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**TRAFFIC ACCIDENT
RESEARCH UNIT**



**COMMUNICATING ROAD
SAFETY TO THE YOUNG
PEDESTRIAN**

JANE SCHREIBER, B.A.,

JILL LUKIN, B.Sc.

AN EXPLORATORY RESEARCH PROGRAMME

VOLUME I

DEPARTMENT OF MOTOR TRANSPORT NEW SOUTH WALES

The Traffic Accident Research Unit was established within the Department of Motor Transport, New South Wales, in May 1969 to provide a scientific approach to the traffic accident problem.

This paper is one of a number which report the results of research work undertaken by the Unit's team of medical, statistical, engineering and other scientists and is published for the information of all those interested in the prevention of traffic accidents and the amelioration of their effects.

A handwritten signature in cursive script, appearing to read 'W. Butler', is centered on the page.

Commissioner.

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AN EXPLORATORY RESEARCH PROGRAMME

VOLUME 1*

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JILL LUKIN, B.Sc.

* COPIES OF VOLUME II WILL BE SUPPLIED ON REQUEST.

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ABSTRACT

Young pedestrians have long been a major target for road safety propaganda partly due to their over-representation in pedestrian traffic crashes. The Australian Department of Transport in co-operation with the traffic and road safety authorities of the Australian States and Territories has been responsible for the production of education material utilising the fantasy animal character, Hector Cat, in communicating to children aged 5-8 years old. An exploratory research programme was developed to observe how children reacted to this educational material. The research was subdivided into the following areas of investigation.

1. Hector Cat's appeal as a communicator to children.
2. Clarity of content of certain of the Hector Cat materials (comic, 1975 calendar, 3 films) to children when the materials are presented without adult support.
3. The effect of a 60 second film "Hector's School of Road Safety" on children's performance of the kerb drill.
4. Children's understanding of the concepts of "safe" and "dangerous".

Results along with child development literature indicated that, while subjects found Hector likeable, he was not as positive a model as was an authority or teaching figure in the reality-based area of traffic safety. Subjects were more involved with the story content than they were with the educational content of the Hector material. The Hector road safety film was unsuccessful in promoting safe road crossing behaviour amongst subjects. Finally, while subjects were able to correctly identify situations as either safe or dangerous, reasons given for these decisions created doubt as to subjects' comprehension of the concept of danger as it related to themselves. These findings suggest that future educational programmes would be more successful if they took into account the serious handicaps of children under 8 in the traffic environment, due to their physical immaturity and lack of experience in assessing traffic situations. Recommendations are made with regard to the types of changes which could be incorporated into future traffic safety education programmes directed at the young pedestrian.

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SUMMARY

(INTRODUCTION AND CONCLUSIONS)

The Department's exploratory research into traffic safety publicity for children began in the early part of 1975. This report, the first of two, outlines the reasons for conducting this research and presents the results of interviews with children aged 3½ to 8 years on their understanding of current traffic safety publicity, their perception of the concept of safety versus danger, and their performance of the kerb drill.

The results of the exploratory research programme regarding the communication of traffic safety information to young children have shown that:

- Characteristics other than likeability need to be considered when selecting a behavioural model to communicate road safety information to children.
- The indirect communication approach embodied in the Hector material is far from successful in communicating its intended message.
- The directives incorporated in the kerb drill do not promote behaviour which leads to safe participation in the traffic environment.
- Many children do not comprehend the concept of safe/dangerous and thus can not be expected to understand the dangers implicit in the pedestrian task.

There is a need for the production and evaluation of traffic safety publicity which acknowledges the limitations of the young pedestrian. Child development theory, and the current research suggest that:

- This material should be presented in a simple and direct manner rather than being embedded in heavy storylines.
- Instructors should be real people behaving competently in real life traffic situations.
- The material should include both male and female role models.
- Rote learning should be replaced by educational experiences which promote an understanding of the child pedestrian as one component in the traffic environment.
- Mastery of sensory and motor skills should be seen as an intrinsic part of a road safety educational programme.
- The material should include audio-visual aids which will promote student/teacher participation and dialogue.

Furthermore, as adults tend to over-estimate childrens' capabilities to cope with traffic environment, there is a need for publicity material - directed at adults - informing them of childrens' physical and mental limitations as they relate to road safety judgement. It is suggested that this dual road safety educational approach would serve to increase understanding on the part of children and adults of the ways in which both groups can act to promote the safe interaction of the young pedestrian in the traffic environment.

BACKGROUND

A BRIEF HISTORY OF TRAFFIC SAFETY PUBLICITY

FOR CHILDREN - 1970 TO THE PRESENT.

On New South Wales roads, 1352 children under the age of 13 were killed or injured as pedestrians in 1975. Children in this age group comprise 23% of the State's population but account for 29% of all pedestrian casualties (Department of Motor Transport 1975). Young pedestrians have long been a major target for road safety propaganda because of this over-representation of primary and pre-school-aged children in pedestrian traffic crashes. The Commonwealth Department of Transport in co-operation with the traffic and road safety authorities of the Australian States and Territories has produced this educational material. A character named Hector Cat was introduced as a vehicle for the communication of road safety information to children aged 5 to 8 years in the 1971 school calendar. Hector was introduced as an inept cat who lost eight of his nine lives because his ignorance of traffic safety rules. Hector made his next appearance in "live form" as a large animal-suited character (that is, an adult dressed in a blue and yellow striped cat costume) in the film "Hector Goes to Play Ball". Hector appeared, at this stage, to be modelled after a popular day-time children's television character - Humphrey B. Bear. The strategy behind the use of an animal personality of this sort was that such a character would catch and hold children's interest, with the aim of teaching the target audience without their being aware of the learning experience. Hector was described at this stage, as "moth eaten", "an aging good natured tramp," and as an animal who "tries hard but errs due to his natural lack of intelligence" (Child Road Safety Films 1971). In this film Hector learnt about traffic safety through a series of dangerous episodes during which he was rebuked by singers on the film sound-track.

The 1972 Hector Calendar presented a wiser Hector Cat, now more aware of traffic safety. Millie Cat, Hector's girlfriend, first appeared on the 1973 calendar. Hector and Millie were married in the 1974 calendar and Uncle Tom was introduced as the "naughty" cat who was ignorant of traffic safety rules. This theme was continued in a 1974 movie "Hector and Millie Save Uncle Tom". The 1975 Calendar introduced Hector and Millie's three kittens as the innocents in need of education with regard to the rules of road safety.

THE EXPLORATORY RESEARCH PROGRAMME

A. The Traffic Safety Publicity Used in the Research Programme.

The Hector Cat material has been produced in several media forms - a comic book, school calendars, and films of varying length and complexity. The material used in the research schedule included the comic book Hector Cat - Secret Agent, the 1975 Hector Calendar; and the three Hector films "Hector Plays Ball", "Hector and Millie Save Uncle Tom", and the 60 second television commercial "Hector's School of Road Safety".

The Hector series of traffic safety publicity has been indicated (Publicity Advisory Committee on Education in Road Safety 1971) to have been directed at children aged 5-8 years - that is, children in infants' schools. The printed material was distributed to all schools in New South Wales through the Traffic Safety Education Section of the Traffic Accident Research Unit. Films could also be obtained by New South Wales schools, upon request, either through the Traffic Safety Education Section of the Traffic Accident Research Unit or through the Department of Education. These films have also been distributed for varying periods of time to all television stations for use at their discretion. "Hector's School of Road Safety" was produced by the Department of Transport in co-operation with the traffic and road safety authorities of the Australian States and Territories as a television commercial and media time was purchased for this film's exposure.

B. Aims of the Research Programme

When formulating the aims of the research programme, the authors were aware that the special limitations of the subjects under study must be understood. To this end, the Traffic Accident Research Unit obtained a brief overview of child development theory as it related to the growth and development of children in the target age group. The understanding of this material (Huntsman 1975), which appears in Appendix B was considered a vital preliminary step to the formulation of a research programme oriented towards studying traffic safety material, the idea of safety, and safe pedestrian behaviour from the point of view of the target audience - pre-school and infant's school children.

The Hector Cat material has used inept animal fantasy characters as communicators to educate children about the real life traffic environment. Furthermore, the road safety information was communicated indirectly in the material, which employed the fantasy characters in various plot situations. The research undertaken was designed to investigate the effectiveness at these communication techn-

iques for communicating road safety information to children. The study was divided into four stages, each oriented towards answering one of the following questions:

- Stage 1: Does an animal fantasy character such as Hector Cat exert a unique appeal as a communicator to young children?
- Stage 2: How clearly does the material produced using Hector Cat communicate road safety information to children?
- Stage 3: How does exposure to a Hector film illustrating the kerb drill affect children's actual road crossing ability?
- Stage 4: How do children perceive the concepts of "safety" and "danger"?

C. The Research Sample

Although the communication being tested was generally aimed at children aged 5-8 years, it was decided to extend our research sample to include children aged 3½-5 years in an attempt to test the possibility of communicating road safety information to the pre-school child. This decision was based on the assumption that children become much more at the mercy of the traffic system once they attend pre-school, since attendance at a pre-school greatly increases a child's exposure to the traffic environment. Up until the time children attend pre-school, they are rarely in a traffic situation unattended by an adult. A small scale Traffic Accident Research Unit survey on school children's exposure to risk in unescorted pedestrian situations has shown that a considerable proportion of 5 year old children are not escorted home from school by an adult (Avery 1973).

Sandels (1975), in her research on children under 10 years of age who had been injured as active road users, found that the majority of child pedestrian traffic accidents occurred between the ages of 3-8 years. Furthermore, additional research at the Traffic Accident Research Unit has provided indications that it could well be possible to teach pre-school kindergarten children how to use the traffic light system under optimal learning conditions (Avery and Wood 1974).

Separate samples of children were interviewed in each section of the current research programme. The research schedule was organised in this manner for the following reasons: inclusion of all the material in one interview would have been far too onerous a task for children of the age group under examination; there was a danger that exposure to any of the test stimuli would contaminate subsequent responses to additional stimuli.

The age range of the respondents included for testing varied from section to section of the research programme - depending upon the suitability of the material being examined to the particular age groups under consideration. Thus, for example, the subjects in younger age range were excluded from the research segment dealing with the evaluation of the Hector comic book since some degree of reading skill was essential for comprehension of the test stimuli. Even within the group 7 to 8 year old children tested, the degree of reading proficiency, and thus comprehension of the test stimuli, varied greatly from child to child. Specifically, the age distributions were as follows for each of the stages of the research programme*:

1. Hector's appeal to children versus other fantasy and real life television characters - respondents aged $3\frac{1}{2}$ to 8 years.
2. Content analysis of Hector publicity
 - (a) Hector calendar - respondents aged 5 to 8 years.
 - (b) Hector comic book - respondents aged 7 to 8 years.
 - (c) Hector film material - respondents aged $3\frac{1}{2}$ to 8 years.
3. Effect of exposure to film "Hector's School of Road Safety" on performance of kerb drill - respondents aged $4\frac{3}{4}$ years to $7\frac{1}{2}$ years.
4. Exposure to photographic stimuli depicting safe and unsafe situations - respondents aged $3\frac{1}{2}$ to 8 years.

* Stage 4 subjects exposed to the Hector film were older than the subjects in Stage 3 exposed to the film because the Stage 4 was conducted in infants' schools only. Subjects aged less than $4\frac{3}{4}$ years were still in "pre-school" ("pre-school" being defined as child care centres which are oriented towards preparing children aged 3 to $4\frac{3}{4}$ years for the formal school environment) as children are not admitted into the N.S.W. educational system until they reach this age.

STAGE 1 - Hector Cat's Appeal as a Communicator
to Children

METHOD 1

It appears that Hector Cat was created as a vehicle to promote traffic safety on the assumption that, as an animal fantasy character, he would have intrinsic appeal to children and that this appeal would make him especially suited to act as a communicator of road safety information to children. This section of the research project was oriented towards exploring this assumption.

Subjects

The sample consisted of 70 children aged 3½ to 8 years from pre-schools and infants' schools in three suburbs in the Sydney Metropolitan Area. The children were interviewed individually. The number of children in each of the five age groups (under 5, 5, 6, 7, and 8 years) selected from each suburb are shown in Appendix D. The schools were selected with the aim of interviewing children at various points along the spectrum of socio-economic class (lower middle to upper middle) so that any variation in responses due to this variable would be identified. There were 35 males and 35 females in the total sample, with equal numbers of both sexes within each age group. Subjects were excluded if unable to understand simple English.

