towards them being a high-risk group.

With this in mind, TRL has been commissioned by the Department for Transport (DfT) to carry out research into the road user attitudes and behaviour of older children and adolescents (11-16 years old). This research forms part of the DfT's 'Child Development and Road Safety Education Research Programme - Phase III'. The project will be carried out in two phases. The purpose of phase 1 is to study the road using behaviour that may contribute towards the safety of children and adolescent road users. In phase 2 of the research, the attitudes associated with a selection of these behaviours will be studied in an attempt to understand why these behaviours are carried out and how they might be discouraged.

This report describes a main survey carried out in phase 1 of this research project. The report is presented in five main sections. Section 2 outlines the aims of the survey. Section 3 outlines the method. Section 4 describes the analyses of the data and the results obtained. Finally Section 5 presents the summary and conclusions of the study.

2 Study aims

The main aim of this study was to carry out a large-scale survey of adolescents aged 11-16 years old to:

- Determine the frequency with which children in the target population carry out various safety related behaviours as road users.
- Determine how the commission of these road using behaviours vary as a function of demographics.
- Identify behaviours which may represent major concerns for road safety - i.e. behaviours which may require targeting in future research and/or government policy. Specifically, there was a requirement for this study to identify those behaviours which might not only represent major concerns for road safety but also those which might be amenable to change via attitude interventions - i.e. behaviours to study in phase 2 of this research.

3 Method

3.1 Questionnaire development

Before carrying out the large-scale survey, pilot research involving both qualitative and quantitative elements was conducted to develop a meaningful and reliable questionnaire for measuring the frequency with which children in the target population carry out various safety related behaviours as road users. Briefly, this involved:

- 1 Focus group research and the re-analysis of a child pedestrian accident database (Christie, 1995) to elicit the pedestrian and cyclist behaviours carried out by children in the target population.
- 2 The design of a questionnaire using the behavioural information obtained from the focus group research and from the re-analysis of the child pedestrian accident database³.
- 3 Consultation with experts working in the field of adolescent assessment regarding the content of the questionnaire and the suitability of the question wording for the target population.
- 4 Cognitive question testing - to see if the questionnaire items were meaningful and that they could easily be completed by children in the target population.
- 5 A pilot survey (N=244) using the questionnaire and analyses of the results.

The results of the pilot research indicated that respondents in the target population could easily understand and respond to the questionnaire items, and that reliable and meaningful data about the road safety behaviour of the target population could be obtained.

3.2 Measures

3.2.1 Questionnaire measures

A number of questionnaire measures were obtained as part of this study. The questionnaire (see Appendix A) comprised the following four sections:

Section 1: Exposure items

Three items designed to collect information about general exposure were included. These were: 'How often do you go out and ride a bike?'; 'How often do you go out and ride a skateboard (or roller-skates/roller-blades)?'; and 'How often do you go out on foot'⁴. A further three items to elicit information about type of accompaniment were also included in this section of the questionnaire. Respondents were asked: 'When you go out around roads⁵, how often do you do this: (1) with adults? (2) with friends? and (3) on your own?'. All items in Section 1 of the questionnaire were rated using 5-point Likert scales anchored never/every day.

Section 2: Behaviour items

Forty-three behavioural items were included in Section 2 of the questionnaire. Most of the items were concerned with pedestrian behaviour, but items related to play-type behaviour (e.g. playing ball games in the road) were also included. Three items associated with cyclist behaviour (wearing a cycle helmet, wearing bright/reflective clothing when riding a bike, and using lights on your bike when it is dark) were included. Respondents were asked to indicate how often they carried out each of the 43 behaviours listed. All items in this section of the questionnaire were rated on 5-point Likert scales anchored never/very often (a full list of the Section 2 items are presented in the results section of this report - see Tables 4 and 5).

Section 3: Belief/opinion items

Information about respondents' beliefs regarding their own behaviour was obtained in Section 3 of the questionnaire. Items were designed to measure respondents' beliefs about how risky or safe they perceived their behaviour as road users to be, and their beliefs about who should be responsible for their safety as road users. The following items were used and were rated on 5-point Likert scales anchored strongly agree/strongly disagree:

- I do things that are risky when I go out around roads.
- I generally pay a lot of attention to the traffic when I go out around roads.
- I am aware of the dangers around the roads.
- In general, I act responsibly when I go out around roads.
- I should be responsible for my safety when I am out around roads.
- Motorists should be responsible for my safety.
- Other people should be responsible for my safety.

Section 4: Demographic information

In this final section of the questionnaire respondents were asked to provide the following information about themselves: age (three age groups - 11-12, 13-14, or 15-16), gender, and ethnic group.

3.2.2 Expert danger ratings

As mentioned earlier, the main purpose of this study was to determine the frequency with which children in the target population carry out various behaviours which might contribute towards their safety as road users. With this in mind, danger ratings were produced for the 43 behaviour items in Section 2 of the questionnaire. Six independent judges, consisting of researchers working in the field of child road safety and school teachers, were asked to rate each behaviour on a scale from 0 ('the behaviour is not dangerous at all') through to 6 ('the behaviour is extremely dangerous'). Items which encompassed desirable behaviour from a road safety point of view were re-worded so that all items described 'unsafe' behaviour (e.g. 'looking both ways before crossing' was re-worded to '*not* looking both ways before crossing'). A danger rating was produced for each of the 43 behaviour items by taking the mean of the judges' ratings for each item. As a measure of inter-rater reliability, the Cronbach's Alpha for the judges' ratings was calculated. The Alpha value was 0.90 indicating a good inter-rater reliability. The danger ratings for each of the 43 behaviour items are presented in descending order in Appendix B.

3.3 Participants and procedure

Pupils from secondary schools completed the questionnaire. Eleven schools, all located within England, volunteered to take part in this study. The sample of schools comprised:

Three schools from large urban areas⁶:

- London - 1 school.
- Birmingham - 1 school.
- Manchester - 1 school.

Three schools from small urban areas²:

- York - 1 school.
- Darlington - 1 school.
- Exeter - 1 school.

Five schools from rural areas:

- Rural areas of Hampshire - 2 schools.
- Rural areas of Berkshire - 2 schools.
- Rural areas of Devon - 1 school.

Within each of the above area types, a good spread of school academic ability was obtained, as indicated by the GCSE/GNVQ average point score per 15-year-old⁷ for the schools taking part. GCSE/GNVQ average point scores per 15-year-old ranged from 28.4 to 53.4 for the schools in the large urban areas, from 33.4 to 42.5 for the schools in the small urban areas, and from 32.2 to 43.7 for the schools in the rural areas.

Within each school participating in the study, pupils from Year 7 (11-12 year olds), Year 9 (13-14 year olds) and Year 11 (15-16 year olds) completed questionnaires. Teachers in each school administered the questionnaires in lesson time at school under pseudo exam conditions. To help respondents complete the questionnaire, teachers were asked to give the instructions outlined in Appendix C, and to use

an overhead transparency which provided respondents with an example question and simple instructions on how it should be answered (see Appendix D).

A target was set to achieve 2,000 questionnaire responses from the present survey. This target was exceeded with data being collected for a total of 2,433 respondents. Tables 1, 2, and 3 show respectively the age and sex characteristics of the sample, the distribution of the sample across ethnic groups, and the distribution of the sample across the three different area types (large urban, small urban and rural).

Table 1 Sample distribution across age and sex (%)

	Sex		Total
	Male	Female	
<i>Age group (Years)</i>			
11-12	19.8	17.9	37.7
13-14	16.8	17.4	34.2
15-16	15.8	12.3	28.1
Total	52.4	47.6	100

Table 2 Sample distribution across ethnic groups

<i>Ethnic group</i>	<i>% of sample</i>
White	77.3
Black	3.8
Asian	14.0
Mixed White/Black	2.3
Mixed White Asian	1.4
Other	1.1
Total	100

Table 3 Sample distribution across area type

<i>Area type</i>	<i>% of sample</i>
Large urban	27.1
Small urban	34.8
Rural	38.1
Total	100

4 Results

4.1 Analyses

A number of statistical techniques were used to analyse the data, including factor analysis, analysis of variance (ANOVA), and multiple regression. For each statistical test carried out, cases used in the analyses that contained missing data were deleted. The tables of results presented in the following sections of this report provide details about the sample size on which each statistical test was based.

4.2 Relative frequency of road using behaviours

The 43 behaviour items in Section 2 of the questionnaire were ranked in order of their mean frequency score to investigate which ones were most prevalent within the sample. As can be seen from Table 4, the five most frequently reported behaviours were all concerned with obeying the Highway Code - thus the most frequently performed behaviours were those which are desirable from a road safety point of view. Many of the least frequently reported behaviours could be classified as being 'extreme risk' behaviours - for example, 'playing chicken by lying down in front of traffic' (rank = 43), 'playing chicken by running out in front of traffic' (rank = 42), and 'holding on

to a moving vehicle when riding a bike' (rank = 41). However, despite being low down in the prevalence ratings, these behaviours were rated as being among the most 'dangerous' by expert judges (see Section 3.2.2). Furthermore, an inspection of the distribution of responses across these items showed that substantial proportions of respondents still reported carrying out these behaviours. For example, although 82% of respondents reported 'never' playing chicken, both by lying down in front of traffic or by running out in front of traffic, nearly 20% of respondents did report carrying out this behaviour at least some of the time (i.e. they reported carrying out the behaviour 'hardly ever', 'sometimes', 'often', or 'very

