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BEHAVIOURAL GROUP TRAINING OF CHILDREN TO FIND SAFE ROUTES TO CROSS THE ROAD

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Summary. Young children show poor judgment when asked to select safe places to cross the road and frequently consider dangerous sites to be safe ones. Thus, a sharp bend, the brow of a hill or positions close to parked cars are considered safe places to cross by most children under 9 years of age. This study examined the effectiveness of two practical training programmes in improving the judgments of 5-year-olds. Children were trained in small groups either in the real road environment or using simulations set up on a table-top model. A series of pre- and post-tests allowed the effectiveness of training to be assessed. Significant improvements relative to controls were found in both groups following training. There were no differences between the two training methods. Improvements were robust and no deterioration was observed two months after the programme ended. However, the benefits of group training were less marked than in an earlier study in which children were trained individually. The implications for road safety education are discussed.

INTRODUCTION

Pedestrian accidents are one of the most prominent causes of death and injury in most countries (Deschamps, 1981). Such accidents are particularly high amongst 5-14 year-old children who sustain a casualty rate approximately four times that of adults aged 20-59 years (Department of Transport, 1989). When the relatively low exposure of children to traffic is taken into account, this trend becomes even more marked (Routledge *et al.*, 1974).

A major factor in children's vulnerability is undoubtedly their lack of skill, especially in view of their relatively modest exposure to risk. Accordingly, road safety education programmes have been developed in most countries. Unfortunately, such programmes have generally failed to improve the behaviour of children in traffic or achieve substantial reductions in accident rates (see Rothengatter, 1981, Thomson, 1991, van der Molen, 1983 for reviews). The development of an effective education programme thus remains a primary challenge for road safety research.

The fundamental problem confronting road safety education is still to decide what constitute valid aims and objectives. Most current approaches aim at increasing children's knowledge about traffic and developing appropriate attitudes toward safety. The teaching of simple, general purpose strategies (such as the Green Cross Code) is another, particularly common aim. Teaching takes place almost entirely in the classroom through verbal means. That is, children learn by being told how to behave rather than by actually doing it. Unfortunately, verbal teaching methods, focused on the acquisition of knowledge and attitudes in the classroom, have been found to be largely ineffective in changing children's behaviour in traffic. Thus, while the children may be better prepared to answer questions about road safety or express appropriate attitudes when questioned by adults, their behaviour in traffic remains largely unaffected. This has led to calls for an increase in practical training with emphasis on the behavioural skills that are required to cope with traffic (e.g., Thomson,

1991;Rothengatter and van Schagen, 1988; Young and Lee, 1987). However, this would require a major shift in what are perceived to be the underlying aims and objectives of road safety education.

Where more specific objectives rather than global aims are concerned, disagreements between authorities are frequently even more fundamental. For example, many authorities discourage children from crossing the road near junctions on the grounds that junctions are complex and demanding road structures both for pedestrians and for drivers. However, others have argued that children be encouraged to cross at junctions because vehicle speeds are generally slower there and drivers are thought to be more alert (see Grayson, 1981). Similarly, in some countries (such as the UK) children are discouraged from crossing near parked cars because these restrict the child's view of the road as well as drivers' view of them. However, in others (such as the Netherlands), children are specifically trained in how to cross at parked cars, using the edge of the vehicle as an extension of the kerb. This effectively reduces the road's width and the length of the time for which the child is exposed to risk (Rothengatter, 1981). These examples illustrate how divergent opinions can be concerning the aims and objectives of road safety education. But unless such fundamental issues are addressed it is difficult to see how an effective training programme could possibly emerge.

One way to tackle the problem of setting objectives would be to clarify in the first place the skills that pedestrians need to interact with traffic. This would provide a theoretically coherent foundation from which objectives and appropriate preventive measures could emerge. Unfortunately, few training programmes have been founded on such an analysis. Instead, most are based on adult intuitions, "common sense" or, at best, the experience of experts. However, it appears that adults and even experts' intuitions of the skills children require may be rather limited. For example, crossing the road close to visual obstructions is heavily implicated in pedestrian accidents, particularly amongst children (e.g., Department of Transport, 1989). Yet parents, teachers, road safety officers and the police, when asked to state the most important skill children need to cross roads, relegated the choosing of a site where visibility was good to a secondary level of importance (Foot *et al.*, 1982). However, the ability to find safe places away from visual obstructions is an essential road crossing skill because if children attempt to cross at a sharp bend or on the brow of a hill they will be in considerable danger. Such skills are barely recognised by current road safety education yet are very poorly developed in young children who typically regard such sites as perfectly safe (Ampofo-Boateng and Thomson, 1991).