Test Materials

There was some problem in deciding upon the stimuli which would be most suitable for testing Hector's appeal to young children. After a series of pilot interviews with 25 children in the age range under consideration it was decided to test a photograph of Hector Cat as he appeared in the TV commercial "Hector's School of Road Safety" against photographs of various television personalities. The selection of a visual representation of Hector Cat for testing was hampered by the need to choose between several different 'Hectors' as Hector's physical appearance had varied from media form to media form as well as within media forms. Hector, as he appeared in "Hector's School of Road Safety", was selected as being the most recent version of Hector and thus probably the most familiar version to subjects. Furthermore, this film was the only one of the Hector films specifically designed for television: television being one media form which would be familiar to even the youngest subject. Schramm, Lyle and Parker (1961) in their study of television in the lives of children found that television, more than any other medium of communication, furnished a common body of information

for the early socialization of children and that by the age of three years old a child was able to shout out the name of his favourite television programmes. Secord (1958) conducted research on the use of facial photographs for the study of perceptual cognitive processes and has indicated that this type of test stimuli can contribute to better understanding of the way perceptual judgements of persons are made. Following these research findings it was decided to use photographs of television personalities as a means of presenting the stimuli to the subjects.

In order to obtain a greater degree of understanding about the type of character preferred by children, Hector was compared against both male and female, real and fantasy characters. Equally, as the relationship between familiarity and popularity of a certain character was unknown, television personalities from a variety of different programmes were selected. Thus, two adult television personalities from news format programmes (Caroline Jones and Iain Finlay) were included to obtain some idea of the rating a normal pleasant-looking adult would receive from subjects. Eight characters, including Hector, were chosen for testing as this number was considered to be large enough to present a varied array of choices and small enough to be manageable for the children being interviewed. The characters chosen for testing were

<u>Character</u>	<u>Television Context/Programme</u>
Hector Cat	Hector's School of Road Safety
Humphrey B. Bear	Humphrey B. Bear Show
Liza	Adventure Island
Ozzie Ostrich	Cartoon Corner; Hey Hey It's Saturday
Daryl Somers	Cartoon Corner; Hey Hey It's Saturday
Marilyn Mayo	The Super Flying Fun Show
Caroline Jones	Four Corners
Iain Finlay	This Day Tonight

The first four of the above mentioned characters have been defined as "imaginary" either because they appeared in a fantasy environment (as was the case of Liza) or because they were animal persons who spoke and behaved as if they were human (the remaining three characters). The fact that three of the four fantasy characters are male reflects the imbalance that exists in the sex of main characters in children's programming. The last four characters appearing on the list were defined as "real" on the basis that they appeared as themselves on television - rather than in an acting role. Daryl Somers and Marilyn Mayo ("Miss Marilyn") have appeared as comperes on popular children's programmes. Caroline Jones and Iain Finlay, were current affairs news readers.

The photographs used for testing showed the television personalities dressed as they would normally be seen on television. The photographs were black and white prints, 18 cm x 25 cm.

Procedure

Interviews were conducted in rooms set aside, within the schools, for that purpose so that interruptions would be kept to a minimum. Subjects were individually escorted to and from their classrooms or play areas throughout the school day, with the exception of recess and lunch periods. Each subject was asked not to discuss the content of the interview with his/her friends so as not to contaminate subsequent interviews.

Subjects were first shown each of the eight television characters, one at a time, in order to determine which of the characters the child could and could not recognize. These photographs were presented randomly; the order of presentation varied with each test subject. The subject was then shown the four imaginary characters, two at a time, using the paired comparison technique, until the most preferred imaginary character was chosen. This procedure was repeated using the real character photographs. The most preferred real character was then paired with the most preferred imaginary character, yielding the character most preferred over-all. Real and imaginary characters were kept separate in the initial pairing as the relative attractiveness of real and imaginary characters was one of the key factors being explored in this study. A ranking procedure then followed in which all eight photographs were spread out on a table in front of the subject. The child was then instructed to pick the character he liked best. This photograph was removed and the best liked of the seven remaining photographs was chosen. This procedure was repeated until only one photograph remained on the table - providing a ranking from 8 (best liked) to 1 (least liked). Again, the order in which the photographs were shown was rotated from interview to interview to avoid any bias evolving as a result of the order in which the photographs were presented. The subject was then asked to explain why he/she had selected his/her most preferred real and imaginary characters.

The interview format next concentrated on the subject's perception of Hector Cat through the presentation of eight sets of bipolar descriptions of the character (Appendix C, Stage 1 Questionnaire, Q15). The child was asked to choose which aspect of each attribute (the positive or the negative) was a better description of Hector Cat. The order of presentation within a particular attribute was alternated - so that sometimes the positive aspect of the attribute was stated first and sometimes the negative aspect of the attribute was stated first. This method of presentation was intended to counter any bias likely from subjects automatically choosing either the first or last alternative within each attribute.

The last part of the interview format presented the test subject with a conflict situation in which Hector and a policeman were giving conflicting advice with regard to whether or not the child should cross the road. The conflict was presented with both Hector and the Policeman

suggesting, in turn, that the child should and should not cross the road.

When a character other than Hector was the most preferred character, that character was also pitted against the policeman in the traffic safety situation.

The questionnaire, which took approximately 15 minutes to administer, appeared to sustain the subjects' interest throughout the interview. The younger subjects' ability to follow instructions and perform the tasks required of them exceeded, in some cases, their ability to verbalise the reasons for a particular choice. This was understandable, bearing in mind that the young child's (i.e. a 4 year old) recall is 75 percent poorer than his recognition. Also, the linguistic ability of some children was presumably insufficiently developed to enable them to communicate all that they were able to comprehend (Kagan 1971).

Interviews were tape recorded and subsequently transcribed onto data sheets. The Stage 1 Questionnaire appears in Appendix C.

RESULTS 1

Knowledge of Characters

For each character which a subject could recognise, the subject received a score of 1; for each character which a subject could not recognise, he/she received a score of 0. Table 1-1 indicates the number of subjects who recognised each character. It will be seen that Hector was neither the most often correctly identified nor the least known of the characters shown.

One way of analysing dichotomous data is to apply analysis of variance techniques just as if the 0's and 1's are quantitative observations. Some assumptions made in the analysis of variance model may be violated, but nevertheless this method has "the major advantage of simplicity and is effective when the dependencies are of simple form" (Cox 1972, p. 113).

An analysis of variance, as described by Winer (1971) for three factor experiments with repeated measures, was carried out and a summary of the results is given in Table 1-2.

The results from the analysis of variance indicate that there was a significant sex by character interaction ($p < 0.05$), a highly significant age by character interaction ($p < 0.01$), and a very highly significant character main effect ($p < 0.001$).

Obviously the subjects recognised some characters much more frequently than others. All the subjects knew Humphrey, only a few knew Caroline and Iain and the other five characters were spread between the two extremes.

The difference between characters, however, varied between the two sexes. For example, female subjects knew Liza almost as well as Ozzie, while male subjects recognised Ozzie much more than Liza. Hector was not well-known by either male or female subjects.

A similar change was found between the difference in recognition of characters over the age groups. Liza was one of the best-known characters for young subjects, but one of the least-known characters for older subjects. Hector, on the other hand, was one of the least-known characters for young subjects, but was better known by the older subjects.

Any differences between the recognition of these characters by subjects should therefore be considered in terms of the age of the child and also in terms of the sex of the child. As there was not a significant age by sex by character interaction, the combined effect of age and sex together on character recognition need not be considered.

Preferred Characters

Two methods were used, the paired comparison technique and the rank order technique, to measure each subject's favourite out of eight characters presented to him.

The two favourite characters who were chosen under the two methods differed for 31 out of 70 subjects. When favourite real characters and favourite imaginary characters were also examined under each of the two methods, the lack of consistency between the two methods was most extreme for the younger subjects but it was still a significant problem among the older subjects.*

Because the two methods produced different results for most subjects, it seemed unwise to carry out any detailed analysis of either set of results. One result which did emerge from both methods, however, was that Humphrey was by far the most popular character among male subjects and Liza and Humphrey were most popular among female subjects. Furthermore, Caroline Jones and Iain Finlay were by far the least popular characters. Ratings of Hector Cat followed the same pattern as Humphrey Bear, Hector being more popular with male subjects (Tables 1-3 and 1-4).

Perceived Attributes of Hector

Each response which each subject gave was assigned a score of 1 if it represented a positive attribute, and 0 if it represented a negative attribute, (for purposes of analysis the attribute "grown-up" was considered to be positive). An analysis of variance was carried out, using the method already attributed to Winer (1971) for a three-factor experiment with repeated measures.

- * One explanation for this problem could be that the children generally were poorly acquainted with most of the characters, and thus were easily confused when confronted with photographs of unknown characters.

Table 1-5 summarises the results of this analysis of variance.

The only significant result was the age main effect ($p < 0.001$). To examine this effect, Table 1-6 gives the total number of subjects within each age group who perceived Hector as having each of the different positive or negative attributes.

This table indicates that the total "positive score" which Hector was given by older subjects was much greater than that which he was given by younger subjects. It should be noted that there was no significant difference between the positive and negative ratings of different attributes. Subjects in general perceived Hector as having positive attributes. This tendency was stronger among older subjects than among younger subjects.

Conflict situation

Most subjects were asked 4 times whether or not they would cross the road. On the first occasion they were asked whether they would cross the road if Hector said to cross and the policeman said not to; secondly the policeman said to cross and Hector said not to; thirdly their favourite character said to cross and the policeman said not to; and finally, the policeman said to cross and their favourite friend said not to. The subjects who said, by the paired comparison method, that Hector was their favourite character, were only asked whether or not they would cross on the first two occasions.

It was hoped that this part of the experiment would determine whether Hector would be obeyed more or less than a policeman in a conflict situation. A child was given a score of 1 whenever he said he would obey Hector, and 0 whenever he said he would obey the policeman (see Table 1-7). (An alternative approach would have been to give a score of 1 as an indication that the child would cross the road, and 0 to indicate that the child would not cross the road).

An analysis of variance was carried out on the resulting dichotomous data. Three factors were examined, age of subject, sex of subject and "occasion" (i.e. who said "cross", who said "don't cross"). The results of this analysis of variance are given in Table 1-8.

There were no significant interactions or main effects ($p > 0.05$). This means that the choice of character to obey (i.e. the policeman or either Hector or the favourite) does not depend on the subject's age or sex or which particular conflict situation was being examined.

This justified looking at the total scores over all four occasions for the policeman versus Hector (or the favourite character). The policeman was obeyed 189 times out of a possible 280 (Table 1-7). To test the hypothesis that the policeman had the same chance of being obeyed as Hector (or the favourite character) against the alternative hypothesis that the policeman had a greater chance of being obeyed, a one-tailed Z test (corrected for continuity) was performed with the result that $Z=5.80$, $p < 0.001$. Thus the policeman was obeyed significantly more often than Hector or the favourite character.

DISCUSSION 1

Familiarity as a basis of preference of fantasy characters

The results of Stage 1 of the research programme indicated that subjects had an affinity towards fantasy animal characters. While inconsistencies between the results of the two measures used to assess each subject's favourite character led to an abandonment of any detailed analysis of either rating procedure (Tables 1-3, 1-4), Humphrey B. Bear clearly emerged as the most popular of the characters tested (this popularity being more pronounced among male subjects).

Positive affect towards a particular character appeared to be related to the subject's familiarity with that character (Table 1-1). For example Humphrey B. Bear, already stated to be the most popular character, was by far the most familiar of the characters presented to the children because of his extensive television exposure. Hector, on the other hand, was far less familiar to the subjects, having far less media exposure. Most judgements about Hector would have therefore been made primarily in response to his appearance on the photographic stimuli. Because familiarity has been shown to affect ratings, Hector's ratings were adversely affected by his lower exposure. Caroline Jones and Iain Finlay were both the least familiar and least popular of the television personalities photographically depicted (Tables 1-3, 1-4).

