**PROJECT REPORT**

# A COMMUNITY APPROACH TO ROAD SAFETY EDUCATION USING PRACTICAL TRAINING METHODS: THE DRUMCHAPEL PROJECT

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**1996**

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## EXECUTIVE SUMMARY

Research shows that practical training methods, in which children receive guided experience of solving traffic problems in realistic traffic situations, are amongst the most effective in improving children's pedestrian competence. However, practical training is both time consuming and labour intensive, making it difficult to capitalise on the strengths of the method. The report describes a solution to this problem by adopting a community participation approach in which local volunteers carried out all roadside training, working in co-operation with schools and project staff. The project took place in an area of Glasgow known for its exceptionally high child pedestrian accident rate. The aims of the project were as follows:

- *to teach three pedestrian skills to 5-7 year old children, using practical training methods.*

- *to arrange for training to be undertaken by local volunteers, recruited and trained by project staff.*

- *To evaluate the effectiveness of the programme by assessing the extent to which it led to improvements in children's traffic judgements and behaviour.*

- *To monitor the problems encountered in running such schemes and to consider the feasibility of introducing them on a wider scale.*

Volunteers were recruited through local schools, community organisations and by word of mouth. Over 100 volunteers took part in at least one training phase over the 30-month duration of the project. Volunteers acquired the necessary proficiency at half day training courses in which they both observed good teaching practice and gained experience of teaching under the guidance of project staff. Separate courses were designed for each of the three skills covered by the scheme and were run in each of the 10 schools in the area.

Skills were chosen on the basis of their relation to accident rates and their known lack of development in young children. They form a coherent group that can be taught progressively over an 18-24 month period. The chosen skills were:

- *Learning to identify dangerous roadside locations, and learning how to construct routes through the traffic environment that avoid them.*

- *Learning how to cross safely at parked vehicles.*

- *Learning how to cross safely near intersections.*

All training took place at designated sites in the streets near children's schools in sessions lasting 25-30 minutes. Children were taught in small groups (of two or three) and received between four and six training sessions on a roughly weekly basis. Trainers maximised children's participation by using open questioning techniques and encouraging co-operation between children wherever possible. Such techniques are known to be more effective in promoting conceptual growth than didactic teaching methods.
In total, more than 750 children received training over the duration of the project. To assess how effective training had been, a 30% sample of trained children undertook a

series of roadside tests both before and after training. We also tested a matched sample of control children who did not undertake the training programme. In all three skills, the judgements and behaviour of trained children improved substantially following training. They were much more likely to choose safe locations to cross the road; used a greatly improved strategy when crossing at parked vehicles; and were able to deal effectively with a range of intersections. Moreover, these benefits were maintained over a two month period after training ended, showing that the improvements were robust. The judgements of trained children also appeared to be underpinned by better conceptual understanding, making them able to deal with novel situations in a relatively flexible manner. By comparison, improvements in control children were much more modest. Although there was slight improvement, especially after the second post-test, this was well behind that achieved by trained children and was also conceptually weaker. The improvement seen in this group probably reflects the experience gained informally during the programme of pre and post-testing. However, at the observed rate of growth, it seems unlikely that this group would attain the level of trained children for several years.

It was not possible to assess the effectiveness of volunteers on an individual basis but, taken as a group, the results they achieved were easily comparable to those achieved by highly qualified staff in earlier studies. Although volunteers were not selected on the basis of having any particular 'qualification' other than an interest in the wellbeing of children in Drumchapel, when given clear instructions about what they were trying to achieve together with a small amount of experience of working with children, they were able to translate this into action rather effectively. This shows that volunteers from deprived communities can play a central role in road safety provision, providing they have been properly prepared for the job. Given the importance of practical training, they must be considered an extremely valuable 'resource'.

Of course, the benefits of involving local people in road safety extend well beyond these narrow objectives. Involving volunteers improves contact between the community and the school more generally, which is desirable in itself. It also involves the community directly in the process of finding solutions to its own problems rather than relying on 'experts' drafted in from outside. This in turn helps to raise morale in the community as a whole. The benefits of community participation approaches are therefore manifold: they should be welcomed on many fronts.

## 1.0 INTRODUCTION AND BACKGROUND

The Drumchapel Road Safety Initiative was set up in February 1993 as part of a long-term strategy aimed at combating the exceptionally high child pedestrian accident rates in the area. It was conceived as a two-year project aimed at developing key pedestrian skills in children between the ages of 5 and 7 years. Three aspects of the project are particularly notable.

- *It taught by means of practical training rather than lessons in the classroom.*
- *The training was undertaken by local parent volunteers.*
- *The volunteers task was to help train all children in the targeted classes:* they did not simply train their own children.

*The approach was therefore fundamentally focused on community action, aimed at improving child safety within the community as a whole, and not just on 'local' action within the family.* So far as we know, no such approach to road safety education has previously been taken.

### 1.1 Theoretical Rationale

It is now well established that road safety education programmes focusing on practical training methods are amongst the most successful in improving children's traffic judgements. Examples of pedestrian skills that have been improved in this way include crossing at parked cars and junctions (e.g., Rothengatter, 1981, 1984; van der Molen, 1983); roadside visual timing judgements (Lee, Young and McLaughlin, 1984; Young and Lee, 1987; Demetre, Lee, Pitcairn, Grieve, Ampofo-Boateng and Thomson, 1993: van Schagen 1988); developing safe route planning strategies (Thomson, Ampofo-Boateng, Grieve, Pitcairn, Lee and Demetre, 1992; Ampofo-Boateng, Thomson, Grieve, Pitcairn, Lee and Demetre, 1993); and even reducing roadside impulsivity (Gerber and Limbourg, 1977).

The principal advantage of practical training methods is that they lead to measurable changes in children's actual *behaviour*. This stands in contrast to more traditional educational methods concerned with knowledge acquisition, where changes in behaviour following training have seldom been reported (see Rothengatter, 1981; Thomson, 1991, for reviews). There are, in fact, sound psychological reasons why practical approaches should be more successful than knowledge-based approaches, particularly among younger children. We have recently analysed these psychological factors in considerable detail (Thomson, Tolmie, Foot and McLaren, 1996).

Unfortunately, implementing practical training methods is difficult because they are intrinsically labour intensive and time consuming. Even though substantial improvements in children's judgements have been reported following as few as four 30-minute sessions at the roadside, this still represents a substantial input. In order to capitalise on the benefits of the practical approach, some means must be found of making it viable.

### 1.2 Increasing Parental Participation

An approach that has been adopted in many countries, including the UK, has been to try to involve parents directly in the educational process. This approach was pioneered by the Scandinavian Traffic Clubs in the 1960s, which sent materials to parents on a regular basis and attempted to maintain an ongoing commitment from them. Moreover, these clubs placed emphasis on the importance of practical exercises as part of the training. Evaluation of the Norwegian Traffic Club (Schioldborg, 1974) showed casualty rates to be significantly lower among club members than non-members. This has led to traffic clubs being promoted with some enthusiasm. The idea of a national traffic club has recently been piloted in the Eastern Region of England, with reasonably encouraging results (West, Sammons and West, 1993; Bryan-Brown, 1995). However, this club has so far focused on elementary road safety education among very young children.

The traffic club idea is a good one, but two problems are associated with it.

- *Only a proportion of eligible parents typically enrol their children, with membership tending to be biased towards higher socio-economic groups.* However, it is well known that accidents are markedly over-represented among lower socio-economic groups (e.g., Roberts, 1996).

- *Whilst traffic clubs ensure that parents receive materials* (and are therefore much better informed about what to do with their children), *they do not provide any form of support or feedback as parents try to work their way through the programme.* Once the materials have been received, parents are very much on their own. This is a particular problem where parents lack confidence in themselves as teachers.

One approach that might at least partially overcome this problem has been reported by Rothengatter (1981) and van der Molen (1983). This group produced videos illustrating training procedures for teaching children how to deal with several traffic situations. These were shown to parents at evening meetings organised in local schools, with parents being encouraged to train their children in the illustrated manner. In addition to demonstrating the teaching method, these sessions offered an opportunity for parents to ask questions or raise concerns about carrying out the training.

This approach offers some support to parents, at least in the initial stages. On the negative side, several problems persist with this approach:

- *It remains relatively passive because the parents simply watched good teaching practice: they did not receive any guided experience of carrying out the training.*

- *Since not all parents attended the course it follows that only a proportion of the targeted children would receive training.*

- I*t was difficult to determine how assiduously parents followed the programme or to assess how robust the procedures were to variations in parental skill.*

Nevertheless, pre- and post-tests showed that children's traffic competence undoubtedly improved relative to that of control children whose parents had not seen the videos, and unobtrusive observation showed some generalisation to children's unsupervised traffic behaviour (van der Molen, 1983).

### 1.3 The Drumchapel Project

The present study aimed to develop the approaches described above whilst introducing several new features:

- *Instead of asking parents to train their own children, we recruited volunteers from the local community to assist in training other people's children.* In this way, it was hoped to reach all children in the community, not just those whose own parents felt capable of making the required commitment.

- *Since volunteers were required to come into the schools at designated times to take children to the roadside, it was possible to monitor precisely how much training children received in practice, not just in theory.* Since inevitably there was some variation in the number of training sessions children actually received, it was possible to examine the effectiveness of different amounts of training. Such information would prove useful in optimising the length of different sections of the programme.

- *Volunteers themselves received practical experience of working with the children under the guidance of project staff.* Thus, the parents not only observed or read about good teaching practice: they were required to try to emulate that practice. It was strongly felt that such a 'hands-on' approach would be particularly beneficial to those parents who lacked confidence in themselves as trainers. It was also felt that parents who had confidence in themselves as trainers would be much more likely to remain committed throughout the programme.

- *Notwithstanding that parental participation in road safety education has long been advocated, relatively few studies have attempted to determine how competent parents actually are as teachers of road safety.* Many road safety skills are extremely challenging for children. If parents are exhorted to teach their children, it must be demonstrated that they are, in fact, able to do so effectively. If not, it might be that their effectiveness could be improved through appropriate training. The present study addressed this by assessing the progress made by children under parental tutelage.

### 1.4 The Skills To Be Taught

- *How to recognise dangerous roadside locations where crossing should not be attempted* (or where a special strategy is needed). *Learning to construct safe routes between locations that would avoid such dangers.*

- *How to cross safely at parked vehicles where this is unavoidable.*

- *How to cross safely near intersections.*

All three skills have been extensively researched and, when taught by professionally qualified trainers, improve the performance of children as young as five years of age. A procedure for teaching how to cross at parked cars and at junctions was first devised in the Netherlands (Rothengatter, 1981, 1984; van der Molen, 1983; van Schagen, 1985; van Schagen and Rothengatter, 1986) and has been evaluated with positive results. A procedure by which children can learn to identify dangerous roadside situations and choose routes that avoid them has been developed and evaluated by Thomson, Ampofo-

Boateng, Pitcairn, Grieve, Lee and Demetre (1992) and Ampofo-Boateng, Thomson, Grieve, Pitcairn, Lee and Demetre (1993). There is also evidence that parent volunteers might be able to use the procedure to improve children's judgements (Thomson, 1994). The project thus rests on a well-researched foundation and capitalises on methods and materials devised and experimentally evaluated by previous research.

### 1.5 Project Aims

The overall aims of the project can thus be summarised as follows:

- *To mount a road safety training programme aimed at teaching three distinct pedestrian skills, using practical training methods.*

- *To teach parental volunteers how to conduct such training.*

- *To assess whether such training produces any improvements in children's traffic judgements and behaviour.*

## 2.0 THE TARGET COMMUNITY

Situated eight miles to the north-west of Glasgow city centre, Drumchapel is one of several large peripheral housing schemes developed in the city during the post-war period as a means of alleviating inner-city housing problems. The stock consists mainly of three or four story blocks with six to eight households up each 'close' or stairway. Only 1% of housing is owner occupied. Most buildings have very limited garden space, usually in the form of a communal drying green to the rear. Although the car ownership rate is substantially lower than the overall rate for the city (18% versus 35%), the streets provide little room for parking and many drivers park on the pavement to keep the relatively narrow streets clear for traffic. The area is currently undergoing extensive refurbishment to replace poor quality, damp or crowded accommodation and to improve the environment, including the roads.

