

INJURY CLASSIC

Young children in traffic

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This paper is the second in a series of Injury Classic. Our goal is to reprint one such paper in each issue to initiate newcomers to the field of these old, often quoted, and important contributions. As many are difficult to find, it should help all of us to have a copy at hand. Your suggestions about future articles are welcome. Write to the editor with details of your favourite, most quoted paper.

Traffic accident statistics in various countries show that young children are one of the age groups which are most affected, both as pedestrians and as cyclists. In Sweden, when accidents involving children are discussed it is often said that these accidents are caused by children's carelessness, incautiousness, and rashness. Such points of view are put forward in verdicts in traffic cases in which children have been involved. It would seem that young children are regarded in approximately the same way as ordinary adults, and held responsible for their incorrect behaviour. Similarly, this identification of children with adults has produced the belief that the behaviour of young children in traffic could be made perfect by instruction, and demands for this have often been raised in some quarters in the name of accident prevention.

But what happens if children are too immature to be able to derive any benefit from traffic instruction? What can be regarded as 'normal' behaviour in traffic for children of different ages? The Research Institute of Child Psychology at the University of Stockholm has, since 1960, been carrying on a series of investigations dealing with traffic maturity in children. These investigations are still incomplete but an account of them has been given in a book entitled *Young Children in Traffic* (in Swedish) published by Läromedelsförlagen, Stockholm, 1968. This paper gives a summary of the book.

A start was made with a survey of *Young children's play habits and ranges of action in modern urban areas*. This survey took the form of a series of exploratory studies, carried out by the institute in conjunction with the Department of Town Planning at the University College of Technology, Stockholm:

(a) A study of young children (of preschool age), their play habits out of doors, and the number of times they went in and out alone with a play group or with an adult through the door of the building in which they lived, in relation to the planning of the building (high rise or low rise blocks of flats).

(b) The main investigation which aimed at finding out where the children played, how far they wandered from home and how their area of activity and selection of play areas was affected by the planning of the housing environment. This test was carried out partly as a random investigation in various out of door environments, and partly as an interview investigation among the mothers of young children in the areas in question.

(c) Field investigation of the attendance habits of the children at the communal playgrounds in one of the housing areas.

Only the main investigation (b) will be dealt with here. In a high rise and low rise housing area in the suburbs of Stockholm, 13 similar observation points were selected. These were distributed among playgrounds, park areas, areas of high traffic density, streets, and shopping centres. During a period of three weeks in May and June, 1960, these points were visited once every hour between 8 am and 6 pm by one of the institute's workers. Notes were made of how many children there were from each area who were at the point when the research worker arrived, as well as the child's name, age, and address. The date, weather, and time of day were also noted. Approximately 550 children were observed. The results from both areas were put together. 80% of the children were out alone or with children of the same age. Apart from a few 3 or 4 year olds, the children who were accompanied by adults were mainly under 2½ years old. The older the children were, the more often they were observed at all types of observation points regardless of whether these were, from the traffic point of view, suitable or not for children. Children as young as 3 and 4 years were seen in more than one quarter of the cases in places which were dangerous from the traffic point of view, such as roadways, pavements and parking areas. They mostly played alone while their mothers tried to keep them under observation from windows or balconies. Five and 6 year olds had less supervision while out of doors, and nearly half of them had chosen unsuitable playing areas. 82.5% of the children were within 100 yards of the door of the building where they lived. Most of the children were observed between 10 am and noon and between 3 and 6 pm. Interviews with mothers confirmed that children as young as 2½-3 years of age were let out alone, and that mothers living in high rise flats had great difficulty in supervising their children. With the exception of some whose children were too young, all mothers said that they had spoken to their children about traffic. The majority of them believed that their children had understood and could profit by the warnings.