It is suggested that the familiarity of fantasy characters to children has served to greatly increase the characters' popularity amongst children. Schramm et al. (1961) have found that television programmes which are directed specifically at young children typically feature animal heroes and/or fantasy figures as their protagonists. These authors further acknowledge television as one of the major sources of early childhood socialization. It is suggested that attempts at establishing communication via fantasy characters has created a familiarity which leads, in turn, to a preference by juvenile audiences for fantasy communicators. It is suggested, however, that it is important that this preference for fantasy in juvenile communication should not block the use of real characters in those situations where they could be more effective.

Sex of Character as a Basis for Preference

Analysis of the subjects' preferences of the characters tested revealed that subjects tended to prefer characters of their own sex (Tables 1-4, 1-5). This preference pattern was also apparent in the second stage of this research (see Content Analysis Section, Table 2-4B). This pattern of preference has been explained by Kohlberg (1967) on the basis of Piaget's concept of childhood egocentrism. This egocentrism leads children to be unable to distinguish between the value they place upon particular objects and the value others may place upon the same object. This tendency to impose self-based values upon the world, due to the assumption that these self-based values form the basis of the valuing of others, leads children of both sexes to think that their own sex is best in some absolute sense. While this same-sex valuing reflects the encouragement of sex-appropriate behaviour by socializing agents, this encouragement is taken by children not as representing the relative social norm "It is good to conform to the behavioural expectations of your own sex" but rather as an egocentric absolute "my sex is better than the other sex" (Kohlberg 1967, p. 114).

Perceived Attributes of Hector

Subjects generally assigned positive attributes to Hector (Table 1-6). This trend was more apparent among the older children in the sample. Hector's greater appeal with the older subjects could be related to their greater familiarity with him (Table 1-1) as positive affect appears to be related to familiarity.

The Conflict Situation - Children's Selection of Behavioural Models

Results of the conflict situation in which Hector, or the subject's favourite character, was matched against a policeman in a traffic situation indicated that subjects chose to obey the policeman in 189 out of a possible 280 times (Table 1-7). It therefore appeared that the subjects preferred to obey a realistic authority figure in preference to Hector or a favourite character within the context of a real situation. These results provide useful data with regard to rethinking the type of character which should be used to communicate road safety material to children. These findings are supported by child development theory. Kagan (1971) has explained how children learn new ideas and skills by watching and listening to those around them. The child learns and develops by orienting himself "to those people who possess physical or psychological attributes he admires. Most children believe that strength, power over others, physical attractiveness, warmth, honesty, sincerity, and a rich collection of abilities are good and valuable traits, and they are attracted to adults who command these characteristics. The child is drawn to adults who are kind to him and to those who he respects or believes others respect" (Kagan 1971, p. 11-12). Thus, the child identifies with heroic adults - adults who are perceived to have power and skill, and who are in control of their environment. It therefore becomes highly doubtful that an inept fantasy character, no matter how appealing and friendly he may be, would necessarily be the best vehicle through which to initiate children into the traffic environment. Bandura and Kupers (1964) have also found that adults served as more powerful modelling stimuli than peers in transmitting self-reinforcing responses.

Summary and Discussion

The results of Stage 1 of the research programme supported by child development literature indicated that factors other than likeability need to be considered in the selection of a communicator or road safety information. A communicator who is both realistic and authoritative would appear to be a more suitable model to teach children about the real life traffic situation.

STAGE 2 - Analysis of the Hector Cat Road
Safety Material

METHOD 2:

It was not possible to treat all the Hector material under consideration as one complete educational package. Variations in communication approach, media format, and even the characterisation of Hector Cat, made it necessary to analyse each of the materials under consideration separately. It was, however, possible to formulate areas of inquiry which were applicable for all the publicity. Those areas, which provided a loose framework to the investigation, were:

- (1) The degree of saliency of the traffic safety message. When asked what the material was trying to communicate, did subjects perceive the material as oriented towards traffic safety?
- (2) The relative saliency of the characters which appeared in the communication. Which characters, if any, were subjects able to identify after exposure to the test material? Which character, if any did subjects like best in a particular communication and why did they feel attracted to that particular character?
- (3) The intended educational message of the communication. This information often appeared in the form of a question "what does a particular character have to learn?"
- (4) Recall of the kerb drill. To what extent did exposure to the road safety material elicit recall on the kerb drill.
- (5) General attitude towards the communication. Did the subject enjoy his/her exposure to the communication?

The above five areas of investigation made up the framework of Stage 2 of the research programme. The material was grouped according to its media format, the films (A), a calendar (B), and a comic book (C). In all the material tested, no attempt was made to measure the subject's familiarity with either the kerb drill, or road crossing procedure in general, prior to testing. Hence, there was no basis for determining whether answers to the second last question ("how should you cross the road?") were reflections of prior learning (long-term memory), or of recent exposure to the stimuli (short-term memory), or of both acting simultaneously. This fact must be borne in mind when analysing these comments. It was hoped, however, that the exploratory data would yield an increased understanding of those aspects of road safety which appear to be more easily absorbed if not applied, by subjects.

While the producers of the Hector material encourage teachers to support the educational content of the material with follow-up lessons, it is considered a valid research goal to investigate the clarity of that material's content to children when the material stands alone. Through this type of research one can better understand what the material has communicated to children, rather than basing assumptions on what the material communicates to adult observers.

A. The Three Hector Cat Films

The Hector Cat film material consisted of three films: "Hector Plays Ball", "Hector and Millie Save Uncle Tom", and "Hector's School of Road Safety". The two former films utilised a heavy storyline approach, the traffic safety message being embedded in the film's story. "Hector's School of Road Safety", on the other hand, was a direct road safety communication (for a more detailed analysis of the storyline/traffic safety message ratio in the films tested, see Tables 2-1A, B). Due to this difference in communication approach it was decided, for the purpose of analysis, to treat jointly the two films which utilise an indirect approach in communicating the road safety message. The one direct road safety film was analysed separately. The relative merits of the two alternative approaches for conveying information to children will also be considered.

The purpose of the analysis was to ascertain the extent to which the road safety content of the films was communicated to the subjects.

Subjects:

A total of 124 children aged between $3\frac{1}{2}$ -8 years were tested using the Hector films. Sixty children were shown "Hector's School of Road Safety" (embodying specific kerb drill instruction). Sixty-four children were tested using the film material based on the indirect learning approach (32 subjects were shown "Hector and Millie Save Uncle Tom" and 32 subjects were shown "Hector Plays Ball"). The children were drawn from two pre-schools and two infants' schools in the Sydney Metropolitan Area. These four schools were selected to represent a cross-section of children from various points of the S.E.S. continuum, one pre-school and one infants' school being situated at both ends of the scale. Equal numbers of boys and girls were interviewed in each of the following age groups: under 5, 5-6, 7-8. The distribution of test subjects by age, sex and school suburb is detailed in Appendix D.

Each subject was exposed to only one of the Hector films - and, indeed, to only one of the five forms of road safety propaganda under investigation - so that the subject's responses could be regarded solely as a response to the particular communication seen. To allow for an adequate number of test subjects, it was necessary to restrict the study to schools with sufficient enrolments within the requisite age range.

Test Materials:

The three Hector films provided audio-visual stimuli for the test subjects, who were required to verbally respond to a one page questionnaire. Responses were recorded verbatim by the interviewer. Copies of the questionnaires used appear in Appendix C.

The three films tested were all colour prints. The films varied in length, "Hector's School of Road Safety" was a 60 second commercial; "Hector Plays Ball" was approximately $9\frac{1}{2}$ minutes long; and "Hector and Millie save Uncle Tom" was approximately $14\frac{1}{2}$ minutes long.

While the interview format for each of the three Hector films was geared towards obtaining substantially the same information as was obtained for the calendar and comic, the final question was specific to the film questionnaires: that is, "Did you like Hector's song? Can you sing it?" In all three films, in fact, the lyrics functioned as the chief means of communicating and explaining the films' content. Recall of some, if not all, of Hector's song, by the subjects could therefore be seen as related to the films' successful communication.

Procedure:

To expedite the flow of interviews, the films were shown to 6 subjects at a time. The film projector was set up in a room away from the mainstream of school life, so that distractions would be minimised. After the film was shown, each of three interviewers asked one of the 6 subjects to come and talk about aspects of the film. The remaining children were given paper and crayons to occupy themselves during the ensuing interval before their interviews, which were conducted individually.*

If a specific question failed to produce a response, interviewers were instructed to probe the question fully in an attempt to obtain a response to the question. Interviews lasted approximately 5 minutes.

The interviewing team consisted of one male and two female interviewers - all with experience in early childhood education. Each interviewed approximately the same number of male and female subjects in order to minimise any bias introduced by sex of the interviewer. The need to establish rapport with the subject before commencement of the interview was impressed upon all interviewers.

B. The 1975 Hector Calendar

Like the other forms of road safety publicity undergoing content analysis, the 1975 Hector Calendar was divided into sections to facilitate appropriate questioning. Information within the calendar was contained both in the visually depicted actions of the chief characters (Hector, Millie, their three children, Willy, Jilly and Bob, and Uncle Tom), and in accompanying printed commentary on each page. The impact the calendar's illustrations and commentary had on subjects was of

- * No differences were noted by the interviewers between those responses which were obtained immediately after exposure to the film and those responses obtained approximately 5 minutes after exposure to the films.

particular interest because of the complete lack of reality and the complex layout of the calendar's pages.

Subjects:

Interviews were conducted with a total of 64 children aged between 5 and 8 years (the calendar's target group) from the two metropolitan infants' schools already participating in this stage of the research programme.

Included in the sample from the school in the lower S.E.S. area were a number of first and second generation migrant children who did not speak English as their first language. As these students had sufficient fluency to comprehend the interview format and were considered to be part of the media's target population, it was considered justifiable to include them in the research sample.

Four boys and four girls aged 5, 6, 7, and 8 were arbitrarily chosen in each school from the children who had not been exposed to any of the other road safety material being tested. The distribution of subjects by age, sex and school suburb is detailed in Appendix D.

Test Materials:

The 1975 Hector Calendar provided visual stimuli for subjects who were required to respond verbally to a three page questionnaire. Subjects' answers were recorded verbatim by the interviewer. A copy of the questionnaire is reprinted in Appendix C.

The calendar's dimensions were about 35 cm x 48 cm (13 ³/₄" x 19 ¹/₄") and, except for a 14 cm strip across the top, each page was dominated by bright red, green, yellow, orange and blue characters against similarly coloured, or white backgrounds. The calendar pages for the months of January/February, April, June, August and October were designed so that pictures of the calendar's characters (i.e. Hector, Millie, the three kittens, and Uncle Tom) could be pushed out and made into a mural. These push-out pictures, along with the illustration for November /December, were unrelated to the road safety message which appeared beside them. Particular attention was therefore paid to whether any difference was apparent in the clarity of communication of these pages versus the pages where the illustration was related to the written message appearing along side it.

The first three questions in the questionnaire were general and oriented towards obtaining data about the calendar in its entirety. Subsequent questions dealt with each page/month separately and in greater detail, these questions dealing with both general and specific aspects of each page. The final two questions were again wider in scope; in the first the subject was tested for his/her knowledge of correct road crossing procedure, in the second the subject's general attitude towards the calendar was obtained. The total questionnaire format complied with the general format used in testing all the materials under consideration.

Procedure:

Subjects were individually called from the classroom to a quiet corner in the school, during which time rapport was established. Each interview lasted for approximately 20 minutes. Each subject's reading capacity was assessed by asking him/her to read a portion of a page of the calendar: this ability was noted at the top of the questionnaire.

The subjects were asked to read the calendar from beginning to end to the best of their ability. Non-readers were requested to look at the pictures. After general questions were asked, the calendar was considered page-by-page. If the initial question regarding the content of each page of the calendar failed to elicit any response from the subject, the interviewer was instructed to probe further by focusing on key components of the calendar pictures.

C. Hector Comic Book

The road safety propaganda in the comic book was conveyed in the context of a quasi-spy story, with Hector Cat as the would-be secret agent. The story revolved around Hector's attempts to get across the road from headquarters, where the Chief ("Big Daddy") had issued Hector with his mission. It was left to Hector to safely cross the road in order to accomplish his task. Ignorance of all road safety precautions did nothing to help Hector on his way, as suggested by a number of exclamatory and action-oriented comments - such as 'Crash', 'Ouch' and 'Beep Beep'. Hector ultimately learnt the correct manner to safely cross the road through trial-and-error mishaps plus advice from his Chief and a policeman. The aim of this part of the study was to discover whether the comic was an effective communicator of road safety information.