Table 4 Behaviour items ranked in descending order of mean frequency score

<i>Item (How often do you...)</i>	<i>Mean</i>	<i>SD</i>
Look both ways before crossing	4.08	1.07
Check to make sure traffic has stopped before using a pedestrian crossing	3.46	1.30
Cross at a place that is well lit when it is dark	3.32	1.16
Keep looking and listening until you get all the way across the road	3.26	1.26
Use lights on your bike when it is dark	2.84 (3.09)*	1.62 (1.59)*
Get part way across road but have to run the rest of the way to avoid traffic	2.82	1.14
Cross without waiting for the 'green man'	2.76	1.25
Not bother walking to a nearby crossing to cross the road	2.72	1.22
See a small gap in traffic and 'go for it'	2.69	1.30
Cross between parked cars when there is a safer place to cross nearby	2.66	1.16
Forget to look properly because you are talking to friends who are with you	2.65	1.15
Walk in single file on roads without pavements	2.54	1.38
Walk in the road facing the traffic	2.51	1.36
Cross when you can't see both ways very well (like on a bend or top of hill)	2.49	1.10
Forget to look properly because you are thinking about something else	2.44	1.08
Make traffic slow down or stop to let you cross	2.43	1.24
Cross from behind a stationary vehicle	2.35	1.17
Have to stop quickly or turn back to avoid traffic	2.34	1.07
Think it is OK to cross safely, but a car is coming faster than you thought	2.34	1.12
Hang around in the road talking to friends?	2.27	1.23
Not look because you can't hear any traffic around	2.25	1.22
Run around in a road (e.g. when playing football or bull dog)	2.24	1.29
Walk in the road rather than on the pavement?	2.22	1.07
Not notice a car pulling out (say from a driveway) and walk in front of it?	2.20	1.03
Run across a road without looking because you are in a hurry	2.20	1.22
Use a lollipop man / lady where there is one available	2.06	1.20
Wear a cycle helmet when riding a bike	2.03 (2.12)*	1.40 (1.41)*
Use a mobile phone and forget to look properly	2.03	1.15
Cross whether traffic is coming or not, thinking the traffic should stop for you	1.99	1.21
Climb over barriers that separate the road from the pavement	1.97	1.21
Not notice an approaching car when playing games in the road	1.93	1.11
Run into the road to get a ball, without checking for traffic	1.87	1.09
Cross less than an hour after drinking alcohol	1.87	1.28
Ride on a skateboard (or roller-skates/roller-blades) in the road	1.85 (2.65)*	1.26 (1.40)*
Wear bright or reflective clothing when riding a bike in the dark	1.79 (1.90)*	1.24 (1.28)*
Wear reflective clothing when out on foot in the dark	1.67	1.07
Deliberately run across the road without looking, for a dare	1.51	0.95
Ride out into the road on a skateboard without thinking to check for traffic	1.50 (1.90)*	0.95 (1.15)*
Wear reflective clothing when crossing a road	1.49	0.93
Hold on to a moving vehicle when riding a skateboard/roller-skates/roller-blades	1.38 (1.61)*	0.91 (1.08)*
Hold on to a moving vehicle when riding a bike	1.36 (1.42)*	0.89 (0.94)*
Play 'chicken' by deliberately running out in front of traffic	1.36	0.88
Play 'chicken' by lying down in the road and waiting for cars to come along	1.35	0.89

* Means and SDs when non-mode users relevant to the item were filtered out of the analysis.
Higher mean scores represent more frequent performance.

often'). Although only 10% of the sample reported playing chicken 'sometimes', 'often' or 'very often', this might equate to large numbers of adolescent road users who engage in this extremely risky behaviour. Similarly, a relatively large proportion of respondents reported not often carrying out the Highway Code type behaviours that were ranked highly in the prevalence ratings. For instance, 26% of respondents reported that they 'never', 'hardly ever' or only 'sometimes' looked both ways before crossing a road. Although the respondents who reported 'sometimes' looking both ways accounted for most of these people, there was still 10% of the sample who reported 'never' or 'hardly ever' looking both ways before crossing a road. This might equate to large numbers of adolescent road users failing to carry out this basic Highway Code behaviour. More striking is that 51% of respondents who rode bicycles reported 'never' wearing a cycle helmet. The distributions of responses across all 43 behaviour items in the questionnaire are presented in Appendix E.

4.3 Factor analyses

In order to reduce the data obtained in this study to meaningful and reliable scales so that further analyses could be carried out, a number of factor analyses were conducted. These analyses are briefly described below.

4.3.1 Road using behaviours

Responses to the 43 behaviour items in Section 2 of the questionnaire were subjected to a principal axis factor analysis with varimax rotation (see Table 5)⁸. The scree plot indicated that the data were best fitted by a three-factor solution accounting for 34.6% of the total variance.

Factor 1 accounted for 14.2% of the variance and almost exclusively encompassed behaviours concerning unsafe road crossing practices. The nature of these unsafe crossing practices ranged from unintentional behaviour involving distraction or forgetting to look for traffic (e.g. 'forget to look properly because you are talking to friends' - 0.61) through to more deliberate decisions about when and where to cross (e.g. 'see a small gap in traffic and 'go for it' - 0.56; and 'cross from between parked cars when there is a safer place to cross near by' - 0.58). In terms of the error taxonomy developed by Reason and colleagues (e.g. Reason, Manstead, Stradling, Baxter, & Campbell, 1990) the behaviours loading on to factor 1 related closely to *errors* (*mistakes* and high risk *slips* and *lapses*) and *violations* (deliberate departures from safe practices). The 26 items loading onto this factor were summed to produce a composite scale which was named 'unsafe road crossing behaviour'⁹. Two items loaded negatively on to this factor, and were therefore re-coded before the composite scale was produced so that high scores on every item corresponded to less desirable performance from a road safety point of view (i.e. greater frequency of unsafe road crossing behaviour). This scale had high internal reliability, with the Cronbach's Alpha being 0.92.

Factor 2, accounting for 12.2% of the variance, encompassed behaviours which as a group could be termed

'play/social activity' in the road. Items loading onto this factor ranged from 'hanging around in the road talking to friends' (0.50), and potentially risky behaviour resulting from playing games (e.g. 'not noticing an approaching car when playing games in the road - 0.50), through to deliberate participation in dangerous behaviour which involves 'playing with traffic'. It should be noted that items loading most strongly onto this factor were those concerned with the deliberate participation in dangerous behaviours - for example: 'playing chicken by deliberately running out in front of traffic' (0.67); 'playing chicken by lying down in the road and waiting for cars to come along' (0.66); 'holding on to a moving vehicle when riding a bike' (0.65); 'holding on to a moving vehicle when riding skateboard, or when on roller-skates/roller-blades' (0.68); and 'deliberately running across the road without looking, for a dare' (0.62). In terms of Reason *et al.* (1990) error taxonomy these behaviours could be thought of as being extremely risky *violations*. The 16 items loading on to this factor were summed to produce a composite scale which was named 'dangerous playing in the road'. One item loaded negatively on to this factor and was re-coded before the composite scale was produced so that a higher score on each item represented less desirable behaviour from a road safety point of view (i.e. a greater frequency of dangerous playing in the road behaviour). The Cronbach's Alpha statistic for this scale was 0.90, indicating high internal reliability.

Factor 3 accounted for 8.2% of the variance. Unlike items loading on factors 1 and 2, items loading on factor 3 related to behaviour for which frequent performance implies safety. In terms of Reason *et al.* (1990) error taxonomy these behaviours were, in effect, the opposite of violations, being characterised by keeping to safe rules and procedures - i.e. obeying the Highway Code. The items loading most strongly on to this factor were 'wearing bright or reflective clothing when riding a bike in the dark' (0.79); 'wearing bright or reflective clothing when out on foot in the dark' (0.72); 'wearing a cycle helmet when riding a bike' (0.55); 'using lights on your bike' (0.49); and 'walk in single file on roads without pavements' (0.42). These items, all of which loaded only on factor 3, seemed to encapsulate behaviour which is protective and derives its effectiveness not from skilled interaction with traffic but from isolating the participant from some form of risk¹⁰. In addition, these behaviours seemed to warrant the need for a greater degree of preparation (or planning) than many other examples of road using behaviours used in this study - i.e. those which loaded strongly on to factors 1 and 2. For example, in the case of 'wearing a cycle helmet when riding a bike' there is the need to make the decision to wear the cycle helmet, locate the helmet, put the helmet on and then ride the bicycle. The label 'planned protective behaviour' seems to describe the concepts relating to this factor reasonably well. As was done with items loading on to factors 1 and 2, items loading on to factor 3 were summed to produce a composite scale. Higher scores on this 11-item scale represented greater frequency of planned protective behaviour, and thus more desirable behaviour from a road safety point of view. The Cronbach's Alpha for this scale was 0.79.

Table 5 Principal axis factor analysis of the 43 behaviour items (varimax rotation) (N=2127)