During the 1960's, employment flourished in Glasgow's heavy industries but these have long since declined, giving rise to significant structural unemployment. Of residents aged 16 years and over in 1991, 50% were registered as being "economically inactive" although a smaller proportion were officially registered as unemployed. In general, the area "...is characterised by decline and underdevelopment, with high levels of unemployment and poverty."[1] Between 1971 and 1987, the population dropped by 40%, leaving a younger community with a higher proportion of children in an increasingly weak local economy. The 1991 census shows a current population of 18,389, of which 10% were children between the ages of 5 and 9 years. Recently, organisations working in partnership with the local population have been established in an effort to improve the area on a range of fronts. These include housing redevelopment; improved economic opportunities for local people; a strategy to tackle poverty and related health issues; upgrading of local education services; and a policy to deal with local environmental issues, including the roads.

### 2.1 Child Pedestrian Accidents In Drumchapel

[1]Taken from "The Drumchapel Strategy" available as part of the "Drumchapel Initiative Information Pack".

In addition to its general economic and social problems, Drumchapel also suffers an exceptionally high child pedestrian accident rate. The scale of the problem is illustrated in Table 1.1. It can be seen that, in 1990, 5-9 year-olds in Drumchapel suffered a pedestrian casualty rate roughly six times the national average. The rate for 10-14 year-olds was only slightly less severe. The figures are prominent even by comparison to the relatively high accident rate for Glasgow as a whole.

**Table 1.1 Child pedestrian casualty rates 1990**

| AREA | AGE | RATE PER 1000 |
|---|---|---|
| **UK National Average** | 5-9 | 2.52 |
| | 10-14 | 2.75 |
| **Strathclyde Region** | 5-9 | 3.87 |
| | 10-14 | 3.43 |
| **Glasgow** | 5-9 | 5.05 |
| | 10-14 | 5.42 |
| **Drumchapel** | 5-9 | 13.68 |
| | 10-14 | 10.92 |

Source: Strathclyde Regional Council Department of Roads

The idea of a road safety education initiative arose in the context of these figures and led to representatives of the community approaching the first author of this report. The idea of enlisting community volunteers to act as trainers was partly driven by the practicalities of undertaking roadside exercises with large numbers of children. However, it was also in keeping with the community's general approach to social and economic revival, which was to foster a spirit of self-help and regeneration from within rather than simply having solutions imposed from outside Given the pivotal role played by the local people who volunteered to undertake the training, we believe the project represents a good example of what can be achieved, even in a socially and economically depressed area, where community action is channelled into tangible activities focused on clearly defined goals.

## 3.0 GENERAL METHODOLOGY

The pedestrian skills were introduced sequentially over a period of 18-24 months beginning with safe route planning, which was introduced during the second term of children's first year in primary school. In Scotland, such children are aged five years. By the time they had been taught how to cross at junctions, the children were approaching seven years of age. Two separate cohorts of children from succeeding year groups undertook the programme. Some modifications to the training procedures were introduced in Year 2 in the light of the findings in Year 1. These are described in the appropriate sections.

All training was carried out by parent volunteers, who were recruited by project staff. Volunteers themselves received training so that they clearly understood what they were supposed to be doing and why (see Section 3.1). Children received between four and six training sessions (depending on the skill), each lasting 20-30 minutes, at a rate of about one session per week. Children were trained either in pairs or in threes (again depending on the skill) and each trainer was asked to take responsibility for six children. The commitment required of volunteers was thus about an hour a week over a four to six week period. Volunteers trained only *other people's* children: they were never allocated their own child. Training was undertaken during school hours, with volunteers collecting the children from their classrooms at designated times and taking them to the roadside. The programme thus depended on a close and mutually supportive collaboration between project staff, parent volunteers and local schools.

**Figure 1.1 Schematic representation of the experimental design.**

| Pre-tests (2 sessions) | Post-test 1 (2 sessions) | Post-test 2 (2 sessions) |
|---|---|---|
| T R A I N I N G (4-6 sessions) | INTERVAL (2 months) | |

To assess the effectiveness of training, an evaluation programme was devised. This consisted of testing a representative sample of children at a series of designated sites before training commenced in order to establish baseline measures of skill. Immediately following training, these tests were repeated to see what changes had taken place. A further test was run approximately two months later in order to assess how robust the training proved to be in the longer term. The results were also compared to those of control children who undertook all the pre- and post-testing but did not receive any training. Control children were drawn from the same classes as trained children, with allocation to the trained or control groups determined randomly. Control children received training later in the programme so that they would not be disadvantaged relative to their classmates. The evaluation procedure is summarised in Figure 1.1.

This general procedure was followed for each of the three skills. In addition to providing outcome measures of the effectiveness of training, it allowed us to examine a number of other issues such as individual differences in children's learning; possible learning differences between boys and girls; and other issues that may affect training outcome.

### 3.1 Volunteer Recruitment

Potential trainers were enlisted in a variety of ways. The consent forms sent to parents asked if they would be prepared to help. Later, similar letters were sent to parents of older children in the school. Head teachers were also able to put project staff in touch with candidates who they thought might be willing to participate. However, once the project became established by far the main source of new recruits turned out to be existing volunteers, who brought the work to the attention of friends and relatives.

In the initial phase, 30 volunteers were recruited. This number increased slightly once the project got under way. Most volunteers committed themselves to only one or two training phases, with only a small number (14) taking part in every phase of the project. However, as volunteers dropped out new recruits were constantly found so that, by the end of the project, over 100 volunteers had taken part in at least one training phase. Thus, although few volunteers committed themselves to the entire two years of the programme, the number of new recruits easily compensated for this. To our surprise, we found no evidence of a 'ceiling' effect, whereby the number of potential recruits becomes exhausted after a certain period of time. On the contrary, as the project became increasingly well known in the area, there developed a 'safety culture', to which increasing numbers of individuals were attracted. The result of increasing volunteer numbers was not only that more children were trained, but that an ever increasing number of community members became involved and played an active role. This success rate markedly surpassed our expectations and, we believe, warrants optimism for future attempts at implementation of community-based programmes of this kind.

Volunteers were all vetted by the project staff with regard to their suitability as trainers and were required to pass statutory police checks against Schedule1 Offences under the Children's Act 1989. All were parents of children in Drumchapel, though not all had children in a Primary 1 class.

Throughout the project, an effort was made to create a club-like atmosphere for volunteers. Refreshments were made available at the end of each training session in each school so that volunteers could get to know each other and the school/project staff. These also provided an opportunity for discussion and monitoring. At the end of each training phase, a buffet was organised in a local community centre to which all volunteers were invited. Each Christmas, all volunteers who had participated in some way during the previous year were invited to a more formal lunch in a nearby hotel. These activities helped to create social cohesion in the group and fostered good relations between the group and project staff.

### 3.2 Volunteer Training

Before beginning work with the children, all volunteers themselves underwent training. This was done by means of courses organised by project staff, one for each of the three skills. Each course lasted half a day and was run separately in each of the 10 schools in the area. The courses involved both observation of good teaching practice and guided practice of working with children.

Courses began with an introduction from project staff, who described the training procedure and emphasised critical points and issues. Questions and discussion were encouraged. The group then proceeded to the roadside where staff demonstrated good teaching practice with parents looking on. This became a basis for further discussion. Parents were then asked to attempt training with staff offering support and feedback. Again, discussion followed these sessions. All parents in the group had the opportunity to receive experience and guided feedback in this way. The overall aim was to ensure that parents acquired a firm grasp of the principles of the programme together with practical experience of running it.

Great care was also taken to ensure that parents learned language and questioning techniques that were appropriate to the age of the children being trained. For example, untrained parents often use 'closed' questioning techniques (in which the child can only reply 'yes' or 'no'). An important aim of the course was to enable them to ask more 'open' questions, which would better reveal the child's thinking about the task. This is obviously important in determining what to do to improve the child's existing conceptualisation.

Emphasis was also placed on the importance of stopping at the kerb, looking and listening for traffic once an appropriate site had been found, and other aspects of good practice. This was used whenever streets had to be crossed to reach the sites, with the children actively participating at all stages. At the end of the course, volunteers received a short manual summarising the key points of training. They also received regular monitoring and backup visits from project staff once the programme had started.

### 3.3 Project Launch

It was decided that the project should be given as high a profile as possible, partly as a means of drawing the community's (including drivers') attention to the fact that children would be moving about the area throughout the day, and partly as a means of alerting potential volunteers to the project's existence. A formal launch was organised to which representatives of local and regional authorities, the police, Scottish Office, Department of Transport and academic guests were invited. We also invited all head teachers from the local schools, the thirty volunteers recruited in the first phase of the project and a group of schoolchildren who had taken part in a competition to design a logo for the project. The winning design was later used on all stationary, posters, stickers, etc. as well as on the project's special Christmas Card. Representatives from the local press and media were also invited as a means of publicising the project. In fact, the project received substantial publicity both in the press and on radio. Later, the project received more widespread publicity in the national press.

### 3.4 Numbers Trained

Table 1.2 summarises the number of children allocated to the trained and control groups in each phase of the project. It also shows the proportion of trained children who undertook the programme of pre and post-testing. This sub-group, representing a 30% sample of the trained group, was balanced for gender but otherwise was selected at random. The control group was selected in the same way.

It can be seen that the number of children receiving training was fairly well maintained across the different phases of the study. It should be noted, however, that control children also received as much training as possible once they had ceased to serve as controls. A further 250 children were trained after completion of the formal evaluation. Thus, slightly more than 750 children received training during the lifetime of the project (30 months), representing approximately 88% of the targeted population. The remaining children did not receive training either because their parents failed to return the consent form, or because the family moved out of the area (often due to housing refurbishment).

**Table 1.2 Number of children allocated to the trained, tested and control groups in the different phases of the project.**

| | SAFE PLACES | | | PARKED CARS | | | JUNCTIONS | | |
|---|---|---|---|---|---|---|---|---|---|
| | Trained | Tested | Control | Trained | Tested | Control | Trained | Tested | Control |
| **YEAR1** | 186 | 50 | 54 | 186 | 66 | 36 | 188 | 50 | 48 |
| **YEAR2** | 214 | 67 | 30 | 175 | 53 | 38 | 174 | 57 | 31 |

## 4.0 CHOOSING SAFE PLACES AND ROUTES TO CROSS THE ROAD

### 4.1 Rationale

Most road safety education is concerned with the mechanics of the crossing task itself: i.e., with ensuring that the child stops at the kerb, looks in appropriate directions for traffic, walks across the road, and so on. However, these activities are only meaningful if the child first selects a suitable roadside location to carry them out. Many locations are unsuitable because they obscure the child's view of traffic (and drivers' view of the child). Examples include sharp bends; the brow of a hill; and positions close to parked vehicles or other obscuring street 'furniture'. In addition, intersections pose special difficulty because the layout means that traffic can arrive from several directions, thereby taxing the child's visual search, memory and information-processing capacities. Perhaps not surprisingly, such locations are over-represented in child pedestrian accidents (Thomson, 1991). Obviously, children must learn to recognise the danger implicit in such situations and know how to deal with them.

In practice, young children show little insight into the dangers posed by such locations and will happily choose to cross there if given the opportunity (Ampofo-Boateng and Thomson, 1991). Indeed, children under the age of nine years tend to think that such sites are positively *safe*. This is because younger children judge the safety or danger of a location primarily on the basis of whether or not they can see cars nearby. If none is visible, they assume that none exists. They fail to recognise that a sharp bend is a dangerous location precisely *because* traffic cannot be seen there. Only from about nine years do untrained children begin to realise the danger posed by such locations and start developing strategies aimed at overcoming them, such as moving further away to a place where approaching vehicles can be seen well before they arrive.

A second problem is that children tend to assume the most direct route to a destination is safest. This means that they will often walk *diagonally* across the road - a route they may even prefer at cross-roads where they would be exposed to traffic from several directions. Such choices are often justified on the grounds that the child is 'going straight across the road' - an obvious misinterpretation of common advice to young children.

These trends have now been well documented (e.g., Ampofo-Boateng and Thomson, 1991; Thomson *et al.*, 1992; Ampofo-Boateng *et al.*, 1993; Demetre and Gaffin, 1994). It is obvious that children must learn to recognise the danger posed by such locations and learn how to deal with them safely. Phase 1 of the programme aimed to do this.