Subjects:

Bearing in mind the comic's target readership (i.e. 7 and 8 year olds) the sample was restricted to children of this age group who attended the two infants' schools utilised in the previous content analysis parts of the research. Thirty-two subjects, half boys and half girls, half from one school and half from the other, were tested. Appendix D shows the precise sample distribution by age, sex and school suburb. Children with some degree of English language difficulty were again considered eligible for inclusion in the research sample, with the proviso that they had sufficient English proficiency to comprehend the interview situation and perform the task required.

Test Materials:

A questionnaire (presented in Appendix C) following the same format as those used in the other segments of this content analysis was prepared for use along with the comic. This questionnaire, administered by the interviewer, began with general questions about the comic, progressed to a more detailed probing so that some assessment could be made of the subject's comprehension of the material, and terminated with a request for subjective reactions to the comic.

The one difference between this and previous questionnaires was the last question - "What sort of person do you think Hector is?" The question was of interest in that one of the points of investigation in this exploratory research was to ascertain the effectiveness of an inept model as a communicator of information to children.

Other aspects of the comic included a 'crossing the road' (pencil and paper) game on the first page, 'Hector's Safety Song' on the two centre pages, and a 'colour-in page' on the back page, which were only tenuously related to the main theme of the story and were excluded from the general analysis of the comic book's content.

Procedure:

Subjects were tested individually after the interviewer had established rapport. Each subject was asked to read as much of the comic as he/she could manage, and to look at the pictures. The interviewer then worked progressively through the questionnaire, writing down the subject's responses verbatim. Where the question failed to elicit an immediate answer, the interviewer was instructed to probe for a response.

RESULTS 2

Due to both the small number of test subjects exposed to each media form and the diversity of the media material under consideration, statistical analysis was rejected as a means of processing the results of this stage of the research programme.

Analysis of the data followed the format outlined in the methodology section. It should be noted that, although data from interviews about each of the media have been compared with regard to each of the topics under consideration, each test subject was exposed to only one of the Hector Cat Road Safety materials.

When considering the data relative to the calendar and the comic, it should be noted that the communication effectiveness of these two media materials was disadvantaged in comparison to the films to the extent that the former media depended upon literacy for full communication. Of the subjects for whom a literacy rating was obtained (66% of males, 72% of females exposed to the calendar; 81% of males, 94% of females exposed to the comic), only 29% of males/35% of females exposed to the calendar and 31% of males/41% of females who were exposed to the comic had sufficient literacy to obtain a full understanding of the media's content (Tables 2-2A,B).

Saliency of Road Safety Message in the Various Media.

The direct approach film ("Hector's School of Road Safety") was the most effective of the materials tested in communicating its road safety message to the test subjects. The two indirect Hector films were least clear in the communication to the respondents, many of whom saw their purpose as primarily entertainment rather than as a vehicle for the communication of road safety information.

Female subjects appeared to become more engrossed in the storyline aspect of the materials than did male respondents.

Older children were more inclined to see the material as educational than were the young respondents (Tables 2-3A-D).

The Relative Saliency of the Characters in the Various Hector Media

When considering the relative saliency of each of the characters in the various Hector educational materials, it should be noted that Hector was the only character who appeared in all the media. Millie Cat and Uncle Tom were prominent characters in one of the three films and in the Calendar. The three kittens (Willy, Jilly and Bob) appeared in the Calendar. The remaining characters in the various media definitely received minor attention in comparison with the formerly mentioned primary characters. Almost all respondents selected Hector as most preferred character whenever there were few other primary characters to attract attention: in "Hector's School of Road Safety", "Hector Plays Ball", and the Hector Comic (Tables 2-4A, C, E). Hector was liked most often for his personality and secondly (in the films) for his physical appearance (Tables 2-5A-D).

Respondents exposed to the comic were asked to describe Hector's personality. The adjectives most often used to describe Hector were "silly/stupid" (7 year olds) and "funny" (8 year olds). The pattern emerging from responses to these question indicated that Hector was not primarily seen by the subjects as a road safety exemplar. It was interesting to note that Hector was most liked for reasons other than his teaching function even in "Hector's School" in which Hector was most clearly shown in a teaching capacity (Table 2-5A, E).

A different preference pattern emerged in the two remaining materials under consideration - "Hector and Millie Save Uncle Tom" and the Hector Calendar. Hector did not dominate these materials - rather he shared the limelight with the other characters who appeared in the film and calendar. While Hector was still the most popular character with male respondents who were exposed to the Hector Calendar, female respondents most often preferred the three kittens, followed by a preference for Millie Cat. Hector received hardly any mention in the film "Hector and Millie Save Uncle Tom". Uncle Tom was the male respondents' favourite character and Millie Cat was the female respondents' favourite character (Tables 2-4B and D).

The Perceived Educational Content of the Various Hector Materials

When specifically probed about the educational content of the test material, respondents did indicate an awareness of its road safety message. This message appeared to have been communicated more clearly in the films than in the two printed materials. This was not surprising - considering the limited reading ability of the research sample. Subject's responses to the material in all cases, however, tended to be rather rote*in character - which indicated a parroting playback rather than a mature comprehension and involvement with the media message.

* This observation was made by the interviewers who stated that, despite excellent rapport with the respondents, the children often became uninvolved with the interview when probed about the material's educational content.

The Films

Although the subjects were very involved in the story content of the indirect approach Hector films, respondents were also aware of the road crossing message in both these and the direct approach films.

There was, understandably, greater recall of detailed instructions regarding the road crossing task among those respondents who were exposed to the direct approach film. Respondents exposed to the indirect approach films merely indicated an awareness that the film contained some road crossing information (Tables 2-6A-C).

The Calendar

The format of the calendar presented a particular problem for the test subjects. The pages for the months of January/February, April, June, August and October, designed so that pictures of the calendar's characters (i.e. Hector, Millie, the three kittens and Uncle Tom) could be pushed out and made into a mural were along with the illustrations for November/December, unrelated to the road safety message which appeared beside them. The subjects, who tended to rely on the visual content of the printed materials to supplement their limited reading ability, found the interpretation of these pages more difficult than the text-related picture pages. For this reason, data which resulted from exposure to these pages have been treated separately from responses to the remaining pages of the Calendar.

Respondents consistently perceived the "mural" pages as being involved with the character who appeared on the page and that character's physical activity (i.e. walking, running, skipping, jumping). With regard to the illustration on the final page of the calendar (November/December), all but two male and six female respondents perceived the page as depicting a celebration of the kittens' birthday, not a celebration of having learned road safety rules - the intended communication (Tables 2-7A - F).

The illustrations on the remaining pages of the calendar (March, May, July and September) were related to the road safety messages with which they appeared. Respondents were again asked what they thought these calendar pages conveyed, being probed on specific aspects of the pages' visual and verbal content. The calendar seemed to be most clear in its communication on the pages for the months of March and May. The illustrations on these two pages were quite simple and directly related to the pages' written content. Subjects generally understood that Hector was teaching Jilly how to cross the road (March); Willy and Bob were being taught not to play on the road (May). When probed on details on the pages' communication, the following points emerged*:

* The Tables in brackets refer to data relating to that calendar month.

March A pedestrian crossing appeared to be perceived as a place where cars stop - therefore it was a safe place to cross the road (Table 2-8A - C).

May The roadway was perceived as a foolish place to play due to risk of injury (Table 2-9A - C). Running between parked cars was understood to be dangerous due to risk of injury, the possibility that the cars might move, and problems of visibility (difficult for child to see oncoming traffic/ difficult for drivers to see children) (Table 2-9D).

Subjects were asked what action should be taken when a ball rolled onto the road. The most common response among all respondents was "wait until the road is clear, then get the ball". This response was much more common among male subjects. Responses appear to be related to the sex of the respondent, nearly one-third of female respondents suggested that adult assistance be sought to retrieve the ball. (Table 2-9E).

The calendar was less successful in its communication for the months of July and September. The illustrations on these pages, while being related to the accompanying copy, were somewhat ambiguous. Once again, there appeared to be respondent confusion in a situation where understanding of the communication was more dependent upon the accompanying written message. Considering these pages individually, the following points emerged:

July

Confusion existed among respondents as to whether Millie was advising the kittens about general wet weather precautions (i.e. don't get wet, don't slip on wet footpaths) or whether she was instructing them specifically about road safety behaviour as it related to wet weather conditions.

When asked why additional precautions were necessary when the roads were wet, risk of injury unrelated to the traffic environment was mentioned almost as often as was risk of injury related to cars/cars skidding (Tables 2-10A - B).

September

The layout of the calendar page for the month of September was somewhat confusing to the respondents, who did not appreciate the sequential nature of the illustration. The bulk of the subjects was divided between thinking that Uncle Tom was trying to teach Jilly about road safety (in general) and thinking that Jilly was learning how to drive a car. Very few respondents mentioned that it is important to wear a seat belt when travelling in a car - the intended communication (Table 2-11A)

When specifically questioned as to what a person should do when he/she gets into a car, approximately half of the children interviewed mentioned putting on a seat belt. An equal number did not mention seat belts, even when probed for this response (Table 2-11B).

Those respondents who stated, without being probed, that a person should put on his seat belt when he was in a car were asked to explain the manner in which a seat belt should be adjusted. Half of these respondents gave no answer to this question. The responses given by the remaining respondents indicated a low level of awareness of proper seat belt adjustment (Table 2-11C).

All of the test subjects were asked the reason for wearing a seat belt. There was a general awareness that seat belts were worn to secure the passenger in the seat of the vehicle in which he was travelling (Table 2-11D).

The Comic

Responses to the educational content of the comic were centred on the road crossing task (Table 2-12A). When specifically probed as to Hector's road crossing mistakes, responses were scattered, with "running" being mentioned with slightly greater frequency than Hector's other specific errors (Table 2-12B).

Comprehension of specific educational pointers stated in the comic (i.e. Hector's reprimand by his Chief and by the Policeman) was low (see Tables 2-12C - D).

Recall of the Kerb Drill

After being exposed to the various road safety materials - all of which promoted the use of the kerb drill in crossing the road - subjects were asked to state the correct manner to cross the road. Subjects were not asked to state the kerb drill specifically, nor were before and after measures of knowledge obtained, so these results should be viewed solely as an indication of the impact of the kerb drill content of the material on subjects.

Verbatim recall of the kerb drill was practically non-existent, even among those children who were exposed to the direct approach film which was made up exclusively of the kerb drill song. This may have arisen from the wording of the question which asked that the respondent tell the interviewer the correct manner in which to cross the road and not specifically for recall of the kerb drill. The most frequent response among all test subjects was a partially correct rendition which - if followed - should provide for adequate detection of traffic for a safe road crossing. This response was most frequent among the older respondents. Younger respondents tended to have no recall of the kerb drill. It was interesting, however, that younger subjects' responses were, in many cases, adequate for a safe road crossing in that they often stated that they were not allowed to cross the road unsupervised (Tables 2-13A - D).

General Attitude Towards the Hector Material

Respondents exposed to the Hector material "Hector and Millie Save Uncle Tom", the Hector Comic, and the Hector Calendar were unanimous in their enjoyment of the test material. Three of the

thirty-two respondents who saw the film "Hector Plays Ball" and four of the thirty-two respondents who saw the film "Hector's School of Road Safety" were less enthusiastic. These children tended to register indifference rather than definite dislike towards the material presented. As response to the material was almost unanimously positive, no tables are presented for this data.

The subsamples who were tested on the calendar and comic were asked why they liked the relevant material. In both cases the road safety content was hardly mentioned. The pictures, characters and the entertainment aspect of the material were obviously far more salient to the respondents (Tables 2-14A, B).

DISCUSSION 2

The Need for Direct Communication of Road Safety Information

Stage 2 of the research programme revealed a number of limitations of the Hector Cat road safety material. Subjects were often unaware of the materials' intended purpose, particularly when the material became involved in detailed plots and characterisations (Tables 2-3A - D) and when the material was not visually self-explanatory (Tables 2-7A - F). Furthermore, the material often assumed a higher degree of reading proficiency than exists among its target audience (Tables 2-2A, B). A similar finding was reported by Colborne and Sheppard (1966) who studied young children's ability to understand a road safety poster and concluded that such posters need to be visually self-explanatory as the ability to read the caption on the poster did not necessarily indicate comprehension of its message.