<i>Item (How often do you...)</i>	<i>Factor 1</i>	<i>Factor 2</i>	<i>Factor 3</i>
Use a lollipop man / lady where there is one available	-.11	-.06	.35
Forget to look properly because you are thinking about something else	.56	.15	-.17
Use a mobile phone and forget to look properly	.49	.17	-.18
Forget to look properly because you are talking to friends who are with you	.61	.15	-.21
Cross whether traffic is coming or not, think the traffic should stop for you	.55	.21	-.13
Not look because you can't hear any traffic around	.50	.17	-.15
Think it is OK to cross safely, but a car is coming faster than you thought	.57	.19	-.10
Cross less than an hour after drinking alcohol	.39	.25	-.18
Check to make sure traffic has stopped before using a pedestrian crossing	-.24	-.18	.36
Climb over barriers that separate the road from the pavement	.43	.34	-.14
Wear reflective clothing	-.00	.07	.57
Not bother walking to a nearby crossing to cross the road	.33	.08	-.12
Look both ways before crossing	-.36	-.31	.34
Keep looking and listening until you get all the way across the road	-.34	-.21	.42
Have to stop quickly or turn back to avoid traffic	.39	.05	.07
Get part way across the road and then have to run the rest of the way to avoid traffic	.54	.06	-.11
Cross from between parked cars when there is a safer place to cross nearby	.58	.12	-.18
Cross from behind a stationary vehicle	.53	.15	-.15
Cross without waiting for the 'green man'	.46	.18	-.28
Cross when you can't see both ways very well (like on a bend or top of hill)	.51	.25	-.13
Cross at a place that is well lit when it is dark	-.14	-.14	.36
Make traffic slow down or stop to let you cross	.37	.10	.09
See a small gap in traffic and 'go for it'	.56	.19	-.25
Run across a road without looking because you are in a hurry	.56	.34	-.22
Run around in a road (e.g. when playing football or bull dog)	.29	.49	-.13
Not notice an approaching car when playing games in the road	.35	.50	-.09
Play 'chicken' by lying down in the road and waiting for cars to come along	.22	.66	-.03
Play 'chicken' by deliberately running out in front of traffic	.23	.67	-.02
Hold on to a moving vehicle when riding a bike	.17	.65	.02
Hold on to a moving vehicle when riding a skateboard/roller-skates/roller-blades	.09	.68	.01
Hang around in the road talking to friends	.37	.50	-.22
Ride on a skateboard (or roller-skates/roller-blades) in the road	-.00	.61	-.01
Ride out into the road on a skateboard without thinking to check for traffic	.13	.69	-.00
Run into the road to get a ball, without checking for traffic	.36	.57	-.12
Not notice a car pulling out (say from a driveway) and walk in front of it	.49	.34	-.15
Walk in the road rather than on the pavement	.43	.39	-.21
Walk facing the traffic when on roads without pavements	.20	.19	.04
Deliberately run across the road without looking, for a dare	.34	.61	-.15
Wear bright or reflective clothing when out on foot in the dark	-.02	.10	.72
Walk in single file on roads without pavements	-.12	-.09	.42
Wear a cycle helmet when riding a bike	-.15	.02	.55
Wear bright or reflective clothing when riding a bike in the dark	-.04	.08	.79
Use lights on your bike when it is dark	-.14	-.02	.49

Figures in bold indicate the factor loadings ≥ 0.3 .

4.3.2 Beliefs about road using behaviours

As with the responses to the behaviour items in Section 2 of the questionnaire, the belief items in Section 3 were subjected to a principal axis factor analysis with varimax rotation (see Table 6)¹¹. The scree plot indicated that the data were best fitted by a two-factor solution accounting for 46.8% of the total variance.

Factor 1 accounted for 29.7% of the variance and encompassed items that were all concerned with perceptions about taking responsibility for one's own safety and acting responsibly. The five items loading on to this factor were summed to produce a composite scale which was named 'responsibility beliefs'. As can be seen from Table 6, one item loaded negatively on to this factor: 'I do things that are

risky when I am out around roads'. This item was therefore re-coded before the composite scale was produced, so that higher scores on all items represented a greater level of agreement with the statements about taking responsibility for one's own safety and acting responsibly. This scale had a Cronbach's Alpha of 0.76.

Factor 2 accounted for 17.1% of the variance. Two items loaded on to this factor and they both referred to beliefs about deflecting responsibility for one's own safety. These items were summed to produce a composite scale with a Cronbach's Alpha of 0.74. Higher scores on this scale reflected less desirable road safety beliefs (i.e. stronger beliefs that other people should be responsible for one's own safety). It is worth noting that the items,

Table 6 Principal axis factor analysis of the belief items (Varimax rotation) (N=2330)

Item	Factor 1	Factor 2
I do things that are risky when I am out around roads.	-.49	.15
I generally pay a lot of attention to the traffic when I am out around roads.	.71	-.02
In general I act responsibly when I am out around roads.	.77	.02
I am aware of the dangers around the roads.	.66	-.01
I should be responsible for my own safety when I am out around roads.	.57	-.08
Motorists should be responsible for my safety when I am out around roads.	-.01	.77
Other people should be responsible for my safety when I am out around roads.	-.11	.77

Figures in bold indicate the factor loadings ≥ 0.3

‘I should be responsible for my own safety when I am out around roads’ and ‘other people should be responsible for my safety when I am out around roads’ did not load on to the same factor. These items may have loaded on to different factor structures because they may not be diametrically opposed to one another (i.e. one explanation is that adolescent road users may believe that both they and others – including motorists – have a role to play in their safety as road users).

4.4 Demographic effects on behaviour factor scale scores

ANOVA analyses were carried out to investigate the effects of age, sex, ethnic group, and area on the three behaviour factor scale scores (described in Section 4.3.1). Full factorial ANOVAs were conducted whereby all main effects and all interaction terms were included in the models. Simplified models were then produced by excluding all non-significant interaction terms¹². All significant effects were explored post hoc using Tukey HSD.

4.4.1 Unsafe road crossing behaviour

With respect to unsafe road crossing behaviour (see Table 7) there were significant main effects of age ($F(2, 2065) = 50.221, p < .001$)¹³ and sex ($F(1, 2065) = 31.552, p < .001$). Post hoc analysis of the age effect revealed that respondents in the 13-14 and 15-16 year old age groups carried out this type of behaviour significantly more often than did the 11-12 age group ($p < .001$). No statistically significant difference was found between 13-14 and 15-16 year olds in their mean reported frequency of unsafe road crossing behaviour ($p = .17$). An inspection of the means for sex showed that it was males who reported carrying out unsafe road crossing behaviour more often than females.

4.4.2 Dangerous playing in the road

Table 8 shows the results of the ANOVA analysis for dangerous playing in the road. As was the case with unsafe road crossing behaviour, there were statistically significant

Table 7 ANOVA analysis: Factor 1 (Unsafe road crossing behaviour) (N=2065)

Variable	Mean	SD	Sum of squares	df	F	p
Area			204.85	2	.37	.689
Rural	59.80	16.96				
Small urban	59.34	17.23				
Large urban	60.07	17.03				
Age*			27566.02	2	50.22	.000
11-12	55.03	16.11				
13-14	61.67	17.18				
15-16	63.50	16.86				
Sex			8659.48	1	31.55	.000
Male	61.64	17.96				
Female	57.60	15.89				
Ethnic group			624.05	4	.57	.686
White	59.46	17.00				
Black	60.29	17.53				
Asian	59.81	17.64				
Mixed White/Black	61.61	17.24				
Mixed White/Asian	57.54	15.41				

* Statistical significance laid between the 11-12 age group and the 13-14 and 15-16 age groups. Mean difference between 13-14 and 15-16 age groups was not statistically significant.

Higher mean scores represent more frequent performance of unsafe road crossing behaviour

Table 8 ANOVA analysis: Factor 2 (Dangerous playing in the road) (N=2173)

Variable	Mean	SD	Sum of squares	df	F	p
Area*			772.57	2	3.71	.025
Rural	29.67	10.79				
Small urban	28.81	10.67				
Large urban	28.13	10.53				
Age**			1889.69	2	9.08	.000
11-12	27.74	10.17				
13-14	30.04	10.77				
15-16	29.29	11.15				
Sex			11434.36	1	1109.89	.000
Male	31.04	11.53				
Female	26.62	9.05				
Ethnic group			199.21	4	.48	.751
White	28.88	10.39				
Black	28.59	11.39				
Asian	28.11	11.22				
Mixed White/Black	30.43	11.05				
Mixed White/Asian	28.06	9.54				
Age x sex***			941.43	2	4.52	.011

* Statistical significance laid between the means for rural and large urban areas.

** Statistical significance laid between the 11-12 and the 13-14 year old age groups.

*** See Figure 1 and Table 9.

Higher mean scores represent more frequent performance of dangerous playing in the road.

main effects of age and sex with respect to this type of behaviour ($F(2, 2173) = 9.080, p < .001$ and $F(2, 2173) = 109.887, p < .001$ respectively). Males reported carrying out this type of behaviour more often than did females. Post hoc analysis of the age effect showed that 13-14 year olds reported a significantly greater frequency of this type of behaviour than did 11-12 year olds ($p < .001$). There was no statistically significant difference between 15-16 year olds and the other two age groups. A statistically significant main effect of area was also found for dangerous playing in the road - although this effect was not as marked as the main effects of age and sex ($F(2, 2173) = 3.712, p < .05$). Post hoc analysis showed that there was a statistically significant difference between respondents from schools in rural and large urban areas ($p < .05$); respondents from schools in rural areas reported carrying out this kind of behaviour more often than did respondents from schools in large urban areas.

As well as main effects of age and sex, there was also a significant age \times sex interaction effect ($F(2, 2173) = 4.524, p < .05$). Post hoc analysis revealed that although there were statistically significant differences between male and female respondents at each level of age, the age effect only applied to male respondents. For female respondents, there were no statistically significant differences in reported frequency of dangerous playing in the road between the age groups. However, 13-14 year old males reported carrying out this type of behaviour significantly more often than did 11-12 year old males ($p < .001$). There were no differences between 15-16 year old males and males from the other two age groups. The age \times sex interaction effect is plotted in Figure 1 and the means and standard deviations relating to this effect are shown in Table 9.