Study of the spontaneous behaviour of young children in traffic

In the Autumn of 1960 the experiment was continued. For a period of six weeks, observations were made in traffic environments in different parts of Stockholm between the hours of 9 am and noon and 1 to 3 pm to see how young children behaved when they were out alone. The observers noted every child under school age who was seen unaccompanied by an

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adult. The whole situation was noted and a sketch made of the section of the street in question with moving and parked vehicles. The position of the observer and the child's route were plotted and finally the observer's own reaction was recorded. In this way a selection of over 200 such traffic situations were recorded. They showed that children as young as 4 years of age were let out alone in the middle of Stockholm and a shockingly high level of immature behaviour was recorded. This provided a background to a more systematic study, which was undertaken in 1961. Two nursery schools were selected, having a similar traffic situation but located in different parts of Stockholm. Eighty five children in the age group 4–7 were studied, half boys and half girls in each year group. (Compulsory schooling begins at 7 in Sweden.) Every day for a month the behaviour of the children was observed at street corners near the nursery school both on arrival and departure from school. Records were kept as in the previous investigation. Children were observed crossing the street on 391 occasions, roughly half in each observation area. No significant differences in the traffic behaviour of 4, 5, 6 and 7 year olds were observed. Fifty two of the 85 children were observed on several occasions. Their behaviour was divided into three groups, bad, average and good. Twenty three of the children were included in only one of the groups, 20 within two, and nine in all three. Thus the same child can be a good pedestrian one day, and bad one the next. The behaviour of girls was much better than that of boys. No difference was noted between behaviour on arrival at school and on the way home, nor between morning and afternoon groups.

In 1961 we continued with an investigation of children's knowledge of *right and left* and their *understanding of traffic*. Models of streets, cars, etc, were used, together with a printed form containing questions and information. This study was carried out on children in the age groups 6, 7, 8 and 9. The aims were (a) to ascertain the applicability of the material and the printed form when testing traffic knowledge of children in the selected indoor situations; (b) to see if there was a definite sequence of development from younger to older children; and (c) to try to reach a more definite understanding of the difficulties which young children experience in such traffic situations. Eighty children took part, 10 boys and 10 girls in each

of the year groups. The investigation confirmed the impression obtained from previous studies that young children have great difficulty in playing their role of pedestrians. The children's behaviour with the model material agreed to a great extent with their actual behaviour in real traffic situations. Knowledge about right and left was still far from satisfactory even in 8 and 9 years old, as far as practical applications were concerned.

Half of the children in the 6 and 7 year age group were not in command of the model situation at road junctions. They forget, above all, to look behind for turning vehicles, and only half of the 8 and 9 year olds remembered this. Not even the simple testing of going straight over a zebra crossing without any vehicles being involved was passed by more than half of the 6 year olds or three quarters of the 9 year olds. This investigation showed no difference between boys and girls. On the other hand there were obvious improvements with age. Examples of performance on 3 of the 49 tasks or questions set are given in the table.

The ability of young children to perceive movements out of the corner of their eyes compared with the same ability in adults

In 1960–1 work was also in progress on a general survey dealing with the ability of 6 year olds to perceive movements out of the corner of their eyes, compared with the same ability in adults. This was carried out in cooperation with ophthalmologists, using a round piece of cardboard, 9 mm in diameter which was placed in the field of vision. Twenty 6 year olds from three nursery schools in Stockholm and 20 adults between 20 and 40 years of age, all without known visual defects, took part in the experiment. Half were male and half female. The results showed significant differences between children and adults in that, without exception, the cardboard had to be nearer the eye's fixation point before the children could perceive it. There was no difference between boys and girls. It thus seems that 6 year olds are not able to see moving vehicles out of the corner of their eyes as quickly as adults can. Also the selection of children for the experiment showed that young children often suffer from defects of vision without either themselves or any responsible adult knowing anything about it.

