EVALUATION OF A CYCLING PROFICIENCY TRAINING COURSE USING TWO BEHAVIOUR RECORDING METHODS

by

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EVALUATION OF A CYCLING PROFICIENCY TRAINING COURSE
USING TWO BEHAVIOUR RECORDING METHODS

ABSTRACT

This study evaluated a cycling proficiency training course which was carried out at a school in Berkshire. Fifteen children received training during the experiment from an experienced teacher who was also a cycling proficiency instructor and a further fifteen children formed a control group, receiving no instruction until after the experiment was completed. The cycling behaviour of the children was assessed before the training course, immediately after the training course and two months after training.

Two methods of recording the cycling behaviour were used and compared. Trained observers recorded cycling commentaries into portable cassette recorders at all four TRRL test junctions and time-lapse photography was used at two of the test junctions. Time-lapse photography alone was used to record cycling behaviour on the public roads.

The children were also questioned about their knowledge of the Highway Code.

The results indicated that the training produced an increase in the proportion of correct cycling behaviour observed, with the improvement being more marked on the TRRL Small Road System than on the public roads.

When the two data recording methods were compared, data loss because of apparatus failure was greater for time-lapse photography (14 per cent) than for cassette recording (3 per cent). For data recorded by both methods the two records showed a high level of agreement (90 per cent).

1. INTRODUCTION

1.1 The effectiveness of the National Cycling Proficiency Scheme

It was estimated by the Royal Society for the Prevention of Accidents (RoSPA) that the number of child cyclists increased from under half of the child population in 1959 when the National Cycling Proficiency Scheme (NCPS) was introduced, to more than two-thirds in 1977. The annual reports of the Department of Transport show that the number of motor vehicles on the road in Great Britain increased from 8.2 million in 1959 to about 18 million in 1977, but that the number of casualties among child cyclists decreased from 14,613 to 9,709 over the same period.

Unfortunately very little information is available on the exposure of child cyclists (i.e. the amount of time they spend cycling on the roads), how this varies with the age of the child, or how it varied between
1959 and 1977. It is, therefore, difficult to estimate the effect of the NCPS on the number of child cyclist casualties.

This study was therefore carried out to examine the results of NCPS training more directly in terms of its effect on cycling performance and skill.

1.2 The aims of the experiment

(i) To measure the effects of a training scheme on cycling performance.

(ii) To compare two observation techniques:

(a) Time-lapse photography.

(b) Observers using tape recorders.

2. METHOD

2.1 Subjects

The subjects were 30 children from the third year (age 9 to 10) of a co-educational primary school in Berkshire. None of them had previously received cycling proficiency training, but all had experience of cycling on the public roads prior to taking part in the experiment.

Children were selected who used either one of two routes to cycle from home to school. Both routes involved the cyclist having to negotiate a left turn into a side road on the way to school and a right turn at the same junction (a T-junction) on the way home (Figures 1 and 2).

Time-lapse cameras could be positioned to film the cyclists at the appropriate junctions on both routes.

The children were divided into two groups, the control group and the training group. These groups were matched for age and sex and were evenly divided between the two routes to be filmed when cycling to and from school.

2.2 Content and structure of the training course

The training course consisted of seven lessons each of approximately 40 minutes duration. The lessons were given at the rate of two a week for three and a half weeks. All the training took place in a playground and was given by a teacher who was an experienced NCPS Instructor.

The content of the lessons was as follows:

Lesson I  Maintenance and repair of bicycles — checking for road-worthiness.
Lesson II  The use of a bicycle; how to ride it; starting; stopping; emergency stopping.
Lesson III  Bicycle control.
Lesson IV  Carrying of luggage; left turn manoeuvre from a minor road to major road at a T-junction; parts of Highway Code which are applicable to cyclists.
Lesson V  Overtaking; the dangers of parked vehicles; right turn manoeuvre from a minor road to a major road at a T-junction.
Lesson VI  Right turn manoeuvre from a major road to a minor road.
Lesson VII  Revision of previous lessons, traffic light sequence and meaning.