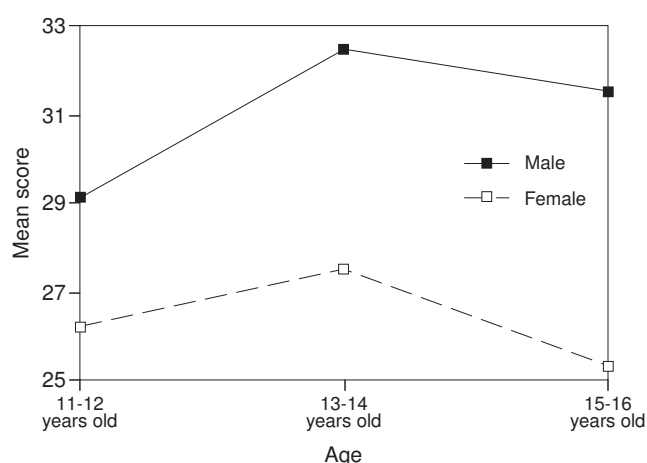


Figure 1 Age \times sex interaction for dangerous playing in the road behaviour

4.4.3 Planned protective behaviour

With respect to behaviour factor scale scores for planned protective behaviour (see Table 10), statistically significant main effects of area ($F(2, 2166) = 8.964, p < .001$), age ($F(2, 2166) = 71.478, p < .001$), and sex ($F(1, 2166) = 21.443,$

Table 9 Age \times sex interaction for behaviour factor 2 (Dangerous playing in the road): means and standard deviations

Age \times sex	Mean	SD
11-12 year old males	29.13	10.76
13-14 year old males	32.48	11.83
15-16 year old males	31.54	11.64
11-12 year old females	26.19	9.17
13-14 year old females	27.52	8.93
15-16 year old females	25.36	7.85

Table 10 ANOVA analysis: Factor 3 (Planned protective behaviour) (N=2166)

Variable	Mean	SD	Sum of squares	df	F	p
Area*			1006.87	2	8.96	.000
Rural	29.32	8.19				
Small urban	27.83	7.60				
Large urban	28.16	7.42				
Age**			8029.04	2	71.48	.000
11-12	30.91	8.38				
13-14	27.25	7.34				
15-16	26.75	6.72				
Sex			1204.31	1	21.44	.000
Male	27.78	7.70				
Female	29.21	7.85				
Ethnic group***			695.94	4	3.10	.015
White	28.74	7.87				
Black	26.06	6.43				
Asian	27.84	7.95				
Mixed White/Black	27.32	8.16				
Mixed White/Asian	26.72	7.81				
Area \times sex****			470.16	2	4.19	.015

* Statistical significance laid between the mean for rural areas and the means for small and large urban areas. Mean difference between small urban areas and large urban areas was not statistically significant.

** Statistical significance laid between the 11-12 age group and the 13-14 and 15-16 age groups. Mean difference between 13-14 and 15-16 age groups was not statistically significant.

*** Statistical significance laid between means for white and black ethnic groups. Mean differences between all other groups were not statistically significant.

**** See Figure 2 and Table 11.

Higher mean scores represent more frequent performance of planned protective behaviour.

$p < .001$) were found. Post hoc analyses showed that respondents from schools in rural areas reported carrying out this type of behaviour significantly more often than did respondents from schools in small urban areas ($p < .001$) or large urban areas ($p < .01$). There was no statistically significant difference between respondents from small urban schools and respondents from large urban schools ($p = .86$). For age, 11-12 year olds reported planned protective behaviours significantly more often than did 13-14 year olds or 15-16 year olds ($p < .001$ in both cases). There was no significant difference between

13-14 and 15-16 year olds ($p=.28$). An inspection of the means for sex, showed that the direction of the significant main effect was such that female respondents reported planned protective behaviours more often than did male respondents.

There was also a statistically significant main effect of ethnic group for planned protective behaviour, although this effect was not as pronounced as the main effects of area, age and sex ($F(4, 2166) = 3.098, p<.05$). Post hoc analysis showed that within the ethnic group variable there was a statistically significant difference only between respondents from the white and black ethnic groups ($p<.05$), with people from the black ethnic group reporting carrying out planned protective behaviours less often than people from the white ethnic group.

Finally, there was a statistically significant area \times sex interaction effect for planned protective behaviours ($F(2, 2166) = 4.186, p<.05$). Post hoc analysis showed that in rural and small urban schools female respondents reported carrying out this type of behaviour significantly more often than did male respondents ($p<.05$ and $p<.001$ for rural and small urban schools respectively). However, for schools in large urban areas there was no statistically significant difference between the genders ($p=.99$). This interaction effect is plotted in Figure 2 and the means and standard deviations relating to this effect are shown in Table 11.

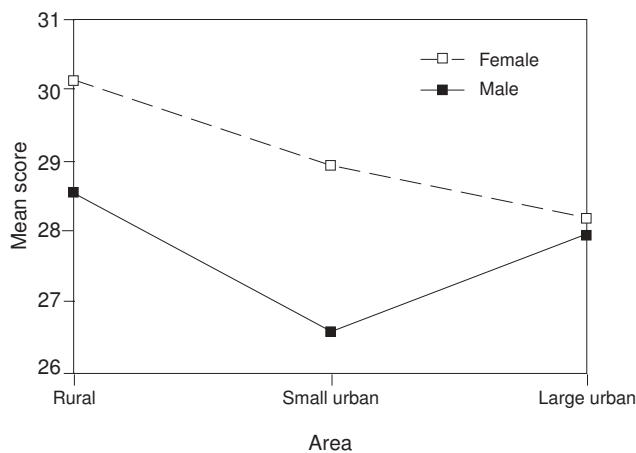


Figure 2 Area \times sex interaction for planned protective behaviour

Table 11 Area \times sex interaction for behaviour factor 3 (Planned protective behaviour): means and standard deviations

Area * sex	Mean	SD
Rural males	28.55	8.06
Rural females	30.13	8.25
Small urban males	26.58	7.39
Small urban females	28.93	7.59
Large urban males	27.94	7.39
Large urban females	28.19	7.57

4.5 Predictors of behaviour factor scale scores

Stepwise multiple regressions were carried out using the behaviour factor scale scores described above (see Section 4.3.1) to establish the independent predictors of:

- 1 Unsafe road crossing behaviour,
- 2 Dangerous playing in the road, and
- 3 Planned protective behaviour.

The following independent variables were used in these analyses:

- 1 'Responsibility beliefs' and 'deflecting responsibility beliefs' (see Section 4.3.2).
- 2 The general exposure items from Section 1 of the questionnaire. In these analyses an overall measure of general exposure was used, and was produced by summing the scores for the three general exposure items - frequency of 'going out' on a bike, on a skateboard (or roller-skates/roller-blades) and on foot.
- 3 The type of accompaniment items from Section 1 of the questionnaire - accompaniment by 'friends', 'adults' and 'on your own'.
- 4 Demographic variables - age, sex, ethnic group and area. As required by these analyses, these variables were coded as dummy variables.

Correlation coefficients between the behaviour, belief and exposure variables used in the regression analyses, presented below, are provided in Appendix F.

4.5.1 Unsafe road crossing behaviour

The results of the regression analysis using the unsafe road crossing behaviour factor scale scores are summarised in Table 12. In this analysis responsibility beliefs were by far the strongest predictors of unsafe road crossing behaviour ($\beta = -.59; p<.001$). The negative beta weight indicated that respondents who thought they behaved 'responsibly' as road users reported carrying out unsafe road crossing behaviours less often than did respondents who thought they did not behave responsibly. This suggests that with respect to unsafe road crossing, adolescents have a realistic perception about the safety of their behaviour.

Table 12 Predictors of Factor 1 (Unsafe road crossing behaviour) (N=2004)

Variable	Beta	t	p
Responsibility beliefs	-.59	-35.66	.000
Accompaniment by friends	.16	9.11	.000
Age (11-12 versus 13-16)	.14	7.13	.000
How often on your own?	.07	4.14	.000
Accompaniment by adults	-.04	-2.60	.009
Overall exposure	.05	2.73	.006
Age (15-16 versus 11-13)	-.04	-2.19	.028

The above variables accounted for 48% of the variance

Accompaniment by friends and age (11-12 versus 13-16) were respectively the next most strongly associated variables with unsafe road crossing behaviour ($\beta = .16$; $p < .001$ and $\beta = .14$; $p < .001$, respectively). Respondents who reported going out around roads with friends more often also reported carrying out unsafe road crossing behaviours more often. For age, these results supported the findings from the ANOVA analysis reported above (see Section 4.4.1), with 13-14 and 15-16 year olds reporting carrying out this type of behaviour more often than 11-12 year olds.

The next three variables most strongly associated with unsafe road crossing were: 'how often on your own?' ($\beta = .07$; $p < .001$); accompaniment by adults ($\beta = -.04$; $p < .001$); and overall exposure ($\beta = -.05$; $p < .01$). As one would expect, these results indicated that respondents reporting a greater frequency of unsafe road crossing also reported going out around roads more often on their own, reported going out around roads less often with adults, and had a greater overall level of exposure.

Finally, the variable age (15-16 versus 11-13) was a statistically significant predictor of unsafe road crossing - although it was less strongly associated with this type of behaviour than the other variables reported above ($\beta = -.04$; $p < .05$). The direction of this relationship was such that 15-16 year olds reported carrying out this type of behaviour more often than 11-12 year olds, or 13-14 year olds. Given that no difference was found between 13-14 and 15-16 year olds for this type of behaviour in the ANOVA analysis reported above, this finding probably reflects the difference between 11-12 and 15-16 year olds in their reported frequency of unsafe road crossing behaviour.

4.5.2 Dangerous playing in the road

Table 13 shows the results of the regression analysis for dangerous playing in the road. As was the case with unsafe road crossing behaviour, responsibility beliefs were the strongest predictor variables ($\beta = -.58$; $p < .001$). The direction of the relationship indicated that respondents had a realistic perception of their behaviour as road users - i.e. the more often respondents reported dangerous playing in the road, the less safe and less responsible they thought their behaviour was.

Table 13 Predictors of Factor 2 (Dangerous playing in the road) (N=2087)

Variable	Beta	t	p
Responsibility beliefs	-.58	-35.49	.000
Overall exposure	.23	13.93	.000
Accompaniment by friends	.10	5.81	.000
Age (11-12 versus 13-16)	.06	3.66	.000
Area (rural versus non-rural)	-.05	-2.85	.004
Accompaniment by adults	-.04	-2.42	.02
Deflecting responsibility beliefs	.04	2.32	.02

The above variables accounted for 48% of the variance

Overall exposure was the second strongest predictor of dangerous playing in the road ($\beta = .23$; $p < .001$). Greater exposure to the road environment was associated with

more frequent performance of this type of behaviour. Also, the more often respondents reported being accompanied by friends, the more frequently they reported carrying out dangerous playing in the road ($\beta = .10$; $p < .001$). This is perhaps unsurprising given that almost all the items used to produce the dangerous playing in the road behaviour scale were related to behaviours which either explicitly or implicitly involve social interaction.