### 4.2 Training Aims

- *to teach children how to recognise dangerous roadside locations where crossing should not be attempted (or where a special strategy is needed);*
- *to teach children how to find safer routes that avoid such locations;*
- *to teach children how to choose routes that reduce their exposure to traffic;*
- *to increase children's conceptual understanding so that they will be able to deal flexibly with a wide range of situations.*

## 4.3 Subjects

In Year 1, 186 children received training. The size of the group was determined by the number of volunteers recruited and the amount of time they were able to offer. A further 24 children received training later as a result of additional volunteer recruitment.

A 30% sample (N=50) from this group was pre-selected to take part in the evaluation process. A similar number of children (N=54) was pre-selected from the same classes to form the control group. The control group undertook the programme of pre and post-testing but received no training. Both groups were balanced for gender and, as far as possible, for school. In other respects, allocation to the groups was determined at random.

## 4.4 Setting

Children were trained at a set of preselected sites in the streets near their schools. Separate sites were used for each school but these were matched as far as possible for overall layout and complexity. All were within easy walking distance. Three locations were visited during the course of each training session, two where visibility was restricted and one where traffic could emerge from several directions. The sites were organised into a 'traffic trail' such that they could be visited comfortably within a 25-30 minute session.

A similar set of sites was used during pre and post-testing. However, these sites were entirely separate from those used during training. The aim was to see if children could generalise the reasoning procedures they had been taught during training to the different contexts used during testing.

## 4.5 Evaluation Procedure

### *4.5.1 Pre and post-testing*

One week before training, children were individually tested on two separate occasions by a member of project staff to establish baseline measures of skill (*Pre-test*). Approximately one week later, the training programme began. This consisted of six sessions presented at a rate of roughly one per week: the exact scheduling varied slightly from trainer to trainer. Immediately after training ended, children were re-tested to establish if any improvements in their judgements had occurred (*Post-test 1*). This was followed by a further test between two and three months later (*Post-test 2*), aimed at assessing the longer term effects of training. Control children undertook the testing programme in the same way.

At each of the three sites visited in the course of each test session, the child was asked to construct four routes between specified locations. This generated 12 routes per test session, making 24 routes in all. An example of a test site is shown in Figure 4.1. Children received no advice or feedback during test sessions.

**Figure 4.1. One of the sites used in the study, showing starting points and destinations. Arrows show examples of routes children might construct from (1) very unsafe to (4) safe.**

At each location, the child was instructed to imagine s/he was alone and wanted to cross to a destination a short distance along the pavement on the other side of the road. The destination was always a meaningful one, such as a doorway, garden gate or identifiable object. The starting point was always at a dangerous location, such as a parked vehicle or sharp bend. Thus, simply walking across the road would never be a safe option. To perform the task successfully, the child would have to assess the surrounding traffic environment and take relevant features into account in deciding how to reach the goal.

Children indicated their preferred route by pointing and describing it to the experimenter: they were never required to walk across the road. The routes were recorded on schematic drawings of the locations. These were updated at the beginning of each test session to take account of changing conditions (for example, parked cars). Scoring was thus always based on the conditions prevailing at the time of testing. If the site was seriously distorted, testing was either postponed till a later date or a similar site was sought nearby.

*4.5.2 Scoring*

The routes that children chose were coded into four categories in accordance with practice in previous studies (Thomson et al., 1992; Ampofo-Boateng et al., 1993). These are shown in Figure 4.2. However, in the present study, coding was made more difficult by the much more complex environment in which testing took place. In earlier studies, sites were always chosen so that the children could make judgements right across the range. In Drumchapel, however, it was often difficult to find sites where the full range of choices was available. For example, in many cases the road layout meant that a category D route simply could not be constructed. In such cases, the highest attainable score would be C.

Also, in the earlier, experimental studies, sites were chosen so that only one dangerous element was present at a time. For example, the site might be located near an obscuring obstacle *or* it might be at an intersection, but not both. This was done to evaluate the relative difficulty posed by different road structures. However, in Drumchapel this proved extremely difficult because dangerous elements were often found in combination and it proved remarkably difficult to find isolated examples.

During the design phase of the study, it therefore became clear that the selected sites would have to be more complex than those used in previous studies. On the whole, we took the view that this was desirable, since it is with this level of difficulty that children will eventually have to cope. However, it also meant that children were trained in complex situations from the outset, rather than being introduced to them gradually. It might be expected that this would have an influence on the overall success of training. It also meant that a more sophisticated scoring procedure was required.

All scoring was done by the same rater, who was well versed in the principles underlying the scoring procedure. This rater had no involvement in the training programme and was unaware of the group (trained or control) to which individual children had been allocated. To assess the reliability of the ratings, a 25 % random sample of the protocols was selected for independent coding by a second rater. Inter-rater reliability was .86.

### 4.6 Training Procedure

Children were trained in groups of three, as far as possible by the same trainer, although this could never be guaranteed for practical reasons. Assignment of trainers to children was randomised, except that trainers were never allocated their own child. Six training

**Figure 4.2. Scoring system used in assessing children's roadside judgements during pre- and post-testing.**

**(A)** ***Very Unsafe***

This was usually a route leading directly to the destination (often involving a long, diagonal traverse of the road). A route classified as 'very unsafe' would also fail to take account of the dangerous features at which the starting point was located (e.g., a parked car).

**(B)** ***Unsafe***

Most routes falling into this category involved the child walking directly across the street (i.e. they took a line perpendicular to the road rather than the target-directed diagonal of the previous category). However, the child continued to ignore the dangerous road features at the starting point. Such choices were considered an improvement on (A) because they at least reduced the amount of time the child would spend on the road. On the other hand, neither route took account of dangerous roadside features. Both routes would be very dangerous if chosen in real traffic.

**(C)** ***More Safe***

This was a route which showed some conceptual understanding of the danger posed by particular features or road configurations. Usually, a 'more safe' rating was awarded when a child would move away from the dangerous features at the starting point (for example, a sharp bend) and attempted to find a safer position. However, the child might end up too close to another dangerous feature, such as a junction or parked vehicle. Whilst still not a maximally safe choice, 'more safe' routes constitute a significant advance on the previous two categories. Moreover, since it was often not possible to find a maximally safe position, many thoughtful routes representing the best choice available under the circumstances received 'C' ratings.

**(D)** ***Safe***

This was a route avoiding all dangerous features and configurations. Usually, the child would have to make a significant detour from the starting point in order to find such a route. In practice, it was often difficult to find routes avoiding all hazardous features and the child was often faced with choosing the lesser of several evils. However, such 'best option' routes would be scored 'C', not 'D'.

sessions were run on a roughly weekly basis, each lasting approximately 30 minutes. During each session the group visited three preselected locations, two where visibility was restricted and one where traffic could approach from several directions.

At each location, one child was selected from the group and asked to decide what would be the safest route to reach the specified destination. The other children were then asked to discuss and comment on the proposed route. The trainer intervened from time to time to guide the children on the basis of the comments made during discussion until the children eventually chose a suitable route or they ran out of alternatives. If this happened, the trainer showed the children a good choice and they moved to a new starting point where another child from the group was selected and asked to propose a route to a new destination. This procedure continued through the 12 trials in that training session. All children thus had an equal number of opportunities to act as 'proposer' and 'commentator'.

As illustrated in Figure 4.3, training adopting a structured learning approach aimed at guiding the children's thinking so that they would reach an appropriate assessment of the site on the basis of their *own* reasoning, rather than *ours*. A particular concern was that the

**Figure 4.3. Example of the training procedure used in learning to choose a safe site to cross the road (taken from the Volunteer Training Manual).**

**TRAINING CHILDREN TO CROSS AWAY FROM OBSTACLES**

*Young children don't understand the danger of crossing where their vision is obstructed. Your job is to help them understand these dangers and learn how to deal with them. To do so, proceed as follows:*

**1.** **Select a place where vision is obscured, for example by a parked car (your project manager will give you a route showing several specific sites where you should train the children).**

**2.** **Ask them if they can see the road to check for traffic.**

*Sometimes the child will say "yes" to this question, even though it is obvious to you that they cannot. If they do this...*

**3.** **Ask them if they can see particular objects across the street that you know are hidden from their point of view (anything will do - a garden gate, some flowers, a passing cat, etc.).**

*This should help them realise that they can't see properly.*

**4.** **If a car comes, ask them about it - what it looks like, when they can first see it, etc.**

*This will help them realise they can't see the car properly until it is very close to them.*

**5.** **Ask them why they couldn't see the car.**

*This will help them realise their view is blocked.*

**6.** **Ask what they might do about it.**

*This introduces the idea that it might be necessary to move.*

**7.** **If they suggest moving, let them take you to a new spot. Get them to explain why this place is better than the last one. If it isn't better, go through the steps again until eventually a better solution is found.**

**8.** **If they really get stuck, show them a reasonable solution and explain why. Then move on to a new location and try again**

*You can see that the idea is to make the children work out for themselves why some places are dangerous and others are safer.* ***NEVER*** *just recite a list of places where they shouldn't cross: this won't help them understand why they shouldn't cross there. They must come to understand that a safe place is one where they can see the traffic a long way ahead and where drivers can see them.*

children should not just memorise a set of rules. For this reason, children were never at any stage told that 'parked cars are dangerous', or given a list of 'dangerous places' to be remember. Instead, we aimed to improve their conceptual understanding of what may render a roadside location dangerous, so they could apply the same principles to many other situations, including ones which would be substantially different from those encountered during training sessions. Questions, prompts and demonstrations were used to guide the children's reasoning and to assist them in reaching a higher level of conceptual understanding.

## 4.7 Safe Places Results (Year 1)

### *4.7.1 Main Effect Of Training*

Although data were collected over two consecutive years, procedural and other modifications introduced in Year 2 made combining of the data inappropriate. The main analysis is therefore based on Year 1 data, with Year 2 data presented separately.

Although it was intended that children would receive six training sessions, this did not always happen for reasons discussed in Section 4.8. For this reason, the main analysis is based on those children who received *at least four training sessions.* Results for children who received fewer than four training sessions are discussed in Section 4.7.2.

Table 4.1 shows the mean number of routes falling into each of the four safety categories as a function of training (trained vs control) and test phase (pre-test, post-test 1, post-test 2). Gender has been omitted because it failed to produce either a main effect or an interaction with any other factor in the statistical analysis.

**Table 4.1 Proportion of judgements falling into each safety category as a function of training and test phase. A=very unsafe B=unsafe C=more safe D=safe**

| | TRAINED | | | | CONTROL | | | |
|---|---|---|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **A** | **B** | **C** | **D** |
| **PRE TEST** | | | | | | | | |
| Mean | **0.47** | **0.40** | **0.06** | **0.07** | **0.50** | **0.34** | **0.08** | **0.08** |
| S. D. | 0.32 | 0.29 | 0.07 | 0.11 | 0.33 | 0.25 | 0.10 | 0.11 |
| **POST TEST 1** | | | | | | | | |
| Mean | **0.12** | **0.47** | **0.15** | **0.26** | **0.30** | **0.49** | **0.06** | **0.15** |
| S. D. | 0.17 | 0.24 | 0.13 | 0.23 | 0.29 | 0.31 | 0.10 | 0.20 |
| **POST TEST 2** | | | | | | | | |
| Mean | **0.18** | **0.44** | **0.18** | **0.21** | **0.30** | **0.44** | **0.07** | **0.19** |
| S. D. | 0.19 | 0.28 | 0.15 | 0.18 | 0.29 | 0.31 | 0.10 | 0.21 |

It can be seen that, prior to training, the vast majority of children's judgements fell into categories A and B (i.e., 'unsafe' or 'very unsafe'). In fact, almost half of all judgements were of the 'very unsafe' type; i.e., the weakest category of all. Following training, however, the situation improved markedly, with the proportion of 'very unsafe' routes falling from 47% to 12%. Correspondingly, there was an increase in the number of routes falling into categories C and D; i.e., into those categories showing conceptual awareness of roadside dangers and how to deal with them. The proportion of such judgements rose from 13% in the pre-test to 41% after training - an improvement of 215%. Moreover, the data from Post-test 2 show that the improvement was maintained over a considerable period, with performance dipping only slightly two to three months after the end of training. In the control group, by contrast, improvements were much more modest. Even though the control group started from a higher baseline than the trained group, (16% of their scores falling into categories C and D in the pre-test), their scores improved by only 31% in Post-test 1, with a further small improvement in Post-test 2.