The Green Cross Code, by far the main theme of road safety education in Britain (Grayson, 1981), does not escape this criticism (Ampofo-Boateng and Thomson, 1990; Thomson, 1991). The Code simply advises children to 'first find a safe place', listing subways, foot-bridges, pedestrian crossings and other purpose-built sites as examples. However, on many occasions children are compelled to cross where such facilities do not exist. Actually, most child pedestrian accidents occur on minor roads in their own neighbourhoods (Howarth and Gunn, 1982; Jones, 1980) and up to 60 per cent of them take place within 1/4 mile of the child's home (Grayson, 1975). Since these are just the areas where controlled crossing facilities would normally be lacking, young children are forced to rely on their own road skills (or lack of them). If their ability to identify dangerous places is poorly developed, then it is likely they will expose themselves to risk no matter how 'good' their attitude to safety or how well they may have mastered the mechanics of the Green Cross Code.

Recently, we have examined the sites and routes that children choose to cross the road when facilities are not available (Ampofo-Boateng and Thomson, 1991). It turns out that young children (under 9 years) are very poor at finding safe places or at recognising dangerous ones. They show little appreciation of the danger posed by sites where their view of the road is restricted (e.g., parked cars, tight bends or the brow of a hill) or where complex traffic movements occur (e.g., at intersections). Moreover, they usually attempt to reach their destination by crossing directly (i.e., diagonally) to their goal: an error they may make even

at crossroads where crossing diagonally means exposing themselves to danger from several directions. Generally, children are reluctant to take detours that lead them away from their immediate goal (Ampofo-Boateng and Thomson, 1991).

We have recently attempted to construct a practical training programme aimed at improving these skills. Using both roadside training methods and models in the classroom, we obtained marked improvements in 5-year-old children who had undergone a short programme of individual training, making them behave like older, more experienced pedestrians (Ampofo-Boateng *et al.*, in press). Moreover, much of the beneficial effects of training persisted some months after training formally ended. This shows that quite long-term changes can be induced in young children — changes that otherwise would take several years to come about.

An immediate question arising from this study is whether such training could be implemented on a larger scale, perhaps as part of an integrated package along with other skills. Currently, much effort is being directed at the problem of how road safety might be integrated into the school curriculum in a more coherent way (Local Authorities Association, 1989). An immediate problem concerning the present research is how programmes based on practical training could feasibly be implemented. Especially where training is conducted individually, time constraints alone pose major problems for the approach. Clearly, some economy is required to make such programmes viable.

One important economy would be to redesign the programme so that it could be used with groups of children rather than individuals. Of course, group training might not be as effective as individual training. Nevertheless, the benefits might still be sufficient to justify their introduction. Moreover, modification of the programme (perhaps simply by increasing its length) might permit further benefits to be realised. Also, there is evidence from other studies that children's conceptual development can be accelerated where groups of children at different stages of conceptual development are required to co-operate in problem-solving (Howe *et al.*, 1990). It may be that 'several heads are better than one' in acquiring road safety concepts just as they seem to be in the acquiring of scientific concepts. For these reasons, evaluation of the effectiveness of group training is worthwhile.

Similarly, whilst behavioural training at the roadside is probably the most effective approach, our earlier research suggests that skills such as safe place finding can be improved using table-top models in the classroom. If group work around the model could be shown to transfer to children's judgments at the roadside, this would present another important economy making the proposed methods much more feasible. Accordingly, the present study examines the effectiveness of group training both at the roadside and using models in the classroom.

The aims of the present study, then, were:

(1) to investigate whether group training improves 5-year-olds' ability to find safe routes to cross the road;

(2) to compare the effectiveness of two different methods of training: roadside training and classroom training using table-top models.

