FINAL REPORT

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Canberra

on the

Seeding Grant:

Predicting Young People's Traffic Risk-Taking

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Predicting Young People's Traffic Risk-Taking

SECTION 1

RATIONALE FOR THIS RESEARCH

Accidental injuries are the leading cause of death among children age 2 through 14 years in Australia (Australian Bureau of Statistics, 1989) and other industrialized nations (Langley, Silvat Williams, 1987). Furthermore, in Australia, road accidents presently constitute the major cause of accidental death among children over the age of 4 years. According to recent figures released by the Australian Bureau of Statistics (1989), 67 percent of deaths by children aged 5 through 9 years were due road accidents. Between the ages of 10 and 14 years, road accidents caused 63 percent of all deaths, while in the 15-to 19-year-old age group 63 percent of deaths were due to road accidents, while 65 percent were caused by transport accidents (road, rail and air combined).

These figures highlight the need for improved road safety to curtail this unfortunate cause of death among Australian children and teenagers. The main aim of the present series of research studies was to explore how parental behavioural and attitudinal factors, in conjunction with children's own age, gender, and personality dispositions, might assist in the prediction of vulnerability to road accidents.

Funded by a Seeding Grant from the Federal Office of Road Safety, these three studies were designed as pilot studies for a larger project. By identifying promising measures and directions of association among key variables, the goal was to outline research directions to be followed in a larger-scale project. This report provides a detailed description of the

results of the three separate experimental studies into which the present Seeding Grant project is divided. This is followed by a brief discussion of the implications of the results of this research for the further investigations that are needed before final recommendations about practical strategies for, (a) teaching road safety skills to children, and (b) assisting parents to reduce their children's risk of accidental road injury, can be made with confidence.

SECTION 2

OVERVIEW OF THIS PROJECT

The major aims of this research project were threefold:

(1) To develop and validate measures of children's road-safety attitudes, knowledge and behaviour suitable for use in Australia with primary - school pupils ranging in age from 7 through 13 years.

(2) To begin to empirically examine the validity of Lipsitt's (1990) proposal that a generalized disposition to take risks may form the basis for longterm continuity in individual patterns of vulnerability to accidental injury, along with exploration of how such variables as gender, age, knowledge of road rules and personality (including locus-of-control for health and accidents and a disposition to seek sensation) may mediate children's tendencies to take risks in road-safety situations.

(3) To begin to explore parents' strategies for teaching road safety skills to their children along with an examination of possible links between parents' own personality dispositions (including their feelings of

personal control over their own health and accident risk) and selected dispositional and behavioural outcomes in their children.

Due to the set of largely accidental factors that governed final selection of samples of subjects for this research (for details see Peterson (1992) and the Method section of Study 1 of this report), it was decided to reorganize the goals of this project into three sequential phases. Thus it is convenient to report the results of this project as three separate studies, each with a different emphasis upon the three major goals outlined above. In overview, Study 1 is primarily concerned with instrument development (Goal 1) and secondarily with parental predictors of children's road-related attitudes and behaviour (Goal 3). Study 2 follows up several of the interesting parent-child connections suggested by the results of Study 1, and is therefore primarily concerned with Goal 3. Finally, Study 3 continues the task of refining the child measures (Goal 1) while also, on the basis of a revised and improved set of scales, undertaking preliminary exploration of how children's personality dispositions, gender, age, and other background factors may assist in the prediction of the child's traffic safety versus risk-taking behaviour (Goal 2).

The aims, methods and major results of each of these studies are outlined in the next three sections of this report.

SECTION 3

STUDY 1

As explained above, the main aims of Study 1 included (a) the selection and development of a set of instruments to measure child's road-related attitudes, knowledge and behaviour and (b) the preliminary assessment of parental predictors of children's tendencies to take versus avoid risks in potentially hazardous traffic situations.

Method

Sample Selection:

Once approval to proceed with this research project was obtained from the Research Services Section of the University of Queensland on 20th August 1991, immediate approaches were made to the relevant educational authorities for permission to contact school principals to explore their interest in participating in this project. Following approval by the Head Office of the Catholic Education Commission in September, the principal of a Catholic primary school located in a predominantly middle-class suburb of Brisbane was contacted. Thanks to his keen interest in the project, permission requests to parents went out almost immediately, and the testing of the first groups of children began early in Term 4 of 1991.

However, because of the lengthy period of time needed to complete the individual open-ended interviews with the youngest subjects, we were not able to send out letters requesting parental volunteers for the adult survey until very late in the 1991 school year.

As a consequence, the final sample of matched parent-child

pairs was smaller than initially anticipated. Furthermore, it was found to contain an uneven balance of the sexes, with nearly twice as many girls as boys. The fact that a similar sex imbalance applied to enrolments throughout the school as a whole indicates that there was no particular gender bias in subjects' survey completion patterns or parental volunteering decisions. However, the fact that we ended up with only 27 males in the final sample motivated the decision to use Study 1 primary to test hypotheses regard parent-child links in road safety attitudes and behaviour while reserving the testing of age and sex difference patterns in children's road-related attitudes and knowledge for Study 3.

In the end, the final sample taking part in Study 1 had the following characteristics.

Subjects

A total of 147 respondents participated in Study 1. Of these, 77 were primary school pupils at a Catholic private school ranging in age from 6 through 13 years, and 70 were the parents of these children, who volunteered to complete confidential survey of parental strategies for teaching road safety skills to children after their offspring had completed the interview or questionnaire at school.

The age and sex distributions of children from each grade level in the final sample are shown in Table 1.1, along with the percentages of their fathers and mothers who completed the matching parental questionnaire. (Replies from only one of the child's two parents were sought, and it was left up to the parents themselves whether father or mother should provide the answers).

Table 1.1

Distribution of Child Subjects by Grade, Sex, Age Group and Sex of Parent Participating in Study 1

Grade in School	Age range	Percent (n): BOYS	GIRLS	Total number of Children	Percent (n): FATHERS	MOTHERS	Total number of Parents
GRADE 2	6 to 7 years	68%* (13)	32% (6)	19	12% (2)	88% (14)	16
GRADE 3	8 to 9 years	44% (4)	56% (5)	9	38% (3)	62% (5)	8
GRADE 4	8 to 9 years	38% (6)	62% (10)	16	31% (5)	69% (11)	16
GRADE 5	9 to 10 years	27% (3)	73% (8)	11	30% (3)	70% (7)	10
GRADE 6	10 to 11 years	17% (2)	83% (10)	12	33% (4)	67% (8)	12
GRADE 7	12 to 13 years	0% (0)	100% (10)	10	25% (2)	75% (6)	8

Procedure:

Children completed the response measures either orally in individual interviews (Grade 2) or in writing in class groups under the supervision of their class teacher and a male experimenter. Parents were instructed to complete the written questionnaires individually. To protect confidentiality, their completed questionnaires were mailed back to the university in postage-paid envelopes marked only with a code name to enable matching to their child's questionnaire.

Measures

The parents completed Campos, Lyman and Prentice-Dunn's (1986) Locus-of-Control Scale for Parenting (PLOC), Montag and Comfrey's (1987) "DES" scale of external attribution for their own involvement (as drivers) in motor vehicle accidents (see Table 2.1 of Study 2 for details of this measure), and two instruments developed especially for this research. These

were (a) a scale assessing the parent's feelings of locus of control for their children's vulnerability to accidents (SPLCCA), and (b) a set of items assessing how worried the parent felt about his or her child(ren)'s safety in each of the following situation of potential everyday risk:

1. As a pedestrian
2. On a bicycle
3. As a passenger in a motor vehicle
4. When playing sport
5. When swimming
6. Safety at home from poisons, falls, burns, etc.

Table 1.2 shows the individual items that formed the SPLCCA (Scale of Parental Locus of Control for Children's Accidents). Responses options ranged from 1 for "strongly disagree" to 6 for "strongly agree" and all items were scored in the external direction so that total externally scores could range from a low of 10 to a high of 50. The scale was found to have satisfactory internal consistency (Cronbach's alpha = .67).

Table 1.2

Items from the SPLCCA (Scale of Parents Locus-of-Control for their Children's Accidents

1. A child's good health and safety is largely a matter of good fortune.
2. When a child gets hurt, it's generally because of something the parent has done or has failed to do.
3. If parents take good care of their children, accidental injuries can be avoided.
4. No matter what parents do, if children are going to

get into accidents, they will get into accidents.

5. As a parent, I am directly responsible for my child(ren)'s health and safety.
6. Children who never have accidents are just plain lucky.
7. Children's injuries usually result from parents' carelessness.
8. There are so many dangerous situations in a child's life that parents can never protect them completely from the risk of accidental injury.
9. As a parent, there are many things I can do to keep my child from getting injured accidentally.
10. When my child gets hurt, I know it is because I have not been taking the proper precautions or teaching safety skills correctly.

Children's Measures. The youngest (Grade 2) children completed the open-ended measure of Knowledge of Road Rules that appears as Appendix A to this report. Using their replies as a guide for constructing response alternatives, a multiple-choice version of the same set of questions about road rules was then created and administered (along with the pictures in Appendix A) to the older groups in questionnaire format. However, preliminary analysis revealed inadequate internal consistency of the multiple-choice form of the test. Therefore, a revised version was constructed as described in detail in SECTION 5 of this report. The final versions of the other measures in the Study, children's response booklets, Road Risk-Taking and General Risk-Taking, are also described in detail in SECTION 5.

Results and Discussion

Each parent's self reported level of worry about their child(ren)'s safety in the six areas of everyday risk listed under Method above was summed to create a total Accident Anxiety (AA) score for each adult respondent. In the present sample, these scores were found to range from a low of 9 to a high of 30 with a mean of 12.9 (S.D. = 4.33). No significant difference was observed in this sample between parent's overall level of worry about accidents to daughters versus sons, $t<1$. Road safety worries (sum of the first 3 items) could range from a low of 3 to a high of 18. Again, no significant difference was found between parents of sons versus daughters in total road safety anxiety, $t<1$.

However, there was a strong, positive, association between a parent's overall level of worry about child accidents and his or her specific worry about the child in road safety situations (as a pedestrian, cyclist or passenger in a motor vehicle), r (68) = .52, $p<.001$. Table 1.3 shows the percentages of parents who expressed higher and lower levels of worry about their children's involvement in road accidents.