The dummy variables age (11-12 versus 13-16) and area (rural versus non-rural) were the next strongest predictor variables ($\beta = .06$; $p < .001$ and $\beta = -.05$; $p < .001$ respectively). For the age variable, 11-12 year olds reported carrying out dangerous playing in the road behaviours less often than did 13-16 year olds. With respect to the dummy area variable, respondents from rural schools reported carrying out this type of behaviour more often than did respondents from urban schools. These findings are likely to reflect the differences in factor scores for dangerous playing in the road between 11-12 and 13-14 year olds, and between respondents from rural and small urban schools respectively (see ANOVA analysis reported above - Section 4.4.2).

Also associated with dangerous playing in the road - although less strongly than those variables reported above - were accompaniment by adults ($\beta = -.04$; $p < .05$) and deflecting responsibility beliefs ($\beta = .04$; $p < .05$). Unsurprisingly, the more often respondents reported being accompanied by adults, the less often they reported carrying out dangerous playing in the road. Also, as one would expect, respondents who reported dangerous playing in the road more often had more strongly held beliefs that people other than themselves should be responsible for their safety.

4.5.3 Planned protective behaviour

Table 14 shows the results of the regression analysis for planned protective behaviour. Once again, responsibility beliefs were the strongest predictor variables ($\beta = .42$; $p < .001$) and respondents who reported a greater frequency of planned protective behaviour believed that they were more safe and more responsible than did respondents who reported a lower frequency of planned protective behaviour. As with the results for unsafe road crossing and dangerous playing in the road, this result suggests that respondents had a realistic perception about the safety of their behaviour as road users.

Table 14 Predictors of Factor 3 (Planned protective behaviour) (N=2071)

Variable	Beta	t	p
Responsibility beliefs	.42	22.17	.000
Age (11-12 versus 13-16)	-.18	-9.39	.000
Accompaniment by adults	.15	7.69	.000
Area (rural versus non-rural)	-.09	-4.78	.000
Overall exposure	.08	4.29	.000
Accompaniment by friends	-.06	-2.96	.003
Ethnic group (black versus non-black)	.05	2.64	.008

The above variables accounted for 31% of the variance

In line with the findings from the ANOVA analysis for this type of behaviour reported above (see Section 4.4.3), the dummy variables age (11-12 versus 13-16), area (rural versus non-rural), and ethnic group (black versus non-black) were statistically significantly associated with planned protective behaviour ($\beta = -.18$; $p < .001$, $\beta = -.09$; $p < .001$ and $\beta = .05$; $p < .01$, respectively). Respondents in the 11-12 year old age group reported carrying out planned protective behaviours more often than did respondents in the 13-14 or 15-16 year old age groups; respondents from rural schools reported carrying out these behaviours more often than did respondents from small urban or large urban schools; and respondents in the black ethnic group reported carrying out these behaviours less often than did respondent from other ethnic groups (although this last finding is likely to be a result of the statistically significant difference between respondents from white and black ethnic groups - see ANOVA analysis which showed no other differences between ethnic groups).

Finally, as one would expect, the results from this regression analysis showed that respondents who reported carrying out planned protective behaviours more often also reported more often being accompanied by adults ($\beta = .15$; $p < .001$) and reported less often being accompanied by friends ($\beta = -.06$; $p < .01$). Overall exposure was also related to this type of behaviour ($\beta = .08$; $p < .001$), such that people reporting greater exposure also reported a greater frequency of planned protective behaviour.

4.6 Identifying behaviours for future research and policy

To identify which of the 43 behaviours used in the present study may represent the largest problem from a road safety point of view, and thus may need targeting in future research and/or government policy, the following logic was applied.

The behaviours which represent the largest problem from a road safety point of view are those behaviours which:

- 1 *Are most frequently performed within the target population; and*
- 2 *Are the most dangerous.*

In an attempt to identify which behaviours used in the current study might meet this criteria, respondents' frequency ratings for each behaviour item in Section 2 of the questionnaire were multiplied by corresponding danger ratings derived from expert judgements (see Section 3.2.2)¹⁴. The resulting multiplicative terms were then ranked in descending order of mean score. As can be seen from Table 15, the behaviours appearing towards the top of the table (i.e. the behaviours which seem to be the greatest concern based on this analysis) were wearing a cycle helmet when riding a bike, wearing bright/reflective clothing and using lights when riding a bike in the dark, and wearing bright or reflective clothing when out on foot in the dark.

The results presented in Table 15, however, do need to be treated with caution and the potential importance of behaviours appearing further down the table should not be ignored. For instance, the subjectivity of the scores used to compute the multiplicative values, and the fact that there

may be a number of other ways to combine the scores, need to be taken into account when identifying behaviours for future research and/or policy. Also, many of the behaviours which expert judges rated as being among the most dangerous (e.g. playing chicken and hold on to a moving vehicle when riding a bike) appear low down in Table 15 because relative to other behaviours they were not rated as being frequently carried out by respondents. However, these behaviours may be worthy of further research and/or policy attention due to their extremely risky nature and, as noted above, substantial proportions of respondents still reported carrying them out at least some of the time (see Section 4.2). Another point to bear in mind is that some behaviours appearing lower down in the table may be more amenable to being changed than other behaviours appearing higher up the table. Furthermore, the items in Table 15 could be considered as having varying status with some of the behaviours indicating in themselves what remedial action might be taken, but others being much more opaque in this respect¹⁵. Therefore, the information presented in Table 15 should only be used, in conjunction with other sources of road safety knowledge, to guide decisions about which behaviours to target in future research and/or policy.

5 Summary and conclusions

In this study, the behaviour of 11-16 year olds as road users was investigated through the use of a self-completion questionnaire which had been shown in pilot research to be a meaningful and reliable measuring instrument. Factor analysis showed that the 43 behaviour items in the questionnaire were best represented by a 3-factor solution. Further analysis of the three factors - unsafe road crossing behaviour, dangerous playing in the road, and planned protective behaviour - showed that there were statistically significant differences in how often these behaviours were reported to be carried out as a function of demographic variables. This information may be useful for targeting road safety interventions.

As one would expect, younger respondents (11-12 year olds) reported carrying out more desirable road safety behaviour than did older respondents (13-16 year olds) across all three types of behaviour - i.e. they reported carrying out unsafe road crossing and dangerous playing in the road behaviours less often, and planned protective behaviours more often. Also, from a road safety point of view, the reported behaviour of female respondents was more desirable than the reported behaviour of male respondents. However, a statistically significant area \times sex interaction effect for planned protective behaviour suggested that for this type of behaviour the difference between male and females only held for respondents from schools in rural and small urban areas. For respondents from schools in large urban areas, there was no significant difference between the genders.

In the case of dangerous playing in the road an interesting finding was that there was an age \times sex interaction effect. This interaction effect suggested that 13-14 year old males

Table 15 Multiplicative behaviour terms (Respondents frequency ratings * expert danger ratings) ranked in descending order of mean score

<i>Item (How often do you...)</i>	<i>Mean</i>	<i>SD</i>
Not wear a cycle helmet when riding a bike	19.84 (19.41)*	6.99 (7.41)*
Not wear bright or reflective clothing when riding a bike in the dark	18.94 (18.45)*	5.58 (5.76)*
Not use lights on your bike when it is dark	18.93 (17.46)*	9.75 (9.54)*
Not wear bright or reflective clothing when out on foot in the dark	14.43	3.58
Not walk in single file on roads without pavements	12.71	5.06
Get part way across the road and then have to run the rest of the way to avoid traffic	12.70	5.12
See a small gap in traffic and 'go for it'	12.58	6.06
Make traffic slow down or stop to let you cross	11.74	5.97
Run across a road without looking because you are in a hurry	11.35	6.30
Forget to look properly because you are talking to friends who are with you	11.05	4.79
Cross from between parked cars when there is a safer place to cross nearby	10.63	4.65
Cross whether traffic is coming or not, think the traffic should stop for you	10.61	6.45
Forget to look properly because you are thinking about something else	10.57	4.67
Not use a lollipop man / lady where there is one available	10.52	3.21
Not keep looking and listening until you get all the way across the road	10.49	4.84
Not walk facing the traffic when on roads without pavements	10.48	4.07
Cross when you can't see both ways very well (like on a bend or top of hill)	10.38	4.59
Not notice a car pulling out (say from a driveway) and walk in front of it	10.30	4.82
Run into the road to get a ball, without checking for traffic	9.99	5.79
Not look both ways before crossing	9.92	5.51
Cross at a place that is well lit when it is dark	9.84	4.26
Not look because you can't hear any traffic around	9.40	5.09
Cross from behind a stationary vehicle	9.38	4.68
Deliberately run across the road without looking, for a dare	9.07	5.69
Not wear reflective clothing	9.01	1.85
Use a mobile phone and forget to look properly	8.77	4.97
Have to stop quickly or turn back to avoid traffic	8.60	3.92
Run around in a road (e.g. when playing football or bull dog)	8.58	4.96
Not notice an approaching car when playing games in the road	8.35	4.79
Hold on to a moving vehicle when riding a skateboard/roller-skates/roller-blades	8.27 (9.65)*	5.46 (6.51)*
Not bother walking to a nearby crossing to cross the road	8.16	3.65
Hold on to a moving vehicle when riding a bike	8.16 (8.49)*	5.32 (5.66)*
Walk in the road rather than on the pavement	8.16	3.94
Play 'chicken' by deliberately running out in front of traffic	8.13	5.29
Not check to make sure traffic has stopped before using a pedestrian crossing	8.05	4.12
Play 'chicken' by lying down in the road and waiting for cars to come along	7.90	5.20
Climb over barriers that separate the road from the pavement	7.86	4.83
Hang around in the road talking to friends	7.55	4.10
Think it is OK to cross safely, but a car is coming faster than you thought	7.42	3.54
Cross without waiting for the 'green man'	7.37	3.33
Ride out into the road on a skateboard without thinking to check for traffic	7.22 (9.19)*	4.59 (5.56)*
Cross less than an hour after drinking alcohol	6.84	4.68
Ride on a skateboard (or roller-skates/roller-blades) in the road	6.78 (9.72)*	4.63 (5.14)*

* Means and SDs when non-mode users relevant to the item were filtered out of the analysis.