METHOD

Sample

The sample consisted of 30 5-year-olds, randomly selected from a larger pool of children whose parents had agreed to their participation in the study. They were assigned to one of three groups: roadside training; table-top training; or control. Each group consisted of 10 children and was balanced for sex. The mean ages were: Roadside Group — 5 years 4 months; Table-top Model Group — 5 years 4 months; Control Group — 5 years 6 months.

Setting

The table-top model group was trained in a school classroom. The model consisted of a large base (approximately 100 x 120 cm) made from hardboard on to which a layout of roads had been constructed. A range of buildings, trees, hedges and other 'furniture' was used to construct a traffic environment to which toy cars and doll-pedestrians could be added to create road situations comparable to those encountered in the real traffic environment. The model was placed on a large table chosen to suit the stature of the children.

The roadside training group was trained in a real traffic environment in the streets near their school. Care was taken to ensure that the road locations and situations developed on the table-top model were similar to those used in the real world, although they were not intended to be identical. Both included bends, junctions, parked cars and other zones of diminished visibility.

General design

The design and procedure were similar to an earlier study of individual training (Ampofo-Boateng *et al.*, in press). All children were tested and trained by the same experimenter. They were individually pre-tested on two separate occasions to ascertain there were no major differences between them prior to training. The pretests also established a baseline against which the effects of training could be judged. Each experimental group then underwent six training sessions at a rate of roughly two a week, either on the table-top model or in the traffic environment, with a brief test in the middle for evaluation purposes. The children were trained in groups of five. Training was immediately followed by two sessions of post-testing (Post-test 1). A further post-test was run approximately two months later to assess the longer-term effects of training (Post-test 2).

Procedure

Pre- and post-tests. Two weeks before training, all children were individually pre-tested on two separate occasions by the same experimenter. The children were taken from their classroom at the convenience of their teachers and were tested at pre-selected sites by the roadside. The sites were all close to a fairly busy two-lane road with a speed limit of 30 mph (48 km/h). The actual locations were spread out on roads in the nearby vicinity. All were within walking distance of the school, ensuring that the time taken to get to the test sites was not too long. Four test locations were selected, consisting of two where visibility was restricted and two where traffic might emerge from several directions (junctions). These locations were selected in accordance with previous findings showing that young children fail to appreciate the danger posed at such locations (Ampofo-Boateng and Thomson, 1991).

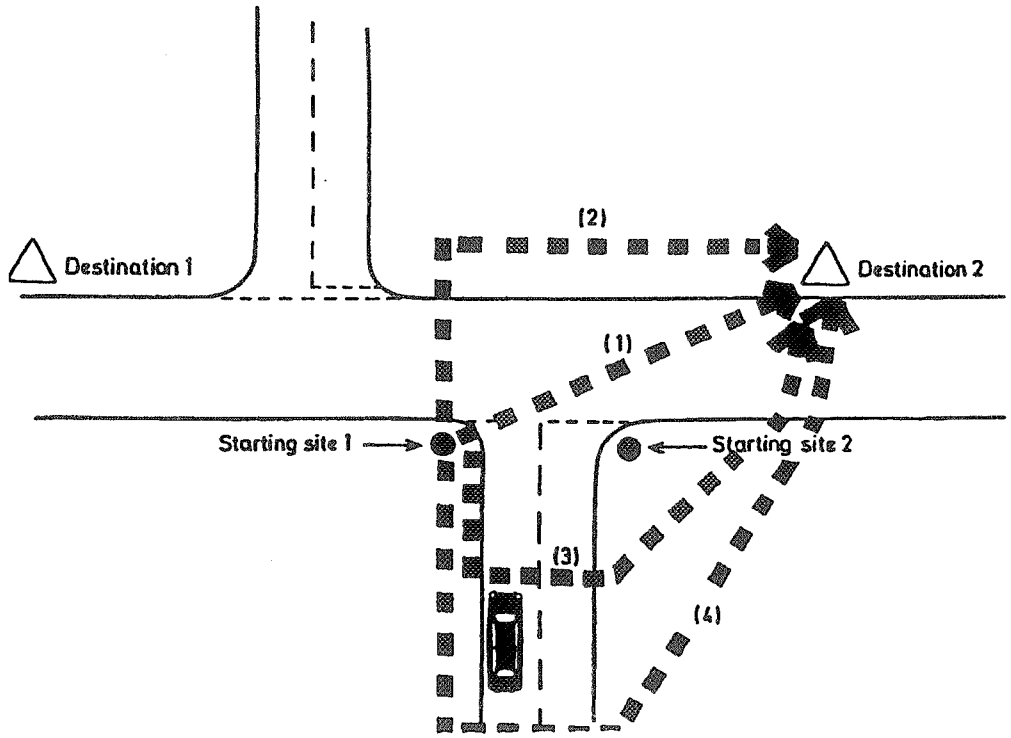
At each location the children were instructed to imagine they were on their own and wanted to cross the road to a destination on the other side. Each destination was indicated by a red cone (32 cm high) of the type used by police for traffic control. The child's task was to select the safest way to get there. No feedback of any kind was given during these test sessions so that there was no bias on subsequent training.