For the purpose of statistical treatment, we used the combined C and D score achieved by each child as the unit of analysis. This is because these categories represent conceptually more advanced choices in which the child showed evidence of insight into the dangers posed by the road layout and proposed routes which at least partially took them into account. Although a shift from Category A to Category B (i.e. from 'very unsafe' to 'unsafe') would also represent an improvement, we did not concern ourselves with such shifts because a child performing at the 'unsafe' level would still have little insight into the factors rendering roadside locations safe or dangerous. The pattern that emerges when the data are treated in this way is shown in Table 4.2.

**Table 4.2. Mean proportion of safer (C+D) routes constructed by children before and after training.**

| | SAFER (C+D) ROUTES | | |
|---|---|---|---|
| | **Pre-test** | **Post-test 1** | **Post-test 2** |

| | | | |
|---|---|---|---|
| **TRAINED** | | | |
| Mean | **.13** | **.41** | **.39** |
| S.D. | .16 | .25 | .24 |
| | | | |
| **CONTROL** | | | |
| Mean | **.16** | **.21** | **.26** |
| S.D. | .18 | .24 | .27 |

The trends were analysed by means of a three-way analysis of variance (ANOVA) with group (trained versus control), test phase (pre-test, post-test 1, post-test 2) and gender as factors. The results showed significant main effects of both group ($F(1,77)=5.95$, $p<.017$) and test phase ($F(2,154)=31.46$, $p<.001$). There was also a significant interaction between these factors ($F(2,154)=11.85$, $p.<.001$). From Table 4.2 it can be seen that this is because the improvement between the pre- and post-tests was much more marked in the trained group than in the controls. There was no significant effect of gender, nor were any of the gender interactions significant.

The trends were further analysed by calculating a *difference score* for each subject, consisting of the difference between their pre-test and post-test scores. Because this measure takes into account the fact that different subjects start from different baselines, it provides a more sensitive measure of the changes that took place within individual children as a result of training. The results of this analysis are shown in Table 4.3.
It can be seen that the difference scores achieved by trained subjects in Post-test 1 were far higher than those achieved by the control group. This effect proved to be highly significant ($t(85) = 4.85$, $p<.001$). There was little change over the succeeding two month period, except for a marginal decline in the scores of trained children and a slight improvement in those of controls. However, this difference between the groups did not prove to be statistically reliable ($t(79) = -2.05$, n.s.).

**Table 4.3 Pre-test and difference scores as a function of training.**

| | **Pre-test** | **Difference between Pre-test and PT 1** | **Difference between PT 1 and PT2** |
|---|---|---|---|
| **TRAINED** | | | |
| Mean | **.13** | **.31** | **-.04** |
| S.D. | .16 | .28 | .27 |
| | | | |
| **CONTROL** | | | |
| Mean | **.16** | **.05** | **.06** |
| S.D. | .18 | .23 | .21 |

*4.7.2 Effect Of Number Of Training Sessions*

The programme was designed to provide children with six training sessions over a six week period. This number was chosen simply because it had proved successful in previous studies. However, it was not known whether this represents an 'optimal' number

of sessions, nor whether reducing (or increasing) the number of sessions would have a different outcome.

In the present study, it was planned that children would receive six training sessions as before. However, in practice this did not always happen. Absences due to illness, temporary decanting of families to make way for housing rehabilitation, and a variety of other factors meant that a significant number of children received fewer sessions than planned (although the vast majority received at least four sessions). These variations, although unplanned, provide the opportunity to examine the relationship between number of training sessions and performance more closely than has previously been possible.

Table 4.4 shows the mean pre-test, post-test and difference scores attained by children who had received six, five, four and three or fewer training sessions. We also compare the scores to those of control children who received no training at all. It can be seen that the difference between four, five and six training sessions is negligible, whereas children who received three or fewer sessions showed noticeably less improvement. This trend was confirmed statistically by a one-way ANOVA ($F(4, 89)=6.17$, $p<.0002$) followed by planned post-hoc comparisons between the groups using the Newman-Keuls procedure ($\alpha = .05$). This confirmed that the six, five and four session groups did not differ significantly from each other, whereas all three performed significantly better than the control group.
The difference between Post-test 1 and Post-test 2 also shows that the improvements were well maintained over the longer term, although there is a suggestion that the performance of those who received only four sessions may be somewhat less robust.

**Table 4.4 Mean pre-test, post-test and difference scores as a function of number of training sessions.**

| No. of sessions | Pre-test | Post-test 1 | Difference between Pre-test & PT1 | Post-test 2 | Difference between PT1 & PT2 |
|---|---|---|---|---|---|
| **6 sessions** | **.11** | **.41** | **.32** | **.41** | **-.01** |
| S.D. | .15 | .22 | .24 | .23 | .22 |
| **5 sessions** | **.18** | **.39** | **.21** | **.37** | **-.04** |
| S.D. | .2 | .32 | .36 | .28 | .35 |
| **4 sessions** | **.10** | **.47** | **.35** | **.33** | **-.17** |
| S.D. | .13 | .26 | .23 | .23 | .27 |
| **<= 3 sessions** | **.14** | **.21** | **.01** | **.33** | **.08** |
| | .15 | .25 | .22 | .27 | .13 |
| **Controls** | **.16** | **.21** | **.05** | **.26** | **.06** |
| S.D. | .18 | .24 | .23 | .27 | .21 |

For children who received three or fewer sessions the picture is rather different. Although there is still evidence of improvement, especially by Post-test 2, the effect is less than in the other groups. This suggests that, whilst three or fewer training sessions are certainly not wasted, the benefits of training appear to be greatly enhanced when children receive at least four training sessions. It seems sensible to conclude that children should receive at least four training sessions wherever possible.

*4.7.3 Individual Differences And Their Effect On Training*

In Section 4.7.1, we argued that not all children started from the same baseline level of competence in safe route-finding, as shown by the variation observed in their pre-test scores. In fact, some children started off very poorly, producing no routes in the C and D categories at all. By contrast other children started off at, or even above, the performance level attained by the group as a whole *after* training. These differences would presumably reflect previous, probably informal, learning on the part of the child. It was for this reason that difference scores were used in addition to straightforward pre/post-test scores: the former provide a better measure of the changes taking place within the individual because, unlike comparisons between mean pre- and post-test performance, they do not pool variance across subjects.
The fact that there was such variation in pre-test performance provides an opportunity to look at the relationship between starting performance and subsequent learning in more detail. For example, do children who start from a higher baseline show more improvement over a given number of training sessions than weaker children? Do the latter require more sessions to catch up with their initially more advanced classmates? Or are there some children who, for one reason or another, do not improve at all? By examining the improvement rates of children with different baseline levels of skill we can gain insight into these issues.

We attempted to answer these questions by dividing the children into three groups in accordance with their pre-test scores. These consisted of the top, middle and bottom thirds of the sample. We then calculated the difference scores separately for each of the three groups. The same procedure was followed with the control group for comparative purposes. The results are shown in Table 4.5.

**Table 4.5. Mean difference scores as a function of pre-test scores for both trained and control samples. Groups correspond to the top, middle and bottom thirds of the sample.**

| | **Pre-test** | | **Difference score between Pretest & PT 1** | | **Difference score between PT1 & PT2** | |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | Mean | S.D. |
| **EXPERIMENTAL** | | | | | | |
| **Top group** (N=14) | **.31** | .17 | **.21** | .32 | **-.03** | .35 |
| **Middle group** (N=12) | **.08** | .04 | **.32** | .22 | **-.10** | .30 |
| **Bottom group** (N=16) | **.01** | .02 | **.39** | .27 | **-.01** | .18 |
| **<=3 SESSIONS** | | | | | | |
| **Top group** (N=4) | **.31** | .15 | **.04** | .24 | **.03** | .05 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Middle group** (N=6) | **.08** | .03 | **.04** | .32 | **.14** | .11 |
| **Bottom group** (N=2) | **.00** | .00 | **.04** | .15 | **-** | - |
| **CONTROL** | | | | | | |
| **Top group** (N=17) | **.38** | .13 | **-.02** | .30 | **.09** | .22 |
| **Middle group** (N=17) | **.08** | .04 | **.05** | .14 | **.11** | .24 |
| **Bottom group** (N=16) | **.00** | .00 | **.10** | .21 | **-.01** | .14 |

It can be seen that there were indeed quite marked differences in pre-test performance between the three groups. For example, in the experimental group, the proportion of C and D routes constructed during the pre-test ranged from a mean of 31% in the top third of the sample to only 1% in the bottom third. Among controls, scores varied even more widely from a mean of 38% in the top group to zero in the bottom group. This pattern was even seen in the scores of those who received fewer than 3 training sessions, even though this group was very small. The trend was tested by means of a one-way ANOVA, with group (top, middle or bottom) as factor. The inter-group differences proved to be highly significant ($F(2,101)=144.02$, $p<.0001$). A follow-up Newman-Keuls test showed that each of the groups differed significantly from each of the others.

Table 4.5 also shows the difference scores subsequently achieved by each of the three groups in Post-test 1. It can be seen that training induced improvements in all three groups. Nevertheless, difference scores varied considerably, from .21 in the top group to .39 in the bottom group. A similar pattern was even found in the scores of control children, notwithstanding that improvements in the control group were very slight. Across the board, the greatest improvements occurred among the *weakest* rather than the strongest children. The effect was found to persist after Post-test 2.

These trends were analysed by mean of a two-way ANOVA with training (trained versus control) and group (top, middle and bottom) as factors (the '<= 3 sessions' group was omitted from the analysis in view of the small numbers). Both main effects were highly significant (*Training*: $F(1, 75) = 8.09$, $p<.006$. *Group*: $F(2,75) = 19.55$, $p<.001$). There was also a significant interaction between these factors ($F(2, 75) = 6.41$, $p<.003$). The interaction is due to the fact that the difference between top, middle and bottom groups was more marked in trained than in control children. The analysis confirms that those children who started from a low baseline were not impoverished relative to more able children. On the contrary, they made significantly greater improvements over the course of the programme, catching up to a large extent with those children who started from a higher baseline. This finding is corroborated by a significant negative correlation ($-.42$, $p<.006$) between pre-test score and the subsequent difference score achieved in Post-test 1. It seems that a carefully constructed training programme can largely overcome differences in initial skill level, and can do so in between four and six training sessions.

### 4.8 Discussion

The findings are consistent with those reported in earlier, experimental studies (Thomson *et al.*, 1992). Although implemented on a much larger scale that inevitably raised many more operational difficulties, Table 4.6 shows that the improvements obtained are rather similar to those previously reported. It is true that, in the earlier study, children were trained in groups of five whereas in the present study they were trained in threes. On the

other hand, in the earlier study children all received six training sessions, whereas the data reported in the present study include many children who received only five or even four sessions. Moreover, in the earlier study training was carried out by highly qualified staff. The volunteers used in the present study had no such qualifications or experience: their qualifications were mainly an interest in the safety of children in Drumchapel and being parents themselves. Nevertheless, the results of the two studies are clearly comparable.

At the beginning of the project, it was intended that all children would receive six training sessions in safe route planning. This figure is essentially arbitrary, but was based on what had proved sufficient to induce improvements in earlier studies. However, the results achieved by children who received fewer sessions suggest that between four and six sessions give rise to comparable improvements. Where the number of sessions was less than four, performance fell away. This would seem to represent a lower limit on the recommended number of training sessions for this skill. This point is important, because

**Table 4.6 Proportion of C and D scores as a function of training and test phase: a comparison with Thomson *et al.* (1992)**

| | TRAINED | | | CONTROL | | |
|---|---|---|---|---|---|---|
| | **Pre-test** | **Post-test 1** | **Post-test 2** | **Pre-test** | **Post-test** | **Post-test 2** |
| **Thomson *et al., 1992*** | **.17** | **.42** | **.40** | **.06** | **.15** | **.17** |
| **Drumchapel project** | **.13** | **.41** | **.39** | **.16** | **.21** | **.26** |

many road safety education activities appear to be run on a one-off basis. The present results suggest that this may not be adequate to induce genuine changes in children's understanding or behaviour.