The ability of 6 year olds to localise sound as compared with the same ability in adults

A similar investigation dealing with the ability of 6 year olds to localise sounds as compared with the same ability in adults was carried out in 1963 and 1964. Forty children and 40 adults between the ages of 20 and 40 participated. The Institute of Child Psychology carried out this investigation in cooperation with the Department of Technical Audiology at the Royal Caroline Institute; field work was carried out at the Royal College of Technology. During the child's first visit an audiogram was taken and

Performance of children aged 6–9 years on model traffic situations

Task	No of children giving right answers (age)				Total % right answers
	6	7	8	9	
Zebra crossing on straight road (not corner): Show me exactly how you must cross here.	8	10	13	14	56
Zebra crossing at street corner: You stand here and you must cross this street. How must you look then?	4	8	11	11	43
Zebra crossings at street corner: Here is one street and here is another one. You stand here and must cross to come here. Show me exactly how you must do then. (Double crossing)	0	1	1	2	5

n = 20 in each age group.

the children were given the chance to become acquainted with the 'silent room' in which the experiments were to take place. The actual experiment was carried out on the second visit. Adult subjects paid only one visit but were allowed to take a rest between the audiogram and the experiment. Only children and adults with normal hearing were permitted to take part in the tests. The person to be tested sat in a chair exactly in the middle of a ring of loudspeakers, which were so arranged that no echo could occur. The loudspeakers were placed at the same height as the subject's ears and 1.5 m from him. The chair had a neck rest which was adjusted so that it was comfortable for the subject who, however, could not turn his head. The taped noise of a car engine was played through each loudspeaker. The car appeared to approach, pass, and drive off. This was heard for three seconds, then there was a pause of five seconds and the sound was repeated according to a predetermined plan through another loudspeaker which had been selected at random. The task of the subject was to point to the loudspeaker from which the sound came. The tape, which was played on a tape recorder in an adjacent room was heard eight times in each loudspeaker. The project leader was present in the test room, but outside the ring of loudspeakers. The result of the experiment showed that there were great differences between the ability of adults and children to localise sounds, but little difference between male and female. The adults' evaluations were accurate while the children had fewer correct directional indications and a greater spread of incorrect alternatives. For both groups the position of the noise source was important. If we superimposed the face of a clock on the ring of loudspeakers, with the figure 12 directly in front of the subject, the easiest directions for children to locate were 12, 11, 1 and 6, while adults could also recognise 3, 4, 8 and 9. The children confused the right and left sides more often than the adults. When the audiograms were being taken several children were discovered to have defective hearing, a fact which neither they nor any responsible adult had discovered.

Investigation of children's understanding of road signs

Our traffic environment is created by adults for adults. This is also true for the design of road signs, but in order to take care of themselves in traffic it is important that young children should know about some road signs, especially the ones which pedestrians and cyclists must recognize and understand. The first observational investigations seemed to show that there were serious gaps in the children's knowledge in these respects.

Several investigations have been made with more than 700 children from both urban and rural areas, from 4 to 10 years of age. The signs were shown to each child in turn, and the answers were recorded and analysed later. Knowledge of road signs increased clearly with age. 4 year olds knew practically nothing about them and even 10 year olds had considerable

gaps in their knowledge. Qualitative differences were revealed in that 4 year olds gave only colour or figure answers; the children interpreted the latter (but often incorrectly) but were seldom able to interpret the former correctly. Some children believed that the 'Pedestrian Crossing' sign (man walking) meant that 'Only adults may cross here' and the warning sign 'School or Playground' (children running) meant 'Here children must run quickly across the road so as not to get run over'. The latter traffic sign entices children out into the roadway and thus militates against its own purpose. Road signs should be designed by technicians and psychologists together and carefully tested before being put into use so that they are understandable and unambiguous for all road users and cannot be interpreted in one way by adults and in another way by children.