2.3 Experimental procedure

Pre-test: Both the training and the control groups were tested on the TRRL road system before training took place. They were also filmed without their knowledge when negotiating a left turn into a side road on the way to school and at a right turn at a T-junction on the way home (see Figures 1 and 2).

Training: Only the training group received training during the course of the experiment. The control group was not trained until after the end of the experiment.

After training, the training group was given a National Cycling Proficiency Test by a Road Safety Officer. The control group did not take this test until a later date.

Post-test I: Both the training and control groups were tested on the TRRL Small Road System immediately after the course given to the trained group (ie one month after the pre-test) and they were also filmed, again without their knowledge, cycling to and from school.

Post-test II: which took the same form as post-test I, was administered after a further two months had elapsed.

2.4 Test procedures

The pre-test and the two post-tests all took the same form.

2.4.1 Journeys to and from school. Time-lapse cameras, running at two frames per second, were sited at two T-junctions near the school. They were sited unobtrusively at the top of lamp posts approximately 60 metres from the junctions.

Two manoeuvres were filmed. These were a left turn from a major to a minor road and a right turn from a minor to a major road (see Figures 1 and 2). For identification of the subjects on the public road, white mud flaps were attached to the rear mudguards of their cycles and a broad black tape stripe down the mudflaps of the training group distinguished between the members of the two groups.

Film data were collected on one morning and two afternoons at the time of the pre-test (recording one left and two right turn manoeuvres), one day at the time of post-test I (recording one left and one right turn manoeuvre), and two days at the time of post-test II (recording two left and two right turn manoeuvres).

2.4.2 The TRRL road test. The children rode round the course shown in Figure 3 and carried out four right turn manoeuvres:

(J1) At a junction with STOP markings and traffic lights.
(J2) From a minor to a major road with GIVE WAY sign and markings.
(J3) and (J4)  From a major to a minor road.
The children also rode round the same course in the opposite direction, carrying out four left turn manoeuvres as shown in Figure 4.

(J4) and (J3) From a minor to a major road with GIVE WAY signs and markings.
(J2) From a major road to a minor road.
(J1) At a junction with STOP markings and traffic lights.

The traffic lights at J1 were red while the children approached and when they arrived at the junction, so that they should stop before turning. They completed either a right or a left turn when the lights changed to green.

The children were sent off at one minute intervals from the point marked START on Figures 3 and 4. They were able to see how other cyclists negotiated the first junction but they could not see how other children tackled later junctions. All the manoeuvres were completed in traffic free conditions. The final part of the test consisted of questions on the children’s knowledge of the Highway Code and general points of safe cycling.

2.4.3 Methods of recording cycling performance data on the TRRL road test. The right turns at (J2) and (J3) and the left turns at (J3) and (J2) were filmed using time-lapse cameras running at two frames per second. The cameras were mounted on top of two vehicles parked at about 60 metres from the junctions (see Figures 3 and 4).

At each test junction there was also a trained observer who recorded a commentary on each child’s cycling behaviour using a portable cassette recorder. Actions carried out were reported as well as some actions omitted.

Two recording methods were used in order to compare their reliability.

2.5 Types of cycling performance data collected

Both the observers’ commentaries and the film analyses concentrated on the following aspects of the children’s cycling behaviour.

(i) Road position (eg left, middle of lane, crown, right).
(ii) Looking behaviour (eg ahead, left, right, behind).
(iii) Signalling.
(iv) Speed, especially at approach to junctions.
(v) Sequence of actions (eg whether a change in road position followed a signal or vice versa, etc).

2.6 Evaluation

Both the cassette data and the film data were transcribed onto coded data sheets and the children’s behaviour before and after training was compared. The observed cycling behaviour was categorised as correct or incorrect behaviour. The correct procedures were those recommended by RoSPA for turning right and left. All other behaviour was categorised as incorrect and the types of error and their frequency were analysed.
Two aspects of the child's behaviour were considered, behaviour on the approach to the junction (pre-junction behaviour) and behaviour at the junction (junction behaviour).