Whether the improvement seen in the present study could be further enhanced by increasing the number of training sessions is not known. However, our experience of running the programme suggests that it might not. Many children become bored and inattentive if the programme is too long and, even in the present study, we noticed that some of the more able children became quite blasé as training progressed. Our impression was that increasing the number of sessions might actually be counter-productive. A more sensible approach in extending the course would probably be to run more advanced sessions at a later date, perhaps using more complex sites or situations, that would further challenge the children. This would give children the opportunity both to consolidate their existing skills and to extend them. We believe this would be a more effective use of resources than simply increasing the number of sessions at any one time.

Given the relatively large number of children for whom complete pre- and post-test data were available, it was considered extremely interesting to examine the relative improvement seen in those who performed well in the pre-test with those who did not. The data summarised in Table 4.5 certainly show that there is significant diversity in the level of ability to be found amongst even five year-old children. Given that those who scored highly in the pre-test would seem to be more conceptually advanced to begin with,

it might have been expected that training would have benefited them disproportionately, pushing them to even greater heights relative to children who started at a more modest level. Correspondingly, it might have been expected that weaker children would require a larger number of training sessions to reach a comparable level of performance.

In fact, the picture that emerged was quite different. Although all children improved as a result of training, the negative correlation between pre-test and difference scores shows that the greatest improvements were to found in the initially weaker children. Two factors are probably at work to account for this interesting result. Firstly, since they came from a lower starting position, the weaker children probably had more capacity for improvement. Secondly, since it is unrealistic to expect that any five year-old could attain adult levels of performance, especially on the basis of a relatively small amount of training, it seems likely that there is a ceiling to what children of this age can attain. If so, the initially-stronger children (who start closer to the ceiling in the first place) would have less scope for further improvement. Training would thus tend to reduce the variance among children, making them more homogeneous as a group. This seems to be just what happened.

Finally, a comment should be made about the lack of gender differences in the data. Notwithstanding the substantial difference in accident rates between boys and girls, no evidence was found of corresponding differences in the ability to recognise dangerous locations or to find safer ones. This, in fact, mirrors previous studies of safe place finding.

## 5.0 CHOOSING SAFE PLACES AND ROUTES TO CROSS (YEAR 2)

Although it was not intended to extend the safe places evaluation into Year 2, timetable arrangements permitted further testing to be undertaken. However, changes were made to the scoring procedure used in assessing children's judgements, making it inadvisable to combine the data. In addition, the Year 2 data were found not to be normally distributed. For these reasons, the results from Year 2 are presented separately.

### 5.1 Subjects

In Year 2, 214 children were selected for training of whom a sample of 67 was selected for pre and post-testing. As before, the group was balanced for gender and (as far as possible) for school. In other respects, selection was randomised. Mean age at pre-testing was 5 years and 8 months.

It was intended that the remaining 30 children would form the control group. However, because a larger group of volunteers was recruited during this phase of the project, it became possible to train a larger number of children than in Year 1. Since it seemed unethical to withhold training from children when the resources existed to train them (and the originally-scheduled evaluation was now complete), it was decided to schedule training sessions for control children as and when resources permitted. In practice, this meant that controls in Year 2 received up to 3 training sessions. Thus, for analysis purposes data are presented as a function of the number of training sessions received, rather than as a simple comparison between trained and control groups.

### 5.2 Safe Places Results (Year 2)

Since the data were not normally distributed, summary statistics are based on the median. Table 5.1 shows the proportion of safe and unsafe routes constructed as a function of the number of training sessions. It can be seen that, prior to training, very few routes fell into categories C and D. In fact, the overall proportion of safe routes constructed during the pre-test was only 4%. After training, however, the proportion of safe routes increased by a factor of nine among those children who had received four or more training sessions. Even allowing for the lower baseline performance in Year 2, this is an impressive change. By contrast, children who received fewer sessions show more modest improvements.

**Table 5.1 Median proportion of unsafe (A+B) and safer (C+D) routes constructed by children before and after training**

| | SAFER | | | UNSAFE | | |
|---|---|---|---|---|---|---|
| | Pre-test | Post-test 1 | Post-test 2 | Pre-test | Post-test 1 | Post-test 2 |
| 4 - 6 SESSIONS | .04 | .36 | .30 | .96 | .64 | .70 |
| <= 3 SESSIONS | .04 | .17 | .21 | .96 | .83 | .79 |

The effect of number of training sessions is examined in more detail in Table 5.2. As in Year 1, it can be seen that those children who received between four and six training sessions all improved quite markedly. Indeed, those who received only four sessions showed superior performance in both post-tests to the performance in Year 1 (although this is offset by the higher pre-test scores in this group). This supports our earlier conclusion that between 4 and 6 sessions of training give rise to comparable gains, whereas performance drops off with fewer sessions. Nevertheless, children seem to

**Table 5.2. Median pre-test, post-test and difference scores as a function of number of training sessions.**

| No. of sessions | Pre-test | Post-test 1 | Diff. between Pre-test & PT1 | Post-test 2 | Diff. between PT1 & PT2 |
|---|---|---|---|---|---|
| 6 sessions | 0 | .33 | .31 | .29 | -.02 |
| 5 sessions | .08 | .38 | .26 | .25 | -.08 |
| 4 sessions | .13 | .50 | .31 | .40 | -.04 |
| <= 3 sessions | 0 | .17 | .21 | .21 | -.01 |

derive benefit from even modest amounts of training, and the Post-test 2 data suggest that the learning in this group was at least as robust as in the other groups. Nevertheless, it would seem sensible to recommend that at least four sessions of training be given wherever possible. Given that this amounts to less than two hours of traffic experience, there seems little justification for scheduling less.

## 6.0 CROSSING SAFELY AT PARKED VEHICLES

### 6.1 Rationale

In Part 1 of the programme, children were taught to recognise the intrinsic danger of locations where their view of approaching traffic would be obscured. They also learned to construct routes that would avoid such locations. However, in the case of parked vehicles it is often very difficult to find routes avoiding them altogether because they are simply so prevalent. Obviously, children must at some stage learn how to cross safely at parked vehicles where avoiding them altogether is impossible or impracticable. Part 2 of the programme built on Part 1 by teaching children a strategy for doing so.

The method used was based on one developed and evaluated by Rothengatter (1981) in the Netherlands. However, a number of changes to his procedure were made:

- *Since untrained children do not appreciate the dangers intrinsic to crossing at parked vehicles, training was introduced only after children had completed the safe route planning course.* This would maximise the children's ability to understand the reasoning behind the crossing strategy. (In practice, we also trained a small number of children who had missed the safe route-finding phase but whose parents were keen that they enter the programme).

- *Drumchapel children were trained in pairs, not individually as in the Dutch programme.*

- *Whereas Dutch parents trained their own child, our volunteers trained other people's children.*

- *Changes were also made to the procedure itself, especially in Year 2. These are discussed below.*

### 6.2 Training Aims

The parked car crossing strategy broke the task down into a set of elements each specifying an action to be performed in the correct order. The aim of training was to increase the number of such behaviours exhibited by the children. We also expected them to explain *why* these actions were being followed - i.e., not just to execute them 'blindly'. Figure 6.1, taken from the Volunteer Training Manual, summarises the main elements.

### 6.3 Training Method

The procedure is based on Social Learning Theory (Bandura, 1977) and comprises three stages as follows:

1. *an 'observation' stage in which the trainer models the desired behaviour to the child;*

2. *a 'practice together' stage in which trainer and child co-operate in performing the task;*
3. *an 'imitation' stage in which the child (still accompanied by an adult) tries to replicate the desired behaviour without feedback.*

**Figure 6.1. The strategy for crossing safely at parked vehicles**

***WHAT THE CHILDREN SHOULD LEARN TO DO***

1. *Find a space between two parked cars that is wide enough for three people to cross through.*

2. *Check that there is a gap on the other side of the road to reach the pavement.*

2. *Stop at the kerb.*

3. *Look in both parked cars to make sure there are no people sitting in them.*

4. *Also look for other clues that the car might move, e.g. lights, exhaust fumes, engine noise.*

5. *If there is someone in one of the cars or if any of the other clues are present, walk to another place as the car could start moving.*

6. *If both parked cars are empty, walk to the outside corner of the car parked on the left and STOP (this is called the 'line of sight').*

7. *Look right to see if there is any traffic coming. If there isn't, then....*

8. *Look left to see if there is any traffic coming. If there isn't, then....*

9. *Look right again for traffic. If there is no traffic....*

10. *Then cross the road at a steady pace. Hold hands and continue to look and listen for traffic as you go.*

11. *If traffic should appear while you are standing at the line of sight, take a step back and wait for it to pass. Then step forward again and repeat from 6.*

12. *If several cars should come, go back to the pavement and wait until it is quieter before starting the procedure again from the beginning.*

During Stage1, the trainer executed the actions correctly whilst giving a running commentary as to why each element was being executed. The commentary is essential in ensuring that the child understands the purpose underlying the actions and does not simply learn to follow them 'parrot fashion'. Similarly, in Stages 2 and 3, the children were required to explain what they were doing as they tried to work their way through the

procedure. In social learning theory, great importance is attached to this process of verbalisation. It also provides trainers with feedback about the child's thought processes, which are important in identifying areas of difficulty that might require special attention.

## 6.4 Setting

Locations were identified in the streets near the schools where parked cars could regularly be found. These were used both for testing and training but the sites used for the two purposes were kept separate. Three sites were visited in the course of each training session. The programme consisted of four sessions, run at approximately weekly intervals.

## 6.5 Training Procedure

All children were trained in pairs, using the method described in Section 6.3. At the first site of the session, trainers worked with the children as a pair so that, in the 'practise together' and 'imitation' phases, they had to cooperate in deciding how to cross. At the second site, one of the children was selected to work individually with the adult whilst the other observed. This procedure was reversed at the third site. Thus, children had the opportunity to work individually with the trainer; to observe another child attempt to perform the task; and to work co-operatively with the other child. At the end of each session, trainers carried out a test in which each child carried out the procedure without any guidance or help. Their behaviour was recorded on a Behaviour Check Sheet. This provided trainers with another source of feedback by showing them how the children's judgements changed from session by session. These proved invaluable in spotting areas of difficulty, enabling the trainer to take remedial action on future sessions.

As before, a half day training course was organised in which volunteers observed good practice and were given guided experience of working with children before undertaking the training programme. They also received a second short manual summarising the main features of the training for subsequent reference. Project staff visited volunteers regularly to monitor training and provide support in dealing with any problems.

## 6.6 Subjects

In Year 1, 186 children undertook the programme, of whom 66 (36%) were pre and post-tested. Thirty-six matched children formed the control group. In Year 2, 175 children received training, of whom 53 (30%) were pre and post-tested. Thirty-eight children were allocated to the control group. Control children received no training in crossing at parked vehicles, although some had taken part in the previous safe places course. Both groups were balanced for gender and school but otherwise allocation was randomised. Mean ages at the start of pre-testing were: (Year 1) 6 years 1 month; (Year 2) 6 years 0 months.

## 6.7 Evaluation Procedure

### *6.7.1 Pre And Post-Testing*

One week before training, children were individually tested by a member of project staff to establish baseline measures of skill (*Pre-test*). Approximately one week later, the training programme began. This consisted of four sessions presented at a rate of roughly

one per week. Immediately after training ended, children were re-tested to assess the effects of training (*Post-test 1*). This was followed by a further test between two and three months later (*Post-test 2*). Control children were pre- and post-tested in the same way. Testing always began near a row of parked cars, where at least one of the gaps was suitable for crossing. The child's task was to choose a gap and then demonstrate to the tester what they would do in order to cross safely by taking the tester across the road. Care was taken that no cars were moving anywhere in the vicinity at the time of each crossing. On reaching the opposite side, testers immediately recorded the child's behaviour using a behaviour check sheet. They then proceeded to a new crossing location. Four locations were visited during each test session.