Young children's comprehension of traffic terms

As has already been mentioned, the first investigation showed that the mothers of young children aged 2½ years and upwards said that they had given their children some instruction in road safety and believed that the children understood the instruction and could profit from it. Nursery school teachers have also reported to us that they have tried to teach their children about road safety but that they found it difficult. Therefore, in 1960 we began an investigation of the extent to which 5 to 8 year olds understood words and phrases which often occur when teaching road safety to young children and, in 1961 and 1962, we carried on with a wider study of the 6 to 10 age group. The children were individually provided with some 80 words selected from tape recordings made of talks given by policemen to nursery school children or from words which often occurred in text books on road safety for the youngest children. The words were listed at random on a form and were given to all the children in the same order. The answers showed that the greatest difference in knowledge was related to age, but sex differences and urban-rural differences also appeared. Misconceptions about the most common traffic words were surprisingly common in all the investigated age groups. Some words were easy for all age groups, others were so difficult that hardly any child understood them, while a third group showed a clear improvement with age. For example, 'easy' words (understood by more than 90% of the children) included: pavement, ambulance, driver. 'Difficult' words included: to walk against the traffic (66% right), vehicle (38%), refuge (4%). Words which showed a clear improvement with age included: pedestrian (9% at age 6, 57% at age 8, 93% at age 10), get out of the way (42% at age 6, 72% at age 8, 91% at age 10). The lists of words in each category will, of course, be different for different languages. If the family owned a car or if the child had a cycle, then children up to and including the age of 8 were better than their classmates without such advantages. For the 10 year olds access to a car or cycle did not make

any difference. An investigation of the comprehension of synonymous traffic words helped us to select words which would be most easily understood by young children when used in road safety instruction.

Two investigations have also been made of the effect of road safety teaching on children. The most important of these (1964) dealt with the following problem. Which is the most effective method of teaching groups of children in the nursery school the basic rules for pedestrians in traffic: teaching indoors, teaching out of doors in real traffic situations, or a combination of both with the indoor teaching being taken first?

About 80 children took part in the experiment with 20 in each of the named groups and 20 forming a control group which was not given any training. Before the instruction commenced individual interviews dealing with traffic questions were held with each child. Individual behaviour tests were also held in real traffic situations. Thanks to the cooperation of the police, these tests were held in closed off streets (though this was unknown to the children). The rules were wished to inculcate were the following:

- (1) Stop at the edge of the kerb before stepping out into the road.
- (2) Look right and left before stepping out into the road and listen.
- (3) Walk straight across the road at the pedestrian crossing.
- (4) Cross at places marked with a zebra crossing and road sign and watch out for

vehicles turning the corner.

The interviews showed that there was a great deal of uncertainty among the children as to how to behave in such situations. The tests showed many cases of incorrect behaviour. Training was then given in four periods spread over two weeks, after which the interviews and the practical tests were repeated. Before the training there was hardly any difference between the four groups of children and the results of both the interviews and the tests were pretty much the same. After the training had been given, the results were considerably different for all groups except the control group. Children who were given nothing but indoor instruction showed the least improvement over their performance at the initial interviews. Out of doors instruction was better and this showed both in the interview answers and in the practical tests. Combined indoors and out of doors instruction was, however best. The final tests showed that the most difficult points to learn were (a) to look back when crossing over the road at a street corner, (b) to look right and left when crossing a road, and (c) to go straight across the road.

Young Children in Traffic concludes with a summary, a discussion of the important results, and a brief outline proposal for basic road safety training intended for use in the home, nursery schools, and the lower division of the comprehensive school. An appendix deals with the requirement for a change in the law dealing with children's liability to damages.



Commenting on the strength of community based injury prevention work, one observer says, '... central bureaucracy-driven strategies ... have the advantage of a much wider impact, often with access to massive resources. Special efforts must, however, be made to take account of community acceptance. Failure to do so can result in a community backlash in the form of repealed laws — such as aspects of the NSW swimming pool fencing legislation — and loss of credibility for injury prevention advocates. At worst it can galvanize a powerful opposition lobby group into action' (Mark Henessy, *Child Safety News*, No 24).



A world first: Volvo will be selling optional side impact air bags on its 850 series, and on the 900 series for \$500.



A recently released federal study in the US concludes that the net effect of antilock braking systems does not reduce crash frequency or cost (*Status Report* 1994; 29: 2).