Higher mean scores may represent a greater concern from a road safety point of view.

participated in dangerous playing in the road more frequently than did 11-12 year old males. By age 15-16, the frequency with which this type of behaviour was performed dropped in males, but not by a statistically significant amount. In females, the results suggested that age had a similar effect but it was not statistically significant.

The results of this study also suggested that area had a significant effect on how often dangerous playing in the road and planned protective behaviours were reported to occur. In both cases, respondents from schools in rural areas carried out these behaviours more often than did

respondents from schools in urban areas (although in the case of dangerous playing in the road a statistically significant difference was found only between those respondents from schools in rural areas and those from schools in large urban areas - the difference between respondents from schools in rural areas and those from schools in small urban areas was not statistically significant). For planned protective behaviour, these results are relatively easy to explain. For example, in rural areas (as opposed to urban areas) there is likely to be a greater need for people to carry out many of the planned protective behaviours (e.g. wearing bright or fluorescent

clothing when out in the dark) due to environmental differences (e.g. possibly poorer lighting conditions at night). Another explanation could be that adolescents from rural schools are generally more cautious in their approach to road safety than adolescents from urban schools. However, the finding that children from rural schools reported dangerous playing in the road more frequently than did children from urban schools suggests that this second explanation may not apply. An explanation for the urban-rural difference in dangerous playing in the road may result from such behaviour being perceived as less dangerous in rural (low traffic density) areas than in urban areas. However, from a road safety point of view, it would be unwise to conclude that such behaviour is less important in rural than in urban areas without further evidence on objective risk. Another possible explanation of the urban-rural difference in dangerous playing in the road is that, leaving aside perceptions of danger, in very highly trafficked locations, playing or socialising in the road environment may become difficult and unpleasant.

With respect to the effect of ethnic group on road using behaviour, there was only one statistically significant finding – that respondents from the black ethnic group reported carrying out planned protective behaviours less often than did respondents from the white ethnic group. There were no differences in planned protective behaviour between any of the other ethnic groups, and there were no differences between any ethnic groups in unsafe road crossing or dangerous playing in the road behaviours. These findings suggest that ethnic group is not a good discriminator for detecting differences between adolescents who report carrying out desirable road using behaviour and those who do not.

As well as demographic effects on adolescents' behaviour as road users, it was found in the present study that a number of variables concerned with exposure and the type of people who accompany adolescents as road users were important. Unsurprisingly, overall exposure was related to all three types of behaviour. The more often respondents reported going out as road users, the more often they reported carrying out unsafe road crossing behaviour, dangerous playing in the road, and planned protective behaviour. Also, and perhaps again unsurprisingly, the more often respondents reported going out with friends, the more often they reported carrying out undesirable road using behaviour - i.e. greater frequencies of unsafe road crossing and dangerous playing in the road behaviours, and lesser frequencies of planned protective behaviour. Similarly, the more often respondents reported going out with adults, the more often they reported carrying out desirable road using behaviour - i.e. lesser frequencies of unsafe road crossing and dangerous playing in the road behaviours, and greater frequencies of planned protective behaviour.

Although a number of demographic and exposure variables had an effect on adolescents' road using behaviour, it is perhaps a more interesting finding that respondents' beliefs regarding the safety of their own behaviour were strongly associated with the three behaviour types. The direction of these relationships

suggested that adolescents have an accurate perception about the safety of their own behaviour as road users - i.e. the more often respondents carried out 'unsafe' behaviour as road users, the more unsafe and irresponsible they believed their behaviour to be. On the basis of these results it could be argued that interventions which merely provide adolescent road users with information about the safety of their behaviour might be ineffective in improving their road safety. This is because those adolescents who carry out undesirable behaviour from a road safety point of view already seem to be aware that their behaviour is 'unsafe', but they still do it (or at least report doing it!). Therefore, changing many of the behaviours investigated in the present study is likely to require a much better understanding of why they are carried out. Social cognition models such as the theory of planned behaviour (Ajzen, 1985) seem to offer particularly useful theoretical accounts of social behaviour, and their application to the behaviour of adolescent road users may be beneficial. However, although this approach provides much explanatory information about why certain behaviours may be carried out (through the study of attitudes), a limitation is that these models are behaviour specific, thus allowing only a relatively small number of behaviours to be investigated in any one survey – primarily due to constraints on questionnaire length. It is therefore important to decide which behaviours are the most important targets for future research and the analyses carried out in the present study (Section 4.6) might prove useful in guiding this decision-making process.

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8 Notes

- 1 Defined in terms of a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour (Eagly and Chaiken, 1993).
- 2 There are examples in the published literature of research studies applying social cognition models to adolescents' behaviour as road users. For example, Quine, Rutter and Arnold (1998) studied cycle helmet use among schoolboy cyclists and Evans and Norman (2002) investigated adolescents' decisions to cross a road without walking to a nearby crossing. However, when one considers the potentially large number of road using behaviours this group of road users might carry out, these studies have, as a group, provided only limited knowledge about adolescent road user behaviour. To the authors' knowledge, there have been no attempts to study adolescents' road user attitudes and behaviour as comprehensively as is the case in the current research project.
- 3 Many examples of pedestrian and cyclist behaviour were elicited from the pilot research. It was clear that all these behaviours could not be assessed in the questionnaire without making it too long. It was therefore decided that the questionnaire would cover all examples of pedestrian behaviour elicited from the pilot research, but only those examples of cyclist behaviour specifically selected by the DfT customer. The items included in the questionnaire are described in 3.2.1 of this report.
- 4 The term 'on foot' was used as a generic term to account for the wide range of activities that might be carried out by the target population when they are within the road environment and not on any form of

transport. Respondents were instructed to include activities such as 'going out for a walk' and 'hanging out with friends around roads'. See Section 3.3 for full details about instructions given to respondents.

- 5 The wording 'when out around roads' was carefully chosen following the focus group exercise carried out with children from the target population in the pilot phase of this project. The phrase was used as a general term to convey to respondents the wide range of activities they may carry out as road users (e.g. all pedestrian, cyclist, and 'play' type behaviours which they may engage in within the road environment).
- 6 In this study urban areas were classified as being either large or small based on population data from the 1991 Census. All large urban areas had population sizes of more than 400,000 people and all small urban areas had population sizes of less than 125,000 people.
- 7 The GCSE/GNVQ average point score per 15-year-old is calculated for schools within England each year by dividing the total GCSE/GNVQ points achieved by the number of 15-year-olds. This provides a fuller picture of the GCSE and GNVQ achievements of pupils of all abilities. The most up-to-date figures for this measure at the time of the present study were for 2001. The England average in 2001 was 39.3.
- 8 These data were also subjected to a principal axis factor analysis with direct oblimin rotation, and principal components and maximum likelihood analyses with varimax rotations. Comparable results to those reported in the main body of this report were obtained from these factor analyses.
- 9 Standard procedures for creating composite scales were followed in this study. In all factor analyses reported in this report, items were considered to load on to a factor if their loading value was 0.30 or higher. Following this criterion, only one item - 'walk facing the traffic when on roads without pavements' - did not load on to any of the three factors. This item was therefore not used to produce any of the composite scales described in Section 4.3.1 of this report. Some items loaded on to more than one factor. These items were used to produce each scale corresponding to the factors which they loaded on to. For example, the item 'climb over barriers that separate the road from the pavement' loaded on to factors 1 and 2 and, therefore, it was used to produce each of the scales relating to factors 1 and 2.
- 10 It is reasonable to suggest that most of the items loading on factor 3 can be interpreted in this way. However, it is acknowledged that this interpretation is more difficult for one or two of the items loading on to this factor (e.g. 'look both ways before crossing' and 'keep looking and listening until you get all the way across the road'). However, these items were few in number, they loaded relatively weakly on factor 3, and they also loaded on to other factors.
- 11 As with the factor analyses carried out on the behaviour items in the questionnaire - reported above - the belief/opinion items were also subjected to a principal axis factor analysis with direct oblimin rotation, and principal components and maximum likelihood analyses with varimax rotations. The results obtained from all factor analyses were comparable.
- 12 It should be noted that in each ANOVA analysis carried out there were statistically significant area \times ethnic group interaction effects. Post hoc analysis of these interactions suggested that there were greater differences within the Asian ethnic group as a function of area than there were within other ethnic groups as a function of area. However, these effects were removed from the ANOVA models because extremely small numbers in some cells meant that the validity of these interactions was highly questionable. For example, cross tabulations of area by ethnic group showed that out of the whole sample only 4 respondents ($< .01\%$ of the total sample) were from the Asian ethnic group in rural areas.
- 13 One anonymous reviewer of this report suggested that although some of the behaviours used to produce the unsafe road crossing scale could be construed as 'problematic', others could be construed as 'skilled'. For example, a skilled pedestrian can in some circumstances cross a road safely without walking to a nearby crossing or waiting for the 'green man'. This might explain part of the increase in factor 1 scores with age. The authors acknowledge this point, but also argue that all the items used to produce the unsafe road crossing scale are likely to be tapping the same underlying construct given they were found, in the factor analysis reported in Section 4.3.1, to load on the same factor.
- 14 Respondents frequency ratings for desirable road safety behaviours (e.g. looking both ways before crossing) were re-coded so that high scores on all behaviour items reflected more undesirable behaviour from a road safety point of view. One of the anonymous reviewers of this report suggested that the interpretation of the frequency \times danger multiplicative terms should be treated with care because the salience attached to performing a behaviour (i.e. what the respondents rated for frequency) does not necessarily equate with that attached to not performing it (i.e. what the experts rated for danger). The authors acknowledge this as a valid consideration. Other reasons for caution when considering the frequency \times danger multiplicative data are presented in the main body of this report.
- 15 The authors would like to thank one of the anonymous reviewers of this report for this suggestion.