The children indicated their preferred route simply by pointing and describing it to the experimenter. They were never asked actually to walk across the road. Each chosen route was recorded onto a scale schematic drawing which incorporated numerous landmarks and reference points. In the few cases where it was difficult to ascertain precisely what path the child would take, referring to these landmarks helped determine the child's chosen route. The diagram was updated at the beginning of each session to take account of changing conditions, for example parked cars. Scoring was thus based on the conditions prevalent at the time. If the setting was seriously distorted, testing was postponed till a later date.

At each location there were two destinations and two separate starting points. Thus the child had to choose four separate routes at each of the four locations, making 16 routes per test session. Each child was tested on two separate days, yielding a total of 32 constructed routes per child. An example of one test site is illustrated in Figure 1.

FIGURE 1

ONE OF THE SITES USED IN THE STUDY. THE ARROWS SHOW EXAMPLES OF THE ROUTES CHILDREN MIGHT CONSTRUCT FROM (1) VERY UNSAFE TO (4) SAFE.



All tests were conducted in the road environment, irrespective of whether training was by the roadside or on the table-top model. The tests also took place in a completely different area from the training so that the roadside group would not have the advantage of familiarity with the testing environment. The same tests were readministered immediately after the training programme (post-test 1) and were repeated two months later (post-test 2).

Scoring. The routes chosen by the children were coded into four safety categories, depending on the degree to which dangerous road features were avoided in the chosen route. The four categories, running from minimum to maximum safety awareness were as follows:

(1) *Very unsafe:* a route leading directly to the destination (often involving a long, diagonal traverse of the road), that also ignored the dangerous road features at which the starting point was located (e.g., a parked car).

(2) *Unsafe:* a route straight across the road, not aimed directly at the destination, but which ignored dangerous road features. This was an improvement on (1) because it at least reduced the time spent on the road.

(3) *More safe:* a route avoiding some but not all dangerous road features. This usually occurred when the child made a detour away from a dangerous position (for example, moving down the road away from a parked car) but ended up at a new spot which might also be dangerous (for example, at a sharp bend).

(4) *Safe:* a route which avoided all the dangerous road configurations. This usually involved walking along the pavement and crossing at a site where the child's view of the road was unobscured.

Reliability of the rating procedure was assessed in an earlier study by randomly selecting a 25 per cent sample of the protocols and having these independently coded by a second rater (Ampofo-Boateng *et al.*, in press). Inter-rater reliability was 0.89. Examples of the categories are shown in Figure 1.

Training objectives

The children were trained in groups of five on either the table-top model or at the roadside. Group size was limited to five since this is the maximum number per adult recommended by the local regional authority on journeys outside school. The training concentrated on two main errors committed by 5-year-olds in making crossing decisions. These were: (1) failure to recognise the danger posed by obstacles such as parked cars near the chosen crossing point; (2) selecting the most direct (often diagonal) route to a destination even in situations where such routes were clearly dangerous.