There also exists a large body of child development literature which suggests that young children are anxious to acquire skill and mastery and do not have to be cajoled into learning. Observations of children at play have shown how children use play to increase their mastery of their environment (Sutton and Smith 1971, Erikson 1973). Optimum learning occurs when the child's natural excitement towards the world is harnessed by creating conditions which enable the child to decide for himself that the skill being taught is within his ability and is a good skill to have (Kagan 1971). Children in the target age group, furthermore, would have difficulty distinguishing between the humorous and educational content of the Hector material. Children are, at this stage, attempting to clarify concepts and relationships through dialogue - rather than indulge in make-believe (Gesell 1940). The ability to understand that humour has rules of its own (i.e. the nonsense in humour) does not occur until adolescence, up until this age children appear to be uncertain as to how to take humorous situations (Wolfenstein 1973). Friedlander, Wetstone, and Scott (1974) have found that children are unable to separate the humorous from the serious content of a communication. The children were found to be unable to pick out the statements of fact embedded in the material. Humorous touches calculated to mobilise attention were found to have a low comprehension payoff, further pointing to the need for direct communication with children.

Hector's Appeal to Subjects

Subjects' reactions to Hector were generally similar to the results discussed in Stage 1 of the research programme. While Hector

was found to be appealing, he was not the most compelling character in those materials in which there were alternative characters with which to identify (Tables 24A - E), nor was his appeal related to his role as a road safety educator (Tables 2-5A - D).

Effectiveness of Material in Promoting Rational Understanding of the Traffic Environment.

Exposure to the Hector material did not appear to contribute to a rational understanding of the traffic environment. Subjects tended to respond to the educational content of the material in a rote, parrot-like manner. The material did not elicit strong recall of the kerb drill (Tables 2-13A - D). It was interesting to note that a number of the younger subjects stated that they were not allowed to cross the road by themselves. This was considered to be an adequate response for coping with the traffic environment by these subjects.

The Hector material appeared to be hindered in communicating its road safety message because of the communication techniques utilized. that is, heavy story lines, indirect messages, and inappropriate behavioural models. Furthermore, the Hector material was overambitious in its goals, since it attempted to educate children to perform a complex task requiring the development of specific abilities (Avery 1974) without providing for the development of these abilities. Finally, the material did not provide adequately for the fact that the young child is handicapped at the outset in the traffic environment (Sandels 1973, 1975). These problems are dealt with in greater detail in the Stage 4 discussion.

Summary of Discussion.

The results of stage 2 of the research programme, along with the relevant child development literature, indicate that direct, concise methods of communication are more effective than indirect methods when attempting to educate young children about safe behaviour in the traffic environment.

STAGE 3 - Effect of Exposure to Film "Hector's
School of Road Safety" on Road Crossing Behaviour

METHOD 3:

Stage 3 of the exploratory research programme was a replication of the Pease and Preston (1967) study of children's kerb drill behaviour and their concept of directionality. While neither the Pease and Preston study nor the present study was conducted in real traffic situations, each offered an opportunity to gain greater understanding of the manner in which children approach a traffic situation. Furthermore, the film "Hector's School of Road Safety" (currently available to N.S.W. Schools) attempts to teach the kerb drill in the same manner as the road safety film tested by Pease and Preston (i.e. Hector's demonstrations of "right" were most frequently performed while facing the viewing audience). It was therefore of interest to investigate whether subjects in the current sample would encounter the directionality problems experienced by the subjects in the Pease and Preston study.

The methodology of Pease and Preston was followed as closely as possible on the basis of those details furnished in their published investigation procedure.

Subjects

The research sample consisted of 176 subjects (87 in the experimental group and 89 in the control group) aged from 4 3/4 years * - 7 1/2 years. This sample was subdivided into six age groups for quota purposes. The sample was less than the 192 subjects originally specified as there was difficulty in fulfilling the younger age quotas due both to illness and the fact that not all those students eligible for inclusion in the younger age range were able to understand and participate in the interview schedule. The sample was almost equally divided between male and female subjects.

Socio-economic status and ethnic composition were kept relatively constant in the two groups as interviews were conducted at neighbouring schools within the same suburb in the Sydney Metropolitan area. Appendix D provides a description of the two groups by age and sex. Children who had insufficient English comprehension to participate in the interview were excluded from the study sample.

Test Materials

The test materials consisted of an imaginary road and the 60 second film "Hector's School of Road Safety." The dimensions of the

* the intake age of N.S.W. infants schools

imaginary road used by Pease and Preston was unspecified in their article. Two strips of tape, each 6 metres long, were placed a distance of 3 metres apart to define the roadway for the purpose of this experiment.

After conducting a pilot study with 24 children selected from kindergarten - 2nd class at a non-participating infants school, an almost totally pre-coded interview schedule was finalised for the recording of respondent behaviour. This schedule was accompanied by a separate timing sheet. The schedule further required the use of a stop-watch for precise measurement of the timed behaviour recorded on the timing sheet. The interview schedule may be found in Appendix C.

Procedure

The test situation required a team of three interviewers. One interviewer established rapport with the subject and then performed the necessary interviewing. The second interviewer acted as a supervisor, being responsible for ensuring that the sample's age and sex quotas were met and for recording each subject's behaviour. The third member of the team acted as timekeeper at relevant periods of the interview. All three team members were free to observe respondent behaviour and to discuss and assess confusing behaviour after the subject had returned to his classroom.

Each subject in both the experimental and control group was interviewed twice using an identical interview procedure, with a four-day interval between the two interviews. The only difference in interview procedure between the two schools was that children in the experimental group were shown "Hector's School of Road Safety" prior to the second interview. Each subject was tested individually in a room set aside by the school. Tests were conducted simultaneously in the two schools, which necessitated the training of two teams of interviewers in the interview procedure.

The Pease and Preston procedure was interpreted to yield the following interview schedule:

Part I - Description of Kerb Drill

The layout of the imaginary road environment and the way in which the cars travelled was explained to the subject. The subject was asked to indicate what he/she ought to do before crossing. That is, the subject was required to give a verbal and token-action account of road crossing behaviour. If part or all the kerb drill was recited-the order of phrases being unimportant - then this was coded by the supervisor; further responses to subsequent probing by the interviewer were coded as 'probed'; unmentioned features of the kerb drill were also coded. If, at this time, the subject was discovered to be non-responsive, the interview was terminated and a replacement subject sought.

Part II - First Crossing

The subject was asked to enact the behaviour which he/she professed to know in theory. The observers established the subject's notion of direction by carefully noting which way the child looked while crossing the road away from, and then returning towards, the interviewer. Subjects' responses were coded as being either static* or relational in orientation. Provision was made for a written account of alternative methods of dealing with direction, such as vague looking in all directions.

Part III - Second Crossing

Once the subject had returned to the initial side of the road, the interviewer asked that the road crossing be repeated. Once the child looked in one direction, he/she was immediately interrupted by the interviewer who asked that the subject pretend there was one car coming down the road (from the subject's right). The subject was to cross safely whenever the car had gone past. This instruction was a cue for the time-keeper to begin timing; timing ended when the subject actually stepped onto the road to cross.

Three specific categories of response to the supposed car were initially allowed, with additional space provided for written accounts of behaviour which did not exactly comply with the specified descriptions. The three major categories were:-

- (a) Child waited for car to pass, then continued kerb drill from point of interruption
- (b) Child crossed road after car had passed with no mention of kerb drill or indication of further attempt to detect traffic
- (c) Adequate road crossing precautions taken regardless of whether this took the form of the conventional kerb drill.

'Adequate precautions' in road crossing implied that the measures taken were sufficient to provide probable safe passage from one side of the road to the other. Hence, correct observation of traffic while standing on the kerb needed to be continued while actually crossing.

If the subject's behaviour was classified as anything other than 'Adequate' (category (c)), then the interviewer reminded the subject that he/she had forgotten to do something. After being allowed to think what he/she might have forgotten the subject was asked to show the interviewer the right way to cross a road, assuming a car was approaching.

* A static orientation implied that the subject perceived "left" and "right" as constant positions whereas a relational orientation implied that the subject perceived "left" and "right" as positions relative to himself.

Subjects were classified as giving either an adequate or an inadequate response under pressure. The timekeeper repeated her function in this repeat performance.

Part IV - Third Crossing

The current study varied slightly from the Pease and Preston study at this point in the interview. Instead of terminating the interview after the second crossing, a comparison was made of a subject's performance when anticipating the approach of one car versus several cars.

Part IV therefore repeated the procedure followed in Part III, with the instruction to the subject that "some cars" were coming down the road. Responses were classified using the same categories as had been used in Part III. Subjects who took inadequate precautions during their first trial were given an opportunity to repeat their performance. These repeat trials were coded as in Part III. The time period allowed for the cars to pass was recorded for the first and second trials.

Upon completion of each interview, the timing sheet was attached to the questionnaire. A complete set of data for each subject consisted of a Phase I and II questionnaire and the respective timing sheets.

RESULTS 3

Part I - Description of Kerb Drill

For each subject, the supervising interviewer coded which of seven basic phrases of the kerb drill were mentioned by the subject. The seven phrases were:-

- (i) Stop at the kerb
- (ii) Look to your right
- (iii) Look to your left
- (iv) Look to your right again
- (v) Then, if the road is clear of traffic
- (vi) Walk straight ahead/across the road
- (vii) Don't run

The aim of this part of the experiment was to measure whether or not recitation of kerb drill improved after seeing the film "Hector's School of Road Safety". Pease and Preston's method of comparing descriptions of kerb drill at the two stages in the experiment was unclear. It has been interpreted as follows:

An adequate description of the kerb drill was one which included phrases (i) to (iv) above. If a subject gave an "adequate" description at each interview, then the total number of points mentioned at each interview was measured, and the answer containing the most points was

considered the better. If a child did not give an "adequate" description at either interview, then again the answer containing the most points was considered the better. If a subject gave an "adequate" description at one interview and not at the other, then obviously the "adequate" answer was considered the better of the two.

Table 3-1 lists the number of subjects at each school whose description of the kerb drill got better, worse or remained the same. A χ^2 test carried out on the data in this table indicated that the proportion of children in each of the three categories "Better", "Same" and "Worse" was roughly the same for each school ($\chi^2 = 1.622$, $p > 0.30$). Sign tests were applied to the figures in Table 3-1 for each school. The results of these tests indicated that there was no significant difference in the number of children who improved and the number who got worse at either school.

Part II - First Crossing

The subjects' concept of directionality fell into one of three categories at each stage of the experiment: relational, static and other. As only a very small number of subject's responses fell into the "other" category, this group was excluded from the analysis, and only children who had either a relational or a static notion of directionality at each stage of the experiment were examined.

Table 3.2 shows the number of children, at the control school, with a static or a relational concept of directionality at each interview session of the experiment. In order to compare these results with those obtained in the Pease and Preston study, the McNemar test for the significance of changes (with a correction for continuity) was applied, with $\chi^2_1 = 0.188$, $p > 0.05$. Thus, for the control group, there were almost as many static-relational changes as there were relational-static changes, and the difference was non-significant.

Table 3.3 shows the number of children at the experimental school with a static or a relational concept of directionality at each stage of the experiment. The McNemar test for the significance of changes gave $\chi^2_1 = 1.84$, $p > 0.05$. Thus even though more children changed from a relational concept of directionality to a static one, than changed from static to relational, the difference was non-significant.

Table 3.4 shows the number of subjects who changed from relational to static and from static to relational at each school. The Fisher-Yates Exact Test, which Pease and Preston used to test their corresponding table, was probably not the best test to use in this case as it is normally applied to samples smaller than 40. A χ^2 test, corrected for continuity, was applied instead, with $\chi^2_1 = 0.237$, $p > 0.05$. These results can be interpreted to mean that there was a slight (but non-significant) decline in subjects' concept of direction after seeing the film.

Part III - Second Crossing

As the situation in which the subjects were tested was artificial, conclusions about their actual road crossing behaviour in a real-world situation based on the results of this experiment can only be of a tentative nature.