Table 1.3

Response	Child's Safety as a Pedestrian	Child's Safety on a Bicycle	Child's Safety as a Vehicle passenger
Extremely worried	22%	33%	7%
Somewhat worried	37%	31%	24%
Neither worried nor secure	23%	16%	40%
Somewhat secure	23%	16%	40%
Extremely secure	3%	3%	7%

These data clearly indicate that a majority of the parents in this sample were worried (either "somewhat" or "extremely") about their children's risk of pedestrian or cycling

accidents. On the otherhand, there was no significant difference in level of worry about their children's road safety between parents of children who had suffered an accident serious enough to cause a broken bone or tooth (x = 7.06) and those whose children had never had an accident this serious (x = 7.42), $t<1$. Possibly this was because most of the serious accidents to children in these particular families had arisen in situations other than traffic accidents.

The PLOC scores, reflecting parents' feeling of being personally in control versus powerless when it came into general parenting (discipline, control, teaching, etc.) were strongly positively correlated with the parent's locus of control for their child(ren)'s accidents, r (68) = .39, $p<.01$. This result suggests that parents might develop a sense of personal control over their offspring's safety (including road safety) on the basis of their success in discipline or teaching their children not only about road rules, but also other aspects of effective living. This suggestion is explored further in Study 2.

We also examined the extent to which parents' locus of control for their children's accidents (SPLCCA scores) and the family's accident history combined to predict parents' self-reported levels of worry about their children's overall safety (total **AA** scores). Table 1.4 shows the results of these comparisons.

Table 1.4

Parents' Mean Levels of Worry about Children's Safety as a Function of SPLCCA Scores and Family Accident History

	Family's Accident History	
Parent's SPLCCA Scores	No serious accidents	At least one accident serious enough to cause a child's broken bone or tooth
High (32++) Externality for Child Accidents	17.5	15.6
Low (31 or less) Externality for Child Accidents	17.3	16.8

A 2(Accident Externality) x 2(Accident History) unweighted means ANOVA for unequal n was conducted on the mean scores shown in Table 1.4. The results of this analysis indicated no significant effects on level of parental worry due to children's accident history $F(1,66) = 1.16$, or to SPLCCA externality, $F<1$ or their interaction, $F<1$. In other words, parents' overall level of worry was not significantly influenced by children's accident history or their locus of control for their children's accidents.

SECTION 4

Study 2

Study 2 followed from Study 1. Its major aims were to further explore the suggestive patterns of association between parental attitudes and child's road risk-taking behaviour that had been revealed by the results of Study 1. The subjects for the study were girls from a Brownie Troop and their mothers who had volunteered for the study after its goals and procedures had been explained to them by their Troop Leader.

Subjects

A total of 76 respondents took part in Study 2. Thirty-eight of them were girls aged 8 through 12 years who belonged to a Brownie Troop, and the remaining 38 were these girls' mothers.

Procedure

Mothers and daughters each individually and independently completed a brief questionnaire measure of road safety attitudes under the supervision of a female graduate student who assisted children by reading words aloud upon request but gave no suggestions regarding appropriate responses.

Measures

The adults' questionnaire consisted of five scales. The Parent Locus of Control Scale (PLOC) (Campos et al., 1986) and the Scale of Parental Locus of Control for Child Accidents (SPLCCA) described in detail in Study 1 were two of these. In addition, the mothers in this study all completed Montag and Comfrey's (1987) Driving Externality Scale (see Table 2.1), which is 15-item measure of the extent to which the mother as a driver blames factors outside her own control for accidents she has been (or might be) involved in. Responses are on a 6-point scale from 1 = "strongly disagree" to 6 = "strongly agree", so that scores can range from 15 for the greatest possible internality to 90 for the highest possible externality for the mothers own driving accidents. Table 2.1 lists the items from this scale.

Table 2.1

Items from Montag and Comrey's Driving Externality Scale

Item

1. Driving with no accidents is mainly a matter of luck.
2. Accidents happen mainly because of different unpredictable events.
3. The driver can do nothing more than drive according to traffic regulations.
4. Accidents happen because of so many reasons we will never know the most important one.
5. People who drive a lot with no accidents are merely lucky; it is not because they are more careful.
6. It is difficult to prevent accidents in bad conditions such as darkness, rain, narrow roads, curves, and so on.
7. Most accidents happen because of bad roads, lack of appropriate signs, and so on.
8. It is very hard to prevent accidents involving pedestrians who come out from between parked cars.
9. Accidents in which children are involved are hard to prevent because they do not know how to be careful.
10. It is very hard to prevent accidents in which old people are involved because they cannot hear nor see well.
11. If you are to be involved in an accident, it is going to happen anyhow, no matter what you do.
12. Most accidents happen because the second driver does not pay attention to traffic regulations even when the first driver does.
13. The driver does not have enough control over what happens on the road.
14. Most accidents happen because of mechanical failures.
15. There will always be accidents no matter how much drivers try to prevent them.

To measure the mother's feelings of personal control over her own vulnerability to illness and disease, we used Wallston, Wallston and Kaplan's (1976) Health Locus of Control Scale (HLOC). This scale was administered and scored

exactly as recommended in Wallston, Wallston and Kaplan's (1976) article.

In addition, mothers reported on their daughter's history of illnesses and accidents (including road accidents) as well as giving demographic details of family size and ages of their offspring.

The children's questionnaire included the Risk-Taking Scale described in Study 1 and Parcel and Meyer's (1978) Child Health Locus of Control Scale (CHLOC). Parcel and Meyer's (1978) instrument was reprinted verbatim from their article, and scored in an "external" direction, so that high scores reflected feelings of lesser control over personal health outcomes.

Results

Table 2.2 shows the patterns of intercorrelation that emerged when individual Pearson's product-moment correlation coefficients were computed among the various child measures we used. Only two statistically significant associations emerged in this relatively small sample of girls. High externality scores on the HLOC scale were positively related to frequent illness and negatively related to the girl's overall level of risk-taking. In other words, girls who had suffered frequent illnesses were, predictably, the ones who felt the least personal control over their own health. But, less predictably, girls with a highly internalized sense of personal control over health were the ones who reported taking more risks both in traffic situations and in other general situations of everyday hazard. Possibly a sense of personal control over positive health outcomes had led these girls to a

acquire sense of being able to escape injury in situations of potential threat. However, further research with a larger and more diverse sample is needed before such a suggestion can be confirmed.

Table 2.2

Patterns of intercorrelation among the various measures on the children's questionnaires

	AGE(1)	ACCHIST(2)	ILLHIST(3)	CRT(4)	CHLOC(5)
CHILD'S AGE (1)	1.00				
CHILD'S ACCIDENT HISTORY (2)	-.10	1.00			
CHILD'S ILLNESS HISTORY (3)	.22	-.16	1.00		
CHILD RISK-TAKING (4)	.28	.25	-.04	1.00	
CHILD HEALTH LOCUS OF CONTROL (5)	.04	.01	.34*	-.37*	1.00

= 38; * denotes significant at p<.05 (2-tailed)

Table 2.3

Intercorrelations among Mothers' Questionnaire Items

VARIABLE	MAGE	PLOC	HLOC	SPLCCA	DES
Mother's Age (Mage)	1.00				
Parenting Locus of Control (PLOC)	.01	1.00			
Mother's Health Locus of Control (HLOC)	-.27	.22	1.00		
Scale of Parental Locus of Control for Child Accidents (SPLCCA)	-.18	.41*	.55**	1.00	
Driving Externality Scale (DES)	-.05	.26	.27	.68**	1.00

f=38; • denotes statistically significant correlations at • = p<.05 and ** = p<.01, (2-tailed).

Table 2.3 shows the interrelationships among mothers' response measures. Interestingly, these results reveal that mothers who believed that their own control over becoming involved in road accidents was minimal (i.e. those earning the highest DES scores) were the ones to give the most external explanations for their daughters' accidental injuries. Furthermore, mothers who (a) had highly external orientations to their own health and illness and (b) who strongly believed their disciplinary control over their daughters' behaviour was beyond their own internal sphere of influence (i.e. high PLOC scores) were likewise the ones to earn the highest scores on our own measure of externality of control over their daughters' accidental injury. In other words, these results suggest a broad dispositional basis for mothers' feelings of inability to prevent accidents to themselves and to their offspring.

Table 2.4 shows the relationships that emerged when mothers' responses to the adult scales were matched with their daughters' scores on the child questionnaires.

Table 2.4

Intercorrelations between Mothers' and Daughters' Response Measures

	Mother Variables			
Child Variables	Parenting Locus of Control (PLOC)	Mother's Locus of Control for Child's Accidents (SPLCCA)	Mother's Locus of Control for Own Health (HLOC)	Mother's Locus of Control for Own Accidents (DES)
Child's Health Locus of Control	.11	.26	.24	.35*
Child's Illness History	-.20	.16	-.07	.14
Child's Risk-Taking Score	-.28	-.12	-.13	-.13

N = 76; df = 36; * denotes correlation significant at $p<.05$

The results shown in Table 2.4 indicate that, among this relatively small sample of mothers and daughters, only one of the 12 cross-generational relationships that we tested was strong enough to achieve statistical significance. This was the link between the mother's Driving Externality Score (Montag & Comrey, 1987) and her daughter's feelings of control over personal health (Parcel & Meyer, 1978). In other words, those mothers who believed their own involvement (as a driver) in road accidents had been (or would be) due to factors outside of their own control were the ones who tended to have daughters who offered similarly external explanations for their susceptibility (as children) to illness and accidental injury. In fact, four of the 20 items on Parcel and Meyer's (1978) CHLOC (or Measure of Children's Health Locus of Control) related specifically to accidental injury. These were:

10. Accidents just happen.

14. I always go to [an adult] straight away if I get [injured] at school.*

15. It is the teacher's job to keep me from having accidents at school.

20. I can do many things to prevent accidents.

*Note: Wording of this item was modified slightly for the sake of comprehension by Australian children

Therefore, it may be that an externally-oriented mother communicates her own feelings of powerlessness to prevent motor vehicle accidents to her daughter in some subtle ways. This might then lead the daughter to feel a sense of powerlessness (i.e. "externality") over her own risk of accidental injury. However, the correlational nature of the present findings admit of more than one possible direction of causality. Further research, preferably including younger children, and/or a longitudinal design, would be desirable in order to define with greater certainty the possible causal pathways that might explain these observed associations between mothers and daughters' externality regarding accidents.