The training tackled these two problems by adopting a structured learning approach aimed at helping the children discover the basic principles for themselves. We were particularly concerned that the children should not just learn a drill or series of rigid rules. Rather, our aim was to guide them to appreciate their errors more globally so that they would be able to deal flexibly with a wide range of situations, including ones that would be very different from those encountered during training. Questions, prompts and demonstrations were used to direct the children's reasoning and in this way to assist them reach an acceptable level of understanding. Our method differed markedly from the 'drill approach', involving the memorising of rules and other information, that has traditionally bedevilled road safety education. All too often such information is either forgotten or else merely recited, almost as a talisman to ward off the dangers of the road (Preston, 1980). These problems have still not been properly solved and continue to be seen in road safety education today (Thomson, 1991).

In each training group, the children and trainer proceeded from location to location on either the table-top model or at the roadside. At each location, a child was selected from the group and asked to decide where it would be safe to cross to a specified destination. The selection of children was systematic, so that every child made as many judgments as every other. The roadside group registered their responses by pointing out the route they would take. On the table-top model, the children indicated their route by walking a doll-pedestrian along it.

Training procedure

The training was aimed at helping the child to understand the danger posed by poor visibility, complex road layouts and lengthy excursions across the road. We tried to guide the children's reasoning so that they would discover the errors in their behaviour through their own rather than our reasoning. Our procedure was as follows:

Choosing a safe site

Children aged 5-7 years frequently think sites with poor visibility are safe crossing places. The children were encouraged to discover the error of these decisions by being taken through the following steps:

(1) Where a child chose to cross near obstacles such as a parked car, the other group members were asked individually to comment on the proposed route. This was intended to involve the whole group and give them the opportunity to comment on each other's behaviour. They were asked to decide whether they agreed with the chosen route and if so why. If a child in the group correctly identified the danger in the situation, the experimenter encouraged the child who committed the initial error to try again. If the child chose a new route, the above procedure was repeated either until the child eventually proposed a safe route or he/she ran out of alternatives. In that case, the group moved to a new site.

Where all the group members failed to detect the danger, they were taken through the following steps:

(2) First they were asked if they could see traffic approaching from the point were they were standing. They were also asked about other objects which the experimenter knew were obscured from that position. This was intended to make the children realise that their vision was restricted at that site.

(3) They were then asked why they could not see the approaching traffic or the object. Here, they were encouraged to realise that it was their current position that made it difficult to see.

(4) The experimenter then invited them individually to do something that might improve visibility. This introduced the idea that it might be necessary to move.

In most cases children could be encouraged to reach this point through their own reasoning. However, if this failed the experimenter intervened more directly as follows:

(5) The experimenter explained that the approaching traffic could not be seen, for example because of parked cars or other obstructions limiting their view of the road. It was explained that it would be safer to find a place where a clear view could be obtained. The children were then invited to try and find such a spot.

(6) Where the children still failed to understand, the experimenter demonstrated appropriate behaviour and encouraged them to do likewise at future locations.

Choosing a safe route

(1) Children frequently take a diagonal route across the road, often arguing that this is safe because they are going 'straight to the target' (see Ampofo-Boateng *et al.*, in press). Such routes increase the length of the road to be crossed and the time spent on it. Where a child in the group chose such a route, the others were invited individually to comment on it. Once again, this was intended to involve the whole group and give them all the opportunity to comment on each other's behaviour. If one of the children detected the danger and explained it correctly, the child who made the initial error was given a second opportunity to select a safe route. If all the children failed to detect the danger, the experimenter guided them as follows:

(2) The experimenter explained that the diagonal route was a long way to go and asked why this might be dangerous. This encouraged them to realise a car might come before they had finished crossing. The children were then asked to suggest routes where they would not be on the road for so long.

(3) In some cases, the children grasped this and made better choices. Often, however, the explanation was not understood. Where this happened, the experimenter suggested a safer solution, such as walking straight across the road and then along the pavement to the target, or along the pavement until they were close to where they wanted to go.

(4) Where the children failed to understand these steps, the experimenter demonstrated appropriate behaviour to them. The children were then asked to choose a safe route to a new destination.

We also emphasised the importance of stopping at the kerb to look and listen for traffic once an appropriate site had been found. Of course, the process of finding a safe site intrinsically involves appreciating the possible whereabouts of nearby traffic. Training in this aspect of road crossing skill thus should have spin-offs for other aspects — a highly desirable situation.

Appropriate behaviour was reinforced verbally. The children in the two training groups completed six training sessions on separate days, each session lasting approximately 30 minutes.