For example:— When turning right from a minor to a major road at a T-junction, the pre-junction behaviour in the correct sequence would be:

(a) Ride on left side of the road.
(b) Look behind over right shoulder, to assess traffic situation.
(c) Signal intention to turn right.
(d) Move out to the crown of the road.

Correct order of junction behaviour would be:

(a) Slow down or stop at major road.
(b) Look right and left.
(c) Ride out without cutting the corner.

3. RESULTS

3.1 Cycling performance of control group

No significant* difference was found between the behaviour of the Control Group in the pre-test and in post-test II, ie over a period of three months.

This result justifies the comparison of the Training Group's behaviour from pre-test to post-test II to give information about the effect of the training course on cycling behaviour.

3.2 Change in cycling performance of training group from pre-test to post-test I

3.2.1 On the Laboratory Small Road System. There was significantly more correct behaviour immediately after training in all manoeuvres tested on the Laboratory Small Road System. More children (40 per cent) behaved correctly than had done so before training (3 per cent).

The greatest improvement due to the training, was in the left turn into a side road (from 0 in the pre-test to 92 per cent correct in the first post-test), (Figure 5b).

* All tests of significance are based on the Sign test which is a non-parametric statistical test that can be used for comparing two sets of scores. It does not take into account subjects who miss one, or both, of the performance tests or subjects whose performance does not change from one performance test to the other. It compares each individual's performance from one test to the other for improvement or deterioration. If the overall amount of improvement balanced against deterioration has a probability of less than one in twenty of occurring by chance (P < 0.05) then the improvement is judged to be significant.
The least overall improvement in the proportion behaving correctly occurred at the traffic lights (Figures 5a and 5b), (right turn 6 per cent to 30 per cent, left turn 0 per cent to 15 per cent) and in the left turns at a T-junction (Figure 5b), (6 per cent to 23 per cent).

Generally there was a marked increase in the proportion of correct behaviour observed on the Laboratory Small Road System. The main sources of incorrect behaviour prior to training were:-- (Figures 6 and 7)

1. failing to move to the crown of the road before turning right into a side road (16 per cent correct) (Figure 6c).
2. failing to look right and left for traffic at traffic lights (25 per cent correct) (Figures 6d and 7b).
3. failing to look behind before changing road position for right turns (29 per cent correct) (Figure 6a).
4. failing to signal before turning right (38 per cent correct) (Figures 6b).

After training, the improvement for the two types of error in (3) and (4) above, was considerable (to 89 per cent and 91 per cent correct respectively). Failure to move to the crown of the road when turning right into a side road ((1) above) remained at a fairly high level (only 54 per cent correct) and failure to look right and left at traffic lights ((2) above) only improved slightly (to 27 per cent correct).

The failure to move to the crown of the road occurred more at a right turn into a side road than at a T-junction, (Figure 6c), presumably because it was more difficult for the children to judge when to move towards the crown of the road when turning right into a side road than when turning right at a T-junction.

As far as turning at the traffic lights is concerned, failure to look right and left for traffic before turning could be attributed either to inexperience, as the children were unfamiliar with traffic lights in their environment or to a belief which the training did not change, that the lights would infallibly prevent any traffic from crossing their path (Figures 6d and 7b).

3.2.2 On the public roads. The only manoeuvres observed on the public roads were the left turn into a side road and the right turn at a T-junction. The left turn was observed while the children were on their way to school in the morning when they were usually cycling alone. Right turns were observed after school when children were often riding in groups and their individual behaviour could have been affected by this.

Two sets of film data for the right turn were available from two days filming during the pre-test. It should therefore have been possible to compare each of these sets of data with the one set of film data obtained during post-test I. However, a camera failure caused the loss of most data during post-test I and only 3 children were filmed turning right. Of the three who were filmed none performed the whole manoeuvre correctly.