Study 3

The major aims of Study 3 were: (a) to further investigate the predictors and correlates of children's road-related risk-taking and (b) to examine children's own levels of worry about road safety in relation to both their worry about other types of hazards, and to their individual patterns of road-related knowledge, attitudes and behaviour. A third, subsidiary, aim was to assess the validity and reliability of

the children's instruments that had been modified on the basis of pilot-testing, including administration of earlier versions of the children's scales to the child subjects of Studies 1 and 2.

Method

Subjects

The 105 child participants in Study 3 consisted of pupils from Grades 2 through 6 of a Catholic private school in suburban Brisbane. Of the total group, 62 were male and 43 were female. Their distribution by chronological age is shown in Table 3.1

Table 3.1

Age Distribution (in years) of the Study 3 Sample

	Age Level:						
	7 years	**8 years**	**9 years**	**10 years**	**11 years**	**12 years**	**Total**
Number of Subjects:	11	28	17	23	18	8	105
Percent:	10	27	16	22	17	8	100
Age Group*:	1	1	1	2	2	2	

Note*: Grouping of subjects into age categories for statistical analyses

In view of the size and overall age distribution of the sample obtained, Study 3 subjects were subdivided into two age categories, as shown in Table 1. The youngest group, with a mean age of 8 years and 1 month (range: 7 to 9 years) was 60 percent male while the oldest group, with a mean age of 10 years and 8 months (range: 10 to 12 years) was 59 percent male. Thus the goal of obtaining a more even balance of the sexes than in Studies 1 and 2 had therefore been achieved.

Response Measures

The children's questionnaire included five main response scales. Four of these (Knowledge of Road Rules, Road Risk-Taking, General Risk-Taking and Sensation-Seeking) were modified versions of instruments that has been used in Study 1 and in Study 2. The modifications were based both on the results of alpha-reliability analyses for the preliminary versions of the measures that were used in Studies 1 and 2, and also upon an individual examination of patterns of errors, blank responses and write-in comments by children who took part in Studies 1 and 2.

The fifth, measure, entitled "Concerns", was a new instrument developed specifically for Study 3. Its purpose was to assess children's ongoing levels of anxiety or worry about their own personal safety in the areas of:

(1) Illness and disease
(2) Pedestrian safety
(3) Car accidents (as a passenger)
(4) Bicycle riding
(5) Swimming and surfing
(6) Playing sport

The five response scales can be described briefly, as follows:

Knowledge of Road Rules: This 10-item measure consisted of written descriptions of 10 different road-safety situations (e.g., "You have come to a zebra crossing on a busy street", or "This boy needs to cross the road at a corner with no traffic lights"). Each description was accompanied by a large black-and-white drawing of a child in the traffic setting in

question (see Appendix A of this Report for copies of these drawings). A specific question was posed for each setting, followed by four multiple-choice response alternatives. The response choices, as in Study 1, were designed to compensate for possible social desirability biases among young children by including some incorrect answers that were based on an overcautious approach, as well as the more obvious wrong answers reflecting failure to consider the rules applying to that specific traffic situation.

Road Risk-Taking. This 11-item measure described 11 situations of potential road risk or safety (e.g., "I ride my bike faster than other boys and girls" (risk) or "I wear a helmet when I ride a bike" (safety). For each situation, children were asked to choose one of three response alternatives to describe their own behaviour. The response choices were: (a) "never" (scored 1) (b) "sometimes" (scored 2) (c) "often" (scored 3). Safety items were reverse scored to compute a total road risk-taking score ranging from 11 to 33.

General Risk-Taking. An additional 4 items in a similar format measured the child's tendency to take risks in situations other than those specifically involving traffic (e.g., "I like to go way out deep when swimming in pools and the ocean" and "I quite like taking risks"). These items were selected from Eysenck, Easting and Pearson's (1984) "Venturesomeness" scale for children on the basis of their high factor loadings in these authors' validation study. The wording of some of the items was modified to suit local Australian conditions (e.g., the original item that described

"riding on the Big Dipper at the fairground" was changed to "rides like 'Thunderbolt' and 'Corkscrew' at Dreamworld or the Ekka"). Responses choices and scoring were the same as for the Road Risk measures (above). Thus the total scores could range from a low of 4 to a high 12, with the latter reflecting the greatest possible level of general risk-taking.

Concerns. This 6-item measure assessed children's level of worry about common situations of mild threat. The scale was introduced with the following instructions:

> "*This part asks you about some things that children your age sometimes worry about. Most children worry about a few things sometimes, while some worry a lot. There are no right or wrong answers to this part. Just mark the choice that described you the best*".

As with the risk-taking scales, response alternatives ranged from 1 = "never" to 3 = "often", with total scores ranging from 6 for the lowest level of worry to 18 for the highest possible level of overall anxiety.

Sensation-Seeking. This 8-item scale assessed a general disposition towards sensation-seeking (e.g., Eysenck and Zuckerman, 1978). All items related to the future, and assessed the child's inclination, when grown up, to experiment with such adult risks and thrills as parachute jumping, bungee jumping, and racing car driving. Response choices were "No" (scored 1), "Maybe" (scored 2) and "Yes" (scored 3) Total scores could therefore range from 8 for the lowest possible disposition to seek sensation to 24 for the highest possible level of sensation-seeking.

Results

Worries about Health and Safety

Table 3.2 reports the Pearson product-moment correlation coefficients for relationships among the six separate dimensions of health and safety concern across the sample of 105 children aged 7 to 12 as a whole.

Table 3.2

	(1)	(2)	(3)	(4)	(5)	(6)
Illness (1)	1.00					
Pedestrian (2)	.16	1.00				
Vehicle (3)	.11	.42**	1.00			
Bicycle (4)	.38**	.39**	.42**	1.00		
Swimming (5)	.13	.35**	.21*	.31**	1.00	
Sport (6)	.42**	.42**	.33**	.47**	.20	1.00

Notes: N=105; * denote relationship significant at p<.05; ** denotes significant at p<.01 (two-tailed)

As Table 3.2 shows, the level of children's worry about their own personal safety as pedestrians ("walking across roads and carparks") significantly predicted their level of worry about the two other dimensions of road-related risk that were explored in this study, namely: "riding a bicycle" (p<.01), and "riding as a passenger in a motor vehicle" (p<.01). In addition, worries about each of these three dimensions of road-related risk were statistically significant predictors of children's heightened anxiety about personal safety while swimming and while playing sport. Interestingly, however, there were no statistically significant associations between the child's level of worry about sporting and swimming

safety. Nor did the child's level of anxiety about illness and disease ("worry about getting sick") predict anxiety about pedestrian, vehicle passenger, or swimming safety. It would seem that children's worries about general health issues are relatively specific, whereas anxieties about road safety are closely interconnected both with one another and with risks of physical injury in swimming and sport.

The overall levels of worry expressed by the present sample of children aged 7 through 12 are shown in Table 3.3.

Table 3.3

Numbers and Percentages of Children Aged 7 to 12 Reporting Worry about Health and Safety

	Frequency of Worry				
Topic of Worry	**Never**	**Sometimes**	**Often**	**No response**	**Total**
Illness	26%	48%	24%	2%	100%
	(27)*	(50)	(26)	(2)	(105)
Pedestrian safety	13%	34%	49%	4%	100%
	(14)	(36)	(51)	4	(105)
Car accidents (as	19%	42%	36%	3%	100%
a passenger)	(20)	(44)	(38)	(3)	(105)
Bicycle safety	22%	46%	30%	2%	100%
	(23)	(48)	(32)	(2)	(105)
Swimming safety	16%	36%	45%	3%	100%
	(17)	(38)	(47)	(3)	(105)
Sporting injury	40%	37%	20%	3%	100%
	(42)	(39)	(21)	(3)	(105)

*Note: Numbers of subjects are in parentheses

As can be seen in Table 3.3, the three sources of most frequent worry were pedestrian safety, swimming safety, and risk of injury as a passenger in a motor vehicle. Furthermore, after grouping together those risks that provoked worry either "sometimes" or "often", it was noted that the three road safety concerns, along with swimming, generated the most widespread anxiety. Over 80 percent of the sample worried at least sometimes about having an accident as a pedestrian or while swimming, and more than 75 percent reported similar levels of anxiety about cycling and motor vehicle accidents. By contrast, more than one child in four reported "never" worrying about illness or having an accident while playing sport.

To assess the contribution of subjects' age and gender to their levels of worry about health, accidents and injury, we computed a 2 (sex) x 2 (age group) ANOVA on children's mean total anxiety scores, as shown in Table 3.4.

Table 3.4

Mean Levels of Worry about Health and Safety among Children Aged 7 to 12

	Age Group		
Subjects' Gender	**7 to 9 years**	**10 to 12 years**	**Total**
Boys	12.7	11.8	12.3
Girls	14.6	12.1	13.4
Total	13.5	11.9	12.8

The results of this analysis revealed statistically significant main effects of age, $F(1,101) = 8.24$, $p<.01$, and

of gender, $F(1,101) = 4.15$, $p<.05$, upon children's tendency to worry about accidents. But there was no significant interaction between these two variables. In other words, the 10-to-12-year-olds experienced less worry overall than the children under 10, and girls of both age levels worried more about their health and safety than boys did. This is consistent with the results of a study conducted nearly 3 decades ago in the U.S.A. (Mechanic, 1964) in which it was found that 35 percent of boys aged 9 to 10 reported that they never worried about getting hurt, as compared with only 11 percent of girls in the same age group. Therefore, while it might seem paradoxical that boys, whose actual risk of serious accidental injury between the ages of 5 and 14 is almost twice that of girls (David, Foot & Chapman, 1990) should be the ones to show the least anxiety about injury, the observed sex difference would appear to be a temporally robust and culturally reliable one.