Table 3.5 gives an indication of the adequacy of the children's behaviour at each interview session of the experiment for the experimental group. Table 3.6 gives corresponding data for the control group.

Unfortunately, due to some early problems at the interviewing level, the experimental procedure of this part of the experiment was not consistent over all stages. Some (i.e. 10) of the under 5 year old children at the first phase of the experiment who did not give an "adequate" response initially, were not probed for a more adequate response. Therefore, the data listed in Tables 3.5 and 3.6 does not include any under 5 year olds.

Tables 3.5 and 3.6 indicate that children at both schools at both trials gave mostly inadequate responses. For the control school, there were slightly more adequate answers given on the second trial than on the first, and for the experimental school there were slightly fewer adequate responses given on the second trial than on the first. Statistical tests were not carried out on these results, which were considered to be of a qualitative nature and therefore unsuited to this type of analysis. It was clear, however, from these results that almost all children from both groups at both trials gave responses judged to be inadequate.

Table 3.7 gives a breakdown for the types of inadequate responses for both groups at both trials. Inadequate responses were broken down into further categories for the child's second crossing attempt (Q.3). When the child was asked to repeat the crossing, responses were classified as either "adequate under pressure" or "not adequate". Subjects who gave inadequate answers on both occasions of the second crossing were included in Table 3.7, with the respondent categorised according to the inadequate response as coded in the first trial (Q.3d). The pattern of changes between Trial 1 and Trial 2 appears to be similar for the control and the experimental schools.

Part IV: Third Crossing

The main reason that this part of the experiment was included was to determine whether the subjects would allow more time for several cars to pass than they had allowed for one car to pass.

As described in the Procedure sections for Parts III and IV, the time which the subject allowed for one or several cars to pass was measured on the second and third crossings. If a child's initial behaviour was not adequate then the child was asked to cross the road a second time, and the time allowed on this second occasion was the time used in the following analysis. If the child's initial behaviour was adequate, then the time allowed on the initial crossing was used in the analysis.

For each subject, therefore, there was one measurement for the time allowed for one car to pass and one measurement for the time allowed for several cars to pass. The time allowed for one car to pass was subtracted from the time allowed for several cars to pass. This difference, D , should have been positive as more time should have been allowed for several cars to pass than for one car. This procedure was repeated for the results obtained from the second trial of the experiment. The difference between the time allowed for several cars to pass and the time allowed for one car to pass in the first trial has been called D_1 . The difference between the times in the second trial has been called D_2 .

A comparison between the signs of D_1 and D_2 indicated whether subjects had improved between trials. Results are listed in Table 3.8. The symbols in brackets for different values of the row variable indicate whether the differences D_1 and D_2 were positive, negative or zero.

Once again, due to the artificial nature of this part of the experiment, any inferences made from the results of a statistical test should be viewed cautiously. Examination of Table 3.8, however, suggests that there was no difference between schools, that most of the subjects' responses remained the same, and about as many children had an improved response as had a poorer response.

Correlation between verbalisation of kerb drill and adequacy of road crossing behaviour

As the film "Hector's School of Road Safety" was primarily concerned with teaching the kerb drill, the relationship between a child's ability to verbalise the kerb drill and the adequacy of his behaviour in crossing an imaginary road was considered to be important.

The different types of road crossing behaviour elicited in Part III (Second Crossing) were given ranks from 1 to 6, (1 representing the safest behaviour) and the score which each subject received on Part III was compared with the subject's score on Part I (Kerb Drill). Kendall's sample tau coefficient was used to test the relationship between road crossing behaviour and kerb drill description, at each school, at each stage of the experiment. As a low rank in Part III represented a good response, but a low rank in Part I represented a bad response, negative coefficients were expected.

The results of these tests (Table 3.9) indicated that there was a negative but non-significant correlation between the control subjects' ability to verbalise the kerb drill and their behaviour in the road crossing task. These results were apparent in both trials of the experiment. There was a highly-significant negative correlation between recitation of the kerb drill and performance among subjects in the experimental group in each phase of the experiment.

Thus, while the film did not seem to make any difference to the degree of correlation between adequacy of road crossing behaviour and description of the kerb drill, there was a large difference between schools in the level of significance of their correlation coefficients. This implies that there may have been an important difference between schools in terms of student's ability to relate the kerb drill to

road crossing behaviour. *

* The researchers have, despite enquiries at the two schools, been unable to ascertain a reason for these differences.

DISCUSSION 3

Effect of Road Safety Film on Performance of Kerb Drill.

Most of the subjects tested in Stage 3 of the Research programme were judged to be incapable of adequately recalling the kerb drill. Furthermore, the ability to recite the kerb drill appeared to be unaffected by exposure to the Hector film (Table 3-1). These findings are similar to those in Stage 2 of this report (Table 2-13A) and are consistent with the results of the Pease and Preston study. Also, the simulated road crossings attempted by subjects were judged as having indicated that most subjects were incapable of crossing a road satisfactorily. Again, as in the Pease and Preston study, exposure to a road safety film did not improve this situation. Results indicated that the film "Hector's School of Road Safety" was ineffective in improving the subject's performance in the experimental situation (Tables 3.5, 3.6). This performance, in both groups, commonly consisted of a rote assessment of the "traffic" situation, followed by a period of inattention before actually crossing the road. Thus, detection of traffic appeared to be unrelated to the actual road crossing task. This pattern of behaviour increased more among experimental subjects than among control subjects (Table 3.7). A curious result was that the correlation between the ability to recite the kerb drill, and the ability to perform the crossing task, was significant for the experimental group ($p < .01$), and non-significant for the control group (Table 3.9). This was the only hint of an extraneous factor differentially operating in the two groups. While the two groups were selected from different schools, both schools drew their students from one apparently homogeneous area and the study team reported noting no substantial differences between the two groups of subjects. We therefore consider that the possibility that this unknown factor could have influenced the main findings of the before/after, control/experimental design used for the study was extremely remote.

The Pease and Preston research schedule was expanded to include a fourth crossing designed to investigate subjects' reactions to the instruction that several cars were approaching the point at which he was to cross the road. This procedure was included to provide some insight into the subject's comprehension of the traffic situation as it allowed the child to demonstrate independent judgement in the experimental situation. If subjects were, in fact, aware of the implication of several cars coming then it was expected they would allow a greater length of time to elapse before attempting a road crossing than they had allowed for one car to pass. The subjects' ability to adjust their behaviour in this task was generally inadequate and appeared to be unaffected by exposure to the Hector film (Table 3.8).

Effect of Road Safety Film on Concept of Directionality.

One of the aims of this experiment was to observe the effect of the "Hector's School of Road Safety" film on subjects' concept of directionality. Results indicated that many subjects did not have a relational concept of directionality and that the road safety film did not clarify this concept for them. These findings can be explained in terms of

child developmental patterns. Boone and Prescott (1968) have found that left-right discrimination was just emerging in 5 year olds and improved until fully developed at about age 10. "It appears that the normal child must first master basic left-right directions related to self before he can make relativistic discriminations, recognising the left-right sides of persons and objects before him, beside him, or in back of him" (Boone and Prescott 1968, p.274). Many of the subjects could therefore be expected to have been lacking in this skill.

Both Hector, in the film shown to Stage 3 experimental subjects, and the kerb drill exemplars in the film used by Pease and Preston, faced their audience during the road crossing demonstration. The findings of Wapner and Cirillo (1968) that younger children have difficulty in transposing left-right movements of a person facing them leads to the conclusion that this feature of the film contributed to its unclear communication.

Another factor which probably contributed to the poor road crossing behaviour of the subjects would have been the tendency of children to center on a single striking feature of an object or an event (Cooke 1976). This characteristic of child behaviour, first noted by Piaget, renders the child unable to select between incoming stimuli, that is that they are incapable of dealing with more than one set of incoming stimuli at a time. Thus, the subjects striving to perform the kerb drill may have shut their minds to "distractions" which may well be far more important to the road crossing task. Baldwin (1967) follows this idea further in discussing Piaget's theory that immediate perception of stimuli is not sufficient for comprehension of that stimuli's significance. Therefore, until the child is able to relate the immediate stimuli to past experiences he is unable to fully utilize the stimuli in decision making.

Of even greater concern to the authors is the possibility, suggested by Pease and Preston, that children may feel that the kerb drill offered some magical protection in the traffic environment. This, along with the previously mentioned factors, makes it possible that the kerb drill may be counterproductive - leading children to be unaware of the need for further appraisal of the traffic situation.

Summary of Discussion

Stage 3 of the research programme indicated that the subjects performed the kerb drill as a magic rite and not in a manner which led to the safe detection of traffic. This behaviour did not improve after exposure to the film "Hector's School of Road Safety". These results were similar to those of Pease and Preston who tested English children.

STAGE 4 - Children's Understanding of the
Concepts of "Safe" and "Dangerous".

METHOD 4

Stage 4 of the research programme was oriented towards obtaining an idea of subjects' perception of the presence or absence of danger in nine photographic situations, and their reasons for formulating this judgement. The formulation of the test stimuli was greatly assisted by Martin and Heimstra's (u.d.) research on young children's perception of hazard.

Subjects

The research sample consisted of 120 subjects aged from 3½-8 years. The sample was subdivided into five age groups with equal numbers of male and female subjects. The children tested were drawn from four schools in the Sydney Metropolitan Area of diverse socio-economic backgrounds. Appendix D provides a description of the sample by age, sex and school suburb. Respondents were required to have sufficient English comprehension to be able to understand the interview schedule, to be included in the sample.

Test Materials

Nine situations, photographically depicted, were selected for testing on the basis of childhood accident data (Royal Alexandra Hospital for Children 1972). The four dangerous situations depicted in the test stimuli were poisoning, motor vehicle accidents, drowning, and burns. One major area of childhood accidents, the home, was excluded from the study due to the difficulty of communicating this hazard area in one photographic situation.

As Martin and Heimstra found that young children tended to exaggerate the danger present in situations and that situations with male models were judged as more dangerous, it was decided to avoid depicting extreme danger in the situations tested and to depict each situation using a male and female model. As a further extension of the sex variable, a third photograph was included showing a male and female child together in each test situation. The dangerous situations depicted were:

Poisons - A child/children tipping tablets out of a bottle (Photo numbers 7, 8 and 9).

Motor Vehicle Accidents - As road safety constituted the subject of the overall investigation, two situations were depicted: a child calling to a friend to come across a road with car approaching in the distance (Photo numbers 1, 2, and 3); a child who had stopped to tie his/her shoe lace behind a parked car in which the driver was seated (Photo numbers 16, 17 and 18).

Drowning - A child/children fully dressed balancing along the side of a pool (Photo numbers 25, 26 and 27).

Burns - A child/children holding an unlit match with the box of matches nearby (Photo numbers 10, 11 and 12).

Four 'neutral' or control situations were chosen for testing against the dangerous situations:

Merry-go-round - A child/children riding a horse on a merry-go-round (Photo numbers 19, 20 and 21).

Reading a book - A child/children sitting on a lounge reading a children's story book (Photo numbers 4, 5 and 6).

Watching TV - A child/children sitting on the floor of a lounge-room watching television (Photo numbers 13, 14 and 15).

Painting - A child/children standing at an easel and painting (Photo numbers 22, 23, and 24).

Since the age of the model did not affect perception of hazard in the Martin and Heimstra study the models used were aged midway between the youngest ($3\frac{1}{2}$ years) and the oldest (8 years) subjects: i.e., approximately 6 years old.

For each of nine situations, then, there were three photographs, differing from each other as little as possible except for the model(s) present. All 27 photographs were black and white, and of uniform size (23.5 cm x 29.5 cm/ $9\frac{1}{2}$ " x $11\frac{1}{2}$ ").

A simple form completed by the interviewer during the interview, was designed to record subjects' responses (Appendix C). Interviews were also tape recorded for later corroboration and/or clarification of recorded responses.

Procedure

Interviewers were assigned rooms away from most disturbances within the schools. Subjects were individually taken from and returned to their classrooms throughout the school day, except for recess and lunch breaks. Each subject was asked to keep the content of the interview secret, in order to minimise possible contamination of naivete amongst subjects. Rapport was established with the subject before the commencement of the interview schedule.