There was some improvement in the children’s left turn behaviour but it had been quite good on the public roads before training (50 per cent correct before training, 74 per cent correct after training), (Figure 5c). Significantly more children signalled when turning left after training than before (Figure 7a).
3.3 Change in cycling performance of the training group from pre-test and post-test I to post-test II

3.3.1 On the Laboratory Small Road System. Two months after training, performance was similar to that immediately after training. On post-test II, more children behaved correctly in the right turn at a T-junction (53 per cent), the left turns at a T-junction (41 per cent) and the left turn into a side road (100 per cent), than immediately after training (38 per cent, 23 per cent and 92 per cent respectively) (Figures 5a and 5b). Fewer behaved correctly in right turns at traffic lights (30 per cent to 19 per cent) and right turns into a side road (49 per cent to 36 per cent). The slightly improved performance in the left turn at traffic lights which had occurred immediately after training was not maintained (15 per cent correct in post-test I to none correct in post-test II) (Figure 5b). The pattern of errors in post-test II was generally the same as in post-test I.

3.3.2 On the public roads. Two days of pre-test film data and of post-test II film data were available for the right turn manoeuvre. It was therefore possible to make four data comparisons for cyclists' right turn behaviour from pre-test to post-test II. Loss of film caused through camera failure at the time of post-test I meant that no comparisons could be made between post-test I and post-test II.

There was a trend towards improvement from pre-test to post-test II in all four comparisons made (Figures 5 and 6). Some children were seen to carry out the complete right turn manoeuvre correctly two months after training, where none had been seen to do so before training. A similar trend was observed when the four actions making up the right turn manoeuvre (looking behind before turning; moving to the crown before turning; looking right and left at the junction and signalling before turning) were compared from pre-test to post-test II.

For the left turn manoeuvre there were two days film data during post-test II, one day of film data for the pre-test and one day for post-test I. This enabled two data comparisons to be made from pre-test to post-test II and two from post-test I to post-test II (Figure 5c). The trend was again towards improvement in all comparisons from pre-test to post-test II with little difference between post-test I and post-test II comparisons. The number of children performing the left turn correctly increased from 50 per cent in the pre-test to 64 per cent in post-test II as compared with 74 per cent in post-test I. The frequency of errors tended to be lower for all comparisons from pre-test to post-test II and was similar for the two post-tests.

3.4 Highway Code

Table 1 shows that the answers to some of the Highway Code questions were already known to most of the children before any training took place, although some improvement in knowledge was found for both the training group and the control group at the time of post-test II.

The greatest improvement in the scores of the training group occurred in the question about carrying luggage on bicycles (8/15 correct before and 14/15 correct afterwards) and in giving 'looking behind' as an answer to the question about what a cyclist should do before overtaking a parked car (5/15 correct before and 10/15 correct afterwards). The need to signal before overtaking a parked car was generally known before training. The control group showed some improved knowledge in these questions but not as much as the training group. The question about the use of brakes in an emergency was the least well answered by both groups at the time of the post-test (9/15 correct for both training and control groups) and from
pre-test to post-test, the control group showed more improvement for this question than the training group (training group 'before' gave 7/15 correct, control group 'before' gave 5/15 correct).

TABLE 1
Number of children correctly answering questions on the Highway Code

<table>
<thead>
<tr>
<th>Question on:</th>
<th>Training group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-test</td>
<td>Post-test</td>
</tr>
<tr>
<td></td>
<td>Second</td>
<td>Pre-test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>post-test</td>
</tr>
<tr>
<td>1. Police 'Stop' sign</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2. Why we make signals</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>3. Motorist's turning right signal</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>4. Two people on bike</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>5. Luggage - best place to carry</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>6. Brakes - Emergency back/front or together</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>7. (i) Overtaking parked car - Looking mentioned</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>7. (ii) Overtaking parked car - Signalling mentioned</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>8. 'Looking' said to be the more important of these if more than one given</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>

Total number of children 15 15 15 ! 5

4. RELIABILITY OF OBSERVATION TECHNIQUES

4.1 On the Small Road System

Film records were compared with cassette records for two junctions observed during the cycling tests at the Laboratory's Small Road System. Film records were made of two right turn manoeuvres and two left turn manoeuvres on each of the three test days: pre-test, post-test I and post-test II. From the four manoeuvres, two right and two left, a total of 14 cycling actions were selected for comparison (see Table 2). Fifteen children rode in the pre-test, 13 in post-test I and 15 in post-test II. Therefore a total of 602 ((15 + 13 + 15) x 14 actions) comparisons between tape and film should have been possible.