Risk-Taking Behaviour

Table 3.5 shows the percentage distributions of the children's self-reported inclinations to take risks in selected traffic situations. As can be seen from this table, overall levels of safe versus risky behaviour were quite variable from one area of traffic-related risk-taking to another. For example, almost none (7 percent) of the children reported taking the risk of riding in a car without a seatbelt. But as many as 70 percent reported at least sometimes "speeding" on a bike (i.e. riding it faster than other children). In addition to bicycle speeding, the other most frequently reported traffic-related risks were (1)

cycling in traffic (84 percent of children claimed to do this at least "sometimes"), (2) playing by the edge of the road (51 percent did so at least "sometimes"), (3) liking to ride as a passenger in a speeding car (51 percent "sometimes" or more often and (4) doing stunts on a bicycle (42 percent "sometimes" or more often).

Table 3.5

Percentages of Children Aged 7 to 12 who Report Engaging in Road Risk-Taking Behaviours.

	Child's self-reported frequency of engaging in behaviour				
Risk Behaviour	**Never**	**Sometimes**	**Often**	**No Response**	**Total**
Riding a bicycle in traffic	14% (15)*	50% (52)	34% (36)	2% (2)	100% (105)
Wearing a safety helmet when riding a bike (reverse scored)	13% (14)	19% (20)	65% (68)	3% (3)	100% (105)
Riding bike faster than other children	28% (29)	48% (50)	22% (23)	2% (2)	100% (105)
Doing stunts (e.g. "wheelies") on bicycle	55% (58)	30% (3)	12% (13)	3% (3)	100% (105)
Riding bike after dark	74% (78)	19% (20)	3% (3)	4% (4)	100% (105)
Riding skateboard in traffic	81% (85)	13% (14)	3% (3)	3% (3)	100% (105)
Doing stunts on skateboard	68% (71)	19% (20)	11% (12)	2% (2)	100% (105)
Playing on road's edge	45% (47)	39% (41)	12% (13)	4% (4)	100% (105)
Crossing busy roads and car parks	62% (65)	31% (33)	4% (4)	3% (3)	100% (105)
Wearing seat belt in cars (reverse scored)	7% (7)	6% (6)	83% (87)	4% (4)	100% (105)
Enjoy car's speeding	47% (49)	35% (37)	16% (17)	2% (2)	100% (105)

Note: * Numbers of subjects are in parentheses

To explore links among various dimensions of traffic-related risk-taking in these primary-school children, a series of Pearson's product-moment correlation coefficients were computed. The results appear in Table 3.6. In general, the results of these analyses indicate that children's levels of risk-taking in most individual traffic situations significantly predict whether or not they will expose themselves to each of the other road-related risks. As one might anticipate, the relationships are especially strong among risks sharing a common vehicle or modality (e.g., the highly significant correlations among most of the individual cycling and skateboarding items). However, even without this added element of use of a common mode of activity, clear relationships among traffic risk behaviours are likewise seen. For example, night cycling significantly predicts pedestrian risk and taking risks on a skateboard.

Table 3.6

Intercorrelations Among Children's Road Risk-Taking Behaviours.

Description and Number of Risk Behaviours	Risk behaviours by number (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Cycling in traffic (1)	1.00										
Cycle helmet use (2) (reverse scored)	-.24*	1.00									
Bicycle speeding (3)	.44**	.11	1.00								
Stunt cycling (4)	.30**	.08	.52**	1.00							
Night cycling (5)	.11	.00	.30**	.47**	1.00						
Skateboarding in traffic (6)	.21*	.09	.24*	.47**	.55**	1.00					
Stunt skate boarding (7)	.17	.08	.40**	.53**	.28**	.47**	1.00				
Roadside play (8)	.13	-.07	.19*	.10	.41**	.09	.18	1.00			
Pedestrian risk (9)	.04	.16	.21*	.33**	.46**	.44**	.25*	.22*	1.00		
Seatbelt use (10) (reverse scored)	-.15	.14	-.04	-.21*	-.27**	.19	-.22*	.01	.05	1.00	
Enjoy car's speeding (11)	.19*	-.20*	.47**	.47**	.33**	.22*	.42**	.17	.23*	.03	1.00

N=105; two-tailed significance levels are denoted * for $p<.05$ and ** for $p<.01$

Risk Behaviour (Item Number)	(1)	(2)	(3)	(4)
Swimming out deep (1)	1.00			
Riding roller coasters (2)	.29**	1.00		
Taking risks (3)	.40**	.26**	1.00	
Danger and excitement (4)	.30**	.46**	.39**	1.00

Notes: N = 105, two-tailed significance levels are denoted * for $p<.05$ and ** for $p<.01$.

As Table 3.7 shows, all of the general risk behaviours that were included in this survey were found to be highly intercorrelated with one another. Such a result was predicted on the basis of Eysenck et al.'s (1984) factor-analytic study of responses to similar items by British children of the same age range as the present sample. But the present result is important as it gives clear evidence of the scale's internal consistency and applicability to Australian children.

Table 3.8 shows the numbers and percentages of children from the present sample who reported each level of general

risk-taking (or "venturesomeness") assessed with the present scale.

Table 3.8

General Risk-Taking by Children Aged 7 to 12.

Risk behaviour	Child's self reported frequency of engaging in behaviour				
	Never	Sometimes	Often	No response	Total
Going out deep when	41%	39%	18%	2%	100%
swimming or surfing	(43)	(41)	(19)	(2)	(105)
Riding roller coasters	21%	34%	42%	3%	100%
	(22)	(36)	(44)	(3)	(105)
Enjoy taking risks	43%	41%	12%	4%	100%
	(45)	(43)	(13)	(4)	(105
Enjoy excitement and danger	11%	56%	29%	4%	100%
	(12)	(59)	(30)	(4)	(105)

To examine how well children's levels of general risk-taking predicted their risk-taking behaviours in the road safety situations that had been devised especially for this research, we computed the individual correlations of each of the 11 road safety items with each of the 4 items from the General Risk-Taking (Eysenck et al., 1984) scale. Out of the 44 correlation coefficients computed, 34 (or 77 percent) were statistically significant, and all of these were in the predicted direction. In other words, a child's disposition to take risks on the road appears to be closely connected with a general personality disposition toward risk-taking, or "venturesomeness" (Eysenck et al., 1984).

In light of this result, it appeared desirable to collapse children's Road Risk-Taking totals and General Risk-Taking totals together into a single combined score for the purpose

of further examining the relationships between risk behaviour and the other variables included in this study. As a procedural check, Cronbach's alpha reliability coefficient (a measure of internal consistency) was computed for the combined 15-item Risk-Taking scale. The result was a satisfactory = .84, confirming the decision to treat the scale as unidimensional.

To assess whether age or gender influenced children's overall dispositions to take risks, a 2 (age group) x 2 (sex) ANOVA was computed on the mean total risk-taking scores (i.e. Road Risk-Taking and General Risk-Taking combined). These means are shown in Table 3.9.

Table 3.9

Children's Mean Risk-Taking Scores as a Function of Gender and Age Grouping *

Gender	Age Group *		
	Younger	Older	Total
Male	25.6	27.1	26.4
Female	21.2	23.8	22.5
Total	23.8	25.6	24.8

* Younger group is 9 and under; Older group is 10 and over

The results of this analysis revealed that there was a statistically significant main effect of subjects' sex, $F(1,101) = 13.18$, $p<.001$, but no significant effects of age, $F(1,101) = 3.23$, $p>.05$, or of the interaction between age and sex, $F<1$. In other words, girls reported taking fewer risks on the road and in other hazardous situations than boys did.

But the apparent tendency (see Table 3.9) for younger children to take fewer risks than their older peers was not statistically reliable.

The Disposition to Seek Sensation

Table 3.10 shows the intercorrelations among children's responses to the eight separate items comprising our Sensation-Seeking Scale, or the measure of an inclination to seek excitement and danger when grown up.

Table 3.10

Incorrelations of Items on Sensation-Seeking Scale

Item Description (Number)	(1)	(2)			(5)	(6)	(7)	(8)
Pilot an aeroplane (1)	1.00							
Racing car driver (2)	.37**	1.00						
Experiment with cigarettes (3)	-.09	.11						
Waterskiing (4)	.34**	.29**	-.02					
Deep-sea diving (5)	.39**	.28**	.16	.41**	1.00			
Dangerous voyage (6)	.29**	.52**	.13	.46**	.37**	1.00		
Parachute jumping (7)	.39**	.53**	.13	.47**	.40**	.61**	1.00	
Bungee jumping (8)	.31**	.49**	.07	.50**	.39**	.61**	.73**	1.00

= 105; * denotes significant at $p<.05$ (two-tailed); ** denotes significant at $p<.01$ (two-tailed)

As Table 3.10 shows, with the exception of the single cigarette item ("smoke a cigarette to see what it tastes like"), all items correlated with one another positively at a high level of statistical significance ($p<.01$). The main cause for the deviant pattern of responses to the question about experimenting with cigarette smoking was undoubtedly the extremely low level of intended cigarette uptake we observed among this particular sample of children. In fact, 91 percent of the present group of 7-to-12-year-olds (n = 95) stated categorically that they would definitely not try smoking a

cigarette when they grew up, and only 4 children (4 percent) stated that they definitely would experiment with smoking. This represents a higher level of intended cigarette avoidance than was observed in a survey of a similar population of West Australian middle-class pupils at a private Catholic school some 8 years ago (Peterson & Peterson, 1986). Thus cigarette smoking may no longer pose as serious a health hazard as it once did. Of course an alternative possibility is that children's intentions as preadolescents may not accurately predict their behaviour later on.

Given the overall strength of the intercorrelations among the 8 separate items forming the Sensation-Seeking Scale, it was deemed appropriate to collapse individual items together into a single total score. When Cronbach's alpha reliability coefficient was computed, the high alpha level (.81) we observed, indicated that the scale had excellent internal consistency.

Table 3.11 shows the mean Sensation-Seeking scores earned by younger (age 7 to 9) and older (age 10 to 12) boys and girls.