In order to ascertain whether the concepts of 'Safe' and 'Dangerous' held any practical significance for subjects, they were initially shown two objects (a serrated fishing knife and a ball of plasticine) and asked to identify which one was safe and which one was dangerous. If the subject could not complete this task the relationships were explained. 'Dangerous' was said to imply hurt ("it will hurt you") while 'Safe' was defined as "it won't hurt you". This explanation

was chosen on the assumption that the danger/hurt association would be made meaningful to the essentially egocentric children. This approach was considered to be valid, as the children's concept of danger, rather than the actual meaning of danger, was the point of investigation. Subjects who proved unable to grasp the connection between the knife/danger and the plasticine/lack of danger were excluded from the research programme.

Part I:

The 27 photographs were numbered and presented in an order, determined by a table of random numbers. The photographs were re-ordered prior to each interview. Subjects were asked to explain what was happening in the photograph, and then to judge whether the behaviour of the models was safe (S) or dangerous (D). The subject's rating of the situation, along with his interpretation of the model's behaviour, was recorded on the answer sheet. All photographs other than the one being considered were placed face down so as not to distract the subject.

Part II:

Immediately following Part I of the interview schedule, each respondent was shown the "male/female model together" version of the five "dangerous" situations along with the "male/female model together" version of the merry-go-round situation. These six photographs were lined up on a table in front of the respondent, care being taken to separate the two motor vehicle situations. The subject was asked to look carefully at all the photographs and select the photograph which represented "most dangerous" to him/her. This photograph was then removed from the table. Once this was accomplished, the process was repeated until only one photograph remained on the table. The order of selection, or ranking, was recorded as was the subject's reason for selecting the first photograph as representing the most dangerous of the six situations. This ranking procedure was included to obtain some idea of the subject's hierarchy of danger. The merry-go-round scene, a "safe" situation, was included as a check that the respondent was in fact using the concept of danger as his/her criteria for the ranking procedure. The interview schedule was completed once this procedure had been carried out.

RESULTS 4

Part I:

The five situations regarding poisons, motor vehicles (two), drowning and burns would normally be perceived by an adult as dangerous. The four situations concerned with reading, watching television, painting and riding a merry-go-round would be perceived by an adult as safe. The subject's description of each photograph was classed as correct or incorrect, depending on whether or not his perception of the situation concurred with the normal adult perception. The subject was given a score of 1 for a correct answer, 0 for an incorrect answer. A summary of the results of each subject's answers is given in Table 4-1.

Cochran's Q test (Siegel 1956) was applied to each group of three photographs for each situation, to test whether there were differences in subjects' perceptions to different photographs depicting the same situation. The main difference between photographs was the sex of the model. The only situation for which the different photographs received a significantly different amount of correct answers was the tablets situation. Examination of the three photographs depicting this situation showed that, as well as a difference between photographs in the sex of the models, there was also a difference in the actions of models. The photographs using either the male model or the female model were essentially the same (except, of course, for the sex of the model) but the photograph using both models showed the children playing with "tablets" which resembled lollies. For the tablet-scene it was therefore decided that the photograph using both models was not representative of all three photographs, and was not a good example of the situation which it hoped to depict. The results obtained for the other two photographs were identical in every respect, and these results were used in the analysis to represent the results obtained from the tablet scene. For all other situations, the results obtained from the ratings of the photographs using both models were used to represent their respective situations.

A factorial analysis of variance was applied to the data, using the method described by Winer (1971) for a three-factor experiment with repeated measures. A summary table of the analysis of variance is given in Table 4-2.

There was a significant Age by Situation interaction ($p < 0.05$) and a very highly significant Situation main effect ($p < 0.001$). Thus there appeared to be a very great difference between how correctly different situations were described by subjects, but these differences varied with the age of the subjects.

The Age by Situation interaction has been interpreted as follows: situations such as reading, burning matches, painting, and walking around a pool were perceived correctly by almost all subjects, and it seems that the number of subjects making mistakes in each age group varied according to the situation being examined. For example, the younger subjects perceived the road crossing situation correctly on more occasions than they perceived the shoe-tying situation correctly. This pattern was reversed for the older subjects.

It was interesting to note that the age and sex of a subject did not seem to affect the overall probability that he would give a correct answer. When different situations were being examined, however, the age of a subject was important.

For each of the nine situations, most of the subjects correctly perceived the situation to be either safe or dangerous.

Part II:

Each of the six situations was given a score from 1 to 6 for each subject, 1 when a subject thought the situation was the most dangerous, 6 when the subject thought the situation was the least dangerous. Table 4-3 provides a sum of the ranks given to the six situations by the subjects.

A check between the results in Part I with those in Part II indicated that some of the under 5 subjects gave inconsistent answers (i.e. in Part I the subject may have classed situation X as safe and situation Y as dangerous, but in Part II the same subject might have ranked situation X as more dangerous than situation Y). Seven out of the twelve under 5 year olds gave such inconsistent answers. Under 5 year olds were therefore omitted from the analysis of results. The problem of inconsistent answers was not serious for the other age groups.

Fisher and Yates (1963) suggest that when original observations are in the form of several sets of ranks (for example if N objects had been ranked from 1 to N by each of several subjects), the ranks might be replaced by the appropriate expected "normal scores" and the resulting data might then be analysed by performing a conventional, parametric analysis of variance. In general, the appropriate expected normal score of an object that was eligible to receive one of the ranks from 1 to N and actually did receive a rank of R, was the expected value of the observation having a rank of R in a sample of N observations from a normal distribution with zero mean and unit variance.

Normal scores were found for each child's set of ranks, and a factorial analysis of variance was applied to the resulting 288 observations. The results are given in Table 4-4.

Because each subject has ranked the situations from 1 to 6, there was no difference between the totals of the ranks for different children, and similarly there was no difference between the totals of the ranks for different age or sex groups. Therefore the sums of squares for Age, Sex and the Age by Sex interactions were all zero, and have not been included in Table 4-4.

The Situation by Age interaction was significant ($p < 0.05$) and the Situation main effect was very highly significant ($p < 0.001$). Some situations were therefore judged by the subjects to be more dangerous than others, but the differences between the situations varied according to the age of the subjects. These results support those of Part I.

The totals of the raw scores assigned to the six situations for each of the four age groups examined, is given in Table 4-5. For every age group, the merry-go-round situation was judged as the least dangerous, and the matches situation was judged as the most dangerous. The distribution of the other four situations, however, varied over the different age groups.

Reasons for classifying a situation as either safe or dangerous were classified as follows:

- a) Mature: the response indicated comprehension of probable consequences which led to the situation being safe/dangerous.
- b) Rote: the response lacked depth of understanding, often sounding as if the child was parroting an adult warning.
- c) Immature: these responses were further subdivided into illogical, fantasy, and fear of punishment.

Examples of the type of response which fell into each classification in each of the nine situations appear in Tables 4-6 to 4-15.

χ^2 tests were performed on the data. While maturation trends were apparent in the subjects' pattern of response to all nine situations, only responses to the following situations revealed significant age differences: tablets (Tables 4-8, 9), television (Table 4-11) and pool (Table 4-15). With regard to the tablets and television situations, the older children tended to give more mature responses and the younger children tended to give more rote responses. The young children all provided rote responses with regard to the pool situation, with the older respondents once more giving primarily mature responses.

A significant relationship was also found between the rating of the 'tie shoes' situation as safe/dangerous and the reason for this rating. As has already been stated, this situation was considered correctly rated when specified as dangerous. Analysis of the response pattern for the 'tie shoes' situation revealed that most dangerous ratings of the situation were accompanied by a mature reason. There were no significant age differences in this trend (Table 4-12).

DISCUSSION 4:

Subjects' Rating of the Photographic Situations

It was considered important to assess the ability of subjects to discriminate between a safe and a dangerous situation as an understanding of this difference would appear to be basic to the ability to participate effectively in the traffic environment. Subjects were presented with a series of photographs of five dangerous and four safe situations. Results indicated that most subjects were able to correctly identify the situations depicted as being either safe or dangerous situations (Table 4-1).

Subjects were asked to rank the five dangerous situations, plus the merry-go-round situation which was included to act as a control, with respect to their perceived level of danger. The Situation by Age interaction was significant, and the Situation main effect was very highly significant. Thus, some of the situations were judged to be more dangerous than others, but the differences between the situations varied according to the age of the subjects. The burning matches situation was consistently judged as the most dangerous situation and the merry-go-round situation judged the least dangerous situation (Table 4-5).

It was interesting to note that it was necessary to eliminate those subjects aged under 5 from the sample for the purpose of analysis of ranking scores, due to the inconsistency of these subjects' ratings of the situations.

Subjects' Reasons for Rating the Situations as Safe/Dangerous

The reasons given by subjects for describing a situation as either safe or dangerous were analysed in an attempt to assess the subjects' awareness of the contributing factors implicit in a situation which lead to it being either safe or dangerous. Responses were classified as being either mature, rote, or immature in character. Maturation trends were apparent in the subjects' patterns of response in all nine situations. Most of the situations which depicted danger showed an age difference in response pattern. Thus, the older subjects tended to give more mature responses and the younger subjects tended to give more rote responses (Tables 4-6 to 4-15). The difference in the quality of response which emerged amongst the subjects relative to age appeared to indicate that while most subjects were able to correctly define a situation as either safe or dangerous, the judgements of some of the younger respondents were not necessarily based upon a rational understanding of the factors operating within the situation which made the situation either safe or dangerous. Thus, for example: the painting situation was described as safe because the models had smocks on and thus wouldn't get dirty and anger their mothers; the reading situation was described as safe because "nothing in the picture (of the book) could jump out and hurt them (the models)"; tying shoes behind a car was seen as dangerous because "if the don't know how to tie your shoe laces up, then you'll fall over or you might trip on the stones." These are but three examples of responses to probes as to the reasons for rating a situation as safe or dangerous. They do, however, serve to illustrate that correct identification of a situation as either safe or dangerous was not always an indication that the subject understood the contributing factors which rendered the situation safe or dangerous. Examination of Tables 4-6 to 4-15 reveals the numerous instances when subjects could only justify their judgements of the safety/danger of a situation with rote or immature responses. This tendency for subjects not to understand the concept behind a judgement has been noted by Sandels (1975) in her research on young pedestrian behaviour. She found, as one of the major implications of her research programme, that "the basic error in current traffic training for young children is that insufficient care is taken in explaining to children WHY one should behave in such and such a way in traffic - our 'why' questions were often left unanswered or answered incorrectly: insight was lacking" (Sandels 1975, p. 137). Sandels in her study of the ability of children to understand traffic signs found that 6 year old children's comprehension of why they should act in a certain way did show some improvement when they were provided with careful explanations of why the behaviour was necessary. It was also found that these children were able to grasp elementary traffic rules and make practical improvements in their behaviour in certain specific situations "especially when they know that their behaviour was being observed by adults responsible for them" (Sandels 1975, p. 137)

Theoretical Explanation of Child's Ability to Understand the Concept of Safe/Dangerous

In discussing the subjects' concept of safety and danger, it should be noted that a concept refers to the characteristics of events and not to a particular event. Kagan (1971) has stated that a child's spoken language is not always a good indication as to whether he is responding to a particular stimulus as a symbol (i.e. specifically) or as a concept. Kagan explains this difference with the example of the word "animal". A child could use the word "animal" to refer only to his pet dog and not yet realise that the word also can be used to refer to a variety of creatures. The dimensions of "good" and "bad" have a great influence on the child's concept development. "Early in life the child learns to call objects and events that cause distress 'bad' and those that bring pleasure 'good' ... the unpleasant feeling of anxiety, fear of punishment and eventually guilt are essential dimensions of the concept 'bad'" (Kagan 1971 p. 89). It is suggested that it may be these feelings of anxiety and fear of punishment that have had a strong bearing on the subjects' judgement of the safety or danger of the nine situations tested, but that often these subjects had not yet formed a concept of the components of "safe" or "dangerous" situations.

The findings of the present study are also explained by Piaget's studies in the area of child development. Piaget (1968) suggests that rules have a completely different meaning to the young egocentric child (3-7 years) as compared to a 12 year old* child. The younger child regards rules as sacred and untouchable while the older child regards a rule as valid after it has been mutually agreed upon. This tendency could have accounted for the trend amongst the younger subjects to judge the situations in a manner which maintained the status quo of adult law, rather than in a manner which conveyed a real understanding of the situations.