REF: _____

**PLEASE DO NOT WRITE YOUR NAME
ON THIS QUESTIONNAIRE**



A SURVEY OF YOUNG ROAD USERS

This questionnaire asks you about what you do when you go out around roads. We are interested in what you do if you go out on your bike or on foot, **NOT** what you do when you go out in a motor vehicle. Please answer the questions by filling in the boxes to show your answer. When answering the questions, think about what you do **during term time in the summer**. Think about all occasions including what you do before and after school, on the way to and from school, and at weekends.

PLEASE ANSWER **ALL** OF THE QUESTIONS.
REMEMBER: THIS IS CONFIDENTIAL, YOU CANNOT BE IDENTIFIED!

SECTION 1: WHAT DO YOU DO WHEN YOU GO OUT?

*For each of the following questions, please tick **ONE** box on **EACH** line*

	Never	Less than once a week	1-3 days a week	4-6 days a week	Every day
Q1 If you use a bike, how often do you go out and ride it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q2 How often do you go out and ride a skateboard or roller-skates / blades?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q3 How often do you go out on foot?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q4 When you go out around roads, how often do you do this:

	Never	Less than once a week	1-3 days a week	4-6 days a week	Every day
(a) With adults?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) With friends?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) On my own?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 2: HOW DO YOU ACT WHEN YOU ARE OUT?

*For each of the following questions, please tick **ONE** box on **EACH** line*

Q5 **When crossing a road**, how often do you:

	Never	Hardly ever	Some- times	Fairly often	Very often
(a) Use a lollipop man / lady when there is one available?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Forget to look properly because you are thinking about something else?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Use a mobile phone and forget to look properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Forget to look properly because you are talking to friends who are with you?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Cross whether traffic is coming or not, thinking that the traffic should stop for you?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Not look because you can't hear any traffic around?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Think you have enough time to cross safely, but a car is coming faster than you thought?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Cross less than an hour after drinking alcohol?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) Check to make sure the traffic has completely stopped before you cross at a pedestrian crossing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(j) Climb over barriers or railings that separate the road from the pavement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(k) Wear reflective clothing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(l) Not bother walking to a nearby crossing to cross the road?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For each of the following questions, please tick **ONE** box on **EACH** line

Q6 **When crossing a road**, how often do you:

	Never	Hardly ever	Some- times	Fairly often	Very often
(a) Look both ways before crossing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Keep looking and listening for traffic until you get all the way across the road?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Have to stop quickly or turn back to avoid traffic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Get half way across a road and then have to run the rest of the way to avoid traffic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Cross from between parked cars when there is a safer place to cross nearby?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Cross from behind a stationary vehicle (for instance a bus that has stopped)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Cross without waiting for the "green man" at a pedestrian crossing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Cross when you can't see both ways very well (like on a bend / top of a hill)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) Cross at a place that is well lit when it is dark so that drivers can see you more easily?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(j) Make traffic slow down or stop to let you cross?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(k) See a small gap in the traffic and "go for it"?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(l) Run across a road without looking because you are in a hurry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For each of the following questions, please tick **ONE** box on **EACH** line

Q7 HOW OFTEN DO YOU DO THESE THINGS WHEN YOU ARE OUT?

	Never	Hardly ever	Some- times	Fairly often	Very often
(a) Run around in a road (e.g. when playing football or bull dog)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Not notice an approaching car when playing games in the road?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Play "chicken" by lying down in the road and waiting for cars to come along?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Play "chicken" by deliberately running out in front of traffic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Hold on to a moving vehicle when riding a bike?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Hold on to a moving vehicle when riding a skateboard (or when on roller-skates / roller-blades)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Hang around in the road talking to friends?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Ride on a skateboard (or roller-skates/roller-blades) in the road?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) Ride out into the road on a skateboard (or roller-skates/roller-blades) without thinking to check for traffic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(j) Run into the road to get a ball, without checking for traffic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For each of the following questions, please tick **ONE** box on **EACH** line

Q8 How often do you do these things when you are out?

	Never	Hardly ever	Some- times	Fairly often	Very often
(a) Not notice a car pulling out (say from a driveway) and walk in front of it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(b) Walk in the road rather than on the pavement?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(c) Walk in the road facing the traffic when on roads with no pavements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(d) Deliberately run across the road without looking, for a dare?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(e) Wear bright or reflective clothing when out on foot in the dark?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(f) Walk in single file on roads without pavements?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(g) Wear a cycle helmet when riding a bike?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(h) Wear bright or reflective clothing when riding a bike in the dark?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
(i) Use lights on your bike when it's dark?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 3: YOUR BELIEFS AND OPINIONS

*Indicate how you feel about these statements by ticking **ONE** box on **EACH** line*

		Strongly agree	Agree	Not sure	Disagree	Strongly disagree
Q9	I do things that are risky when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q10	I generally pay a lot of attention to the traffic when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q11	In general, I act responsibly when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q12	I am aware of the dangers around the roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q13	I should be responsible for my own safety when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q14	Motorists should be responsible for my safety when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Q15	Other people should be responsible for my safety when I am out around roads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SECTION 4: INFORMATION ABOUT YOU

*Tick **ONE** box for each of the next three questions*

Q16 How old are you?

11-12 years old ☐

13-14 years old ☐

15-16 years old ☐

Q17 Are you:

Male ☐

Female ☐

Q18 Which of the following best describes you?

White ☐

Black ☐

Asian ☐

Mixed White / Black ☐

Mixed White / Asian ☐

Other (If you tick 'other', please write on this line what best describes your ethnic group: ☐

Appendix B: Expert danger ratings

Table B1 Expert danger ratings: judges' mean dangerousness rating scores

<i>Item</i>	<i>Mean</i>	<i>SD</i>
Play 'chicken' by deliberately running out in front of traffic	6.00	0.00
Hold on to a moving vehicle when riding a bike	6.00	0.00
Hold on to a moving vehicle when riding a skateboard/roller-skates/roller-blades	6.00	0.00
Deliberately run across the road without looking, for a dare	6.00	0.00
Not use lights on your bike when it is dark	6.00	0.00
Play 'chicken' by lying down in the road and waiting for cars to come along	5.83	0.41
Cross whether traffic is coming or not, think the traffic should stop for you	5.33	0.52
Run into the road to get a ball, without checking for traffic	5.33	0.52
Not look both ways before crossing	5.17	0.75
Run across a road without looking because you are in a hurry	5.17	0.98
Not wear a cycle helmet when riding a bike	5.00	0.89
Make traffic slow down or stop to let you cross	4.83	0.98
Ride out into the road on a skateboard without thinking to check for traffic	4.83	0.98
See a small gap in traffic and 'go for it'	4.67	0.82
Not notice a car pulling out (say from a driveway) and walk in front of it	4.67	0.82
Get part way across the road and then have to run the rest of the way to avoid traffic	4.50	1.38
Not wear bright or reflective clothing when riding a bike in the dark	4.50	1.38
Forget to look properly because you are thinking about something else	4.33	0.82
Use a mobile phone and forget to look properly	4.33	0.82
Not notice an approaching car when playing games in the road	4.33	0.82
Forget to look properly because you are talking to friends who are with you	4.17	0.98
Not look because you can't hear any traffic around	4.17	0.41
Cross when you can't see both ways very well (like on a bend or top of hill)	4.17	1.17
Climb over barriers that separate the road from the pavement	4.00	1.41
Cross from between parked cars when there is a safer place to cross nearby	4.00	1.10
Cross from behind a stationary vehicle	4.00	1.26
Not keep looking and listening until you get all the way across the road	3.83	1.17
Run around in a road (e.g. when playing football or bull dog)	3.83	1.17
Cross less than an hour after drinking alcohol	3.67	1.37
Have to stop quickly or turn back to avoid traffic	3.67	1.21
Not cross at a place that is well lit when it is dark	3.67	0.82
Ride on a skateboard (or roller-skates/roller-blades) in the road	3.67	0.82
Walk in the road rather than on the pavement	3.67	0.82
Not walk in single file on roads without pavements	3.67	0.82
Hang around in the road talking to friends	3.33	1.21
Not wear bright or reflective clothing when out on foot in the dark	3.33	1.03
Think you have enough time to cross safely, but a car is coming faster than you thought	3.17	0.75
Check to make sure traffic has stopped before using a pedestrian crossing	3.17	0.75
Not bother walking to a nearby crossing to cross the road	3.00	1.26
Not walk facing the traffic when on roads without pavements	3.00	0.89
Not use a lollipop man / lady where there is one available	2.67	1.03
Cross without waiting for the 'green man'	2.67	0.82
Not wear reflective clothing	2.00	0.89

Higher mean scores represent higher danger ratings



TRANSPORT RESEARCH LABORATORY

A SURVEY OF YOUNG ROAD USERS

NOTE FOR TEACHERS TO DELIVER THE QUESTIONNAIRE

Thank you for agreeing to administer this questionnaire to your pupils.

The questionnaire contains a number of questions that we would like pupils to answer to help us collect information about their behaviour on the roads. This information is important to design more effective road safety interventions to reduce road accidents involving young people.

Before your pupils start to answer the questionnaire, please give them the instructions in the box below:

Researchers from the Transport Research Laboratory (TRL) are carrying out a national survey into what young people do when they are out around the roads. They are interested in what you do if you go out:

- On a bike,
- On a skateboard,
- On roller skates / roller blades, and
- On foot.