### 6.8 Parked Cars Results (Year 1)

Since some changes were introduced in Year 2, the data from the two years are treated separately. Table 6.1 summarises the behaviour displayed by trained and control children when attempting to cross between parked cars before and after training in Year 1. It can be seen that, prior to training, some aspects of the crossing task were adhered to reasonably well. This includes the stipulation that children should be walking on approach to the kerb; that they should walk, not run, across the road; and that they should cross in a straight line. Walking straight across the road was, of course, a major feature of the safe route planning part of the course which most children had completed several months earlier. It is pleasing to find that the children seem to have carried this over to the new task. By contrast, the fact that children walked at an acceptable speed both on approach to the kerb and whilst crossing may be artifactual since they were accompanied by an adult and probably had little scope for running! We thus continued to lay stress on the importance of the child's speed of movement throughout training.

It can be seen, however, that most aspects of the crossing task were poorly served prior to training and, in some cases, the target behaviours were scarcely exhibited at all. For example, on approximately half the crossings children failed to stop at the kerb. This happened even though stopping at the kerb is strongly emphasised in road safety education. They also failed to stop at the line of sight (the outer edge of the car). This means that, even though they did make head movements to right and left on over 80% of the trials, it is obvious that they could not have properly assessed whether or not it was safe to cross, because they did not give themselves time to do so before stepping out. In addition, the children displayed a marked failure to look to the right for a second time before crossing. Our impression was that the children were 'going through the motions' without engaging in proper visual search - a familiar feature in inexperienced child pedestrians. Finally, untrained children almost never looked into the cars before deciding to step out, nor did they check for exhaust fumes, brake lights or other cues that would indicate whether the car might be about to start. They also positioned themselves inappropriately at the line of sight even on those occasions when they did stop there.

Following training, however, children's behaviour improved quite markedly. Whereas before training only 6% of the trained group looked for signs that the cars were occupied before stepping out, this rose to 74% after training. By comparison, only 6% of control children did this. Similarly, before training only 4% of children in the trained group positioned themselves correctly at the line of sight. After training, however, this figure rose to 73%. Marked improvements can also be seen in stopping at the line of sight; looking to right and left; and, importantly, looking to the right once again before stepping

**Table 6.1 Proportion of children exhibiting the target behaviours during crossing at parked cars before and after training (Year 1)**

| | | *TRAINED* | | | *UNTRAINED* | | |
|---|---|---|---|---|---|---|---|
| | | *Pre-test* | *Post 1* | *Post 2* | *Pre-test* | *Post 1* | *Post 2* |
| **1.** Correct walking speed along pavement | | **98** | **100** | **100** | **100** | **96** | **97** |
| **2.** Stops at kerb | √ | **54** | **96*** | **94** | **44** | **67*** | **71** |
| **3.** Looks in both cars after stopping | √ | **6** | **74*** | **67** | **0** | **6** | **9** |
| **4.** Positions him/herself by parked car on left | √ | **4** | **73*** | **67** | **7** | **6** | **4** |
| **5.** Stops at line of sight | √ | **49** | **93*** | **96** | **41** | **55** | **55** |
| **6.** Looks R at line of sight | √ | **83** | **97*** | **99** | **77** | **81** | **86** |
| **7.** Looks L at line of sight | √ | **83** | **97*** | **100** | **72** | **80** | **88** |
| **8.** Looks R again at line of sight | √ | **47** | **85*** | **87** | **29** | **51*** | **45** |
| **9.** Correct crossing speed | | **97** | **99** | **99** | **97** | **100** | **97** |
| **10.** Walks straight across | | **99** | **100** | **100** | **100** | **99** | **100** |

*** = improvement in Post-test 1 is significant**
**√ = improvement in trained group is significantly greater than in controls**

out. Moreover, the results of Post-test 2 show that these improvements were maintained over the 2-3 month period following the end of training. Indeed, in several cases there is evidence of further improvement in judgements that were already at a very high level. By contrast, improvements among control children were modest and some behaviours show little evidence of improvement at all. It is certainly clear that their strategy for crossing at parked cars remains rudimentary and would be dangerous if implemented on real roads.

The trends were analysed by means of a two-way ANOVA with training (trained vs. control) and test-phase (pre vs. post-test 1 vs. post-test 2) as factors. The analysis was not conducted on behaviours 1, 9 and 10 since the differences are obviously insignificant. Separate ANOVAs were conducted on each of the remaining behaviours. In every case, there was a highly significant effect of both training and test-phase. There was also a significant interaction in all cases except category 8. Inspection of Table 6.1 shows that

this is because the improvements achieved by the trained group were much larger than those achieved by controls. Moreover, these improvements were well maintained over the period leading to Post-test 2, with none of the changes between Post-tests 1 and 2 proving statistically reliable.

In the control group, by contrast, changes were far more modest. Table 6.1 shows that control children were significantly more likely to stop at the kerb than they were in the pre-test, and they were also more likely to look to the right for a second time before stepping out at the line of sight. However, these improvements were significantly smaller than in the trained group. The slight improvements seen in other behaviours did not prove to be statistically reliable.

At first sight, the strongest aspect of the controls' behaviour seems to be their looking strategy which was reasonable even in the pre-test (although their failure to look to the right for a second time before stepping out is an important weakness). This conclusion is compromised, however, by the difficulty that was experienced in clearly defining some of the behavioural categories. This particularly applied to behaviours 5, 6, 7 and 8 (stopping and looking at the line of sight). In practice, it was often difficult to decide whether the child should be recorded as having stopped at the line of sight, because they often *hesitated* rather than stopped. Also, these pauses did not usually give the child sufficient time to look for traffic, and the typically fleeting head movements that resulted were often made *after* the child had stepped out rather than before it. At the same time, since the behaviours were actually displayed, it seemed inappropriate to record them as absent. However, it was felt that this made the control children's performance appear stronger than it actually was.

### 6.9 Parked Cars Results (Year 2)

It was therefore decided to alter the scoring categories in Year 2 to try and capture the children's behaviour more accurately. The changes were made to items 5, 6, 7 and 8. In the case of item 5, it was decided to distinguish between *stopping* and merely *pausing* at the line of sight. In the case of looking behaviour (items 6, 7 and 8), a distinction was made between looking *whilst stopped at the line of sight* and looking *whilst continuing to step out*. Note that the latter does not correspond to the injunction 'keep looking and listening as you cross' - it corresponds to the first time the child looked round for traffic.

The results obtained when this revised coding scheme was used are shown in Table 6.2. Taking the results for the trained group first it can be seen that, prior to training, the pattern is broadly similar to that found in Year 1. However, this does not hold for the looking behaviour shown in items 7, 9 and 11. In Year 1, over 80% of children in the trained group were coded as having looked to right and left at the line of sight and 47% looked to the right a second time. However, when a distinction is introduced between 'looking' and 'looking whilst stopped at the sight line', these proportions drop by roughly 50%. Thus, only 47% of children made head movements whilst stopped at the line of sight and only 24% looked right again before stepping out. In the remaining cases, they either looked whilst continuing to walk (categories 8, 10 and 12) or did not look at all.

**Table 6.2. Proportion of children exhibiting the target behaviours during crossing at parked cars before and after training (Year 2)**

| | ***TRAINED*** | ***UNTRAINED*** |
|---|---|---|

| | | *Pre-test* | *Post 1* | *Post 2* | *Pre-test* | *Post 1* | *Post* |
|---|---|---|---|---|---|---|---|
| **1.** Speed of approach | | - | - | - | - | - | - |
| **2.** Stops at kerb | √ | **78** | **99*** | **100** | **82** | **87** | **97†** |
| **3.** Looks in both cars after stopping | √ | **0** | **83*** | **71** | **3** | **9** | **10** |
| **4.** Positions him/herself by parked car on left | √ | **3** | **81*** | **74** | **0** | **3** | **8** |
| **5.** Stops at line of sight | √ | **45** | **95*** | **90** | **30** | **36** | **53†** |
| **6.** ***Pauses at line of sight*** | √ | **16** | **2** | **6** | **23** | **18** | **17** |
| **7.** Looks R at line of sight | √ | **47** | **95*** | **90** | **30** | **39** | **54†** |
| ***8. Looks R while walking*** | √ | **39** | **4*** | **4** | **47** | **46** | **30** |
| **9.** Looks L at line of sight | √ | **47** | **95*** | **90** | **29** | **38** | **53†** |
| **10.** ***Looks left while walking*** | √ | **32** | **4*** | **6** | **45** | **45** | **28** |
| **11.** Looks R again at line of sight | √ | **24** | **91*** | **85** | **10** | **34*** | **41†** |
| **12.** ***Looks R again while walking*** | √ | **13** | **4*** | **5** | **14** | **35*** | **13** |
| **13.** Correct crossing speed | | - | - | - | - | - | - |
| **14.** Walks straight across | | - | - | - | - | - | - |

*** = improvement in Post-test 1 is significant**
**†= improvement in Post-test 2 differs significantly from Pre-test**
**√ = improvement in trained group is significantly greater than in controls**

After training, this pattern changed considerably. In Post-test 1, it can be seen that their was a dramatic increase in the proportion of children who looked whilst stopped at the sight line, whereas the proportion who looked whilst continuing to walk almost disappeared. Similarly, the proportion of clear-cut stops at the line of sight more than doubled to 95%. Statistically, the pre/post-test differences proved highly significant in every case, with children demonstrating a far higher proportion of appropriate behaviours, whilst almost eliminating the inappropriate ones defined by categories 6, 8, 10 and 12. Moreover, the improvements proved robust: although there was a slight decline in Post-test 2, none of the Post-test 1/2 differences proved to be statistically reliable

In the control group, a similar pattern of pre-test scores was obtained. However, in their case the pattern did not change to any extent in Post-test 1. As with the trained children, the Year 1 data clearly over-estimated children's pre-test performance. For example, the proportion of children deemed to have stopped and looked to right and left at the line of sight fell from over 70% in Year 1 to 30% in Year 2. Similarly, 41% of children were deemed to have stopped at the line of sight in Year 1. However, when a distinction is made between stopping and pausing, the proportion drops to only 30%. In the remaining 70% of cases children merely hesitated at the sight line (23%) or walked straight out without any delay at all. In spite of starting from this much more modest baseline, control children showed almost no improvement in Post-test 1 and in the one category where significant progress was made (category 11), the level of performance was still far below that of trained children (34% versus 91%). Only in Post-test 2 do control children begin to show some improvement over their pre-test performance, though still at a modest level.

### 6.10 Discussion

The results are a good illustration of what can be achieved in road safety by means of a short programme of practical training. Although children received only four 30-minute sessions of training, the effect on their performance was little short of dramatic. Even behaviours that were scarcely exhibited at all in the pre-test were observed in 80 or 90% of cases afterwards. Moreover, the gains were well retained over the substantial period leading to Post-test 2 during which no further instruction was given.

Interestingly, some improvements were also seen in the behaviour of control children, though at a much lower level. The improvements were also rather haphazard and do not appear to be underpinned by very clear conceptual growth. For example, whilst in Year 1 it appeared that the children were using a fairly efficient looking strategy even in the pre-tests, the more subtle analysis conducted in Year 2 shows that the strategy was much less impressive than at first appeared. To a large extent, the children were 'going through the motions' of looking, without giving themselves time to make decisions on the basis of what was seen. This was most clearly seen in the tendency to look for traffic only *after* the decision to step into the street had already been made. Even then, the fleeting nature of many of the movements instilled little confidence in the quality of their visual search.

Nevertheless, some improvements were seen in this group by the end of Post-test 2. These changes probably reflect the learning that takes place informally whenever children are exposed to traffic problems. Bearing in mind that, by the end of Post-test 2, even control children had been presented with a systematic series of traffic problems on several occasions, it would be surprising if no learning had taken place at all. However, comparison with the trained group shows just how much more can be achieved by injecting a modest amount of guided instruction into the equation.

## 7.0 CROSSING SAFELY NEAR JUNCTIONS

### 7.1 Rationale

In the final phase of the project, a training procedure was devised to teach children how to cross at junctions. As with parked cars, the procedure and materials were based on those

developed by Rothengatter (1981). However, the original procedure did not work well in the present context and a number of modifications were introduced, especially in Year 2.