Table 3.11

Sensation-Seeking as a Function of Age and Gender

Age group:	Boys	Girls	Total
Younger	15.1	10.9	13.4
Older	14.6	12.4	13.7
Total	14.9	11.7	13.6

To explore differences in sensation seeking due to gender and age, a 2 (sex) x 2 (age group) ANOVA was computed on the mean scores shown in Table 3.11. The results revealed a statistically significant main effect for sex, $F(1,101) = 17.23$, $p<.001$, but no significant effects of age, $F<1$, or for the age x sex interaction $F(1,101) = 1.65$, $p>.20$. In other words, boys at both age levels scored higher in the disposition to seek exciting sensations than girls did, paralleling the earlier results (see Table 3.10) for risk-taking behaviour.

Road Safety Knowledge

The road-safety knowledge measure used in Study 3 was a modified version of the instrument which, on the basis of the Study 1 pilot, had been shown to have too little internal consistency (alpha = .48) to be treated as a unidimensional scale. Unfortunately, despite extensive modifications and the larger and more diverse sample of boys and girls who responded to the new scale in Study 3, a similar result emerged. With a Cronbach alpha score of only .20, the new scale was deemed to have too little internal consistency to serve as a reliable measure of children's overall level of knowledge of the rules of the road. Therefore no further analyses were conducted using this measure.

In retrospect, it appears that the effort to guard against social desirability biases by including "overly-cautious" incorrect choices may have made the items too difficult for many children. In addition, unfamiliarity with the 4-item "multiple-choice" style of test construction by many members of the present age groups led to further incorrect answers

(e.g., marking more than one "best" choice). Therefore, for future research, the open-ended Road Safety Quiz which we used as an interview schedule with the youngest children in Study 1 (see Appendix A) would perhaps serve as a more useful instrument for all age groups than did the multiple-choice knowledge quiz which we attempted to develop in Studies 1 and 3.

Bicycle Helmet Knowledge

In the absence of a satisfactory measure of overall knowledge of rules of the road, we examined childrens' responses a single item from the quiz as a discrete measure. This item was topical, as it assessed knowledge of the legal requirement to wear a cycle helmet which had been introduced in Queensland shortly before this research project began. A 2 (age group) x 2 (sex) ANOVA was conducted to test whether children's knowledge of this particular road safety rule varied as a function of gender or age grouping. But there were no statistically significant differences between boys and girls $F<1$, or between younger and older children $F(1,101) = 2.01$, $p>.10$. Nor was the interaction between these variables significant $F(1,101) = 1.98$, $p>.10$. In other words, children's knowledge of the helmet law was consistent across all age and sex groupings, and was generally quite high. In fact, most of the errors children made on this item reflected an overcautious belief that warning flags, as well as helmets, were a legal requirement for all cyclist using Queensland's roads.

Relationships among Children's Response Measures

Table 3.12 reports the results of correlational analyses to explore relationships among the various child response measures used in this research. (The test of knowledge of road rules was not included, due to its low internal consistency, as explained above).

Table 3.12

Intercorrelations among Global Measures used in Study 3

	Worry about own Safety	Total Risk-Taking	Sensation-Seeking
Worry about Own Safety	1.00		
Total Risk-Taking	-.47**	1.00	
Sensation-Seeking	-.41**	.41**	1.00

** denotes significant at p<.01, two-tailed

The pattern of significant relationships shown in Table 3.12 indicate that children who worry more about their own safety are inclined to take fewer risks and to score lower in the disposition to seek sensations and excitement. Furthermore, when we examined the specific relationship of greatest interest to the present study, namely, the link between road-safety worries and road-related risk-taking, a statistically significant correlation in the predicted direction likewise emerged, $r(103) = -.36$, $p<.01$. In other words, children who worried most about having accidents as cyclists, pedestrians or in motor vehicles were the ones who reported taking the fewest behavioural risks in traffic situations.

SECTION 6

SUMMARY AND RECOMMENDATIONS FOR FURTHER RESEARCH

In sum, the results of the three studies reported here suggest some interesting trends warranting further exploration in larger and more diverse samples of children and their parents. The major goal of this pilot project, to develop and validate instruments to be used in such a large-scale project, were for the most part achieved. With the exception of the Road Knowledge Quiz, all the final instruments used in this research were shown to (a) have adequate internal consistency and (b) be comprehensible, meaningful, and easy-to-use with samples of Australian children and adults, respectively.

The trends suggested by the results of all three studies were also of clear interest. It would be especially worthwhile to follow up, in future research, the interesting patterns of association between parental worry, parental locus-of-control, and children's road-related risk-taking that were suggested by the results of Studies 1 and 2. In addition, the links between children's road-related risk-taking and other dependent measures used in Studies 2 and 3 also warrant further investigation, provided they can be confirmed in larger samples of boys and girls.

Finally, the relatively high levels of worry about road safety that were reported by both the children and the parents who took part in these three studies are a source of practical, as well as theoretical, interest. While highlighting a felt need for more road safety instruction and/or applied intervention on behalf of children's road safety in Queensland, these results are likewise open to

an optimistic interpretation. The high level of concern about children's road safety that was displayed by the Queensland parents and children who took part in this study indicates an openness to road-safety education among members of both generations. Road safety instruction programmes might derive encouragement from this empirical evidence of parents' strong motivation to improve their road-safety skills, attitudes, behaviour and their parent-child communication about road safety.

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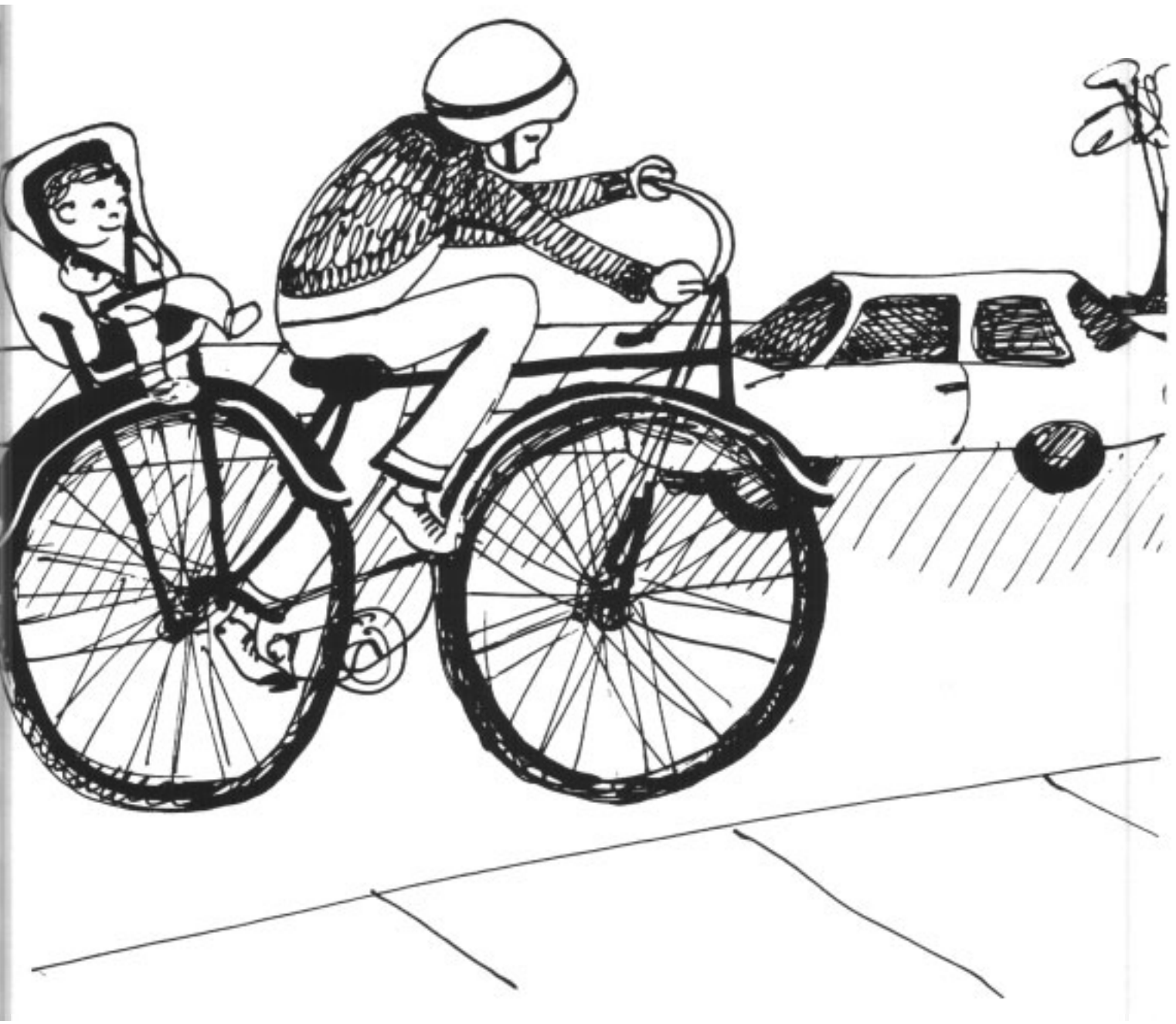
Appendix A