Summary of Discussion

The results of Stage 4 of the exploratory research programme indicated that the subjects' ability to identify situations as either safe or dangerous could not be taken as an indication that the subjects understood the factors operative within the situations which made them either safe or dangerous.

* This is due to the fact that, at the egocentric stage of development, the child is unable to understand rules from any point of view other than his own.

CONCLUDING DISCUSSION

The Research of Sandels(1973, 1975) as it Relates to the Current Research Programme.

The results of the current exploratory research programme as they relate to the subjects' use of the kerb drill, inability to assess an experimental road crossing situation and behave in a manner which would lead to competent participation in the traffic environment, and inability to fully comprehend the concepts of "safe" and "dangerous" would appear to create serious doubts about young children's ability to participate independently in the traffic environment. These doubts are shared by Sandels (1973, 1975), whose research into traffic accidents involving children aged 0-10 years has provided new insights regarding the ability of children to cope in the traffic environment. Sandels specified several important differences between children and adults which are noteworthy within the context of children's interaction in the traffic system. These differences were:

1. Children's Need for Games and Movement

Unlike an adult, a child's body is immature and the child does not have a high degree of control over his movements. This physiological immaturity is accompanied by rapid physical development and change in the child's body proportions. Thus, the child must continually adjust and revise his learned movements which leads to the child's need for movement. "The traffic environment is created by adults for the basic purpose of permitting them to move about - not for the purpose of permitting physical training ..." (Sandels 1975,p. 129). This clash between children's needs and the purpose of traffic environment is most dramatic amongst those children who are without space to move (i.e. gardens, playgrounds) and who thus attempt to satisfy their needs in the traffic environment.

2. Physical Deficiencies

Sandels concluded that 6 year old children did not have an ability equal to an adult to see traffic out of the corners of their eyes, due to the fact that their peripheral vision was not yet fully developed. Furthermore, 5 year old test subjects were found to have an immature near/far eye accomodation. This accomodation did not show marked increase in speed until age 8 and maturation trends were apparent until age 16.

Small children were further disadvantaged due to their height. The children's lower eye level led them to experience traffic differently; for example, small children could not look over the tops of cars to determine if traffic was approaching.

The child's ability to locate the source of a sound similarly showed developmental trends. Thus, the child was to some extent,handicapped in the use of hearing to locate the sounds of approaching traffic.

3. Problems of Attention

Children tended to focus all their attention on those situations which interested them. They had not yet learned to differentiate between stimuli, to make their actions automatic, or to control their impulsive behaviour.

4. Problems of Instruction

It was found that adult instructors tended to overestimate subjects' level of comprehension of traffic instructions. Observations of children also led Sandels to conclude that children tended to forget instructions if something more interesting attracted their attention.

5. Problems of Divergent Child/Adult Expectations

Adults, in their capacity as drivers, were found to disregard the child pedestrian's limited ability to cope with traffic or to be ignorant of how limited this ability was. Child pedestrians, on the other hand were found to act unpredictably by adult standards of behaviour (e.g. by dashing out into the road, failing to estimate the correct time to cross the road, reacting to a horn signal by trying to run across the road).

Sandels' findings that children need games and movement are supported by Halverson (1974) in her work on ways in which children may - through movement - learn more about themselves, their environment, and their world. Learning to move has been found to involve continuous development on the part of the child in his ability to use his body effectively with increased evidence of control and quality of movement. Halverson points out that complete motor development does not necessarily unfold automatically for all children at some "magical maturation moment". Rather, it is the result of both maturation and experience. It would thus appear to be the educator's responsibility to provide those experiences which will most assist this maturation.

It would appear, after considering the differences in the capacities of children and adults that many of the currently held expectations of children's ability to interact in the traffic environment need to be revised. This, in turn, would lead to a reassessment of former approaches to traffic safety education and traffic safety publicity for children.

SUMMARY AND CONCLUSIONS

The results of the exploratory research programme regarding the communication of traffic safety information to young children have shown that:

- Characteristics other than likeability need to be considered when selecting a behavioural model to communicate road safety information to children.
- The indirect communication approach embodied in the Hector material is far from successful in communicating its intended message.
- The directives incorporated in the kerb drill do not promote behaviour which leads to safe participation in the traffic environment.
- Many children do not comprehend the concept of safe/dangerous and thus can not be expected to understand the dangers implicit in the pedestrian task.

There is a need for the production and evaluation of traffic safety publicity which acknowledges the limitations of the young pedestrian. Child development theory, and the current research, suggest that:

- This material should be presented in a simple and direct manner rather than being embedded in heavy storylines.
- Instructors should be real people behaving competently in real life traffic situations.
- The material should include both male and female role models.
- Rote learning should be replaced by educational experiences which promote an understanding of the child pedestrian as one component in the traffic environment.
- Mastery of sensory and motor skills should be seen as an intrinsic part of a road safety educational programme.
- The material should include audio-visual aids which will promote student/teacher participation and dialogue.

Furthermore, as adults tend to over-estimate childrens' capacities to cope with the traffic environment, there is a need for publicity material - directed at adults - informing them of childrens' physical and mental limitations as they relate to road safety judgement. It is suggested that this dual road safety educational approach would serve to increase understanding on the part of children and adults of the ways in which both groups can act to promote the safe interaction of the young pedestrian in the traffic environment.

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APPENDIX A

Overview of child development theory as it relates to the growth and development of children in the target age group of the research programme.*

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Children are not passive recipients of life, they are active participants in their own development. They do not merely passively absorb the culture in which they live: they react selectively to it and act on it in various ways; they get out of an experience what they bring to it. As they mature, they become more capable of reacting selectively; their understanding of their world, their meaningful world, becomes more complex. What are the specific characteristics of young children which they may bring to their understanding of road safety materials?

The target age range of the materials straddles two stages of a child's life: the pre-school period, and the early school years, to approximately third grade. During this time, a child changes from a person who has rather rudimentary skills to one who is fairly adept. Unable to tie his shoes when he is only four, by six he will be riding his tricycle with considerable dexterity, and by eight will be using some kinds of gymnastic equipment skillfully and imaginatively. His motor development is consistent with his physical growth, and by age 8, he will have quite good control over his movements, balance, and co-ordination. (Foundation for Character Education 1962). He will generally possess the necessary physical skills to enable him to participate more independently in the traffic environment. There are several features of his social, linguistic and intellectual development which are important elements

* This summary has been provided by Dr. Huntsman under contract to the Traffic Accident Research Unit, N.S.W. Department of Motor Transport.

in attainment of this level of competence, and these will be discussed, if only briefly, since they have relevance for the production of instructional materials.

The social life of the very young child of pre-school years is primarily home centered. Here he grows socially by directly imitating models within his environment. This imitative process continues throughout childhood (Thornburg 1973), and is related to modelling, which is defined as the process whereby an individual acquires new behaviour patterns, or modifies already existing ones, as a result of observational learning, of watching others engage in some behaviour, and seeing the consequences of their acts (Bandura 1969, Sears 1953, Vernon 1972). Extensive research on modelling has shown that it may be carried on by imitating a person, or it may be stimulated by seeing a film or cartoon. (Bandura and Huston 1961, Bandra, Ross and Ross 1963). If a child observes a model being punished for a given act, then the chances that he will imitate that act are reduced. (Lefcourt, et al 1960). Similarly, children are more likely to imitate behaviour that is rewarded (Middlebrook 1974). By the time he reaches school, the child has begun to learn how far he can go, where the limits are, how the world is organised, what is real, how others will react. He has begun to develop a notion of roles - and to understand that consistent differences in behaviour can be expected accordingly. His life is still very much organised by adults: it is not until about the age of ten years that the "other kids" play a highly significant part in his life.

Intellectually, the child makes exceptional progress. During the pre-school period, his language development is rapid, and with this growth comes a hunger to use words, and to learn what they can do. Not only is growth in vocabulary marked: he is progressively able to bring his behaviour under the control of language. According to Luria (1961) a child's speech comes to exercise a regulatory influence over his behaviour, and he describes four stages through which this passes. The sequence has also been found for Australian children (Joynt and Cambraune 1968). The stages briefly are:

1. 18 months - 2 years of age: Initiating function of speech

occurs: the child will clap hands on command. Instructions do not change an activity which is already under way, however.

2. Three - four years: The child can follow both initiating and inhibiting instructions - although the initiating part of an instruction is stronger. Often the child can inhibit only briefly.
3. At about 4 - 5 years: The child can use his own speech to start his own actions ("I will turn this now") and stop his actions ("No more now").
4. The external regulatory speech becomes progressively internalised. The child no longer has to say a direction out loud, but seems to say it to himself when he regulates his behaviour.

While language development is rapid, the child's conceptual and reasoning development is limited. It is true that he has grasped the meanings of many words, and if he is imaginative, he will effect some unusual combinations of words. His concepts are generally verbal in character, and tend to be specific in their intention. According to cognitive developmental theorists, such as Piaget, many features of children's thinking of this age group are different from the thinking of adults and not only in the matter of the degree of difficulty**. Some of the features of the thinking of children which would seem relevant here are:

1. Egocentrism: young children up to the age of about 8 years, are unable to take another person's point of view when it is different from their own. There is an inability, rather than a refusal, to comprehend that others may have

** The following general description of the characteristics of young children's thinking is summarised from Flavell, J. (1963).

different information, or experiences, and perceive the world in a different way.

2. Centration: young children tend to focus or centre, on one aspect, on the most striking (to them) feature of a situation, and neglect the importance of other aspects, for example, children believe a quantity of water becomes greater or smaller when it is poured from one container to another of a different shape. They centre on the height of the liquid in the container, ignoring the complication of width. This error also occurs because their thinking cannot handle reversibility, i.e. they cannot mentally reverse the action, and imagine the water back in the original container (where, therefore, it could not be more, or less, than it was before).
3. Focus on states: the young child tends to see action sequences as a series of not-too-well related static states. They focus on successive states, and it is very difficult for them to visualise the series of transformations that would occur, for example, if they followed a ball across a road. Towards the end of the age range (4 - 8), they recognise the transformations taking place between a beginning and an end state as a continuity, and can more easily picture a transformation at any given point.
4. Animism: the young child may attribute to inanimate objects the powers of humans such as motives, intentions, knowledge, emotions. (Piaget 1929). Thus if stones are perceived in motion, they may be thought to be alive.
5. Phenomenalistic Causation: the young children believe that when two events occur in succession (or close to one another) the first causes the second. Thus if a young child observes that when his father washes the

family car, it rains, he may conclude that the car washing causes the rain. (Elkind 1975). Indeed, children seem to feel that everything has directly observable cause and they usually give a cause for almost anything if they are asked to do so, and are in the mood to answer.

6. Preconceptual thinking: the thinking of younger children lacks clearly defined subject boundaries, which would permit them to categorise instances and non-instances of a concept consistently. Their concepts, such as they are, are concrete, and related to action, rather than being schematic and abstract.
7. Realism: this is the belief that all things are equally real, including objects, pictures, dreams, or words. (Piaget 1929). At a young age, children have difficulty separating thoughts and fantasy from the physical world.

Children's perceptions of speed and movement exhibit similar kinds of limitations. They learn movement at an early age, and to estimate speed in a practical way, e.g. they can anticipate and avoid the surge of a wave up the beach. Below the age of 8 or 9, children are influenced in their judgement by the total situation in which movement occurs, e.g. two objects arriving at the same place at the same time are judged to move equally fast, no matter where or when they started. Relative speed is little understood: one object is judged to move faster than another, only when the former can be seen to go past the latter. (Piaget 1970). Thus while the child's judgement of speed and movement may be adequate for practical purposes, it is not based on an adult's grasp of the concepts involved.

8. Probability and Chance: A child in this period is unable to distinguish between chance and non-chance events, between the possible and the necessary. Not until middle childhood does the child become aware that there is one domain in which he can know, and another

in which he can only guess, and the realisation that some events are more likely to occur than others develops even more slowly. (Piaget, J. and Inhelder, B. 1951).

These limitations begin to disappear between the ages of 6 and 8 years; they do so gradually, not immediately. Some features of children's thinking do persist longer than others, and there will be considerable differences among children of the same age with respect to their development.