Owing to camera failure, no film data for two junctions on the pre-test were obtained. Similarly a small amount of tape data was not obtained because of inexperience in operating cassette recorders. The film loss affected 90 comparisons (14 per cent) and the tape loss 16 comparisons (3 per cent), (Tables 2a—2b).

In terms of ensuring data collection, cassette recorders were therefore in this study more reliable than time-lapse cameras. Because twelve of the possible comparisons were lost from both tape and film the total number of comparisons lost was 94 (16 per cent). When the descriptions of the remaining 508 actions
<table>
<thead>
<tr>
<th>Action</th>
<th>Number of cycle runs</th>
<th>Data loss through apparatus failure</th>
<th>Comparisons</th>
<th>Level of agreement/disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Junction</td>
<td>Film</td>
<td>Tape</td>
<td>Lost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre</td>
<td>Post I</td>
<td>Post II</td>
</tr>
<tr>
<td>Look behind</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Signal</td>
<td>3</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Move to crown of road</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Look right and left at junction</td>
<td>3</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Total data loss</td>
<td>45</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Total comparisons possible</td>
<td>105</td>
<td>91</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>Total disagreement between recording methods</td>
<td>8/60</td>
<td>0/87</td>
<td>14/105</td>
</tr>
<tr>
<td></td>
<td>Total agreement between recording methods</td>
<td>52/60</td>
<td>85/87</td>
<td>90/105</td>
</tr>
</tbody>
</table>
### TABLE 2 (continued)

<table>
<thead>
<tr>
<th>b) LEFT TURN</th>
<th>Number of cycle runs</th>
<th>Data loss through apparatus failure</th>
<th>Comparisons</th>
<th>Level of agreement/disagreement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Junction</td>
<td>Film</td>
<td>Tape</td>
<td>Lost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre</td>
<td>Post I</td>
<td>Post II</td>
</tr>
<tr>
<td>Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Look right at junction</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Swinging out at junction</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Signalling while turning</td>
<td>2</td>
<td>15</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Total data loss</td>
<td></td>
<td>45</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total comparisons possible</td>
<td></td>
<td>105</td>
<td>91</td>
<td>105</td>
</tr>
<tr>
<td>Total disagreement between recording methods</td>
<td></td>
<td>9/60</td>
<td>11/91</td>
<td>3/105</td>
</tr>
<tr>
<td>Total agreement between recording methods</td>
<td></td>
<td>4/60</td>
<td>7/91</td>
<td>3/105</td>
</tr>
</tbody>
</table>
recorded on both tape and film were compared, the results derived for tape and film agreed in 455 (90 per cent) of comparisons.

On no occasion were the two records in direct conflict, with one record stating the presence of an action and the other stating the absence of the same action. In 53 (10 per cent) cases an action was not mentioned or recorded by one recording method but was mentioned or recorded by the other (Table 2a–b).

An examination of these discrepancies revealed that nearly all were likely to be errors of omission rather than of incorrect inclusion. Forty-five actions were on film and omitted from the tape record and eight actions were recorded on tape but not visible on film.

Table 2 shows which actions were recorded by only one method of recording.

Because actions not visible on the film occurred either too far away from the camera to be clearly identifiable or out of the field of view of the camera, the siting of the camera was the cause of omissions from the film record.