Open-Ended Road Rule Knowledge Quiz

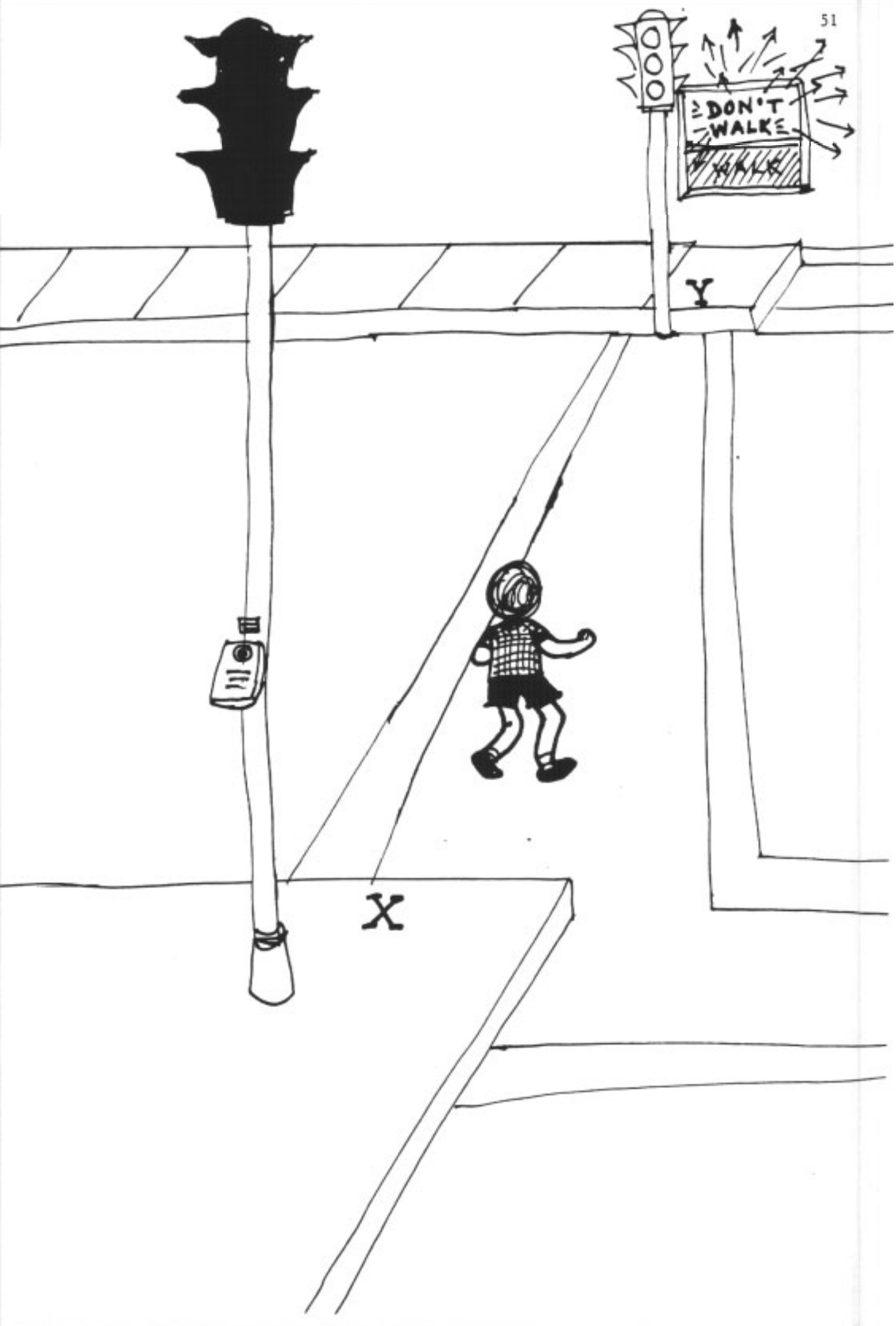
Do chidren who ride their bikes only on cycle paths, not on roads cars use, always need to wear cycle helmets?

Do they always need flags?

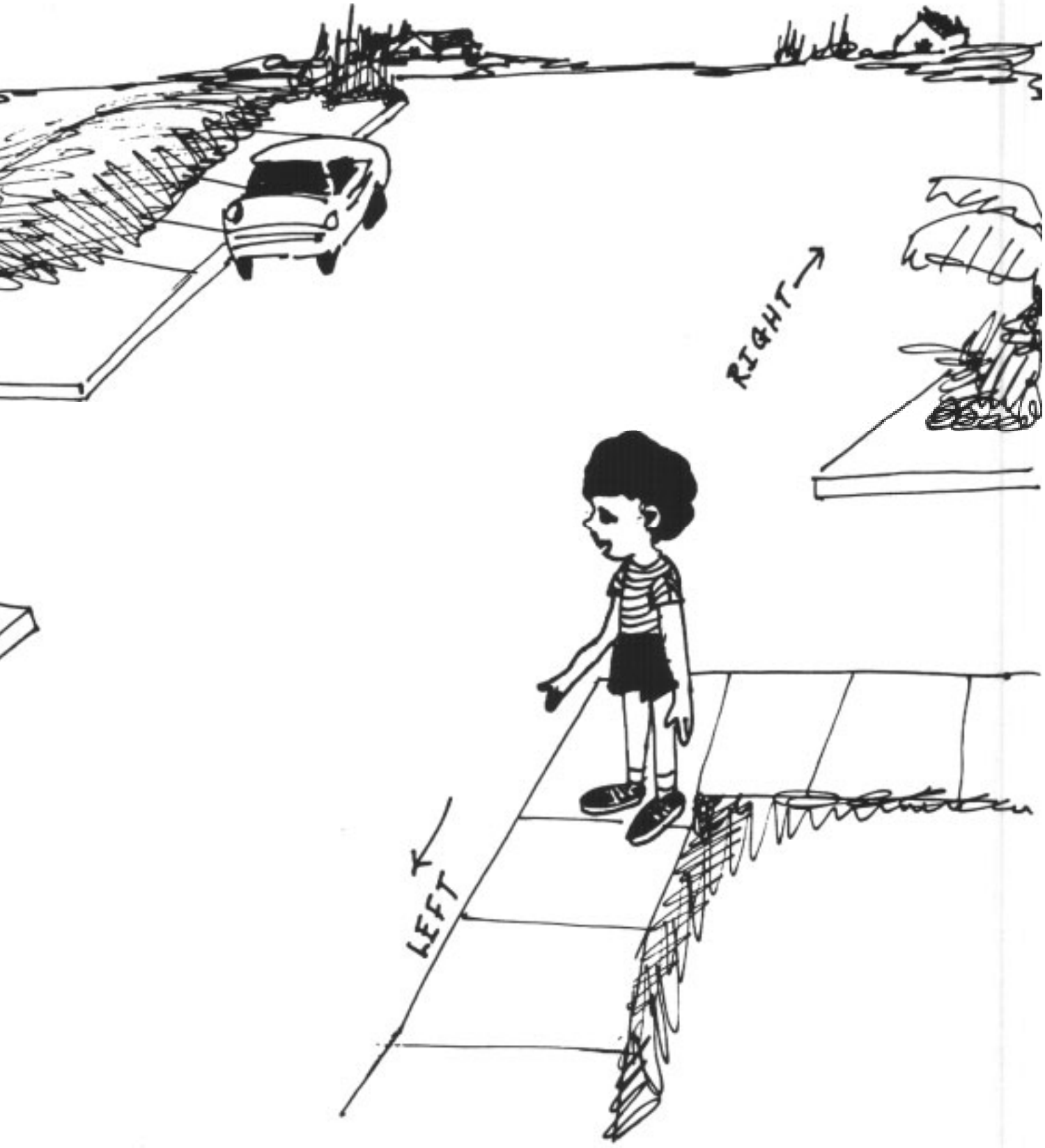


Are children under 12 allowed to ride bicycles or tricycles on roads cars use?

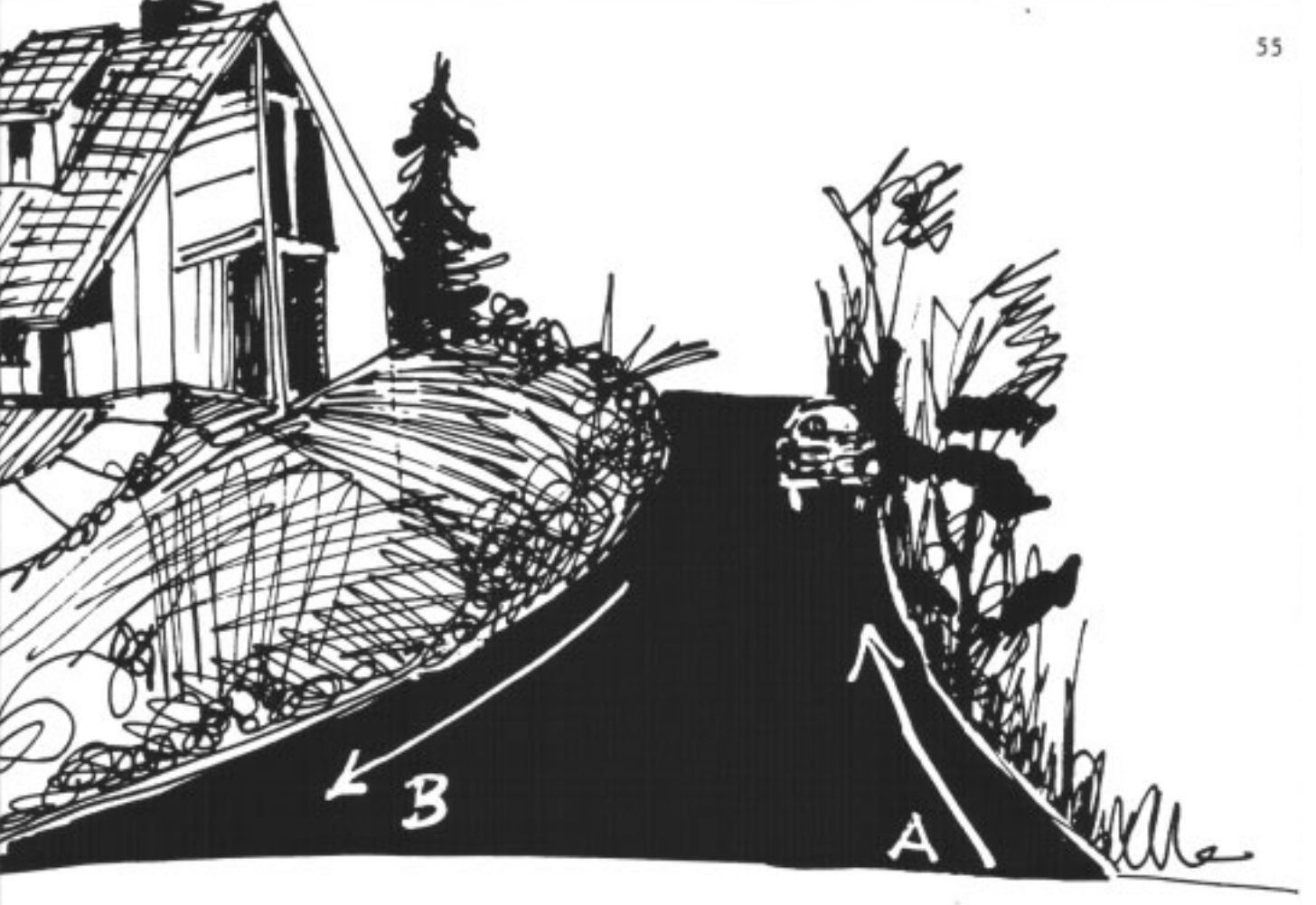
Do they always need to wear helmets if riding in a bike carry-seat (like this) behind a grown-up on a bike?