After the fourth training session, both training groups and the controls were individually re-tested. Only one session was arranged for this interim test. As before, the child was asked to choose four routes at each of the four test sites making a total of 16 routes per child. This test was conducted primarily as a process evaluation to monitor the effectiveness of the training programme thus far and to help the experimenter determine if some aspects of the training were progressing more rapidly than others.

RESULTS

Table 1 shows the mean proportion of routes falling into each of the four safety categories as a function of training and test phase. Sex has been excluded from Table 1 as it did not yield either a main effect or an interaction in the statistical analysis (see below)

In conducting the statistical analysis, we restricted ourselves to those choices that were scored as "safe" in Table 1. We did this because these routes would all have been adequate for crossing purposes had the children been permitted to cross. This is not the case for any of the other categories. Thus, although a shift from "very unsafe" to "unsafe" constitutes an improvement, these choices were clearly not sufficient to keep the children tolerably safe on real roads. Accordingly, we concerned ourselves exclusively with the programme's ability to train children to a criterion that was acceptable for use in traffic.

The effect of training (roadside, table-top or control), test phase (pre-test, post-test 1, post-test 2) and sex on choice of route was examined using a three-way analysis of variance (ANOVA). The results showed significant main effects of training ($F(2,24)=5.57, p<0.05$) and test-phase ($F(2,48)=19.01, p<0.001$). There was no effect of sex ($F(1,24)=0.05$, NS), nor were any of the interactions significant.

Follow-up tests showed that the roadside and table-top groups performed better than the control group on both post-test 1 ($t(18)=2.17, p<0.05$; $t(18)=2.41, p<0.05$ respectively) and post-test 2 ($t(18)=2.36, p<0.05$; $t(18)=2.83, p<0.05$ respectively). There was no significant difference between the two training methods. Follow-up tests also confirmed no significant change in performance between post-tests 1 and 2, indicating maintenance of the trained skill over a two-month period.

The equal effectiveness of the table-top and roadside training methods merits comment, especially since the evidence on the efficacy of table-top models is conflicting. Whilst it has been demonstrated in some studies that children can benefit from training with models (Ampofo-Boateng *et al.*, in press; Boyle, 1973; Rothengatter and Van Schagen, 1986), others have maintained that children are incapable of learning from a table-top model (Gardner *et al.*, 1986; Rothengatter, 1981). The present results are consistent with the former view. Not only did the children learn but training on the model transferred to decision-making at the roadside. This would suggest that training with models may be a useful supplement to roadside training, at least when "primed" by a short period of experience in real traffic.

The evaluation test, conducted after the fourth training session, was primarily a process evaluation intended to provide the experimenter with feedback, especially about errors that

TABLE 1

MEAN PROPORTION ROUTES FALLING INTO EACH SAFETY CATEGORY AS A FUNCTION OF TRAINING GROUP AND TESTING PHASE (STANDARD DEVIATIONS IN PARENTHESES)

Training groups	Real traffic			Table-top model			Control		
Test phase	PT	PT1	PT2	PT	PT1	PT2	PT	PT1	PT2
Safety categories									
Very unsafe	0.43 (0.42)	0.12 (0.29)	0.10 (0.30)	0.35 (0.33)	0.02 (0.03)	0.00 (0.01)	0.61 (0.38)	0.54 (0.48)	0.59 (0.48)
Unsafe	0.41 (0.35)	0.47 (0.23)	0.51 (0.21)	0.40 (0.33)	0.49 (0.25)	0.55 (0.21)	0.34 (0.39)	0.30 (0.38)	0.25 (0.37)
More safe	0.07 (0.08)	0.07 (0.07)	0.06 (0.05)	0.11 (0.13)	0.11 (0.01)	0.07 (0.09)	0.02 (0.03)	0.03 (0.04)	0.05 (0.07)
Safe	0.10 (0.14)	0.35 (0.21)	0.34 (0.18)	0.14 (0.12)	0.37 (0.21)	0.37 (0.16)	0.04 (0.05)	0.12 (0.25)	0.12 (0.24)

PT = Pre-test
PT1 = Post-test 1
PT2 = Post-test 2

might prove particularly difficult or resistant to training. However, these data also provide us with a means of assessing whether improvements occur as early as the fourth training session. Comparing the evaluation test scores for the three groups (see Table 2), it can be seen that both training groups showed improvement over the controls (roadside group, $t(18)=2.80$, $p<0.05$); table-top group ($t(18)=2.67$, $p<0.05$). The difference between the two training groups was not significant.