Recording errors were equally likely on left and right turns. On right turns the greatest discrepancies occurred at Junction 2 in the pre-test (Table 2a) when signals were seen on the film but were not reported on tape and at Junction 3 in post-test II (Table 2a) when ‘looks behind’ were seen on film but not recorded on tape. These omissions appeared to be specific errors on the part of one observer at one site on one occasion. On left turns most discrepancies occurred at Junction 3 in the pre-test (Table 2b) and post-test I. By post-test II these discrepancies had disappeared which might suggest that the observer at this site having been less accurate in earlier tests improved in performance by post-test II (Table 2b).

Assuming that most errors were errors of omission, film was a slightly more accurate method of recording cycling actions than tape, but in general, the level of agreement was very high (455/508 = 90 per cent) (Table 2). No allowance could be made in these comparisons for any action which might have been missed from both records. To be certain of recording on film every action of the cyclist from well before the junction to after negotiation of the junction, it would probably be necessary to use more than one camera sited so that both front and rear views of the cyclist could be recorded.

Increased accuracy from the cassette tape record might be achieved by having two observers working in co-operation at each junction. In terms of cost (see Table 3) the film method in this experiment was 25 per cent cheaper than the tape cassette method.

Cost was broken down into the following factors:

1. Labour time on site
2. Travel and subsistence of operators
3. Cost of materials, and processing of film
4. Coding time.
TABLE 3
Comparative costs (1973) of two methods of recording

<table>
<thead>
<tr>
<th>Item</th>
<th>Film</th>
<th>Tape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Labour time on site</td>
<td>£45</td>
<td>£45</td>
</tr>
<tr>
<td>2. Travel and subsistence of operators</td>
<td>—</td>
<td>£135</td>
</tr>
<tr>
<td>3. Materials and processing of film</td>
<td>£150</td>
<td>£5</td>
</tr>
<tr>
<td>4. Coding time</td>
<td>£175</td>
<td>£350</td>
</tr>
<tr>
<td></td>
<td>£370</td>
<td>£535</td>
</tr>
</tbody>
</table>

The labour costs of the two methods were roughly comparable. Two observers with tape recorders were involved at the two junctions which were filmed and the two cameras were operated by a crew of two. If a similar experiment were carried out away from the Laboratory it is probable that the camera crew would have to be larger in order to handle and operate the equipment in less convenient places. As the experiment was carried out at the Laboratory, travel and subsistence costs applied only to the observers with tape recorders and was approximately £135. In any experiment away from the Laboratory this expense would be similar for the two methods as both observers and camera crews would have to travel.

Item 3, cost of materials and processing were very dissimilar between the two methods as the cost of cassettes and batteries for the portable tape recorders was under £5, while the cost of film and film processing was approximately £150.

The transcribing and coding of the tapes was a much more laborious process than the coding of the film and it is estimated that the amount of time involved was double that of film coding.

Taking the four cost items together, in this experiment the cost of the film record was approximately 70 per cent of that of the tape record (film £370, tape £535).

Since the transcribing and coding costs form the greatest proportion of the total it is suggested that there should be developed a method of recording which allows on the spot coding in an accurate form. As it seems likely that observers can be expected to increase in accuracy with practice, a coded check sheet to be completed on the spot by trained observers might be a useful alternative to cassette recorders. This method would almost eliminate both the cost of materials and the labour of transcribing and coding and should be at least as accurate as the tape record in this experiment. Two observers using check sheets and working together, one filling in the check sheet as the other verbalises the cyclist’s actions should increase the accuracy of the observer method with no increased cost of transcribing and coding.

To increase the likelihood of complete accuracy of the film method, both film processing and coding costs would be likely to be increased as more than one camera might be needed to be certain of recording both early actions and head movements at the junction.
### TABLE 4
Proportion of children seen and identified from film records on public roads