DON'T
WALK
WALK
Y
X

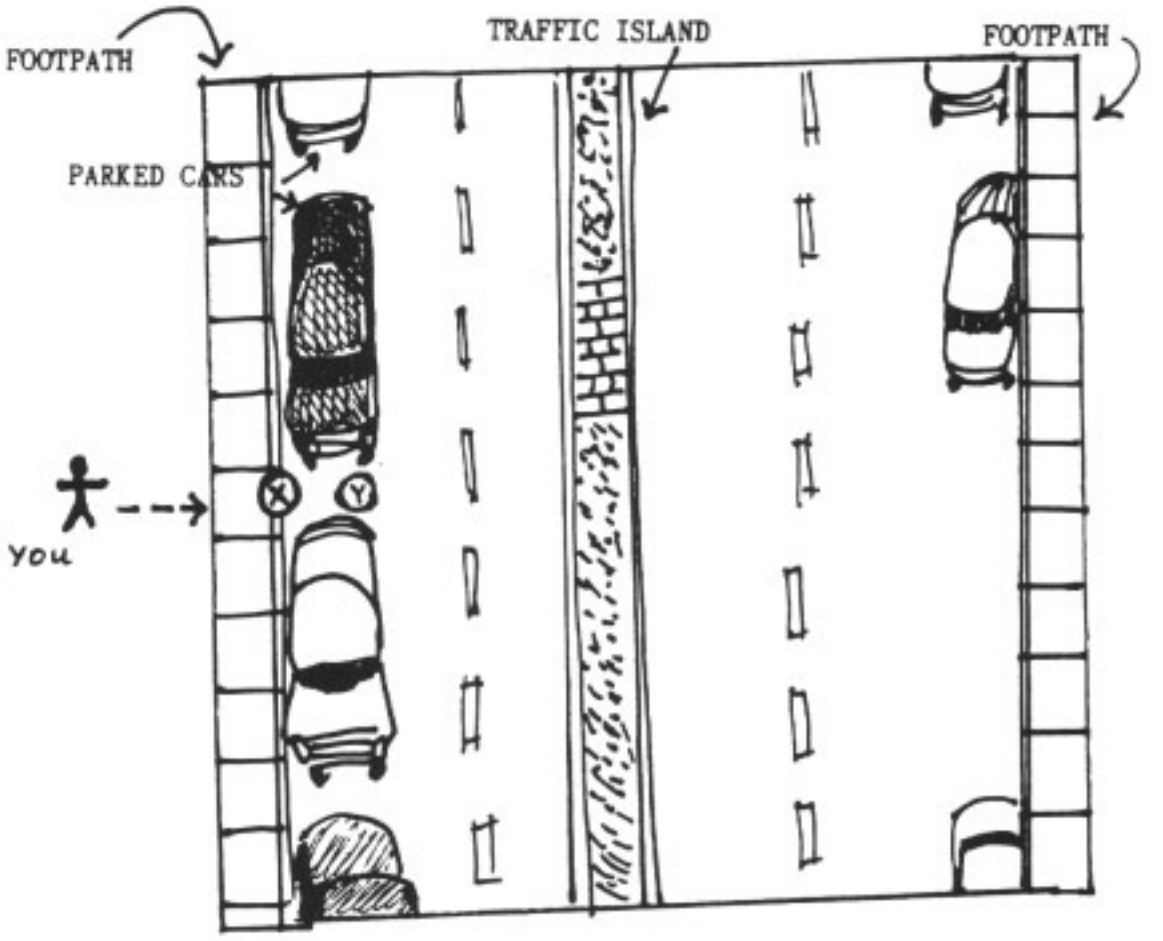
What should this child do at this corner before crossing the road?


RIGHT
LEFT

Pretend this is you. You are at a crossing with a walk / don't walk signal. When you started across, the green signal said WALK. But now it has changed to a flashing red DON'T WALK and you are less than half-way across. What should you do?


B
A

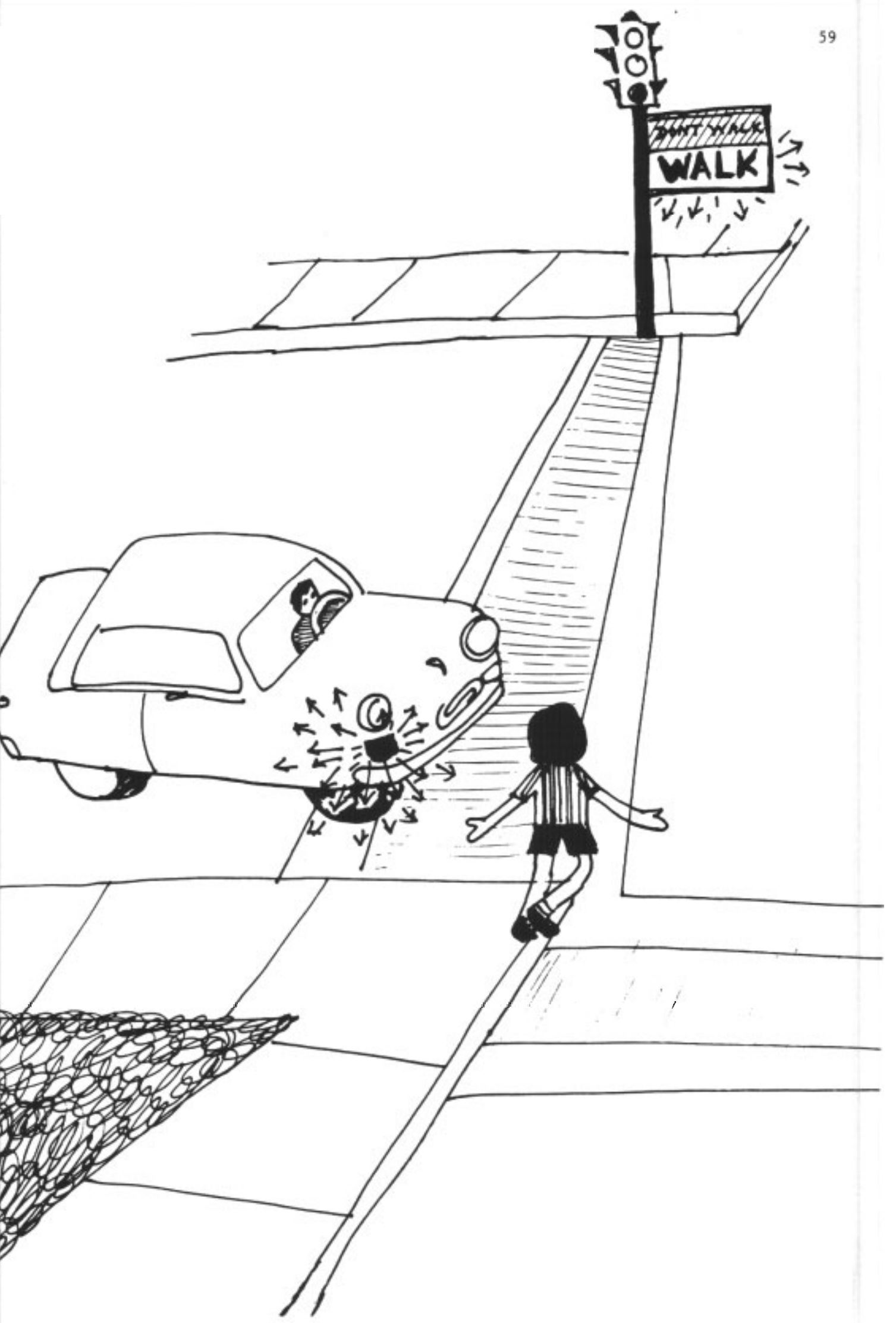
You are on foot on this road. It has no footpaths and there are steep slopes and thick bush on both sides of the road so there is no verge to walk on. What should you do?


FOOTPATH
TRAFFIC ISLAND
FOOTPATH
PARKED CARS
X
Y
you

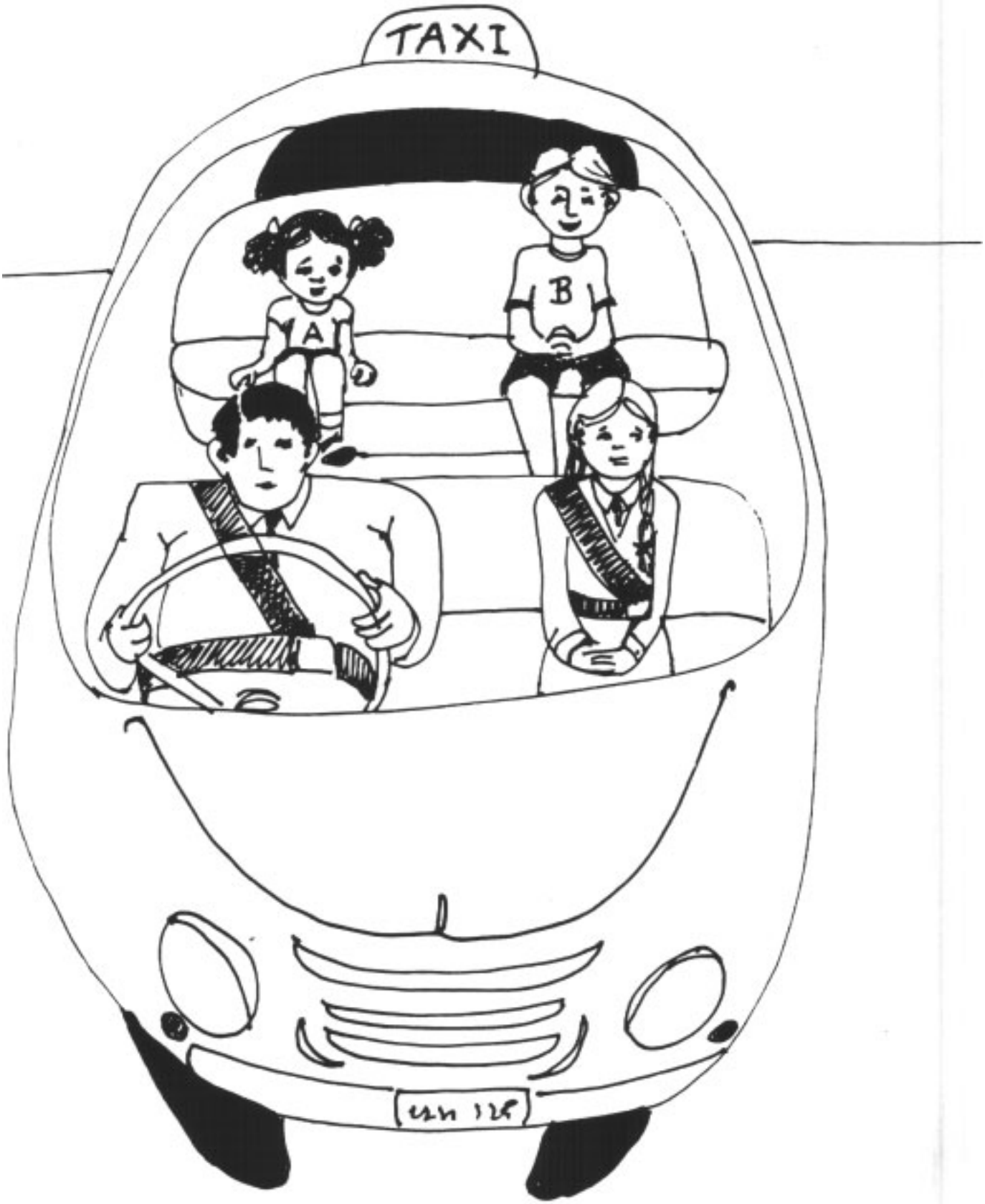
See this person here?
Pretend it is you. You want to cross the road. What should you do?