TABLE 2

MEAN PROPORTION OF ROUTES FALLING INTO THE DIFFERENT SAFETY CATEGORIES FOR EACH GROUP IN THE EVALUATION TEST (STANDARD DEVIATIONS IN PARENTHESES)

Groups	Roadside		Table-top		Control	
Safety category						
Very unsafe	0.13	(0.31)	0.16	(0.30)	0.54	(0.48)
Unsafe	0.47	(0.32)	0.52	(0.24)	0.35	(0.38)
More safe	0.11	(0.11)	0.06	(0.08)	0.04	(0.07)
Safe	0.29	(0.24)	0.26	(0.22)	0.06	(0.09)

DISCUSSION

These findings are consistent with our earlier study using individual training methods (Ampofo-Boateng *et al.*, in press). It appears that a short programme of training amounting to six sessions over a three-week period can significantly improve the skills of 5-year-olds in finding safe routes to cross the road. Indeed, the evaluation test scores suggest that significant improvements were derived from only four sessions. It seems likely that further improvements could be attained simply by extending the period of training. As in the previous study, we found no significant difference between table-top and real road training methods.

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SUCCESS AND PROGRESS IN HIGHER EDUCATION: A STRUCTURAL MODEL OF STUDYING

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SUMMARY. In Belgium, the success rates of freshmen in higher education are relatively low. To understand this phenomenon a structural model for individual differences in study success and progress is suggested. Starting from the theory that studying is the integration of thinking and learning on the basis of motivation, a content valid study-skill test was designed as an imitation of the situation of a first year student and applied to a group of 161 freshmen in psychology at the University of Leuven. In connection their curriculum completed in high school was registered. PC-LISREL was used to evaluate the model. It explains 51 per cent of the variance in success and progress in higher education. The model reveals the importance of domain-specific prior knowledge and intrinsic motivation. The latent variable goal-oriented restructuring in studying (measured by analyse, synthesise and long-term expertise) seems to be very substantial, not only because of its direct effect on success and progress in higher education, but also as an intermediate variable in the process of studying. The study-skill test generates decisive diagnostic information to be used by future students in their process of vocational choice.

INTRODUCTION

IN Belgium, the failure rate of freshmen in higher education is relatively high (about 55 per cent). On account of the law of 1963 concerning the equivalence of different curricula in general secondary education, almost everyone who graduates from high school can enrol at a university of her or his choice without an entrance examination. The only exception to this rule exists at faculties of applied sciences; enrolment for civil engineering requires a successful entrance examination. Owing to the lack of selection at the beginning of higher education, the success rates of freshmen at the end of the first year are relatively low (De Neve, 1991): 40 per cent in the faculties of Human Sciences, 49 per cent in the faculties of Biomedical Sciences and 51 per cent in the faculties of Exact Sciences (63 per cent in civil engineering).

For a quarter of a century this important problem was extensively studied, mostly on freshmen in Psychology. Regularly new approaches were developed (Decruyenaere and Janssen, 1989; Minnaert and Janssen, 1990; Van Overwalle, 1989). Nevertheless, most Belgian politicians refuse any intervention at all, because of the democratisation of (higher) education. In the meantime, however, a structural model for individual differences in academic achievement has been developed in order to improve the psychological and educational insights into the so-called "threshold" of the first year in Belgian higher education. In this causal model of studying, academic performance is assumed to be influenced directly or indirectly by a combination of cognitive and motivational variables. The theoretical framework underlying our model of studying in higher education is based on Janssen's (1989) theory of studying as the integration of learning and thinking on the base of motivation.

To enhance insight into the process of studying, a content valid study-skill test was designed as an imitation of the situation of a first-year student. A brief description of that study situation follows as far as this is relevant to the objectives of this paper. Within a limited amount of time a student has to study an explicit amount of new information within the chosen