Rothengatter's procedure involved training at a standard junction (a cross-roads) and was primarily concerned with teaching children to use a systematic strategy when looking for approaching vehicles. This involved looking at the road furthest to the child's right (which might be the road behind them). They were then taught to check each subsequent street in turn as they scanned from right to left. This was intended to eliminate an inclination in young children to look for traffic haphazardly, often failing to look down certain streets in the process. The aim was to improve the child's search pattern so that there would be less chance of missing a street. Since the children were trained at a cross-roads, it was assumed they would be able to generalise to simpler intersections involving fewer streets (e.g., T junctions) because the basic procedure would be the same.

In Year 1, children were trained using this procedure (although the lack of cross-roads in Drumchapel meant that it had to be adapted to T junctions). Unfortunately, this approach proved unsatisfactory because children's performance approached 90% even in the pre-tests. Whilst this high level of performance (much higher than that observed by Rothengatter) might be attributed to generalisation from earlier phases of the training programme, observation of the children suggested this was not the case. For example, whilst children did, in fact, systematically look towards each street as they had been taught, it was observed that they were often unable to see down the streets properly from the chosen kerbside position. It became clear that the children were often 'going through the motions', without properly appreciating why they were doing so.

To rectify this, a series of major changes were introduced in Year 2, both to the training procedure and the evaluation. It was also felt that the original procedure did not do justice to the range of intersections that characterise the traffic environment, at least in the UK. Given the variety of forms that intersections can take, it was felt that training should not be restricted to any one example but should cover a range of them. For this reason, in Year 2 children were first introduced to relatively easy junctions and moved on to more challenging ones as the course progressed. Three categories were distinguished :

- *Simple intersections.* These consisted of T-junctions offering clear views in all directions (i.e., there were no obstructions to vision along any of the roads, provided the children positioned themselves appropriately). So long as the children employed an appropriate looking strategy, they could cross safely at the junction.

- *Hazardous intersections.* Simple intersections become much more hazardous when they are combined with additional dangerous features, such as parked vehicles, which obscure vision. The aim of training was to get children to appreciate that, even though they could *look* in all directions, they could not always *see* properly in one or more of them. The correct action in such cases would thus be to *move away* from the junction to a more appropriate location nearby.

- *Complex intersections.* These were usually staggered junctions where it would never be possible to see down all roads from a single kerbside position. Children were taught how to recognise this and then find a new location nearby where at least one of the roads would be 'eliminated'.

Training was thus not simply concerned with improving the child's search strategy. It was equally concerned with what the child should do on the basis of what was or was not seen. The programme thus drew on elements from both the previous training phases, involving both *conceptual* elements (emphasised in safe place finding) and *strategic* elements (emphasised in the parked car training).

### 7.2 Training Aims

- *To teach children how to position themselves at junctions so that they can see down all roads leading to the junction.*

- *To teach a systematic search strategy when looking for vehicles.*

- *To teach how to find alternative sites, where crossing directly at the junction is inappropriate.*

- *To teach how to apply these principles at different types of intersection.*

### 7.3 Training Method

At each type of junction, the procedure involved three phases as in parked car training:

1. *Observation* - in this stage, the trainer showed children how to take up position at the kerbside and demonstrated how to search for traffic. As they did so, they explained *why* they were carrying out the various elements. If it was not possible to see clearly down all relevant streets, then a discussion was opened with the children about where a safer alternative crossing point might be found.

2. *Practising together* - the children then tried to go through the procedure correctly, whilst the volunteer helped them with appropriate prompts and corrections. The children were also required to *say out loud* what they are doing and why.

3. *Practising alone* - Finally, each child tried to carry out the procedure without any help or prompting from the volunteer. The child's performance is scored using a Behavioural Check Sheet.

### 7.4 Setting

Examples of the three classes of junction were sought in the streets near each school. So far as possible, these were matched for difficulty across schools. Sites earmarked for test purposes were kept separate from those used for training.

### 7.5 Training Procedure

Since children were not required to cross roads as part of the training, they were trained in groups of three. Six sessions were scheduled, two at each of the three classes of

intersection, although time constraints required that this be reduced to five sessions. The modified programme consisted of two 'simple' junctions, one 'hazardous' and two 'complex'. Sessions were run at approximately weekly intervals.

In each session, children visited three sites at which 4 starting points and destinations had been pre-selected. A child was selected from the group and was shown a destination on the other side of the street. This was always a short distance along the road on the far side of the junction. Similarly, the starting point was always a short distance from the corner of the junction. The child's task was to select an appropriate kerbside position from which they could see down the relevant streets; search for traffic in what they thought was an appropriate way; and indicate the route they would choose to cross the road. If it was not possible to see down all adjacent streets from the chosen kerbside position, they were expected to choose an alternative position or, if necessary, move to a different location where it would be safe to cross. Often, this meant that a more circuitous route was required to arrive safely at the destination.

At all stages, the children were encouraged to discuss possible solutions amongst themselves, with the trainer intervening from time to time to get the conversation going in an appropriate direction. The child making the basic judgements was systematically varied, with the other two acting as discussants. This meant that all children received equal amounts of practice. At no time did the children actually cross: instead, they described the routes, taking the trainer along the pavement to suitable positions.

A new half day training course was organised for volunteers so that they would have experience both of observing good teaching practice and of working under guidance with the children. As before, they received a small manual summarising the main training features for subsequent reference. Project staff monitored training sessions regularly, providing support as necessary.

## 7.6 Subjects

In Year 1, 188 children were trained, of whom 50 were pre- and post-tested. Forty-eight control children were also tested. However, because the procedure used in Year 1 was not felt to be effective, data from this group are not presented. In Year 2, 174 children were trained, of whom 57 were tested. The second year control group consisted of 31 children. The mean age at the start of training was 6 years and 3 months.

## 7.7 Evaluation Procedure

Before training began, children were pre-tested to obtain baseline measures of skill. In each test phase, children were asked to construct four routes that solved the problems inherent in that location. A group of control children who received no training were pre and post-tested in the same way. Both groups were balanced for gender and school but were otherwise allocated on a random basis.

## 7.8 Junction Results (Year 2)

### *7.8.1 Main Effect of Training*

Table 7.1 summarises the main trends observed in the trained and control groups before and after training. As in parked car training, it can be seen that some behaviours were exhibited from the outset. For example, almost all children spontaneously took up position at the corner opposite the destination and stopped at the kerb. Between 75% and 80% also made head movements in the relevant directions. However, it is apparent that they were often not positioned so that they could actually *see the traffic* when they did this. This happened on around 40% of occasions during the pre-test. Thus, although the children looked in the general directions from which traffic might approach, their vision was often obscured there. This is consistent with the impression previously reported in Section 6.8 that, on many occasions, the children were 'going through the motions' of looking, without understanding what they were supposed to be looking for.

**Table 7.1 Proportion of children exhibiting the target behaviours during crossing at junctions before and after training (Year 2)**

| | *TRAINED* | | | *UNTRAINED* | | |
|---|---|---|---|---|---|---|
| | ***Pre-test*** | ***Post 1*** | ***Post 2*** | ***Pre-test*** | ***Post 1*** | ***Post 2*** |
| **1.** Child stop at kerb | **99** | **98** | **99** | **98** | **87** | **99** |
| **2.** Child takes up position at the corner | **93** | **92** | **94** | **94** | **91** | **94** |
| **3.** Position chosen offers a clear view | **59** | **73*** | **76** | **65** | **60** | **66** |
| **4.** Child looks for traffic appropriately | **81** | **99*** | **94** | **76** | **94*** | **89** |
| **5.** Child repeats looking sequence. | **74** | **82** | **71** | **52** | **34†** | **41** |
| **6.** Child finds a safe route to the destination | **68** | **82*** | **81** | **58** | **57** | **51** |

*** = improvement in Post-test 1 is significant**
**† = decrement in Post-test 1 is significant**

After training, however, significant improvement can be seen. For example, whereas before training 81% of children looked in the correct directions for traffic, this increased to 99% following training. In addition, whilst only 59% could actually see the traffic in all directions when they did this (because of taking up an inappropriate position at the roadside), this improved to 73%. By contrast, although control children also made more head movements after training (94% versus 76%), these were even less likely to enable them to see approaching traffic than in the pre-test. Control children were also much less likely to repeat their observations before launching into action and the route subsequently proposed for crossing to the destination was much less likely to be safe.

These trends were confirmed by a set of two way ANOVAs conducted on each question separately and followed up with appropriate post-hoc comparisons. Categories 1 and 2 were omitted from the analysis as the differences are clearly non-significant. The results are summarised in Table 7.1. In spite of starting from high baselines in every case, trained

children were still significantly more likely to take up positions offering a clear view; to use an appropriate and systematic search strategy when looking for vehicles; and to find a safe route to the destination. By contrast, although control children started from a lower baseline in all but one case (and therefore had more room for improvement), only in category 4 (looking in the appropriate directions for traffic) did they do significantly better than in the pre-test. However, this can scarcely be considered an improvement, because the scores in category 3 show that the children were no more likely to have taken up a position offering a clear view. Thus, although more likely to make head movements in the appropriate directions, they were no better able to see anything as a result. They were also significantly *less* likely to repeat the looking sequence in order to check their original judgements. Perhaps not surprisingly, there was no improvement in the number of safe routes chosen to reach the destination. These findings proved robust, with none of the differences between Post-tests 1 and 2 approaching significance.

The results, then, show that junction training leads to a number of improvements in children's behaviour. Trained children position themselves better so as to see down the various roads from which traffic might come; employ a better visual search strategy; are more likely to double check by repeating the visual search before committing themselves to action; and are more likely to propose a safe route to the destination.

*7.8.2 Effect of previous training on pre-test performance at junctions*

Notwithstanding these differences, a striking feature of Table 7.1 is the remarkably high standard achieved by both groups, even in the pre-tests. This was the case even though junctions are widely regarded as complex and demanding structures. The performance is certainly higher than that reported in previous studies (e.g., Rothengatter, 1981; van der Molen, 1983). This raises the possibility that there may have been some generalisation from earlier phases of the programme. The study was, of course, intended to be hierarchical and it was assumed that the earlier phases would pave the way for later training. This would particularly apply to the relationship between safe places training and junction training, where finding alternative crossing sites was often required.

In fact, the data permit a partial test of this possibility because some children who received junction training had not, in fact, undertaken the earlier, safe places training. Similarly, whilst some of the control children had received no previous training at all, many of them had received at least some previous safe places or parked car training. This had the fortunate effect of making it possible to examine, to some extent, the effect of earlier phases of the programme on performance in later phases.

**Table 7.2. Proportion of children exhibiting the target behaviours in junction pre-test as a function of previous training**

| | **4-6 safe place sessions (N=15)** | **No previous training (N=14)** |
|---|---|---|
| **3.** Position chosen offers a clear view * | **72** | **55** |

| | | |
|---|---|---|
| **4.** Child looks for traffic appropriately * | **90** | **66** |
| **5.** Child repeats looking sequence. | **60** | **48** |
| **6.** Child finds a safe route to the destination * | **79** | **52** |

*** = difference between groups is significant**

Table 7.2 therefore examines the pre-test scores achieved in crossing at junctions as a function of whether or not safe places training had previously been received. The trends turn out to be in line with the prediction. In every case, the pre-test performance of children who had received safe places training the previous year is higher than in children who had not received it. In three cases, these differences turned out to be statistically reliable. These are interesting results, because in two cases (3 and 6) the action sequences are precisely those where one would most expect to find transfer from the earlier safe places training. Indeed, that course laid great stress on finding roadside positions offering an unobstructed view of traffic and on constructing routes that would link such positions. However, the safe places training took place in rather different contexts and over a year previously. That young children should apparently make the connection to the new task when no deliberate attempt was made by trainers to emphasise these links, is further evidence both of the robustness of the original training and of the possibility that significant transfer of learning can take place when children are given meaningful problems to solve in realistic contexts. An experimental study systematically varying the amount of previous training received by different groups of children would be needed to establish clear evidence of transfer of learning. The pattern of findings certainly suggest that such an investigation would be worthwhile.