Where should you stop to look for cars?

Anywhere else?


WALK

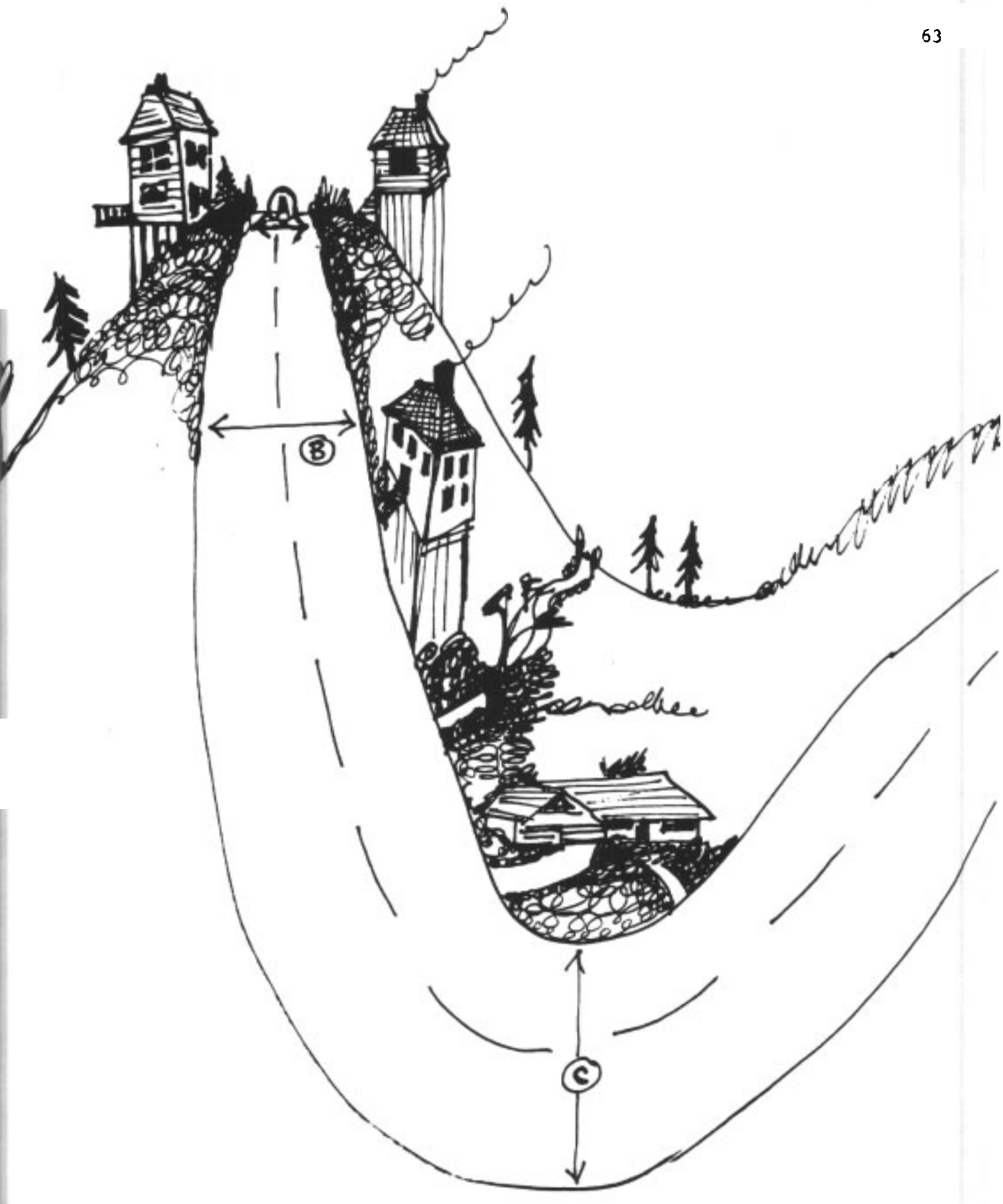
Now you are waiting at the corner to cross the street. The WALK signal goes green. But just then you see a car with the turning indicator light on here.
What should you do?


TAXI
A
B

Here are some children in a taxi. The girl in the back is 4 and the boy is 10. Should either of them be wearing seat belts?

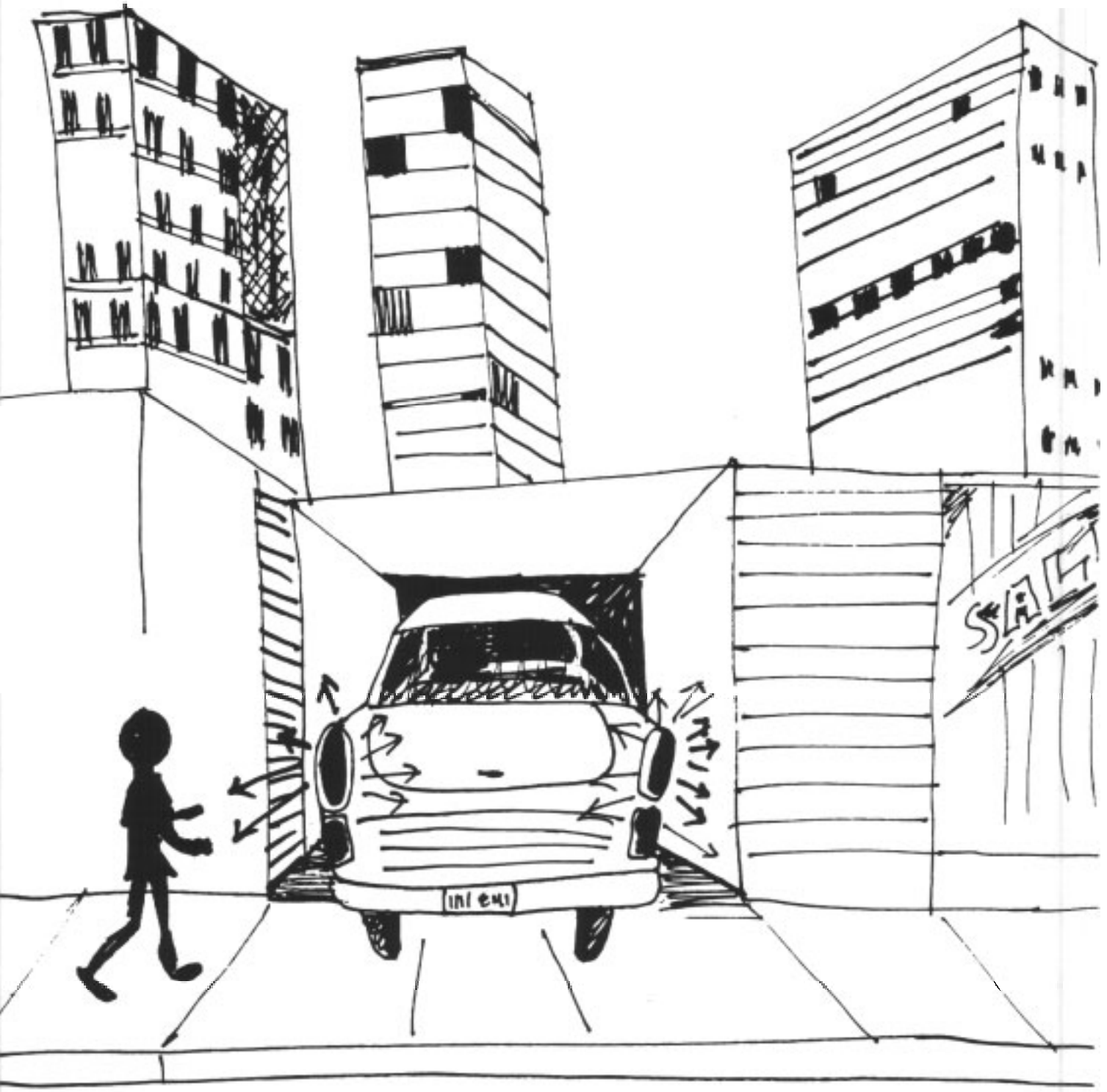
_____

(If "yes", tell me who)


B
C

You are walking here. There are steep hills and curvy roads. Where is the best place to cross the road shown here?

Why?


SAL

You are walking on a footpath that has a driveway across it. A car in the driveway has its red brake lights on. What should you do?