<table>
<thead>
<tr>
<th>Group</th>
<th>Date</th>
<th>22/2</th>
<th>26/2</th>
<th>26/2</th>
<th>26/3</th>
<th>26/3</th>
<th>17/5</th>
<th>17/5</th>
<th>20/5</th>
<th>20/5</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pm</td>
<td>am</td>
<td>pm</td>
<td>am</td>
<td>pm*</td>
<td>am</td>
<td>pm</td>
<td>am</td>
<td>pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
<td>14/15 (+2)</td>
<td>12/15 (+3)</td>
<td>12/15</td>
<td>12/13 (+1)</td>
<td>6/15</td>
<td>12/15 (+1)</td>
<td>11/15</td>
<td>14/15 (+1)</td>
<td>96/131 ( +8)</td>
<td>= 73%</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>13/15</td>
<td>13/15 (+1)</td>
<td>14/15</td>
<td>11/13</td>
<td>4/13</td>
<td>13/15 (+1)</td>
<td>10/15</td>
<td>14/15 (+1)</td>
<td>106/131 (+3)</td>
<td>= 80%</td>
<td></td>
</tr>
</tbody>
</table>

Numbers in brackets = children seen twice but included once in total.

Base numbers vary owing to absentees on 26/3.

* Camera failure caused some loss of data.
4.2 On the public roads

No tape records were made on the public roads.

On the public roads two additional problems reduced the number of data records. One was created by the difficulty of identifying individual children from the film record (training and control groups were easily distinguished from each other by a broad tape stripe placed on the mudflaps of the training group). The second problem occurred because although considerable efforts were made to ensure that all the children taking part in the study would pass the junctions where the cameras were sited on the way to and from school, 27 per cent of the training group's and 20 per cent of the control group's possible records were lost (Table 4), because children took an alternative route, walked with their bicycles, or rode on the pavement.

5. CONCLUSIONS

This experiment showed that a National Cycling Proficiency training course had succeeded in bringing about improvements in certain important aspects of the children's cycling behaviour and some of this improvement had been maintained after a lapse of two months after training. The degree of improvement after two months was in general greater when measured on the TRRL Small Road System than it was on the public roads.

On the TRRL Small Road System the training had significantly increased the frequency of totally correct behaviour for the right turn manoeuvre at a T-junction (from 1/15 in the pre-test to 8/15 in post-test II), for the right turn into one side road (from 0/15 in the pre-test to 8/15 in post-test II), and for the left turn into a side road (from 0/15 in the pre-test to 15/15 in post-test II). There had been increases in the proportion of children carrying out recommended actions which should form part of a manoeuvre. For example, the number of children looking behind before moving to the crown of the road had significantly increased for all types of right turns. The number of children moving to the crown of the road before turning right had significantly increased at the traffic lights, the T-junction and at one out of two side roads. The number of children signalling had significantly increased for both left and right turns at all types of junctions.

On the public roads there was a trend towards an increase in the proportion of children carrying out both left and right turns correctly after training and towards a reduction of errors. The fact that the increase in the amount of correct behaviour was greater under the protected conditions of the TRRL Small Road System when the children were aware of being tested, than in the practical conditions of the public roads, when they were making decisions on their own, suggests that the children had not transferred the whole of their training to practical use.

A comparison of the two recording methods used in this experiment, time lapse film and observers with tape recorders, suggested that with a loss of 14 per cent of data through apparatus malfunction, the camera was slightly less reliable than the cassette recorders which lost 3 per cent. After deduction of the 16 per cent of data which was lost through apparatus failure there was a high level of agreement (90 per cent) between the two records. The discrepancies that did occur might have been reduced either by restating or increasing the number of cameras, or, in the case of observers with tape recorders, increasing the amount of practice and training in the task given to observers.
6. ACKNOWLEDGEMENTS

The work described in this report was carried out in the Road User Characteristics Division (Division Head: Mr K Russam) of the Safety Department of TRRL.

Thanks are due to the Headmaster and Staff of Oaklands County Primary School, Crowthorne, for co-operating in the arrangements made for the children to take part in the tests, and to the observers and the photographic staff who helped in collecting the data.