## 8.0 OBSERVATIONS OF PEDESTRIAN ACTIVITY

An issue that arises in the context of any road safety education programme is the extent to which children's behaviour changes as a result. Many programmes based on knowledge acquisition, for instance, do improve children's knowledge but do not necessarily lead to changes in children's behavioural judgements when faced with concrete traffic situations (Rothengatter, 1981; Thomson *et al.,* 1996). The present programme sought to overcome this problem by focusing directly on children's behaviour from the outset and the evaluation shows that their behaviour did indeed improve, at least when tested in the company of adults. This represents a significant step forward in the long-term process of preparing children for independent travel, because it shows that the children now possess capacities which they previously did not possess. Even if they have some way yet to go to reach adult levels of competence, the results suggest that the programme lays a sound foundation from which further learning could realistically be expected to progress. The results do *not* imply that the children are capable of deploying the skills to a level that would make independent travel permissible. Nor do they imply that the children could yet to be relied on to use their new-found skills in a mature way if left to their own devices at the roadside. The programme is therefore to be seen as part of a long-term process aimed at preparing children for *future* independent travel. For this reason, in all communication with parents great stress was laid on the need to continue to protect their children and to accompany them in accordance with government guidelines.

Nevertheless, it is not uncommon to come across young children out on their own, even at six years of age, and it was felt important to assess the extent to which children from the programme were, in fact, permitted access to traffic. If, for example, parents mistakenly believed that their children were now sufficiently competent to be allowed greater freedom on the road, this would have important implications for the programme. Indeed, such misguided beliefs could even lead to an *increase* in casualties rather than a reduction.

For these reasons, it was decided to carry out a series of observations throughout the Drumchapel area aimed at assessing the extent to which children from the programme were allowed to walk to school alone and, if they were, what their standard of behaviour would be. The journey to and from school was selected for two reasons. Firstly, there already exists a body of data concerning the behaviour of children on school journeys (van der Molen, 1983). This data would prove useful for comparative purposes. Secondly, in order to gain an acceptable amount of data it is necessary to record at sites and times of day when a significant number of children can be observed. The periods between 8 and 9 a.m. and 2.30 to 4.00 p.m. are especially valuable in this.

Accordingly, a set of sites was identified in the streets near each school where a significant number of children could be observed to pass at school times each day. The sites were selected with two aims in mind. Firstly, they should we close to roadside locations where the children's acquired skills could be put into practice. Secondly, they would permit unobtrusive filming so that the observed roadside behaviour would be natural. Positions were thus sought in streets where significant numbers of parked cars were regularly parked; in the vicinity of junctions; and close to dangerous locations, such as bends or hills, where these existed near the schools.

The search for locations where unobtrusive filming could be carried out proved arduous. As is common in areas of this kind, Drumchapel residents are suspicious of and occasionally aggressive towards strangers found filming in the area. Even when the purpose behind the filming was explained, the explanation was often found unacceptable or was simply not believed (researchers were always able to identify themselves and the purpose of the filming). In addition, there was felt to be a significant risk to researchers, especially women, found carrying expensive pieces of equipment around certain areas on a regular basis. For these reasons, it was eventually decided that filming would have to be done from a car. In practice, this proved a reasonable solution since the car could often be parked near a suitable location; filming was rendered reasonably unobtrusive; and the vehicle offered researchers a degree of security. It did not, however, stop suspicious neighbours emerging to complain about the researchers' behaviour on a number of occasions. In the end, it was decided that the unobtrusive observations were more likely to undermine the goodwill generated by the project than they were to extend it, and it was decided to cease filming. However, this decision was delayed until a set of recordings had been made which, it was felt, captured the daily behaviour of children going to school, such that filming was becoming repetitive.

Recordings were made at 20 separate locations on 25 separate days, spread out over a period of approximately seven weeks. This period was located during the final six months of the project, by which time children from Year 1 would have completed the whole programme and children from Year 2 would have completed most of it. Filming took

place both in the morning and afternoon, often at more than one location. After each session, the recording was scrutinised in order to identify known children and/or parents. Project staff (who had day to day contact with the children) were consulted in this. Several hundred examples of road crossing were obtained in this way. A significant number of additional crossings were captured which could not easily be analysed because of weather conditions, obscuring traffic and similar factors.

Two findings of particular note emerged from these observations. Firstly, in all the recordings, we never found a single example of a trained or control child walking to or from school alone. Examples were certainly found of children being accompanied by parents or by groups of older children. However, there was no evidence that significant numbers of 5 and 6 year-old children were permitted to travel to school unaccompanied. This finding stands in contrast to that reported in Holland by van der Molen (1983), who was able to make a detailed appraisal of children's behaviour on such journeys following a traffic education programme.

It is not clear how this discrepancy should be accounted for. One factor may be the general decline in the proportion of children of all ages who walk to school - a decline that is likely to have accelerated in the period since the research reported by van der Molen was undertaken (Hillman, Adams and Whitelegg, 1990). However, Drumchapel children are less likely to be driven to school than children in many other areas (the car ownership rate is approximately half that of Glasgow as a whole). It is therefore possible that awareness of traffic risk in the area (emphasised not only by the present project but by the active programme of traffic calming in the area) may have produced a relatively high level of accompaniment, at least relative to Holland in the late 70's and early 80's. Other contemporary concerns, such as the fear of abduction, may also be a contributory factor.

A further interesting finding was that many examples were found of volunteers accompanying their children to school. It was decided to raise this with volunteers at the monitoring sessions, which were held regularly throughout the programme. Contrary to the concern raised earlier in this section, volunteers showed no inclination to over-estimate their children's competence as a result of having undertaken the programme. On the contrary, they claimed to have become increasingly aware of the risks posed by traffic and of their children's limited ability to deal with them. This occurred even though the programme was actively designed to enable volunteers to see the progress made by children as clearly as possible (e.g., by means of the Behaviour Check Sheets). A similar effect has been reported by other researchers following parent/child traffic education programmes (Rothengatter, personal communication). There is thus no evidence that parents were inclined to permit their children greater freedom on the road as a result of having undertaken the programme. Indeed, the evidence seems rather to the contrary.

Too much emphasis should not be placed on data derived from unobtrusive observations since, inevitably, they are based on a highly restricted sample of reality. Such data are most valuable when used to supplement data gathered in other ways, or when compared to other sets of observations made elsewhere. However, the pattern was consistent over a large number of observations made at a relatively large number of sites on many different days. It seems possible to be optimistic about the effect that the training had, at least on those parents who became actively involved in it. In general, their attitude towards their

children's capabilities seems to have become *more* rather than less realistic as a result of participating in the project.

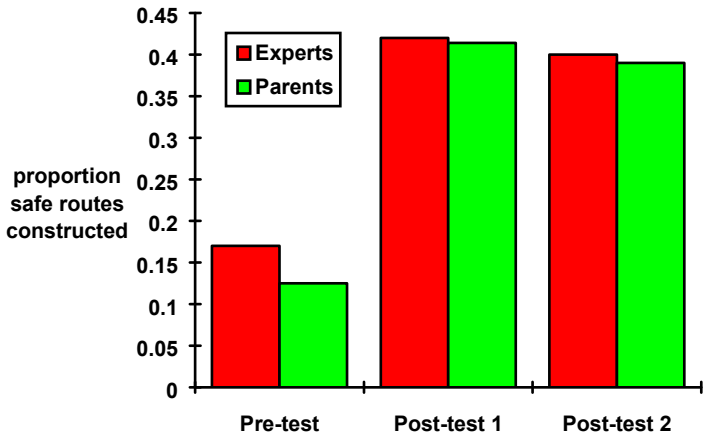
## 9.0 SUMMARY AND CONCLUSIONS

Taken as a body, the results would seem to provide strong evidence that the programme is effective in improving the traffic judgements of children as young as five years. The ability to find safe routes through the traffic environment; acquiring a strategy for crossing at parked vehicles; and learning to deal appropriately with a variety of different kinds of intersection have been shown to improve substantially following training. By contrast, control children showed only a modest amount of improvement. In fact, the level of skill seen in the trained children (aged 5-6 years) is several years in advance of what could normally be expected of children in this age range. It should also be noted that the improvements were achieved on the basis of between four and six training sessions, each lasting only half an hour. It might reasonably be asked how much further improvement could be expected simply by increasing this modest amount of training.

### 9.1 The Effectiveness Of Parents As Trainers

It is equally clear that parental volunteers from within the local community are capable of playing a fundamental role in the road safety education of children. Our volunteers were not selected on the basis of having any particular 'qualifications' to become trainers, other than an interest in the safety of children in Drumchapel. The results show that, when given clear instruction as to what they are supposed to be doing and why, volunteers can achieve impressive results. Indeed, the level of success achieved by the Drumchapel group of volunteers is virtually identical to that achieved in similar training programmes run by highly-qualified 'expert' trainers. Figure 8.1 shows the data from the safe place finding phase of the present study in comparison to data from an earlier study where training was conducted by highly qualified trainers (Thomson *et al.*, 1992). Although the 'experts' trained children in larger groups of five rather than three, the overlap in effectiveness is striking. It appears that parents from vulnerable communities are indeed capable of

**Figure 8.1. Effectiveness of parent volunteers versus 'experts' in training children to find safe routes to cross the road**



improving children's skills, provided they have themselves received proper training and fully understand what they are trying to achieve. This suggests that community-based approaches may have considerable potential as a means of extending current road safety provision, especially in relation to the crucial component of practical roadside experience.

### 9.2 Conclusion

In summary, the programme seems to have been rather successful. Notwithstanding the commitment and responsibilities involved, the project succeeded in attracting a very large number of volunteers, most of whom were prepared to devote several weeks to it. Although few volunteers remained active throughout the whole two years of the project, a significant number assisted in more than one training block and a regular stream of new recruits filled the gap produced by those dropping out. To our great surprise, we found no evidence of a ceiling to volunteer recruitment as the project developed. In fact, at the time of writing a further group of 36 volunteers have come forward to participate in what will be a final phase of training before responsibility is passed to the local authority. It is notable that many volunteers have expressed a concern to ensure that the work of the project continues to run smoothly as the project enters this new phase, and have offered to take an increasingly active role, not just in recruiting, but in helping to train new volunteers. It remains to be seen how best this accumulated experience and goodwill can be deployed in advancing the work of the project.

Of course, there remains much room for development and further skills both could and should be introduced in continuation of the current programme. An obvious example is the visual timing skills that are required when older children begin to venture on to busier roads (Lee, Young and McLaughlin, 1984; Demetre, Lee, Pitcairn, Grieve, Thomson and Ampofo-Boateng, 1994). Such training would be a logical extension of the present project. A range of other activities could be employed, both to reinforce the learning that has already been achieved and to promote further development. Nevertheless, the present group of skills constitutes a coherent package that fits together in a logical and progressive way. It would seem appropriate to consider ways of refining the programme into a package for the use of professionals who might wish to introduce similar schemes elsewhere. We have recently attempted to do this in a manual written for road safety professionals (Thomson, 1996b). We hope this will of some assistance to those who are interested in promoting community approaches to traffic safety.

## 10. ACKNOWLEDGEMENTS

The authors particularly wish to thank the following: Deirdre O'Reilly of the Department of Transport for her support and encouragement throughout the project; Gavin Lord for his support in securing the original funding; Gordon Harland of the Transport Research Laboratory for thoughtful comments on an earlier draft of the report; Alison Motion, Janice Docherty and Chris Dodds for running the project and for devoting so much time to the testing programme; and John Crotty and John McManus for helping to set up the project and for serving on the Management Committee. We extend a very special expression of gratitude to Councillor Charles Gordon of Strathclyde Regional Council for his unfailing support and enthusiasm at all stages. Without him, the project would simply

never have happened. We also thank the head teachers and class teachers of the primary schools of Drumchapel for their support and for tolerating our intrusions; and the parents and children without whom the project could not have taken place. Above all, we thank the volunteers who devoted so much time, energy and enthusiasm to the project, all in the hope of making Drumchapel a safer place. To them we dedicate the report.

Funding for the project was provided by the Department of Transport, the Drumchapel Initiative, and Strathclyde Regional Council to whom we express our sincere appreciation.

The authors wish to thank the following groups and organisations for their support:
Department of Transport
Drumchapel Initiative
Drumchapel Initiative Management Group
Drumchapel Community Organisations Council
Strathclyde Regional Council
Strathclyde Region Roads and Transportation Sub-Committee
Strathclyde Region Department of Education
Strathclyde Region Department of Roads
Strathclyde Region Road Safety Education Advisory Group
Strathclyde Police

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