The term 'on foot' means being outside when not on any form of transport. This includes activities such as going out for a walk, walking to somewhere (e.g. the shops or a friends house), simply wandering around outside, or hanging out with friends around roads.

This questionnaire is **NOT** concerned with what you do when you go out in a motor vehicle (e.g. when you are a passenger in a car, or on a scooter or moped, and so on), so please do not think about these things when answering the questions.

Answer **ALL** of the questions in the questionnaire by filling in the boxes to show your answer. Please do not talk to other people about your answers. The answers you give should be your own, based on what you actually think and what you actually do.

When answering these questions, **please think about what you do during term time in the summer**. Please think about all occasions including:

- Before and after school,
- On the way to and from school, and
- At weekends.

To help you complete the questionnaire here is an example of a question and how to answer it.

One of the questions might be:

"When crossing a road, how often do you use a lollipop man/lady when there is one available?"

For this question you would be presented with 5 possible options to choose from. These would be:

- *Never*
- *Hardly ever*
- *Sometimes*
- *Fairly often*
- *Very often*

If you never use a lollipop man/lady to cross the road when there is one available you would tick the "never" box. If you only rarely use a lollipop man/lady when there is one available, you would tick the "hardly ever" box. And so on...

All questions in this questionnaire are like this. The options that you can choose from to answer the questions do change, but the questions should be answered in a similar way to that shown in this example.

Please do not worry about other people knowing your answers. This questionnaire is confidential. You will **NOT** be asked to write your name anywhere on the questionnaire. The information you give will not be used to identify you.

EXAMPLE QUESTION

Please tick ONE box

When crossing a road, how often do you look both ways before crossing?

Never	Hardly ever	Sometimes	Fairly often	Very often
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Tick the box underneath "NEVER" if you never look both ways before crossing.

Tick the box underneath "HARDLY EVER" if you only rarely look both ways before crossing.

Tick the box underneath "SOMETIMES" if you sometimes look both ways before crossing and sometimes don't.

Tick the box underneath "FAIRLY OFTEN" if you look both ways before crossing quite often but not all the time.

Tick the box underneath "VERY OFTEN" if you look both ways before crossing nearly all the time.

Appendix E: Distribution of sample across 43 behaviour items

Table E1 Distribution of responses across 43 behaviour items

Item ('When crossing a road, how often do you...')	Percent				
	Never	Hardly ever	Some -times	Fairly often	Very often
Use a lollipop man / lady when there is one available?	44.6	23.4	19.4	6.7	6.0
Forget to look properly because thinking about something else?	21.3	32.6	32.3	8.6	5.3
Use a mobile phone and forget to look properly?	43.6	26.6	18.2	7.1	4.6
Forget to look properly because talking to friends?	18.2	27.0	34.0	13.0	7.8
Cross whether traffic is coming or not, thinking that the traffic should stop for you?	48.3	23.3	15.9	6.1	6.4
Not look because you can't hear any traffic around?	35.1	27.3	21.5	9.2	6.9
Think you have enough time to cross safely, but a car is coming faster than you thought?	26.5	32.4	27.0	8.8	5.2
Cross less than an hour after drinking alcohol?	60.1	14.5	11.9	5.7	7.7
Check to make sure the traffic has completely stopped before you cross at a pedestrian crossing?	10.0	14.3	22.8	25.2	27.6
Climb over barriers or railings that separate the road from the pavement?	50.6	20.4	16.7	6.4	5.9
Not bother walking to a nearby crossing?	18.7	25.5	31.6	13.8	10.5
Look both ways before crossing?	2.8	6.6	16.8	27.5	46.4
Keep looking and listening until you get all the way across the road?	9.9	19.4	26.5	23.0	21.2
Have to stop quickly or turn back to avoid traffic?	23.3	36.6	27.5	7.8	4.9
Get part way across a road and then have to run the rest of the way?	14.2	23.6	36.8	16.6	8.8
Cross from between parked cars when there is a safer place to cross?	18.8	26.1	33.8	13.2	8.1
Cross from behind a stationary vehicle (e.g. a bus that has stopped)?	29.6	27.5	27.9	8.8	6.2
Cross without waiting for the 'green man' at a pedestrian crossing?	20.36	21.2	31.4	16.4	10.7
Cross when you can't see both ways very well (e.g. on a bend/top of a hill)?	20.5	31.8	31.9	9.9	5.9
Cross at a place that is well lit when it is dark so drivers can see you?	7.8	15.0	32.7	26.4	18.1
Make traffic slow down or stop to let you cross?	28.4	27.2	25.9	9.9	8.6
See a small gap in the traffic and 'go for it'?	22.2	24.8	26.9	13.5	12.6
Run across a road without looking because you are in a hurry?	37.2	27.8	20.9	6.7	7.5
Wear reflective clothing?	71.3	15.0	8.9	2.4	2.4
Run around in a road (e.g. when playing football or bulldog)?	39.8	22.4	20.7	8.3	8.8
Not notice an approaching car when playing games in the road?	46.7	27.8	15.7	5.5	4.3
Play 'chicken' by lying down in the road in front of cars?	82.1	8.0	5.1	1.9	2.9
Play 'chicken' by deliberately running out in front of traffic?	81.7	8.6	5.1	2.0	2.7
Hold on to a moving vehicle when riding a bike?	81.8	7.9	5.4	2.3	2.6
	(79.0)*	(9.2)*	(6.1)*	(2.7)*	(3.0)*
Hold on to a moving vehicle when riding a skateboard (or roller-skates/roller-blades)?	81.0	7.9	6.1	2.1	2.9
	(69.0)*	(13.8)*	(8.9)*	(4.0)*	(4.3)*
Hang around in the road talking to friends?	34.8	27.5	21.7	8.4	7.6
Ride on a skateboard (or roller-skates/roller-blades) in the road?	61.1	13.1	12.9	5.6	7.2
	(28.3)*	(21.2)*	(23.0)*	(12.1)*	(15.4)*
Ride out into the road on a skateboard (or roller-skates/roller-blades) without thinking to check for traffic?	72.1	14.7	7.5	2.9	2.7
	(50.2)*	(25.5)*	(13.5)*	(5.6)*	(5.2)*
Run into the road to get a ball, without checking for traffic?	48.8	28.1	14.6	4.1	4.4
Not notice a car pulling out (say from a driveway) and walk in front of it?	27.2	38.9	24.4	5.3	4.2
Walk in the road rather than on the pavement?	28.8	35.5	24.8	6.4	4.6
Walk in the road facing the traffic when on roads with no pavements?	31.5	22.0	22.8	11.4	12.3
Deliberately run across the road without looking, for a dare?	69.8	17.6	7.3	2.2	3.1
Wear bright or reflective clothing when out on foot in the dark?	63.9	17.6	10.5	4.1	4.0
Walk in single file on roads without pavements?	32.2	20.0	22.0	13.4	12.4
Wear a cycle helmet when riding a bike?	55.5	15.2	11.3	6.6	11.4
	(51.2)*	(17.0)*	(12.7)*	(7.4)*	(11.8)*
Wear bright or reflective clothing when riding a bike in the dark?	63.5	13.1	10.9	5.8	6.7
	(58.2)*	(15.4)*	(12.1)*	(6.8)*	(7.5)*
Use lights on your bike when it's dark?	33.7	12.8	15.7	10.8	26.9
	(25.8)*	(13.9)*	(16.9)*	(12.4)*	(31.0)*

* Distributions when non-mode users relevant to the item were filtered out of the analysis

Appendix F: Correlation coefficients between all variables used in the study

Table F1 Correlation coefficients between the behaviour, belief and exposure variables used in the study

	1	2	3	4	5	6	7	8	9
1 Unsafe road crossing behaviour	–	.82 [†]	-.51 [†]	-.63 [†]	.10 [†]	.12 [†]	-.17 [†]	.29 [†]	.10 [†]
2 Dangerous playing in the road		–	-.37 [†]	-.62 [†]	.12 [†]	.29 [†]	-.13 [†]	.23 [†]	.06*
3 Planned protective behaviour			–	.44 [†]	-.07 [†]	.07 [†]	.23 [†]	-.17 [†]	-.03
4 Responsibility beliefs				–	-.12	-.09 [†]	.14 [†]	.16 [†]	.01
5 Deflecting responsibility beliefs					–	.00	-.01	.04	-.01
6 Overall general exposure						–	.02	.22 [†]	.11 [†]
7 Accompaniment item 1 ('how often do you go out with adults?')							–	.06*	-.04
8 Accompaniment item 2 ('how often do you go out with friends?')								–	.09 [†]
9 Accompaniment item 3 ('how often do you go out on your own?')									–

* $p < .01$

[†] $p < .001$

Abstract

This study was carried out to investigate the safety related behaviour of road users aged 11-16. A self-completion questionnaire was designed to measure the frequency with which children from the target population carry out 43 different road using behaviours and a number of other variables including children's beliefs about the safety of their own road using behaviour. Two thousand four hundred and thirty three children from eleven secondary schools within England completed the questionnaire in lesson time at school. Factor analysis showed that scores on the 43 behaviour items were best represented by a three-factor solution. The three factors were named unsafe road crossing behaviour, dangerous playing in the road, and planned protective behaviour. Analysis of variance and stepwise multiple regression analyses showed that demographic variables and exposure variables had statistically significant effects on how often these behaviours were carried out. More interesting was the finding that respondents had realistic perceptions of their own behaviour as road users. The more respondents believed their road using behaviour to be unsafe and irresponsible, the more often they reported carrying out road using behaviour that was undesirable from a road safety point of view. These results and their implications for road safety interventions and further research are discussed.

Related publications

TRL542 *In-depth accident causation study of young drivers* by D D Clarke, P Ward and W Truman.
2002 (price £25, code AX)

SR295 *The psychology of children in traffic* by K Russam. 1977 (price £20)

CT45.3 Child safety on the road update (1998-2001) *Current Topics in Transport: selected abstracts from TRL Library's database* (price £20)

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