7. REFERENCE

Fig. 1 PUBLIC ROAD SYSTEM CLOSE TO THE SCHOOL SHOWING POSITION OF CAMERAS AND CHILDREN’S ROUTE TO SCHOOL IN THE MORNING WHEN TURNING LEFT INTO A SIDE ROAD

NB Not to scale. Major roads in these diagrams were quiet estate roads

--- Cyclists’ route

--- Cyclists’ route

Fig. 2 PUBLIC ROAD SYSTEM CLOSE TO THE SCHOOL SHOWING POSITION OF CAMERAS AND THE CHILDREN’S ROUTE HOME FROM SCHOOL WHEN TURNING RIGHT AT A T-JUNCTION

NB Not to scale. Major roads in these diagrams were quiet estate roads

--- Cyclists’ route
Fig. 3 THE FOUR RIGHT TURN MANOEUVRES SHOWING CYCLISTS' ROUTE, CAMERA POSITIONS AND OBSERVERS' POSITIONS ON T.R.R.L. SMALL ROAD SYSTEM
Fig. 4 THE FOUR LEFT TURN MANOEUVRES SHOWING CYCLISTS' ROUTE, CAMERA POSITIONS AND OBSERVERS' POSITIONS ON T.R.R.L. SMALL ROAD SYSTEM
Fig. 5 BEHAVIOUR OF TRAINING GROUP
Fig. 6 FAULTS MADE BY TRAINING GROUP BEFORE AND AFTER TRAINING

(a) FAILURE TO LOOK BEHIND BEFORE JUNCTION

(b) FAILURE TO SIGNAL BEFORE JUNCTION

(c) FAILURE TO MOVE TO CROWN OF ROAD BEFORE JUNCTION

(d) FAILURE TO LOOK RIGHT AND LEFT AT JUNCTION

* Filming took place on two days
Numbers of children seen not to be making the fault

Numbers of children seen making faults

Numbers of children seen riding on the footway (Public Roads)

No. of cyclists observed

Junction 1
Traffic lights
X-road

Junction 2
side road

Junction 3
T-junction

Junction 4
T-junction

(a) FAILURE TO SIGNAL BEFORE JUNCTION

No. of cyclists observed

Junction 1
Traffic lights
X-road

Junction 2
side road

Junction 3
T-junction

Junction 4
T-junction

Public Road
Side road

(b) FAILURE TO LOOK RIGHT AND LEFT AT JUNCTION

No. of cyclists observed

Junction 1
Traffic lights
X-road

Junction 2
side road

Junction 3
T-junction

Junction 4
T-junction

Public Road
Side road

(c) SWINGING WIDE AT JUNCTION

No. of cyclists observed

Junction 1
Traffic lights
X-road

Junction 2
side road

Junction 3
T-junction

Junction 4
T-junction

Public Road
Side road

(d) HAND OFF WHEN TURNING

Filming took place on two days

Fig. 7 FAULTS MADE BY TRAINING GROUP BEFORE AND AFTER TRAINING—LEFT TURNS

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Evaluation of a cycling proficiency training course using two behaviour recording methods:
MARIE BENNETT, BARBARA A SANDERS BSc AND C S DOWNING BSc: Department of the Environment Department of Transport, TRRL Laboratory Report 890: Crowthorne, 1979 (Transport and Road Research Laboratory). This study evaluated a cycling proficiency training course which was carried out at a school in Berkshire. Fifteen children received training during the experiment from an experienced teacher who was also a cycling proficiency instructor and a further fifteen children formed a control group, receiving no instruction until after the experiment was completed. The cycling behaviour of the children was assessed before the training course, immediately after the training course and two months after training.

Two methods of recording the cycling behaviour were used and compared. Trained observers recorded cycling commentaries into portable cassette recorders at all four TRRL test junctions and time-lapse photography was used at two of the test junctions. Time-lapse photography alone was used to record cycling behaviour on the public roads.

The children were also questioned about their knowledge of the Highway Code.

The results indicated that the training produced an increase in the proportion of correct cycling behaviour observed, with the improvement being more marked on the TRRL Small Road System than on the public roads.

When the two data recording methods were compared, data loss because of apparatus failure was greater for time-lapse photography (14 per cent) than for cassette recording (3 per cent). For data recorded by both methods the two records showed a high level of agreement (90 per cent).

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