TEST SCORES BEFORE AND AFTER DRIVING SCHOOL ATTENDANCE IN DAMMAM, SAUDI ARABIA

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1. INTRODUCTION

Vehicle accidents are a major problem suffered by virtually every country in the world. There are three elements which affect traffic operation and consequently contribute to automobile accidents, namely, the driver, the vehicle, and the roadway. Nevertheless, studies have shown that more than 90% of accidents involve some form of driver error [1]. Interviews held in Riyadh (capital of Saudi Arabia), involving over 200 drivers, showed that human error contributed to over 85% of Riyadh accidents [2]. The same study showed that 66% of the drivers had learned how to drive from a family member or a friend which probably caused their driving skills to be inadequate and/or unreliable [2].

Thus, an obvious way of reducing accidents is by improving drivers' skills and knowledge of driving regulations through training programs and licensing. In fact, such training programs have been shown to play a major role in enhancing road safety and reducing accidents [1–4]. With this intention, driving schools in Saudi Arabia were established and enrollment in their training programs became a prerequisite for anyone seeking a Saudi driving license [4]. The first evaluation study of these driving schools was done in 1987 [4]. As part of this study, a sample of driving school graduates was given a written examination on driving skills, traffic signs, and regulations. It was found that the examinees correctly answered 78% of the questions concerning traffic signs and 40% of the questions covering driving skills and regulations. While this study examined how much the graduates knew about driving, it did not investigate whether the driving school, per se, had contributed to this knowledge.

The main objective of this study is to investigate whether the driving school in Dammam, Saudi Arabia, in its current form, enhances the knowledge of its graduates with regard to driving skills, traffic signs, and traffic regulations.

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2. THE DAMMAM DRIVING SCHOOL

The first driving school in the Kingdom was established in Jeddah in 1975 [5]. Since that time, a number of driving schools have been established in other major cities in the Kingdom. All of these schools provide almost identical training programs and follow the same training system required by the Traffic Police authority. There are basically two types of training programs in the driving schools. One program is short and applies to people who can drive a car. The other program is long, more detailed, and designed for people who cannot drive.

The short training program is basically a one-day session named the "3 hours program". This program consists of lectures on basic vehicle mechanics, driving skills, first aid, and traffic signs and regulations [6]. The students enrolled in this program are also supplied with a sheet covering the meanings of traffic signs and lane markings. The program ends with a driving-license examination. The examination contains two parts. The first part is an oral examination where a traffic police officer and a representative of the driving school examine the students on the material given in the lectures. If the student passes this examination, he becomes eligible for the second part of the driving-license examination, which is a field driving test. By passing this test, the student gets his driving license.

The long program, which is a thirty-hour course spread over a period of approximately ten days, is similar to the 3 hour program in terms of topics covered, but quite elaborate in teaching and training. Students enrolled in this program are supplied with a textbook [5] that covers the information given in the program in great detail. The program ends with the same examination as the 3 hour program [6].

3. EXPERIMENTAL DESIGN

A multiple choice questionnaire containing a total of 28 questions was prepared for this study. These questions covered the basic driving skills, traffic signs and regulations. All of these issues are explicitly covered in the training program of the driving school. A complete listing of the questions is shown in Table 1. Because most of the people enrolled in the driving school are assigned to the 3 hour program [4, 6], and due to time and resource limitations, the questionnaire was distributed only to people assigned to the 3 hour program. The study was conducted over one week (5 working days). Each day, approximately ten individuals were selected randomly and asked to answer the questionnaire before attending the training program. The total sample size was 50 individuals. In the same manner, a different group of 50 individuals was asked to answer the same questionnaire after they completed the training program and before taking the driving license examination.

Inquiries regarding personal data and socioeconomic status such as age, income, education and occupation were also included in the questionnaire. With the exception of the age inquiry, less than 4% of each studied sample responded to any of these inquiries. In the age inquiry three age groups were listed. The individual answering the questionnaire was asked to identify his corresponding age group. It should be pointed out that only males are allowed to drive in Saudi Arabia.

The respondents were given ample time to answer the questionnaire and assistance in understanding it was provided whenever this was needed.

4. DATA ANALYSIS

The first studied sample consisted of fifty individuals, five of whom did not respond to the age inquiry. The second sample consisted of fifty different individuals. Every individuals in this sample responded to the age inquiry. In both samples, only a small number responded to any of the other socio-economic inquiries. Consequently, these inquiries were not included in the analysis.

The questions included in the questionnaire can be categorized into two basic categories, namely, traffic signs and regulations (24 questions), and basic driving skills (4 questions). The percentage of respondents correctly answering each of the questions is shown in Figure 1. The figure shows that questions 1, 8, 22, 25, and 26 are responsible for most of the incorrect answers in the first sample (before enrolling in the training program) as well as in the second (after finishing the program). Because assistance in understanding the questions and the answers of the questionnaire was provided whenever it was needed, and since the respondents were given ample time to answer the questionnaire, the above observations cannot realistically be attributed to any difficulty in understanding these particular questions or their correct respective answers. In the case of the second sample (after finishing the program), the only explanation for the above observation seems to be that the topics related to these particular questions were not covered adequately in the training program of the driving school. In the first sample of individuals (before enrolling in the school), on the other hand, the previous observation might be explained by the fact that the issues covered by these particular questions are not commonly faced by people

Table 1. List of Topics Covered in the Multiple Choice Questionnaire.

Question Number	General Area	Topic of the Question
1	Traffic signs and regulations	Shape of warning signs.
2		Shape of regulatory signs.
3		Meaning of a "STOP" sign.
4		Reaction to a traffic signal which is continuously flashing Red.
5		Reaction to a traffic signal which is continuously flashing Yellow.
6		Meaning of "Yield" sign.
7		Meaning of "No Parking" sign.
8		Meaning of "Short term Parking Sign" (loading & unloading).
9		Meaning of "Closed road" sign.
10		Meaning of "No overtaking" sign.
11		Meaning of "No right turn" sign.
12		Meaning of "No U-turn" sign.
13		Meaning of "No entry" sign.
14		Meaning of "Speed limit" sign.
15		Meaning of "End of no passing zone" sign.
16		Meaning of a warning sign (Roundabout intersection ahead).
17		Meaning of a warning sign (Winding road ahead).
18		Meaning of a warning sign (Slippery road ahead).
19		Meaning of a "Keep right" sign.
20		Meaning of two white continuous lines in the middle of two direction undivided roadway (pavement marking).
21		Meaning of a white broken line in the middle of two direction undivided roadway (pavement marking).
22		Right-of-way at unsignalized intersections.
23		Right-of-way at roundabout intersections.
24		Proper speeds on different lanes along multilane highway.
25	Driving skills	Proper reaction when vehicle slides while in motion.
26		Proper reaction when pavements is wet while driving.
27		Proper reaction if a tyre bursts while driving.
28		Precautions to be taken when driving in poor visibility.

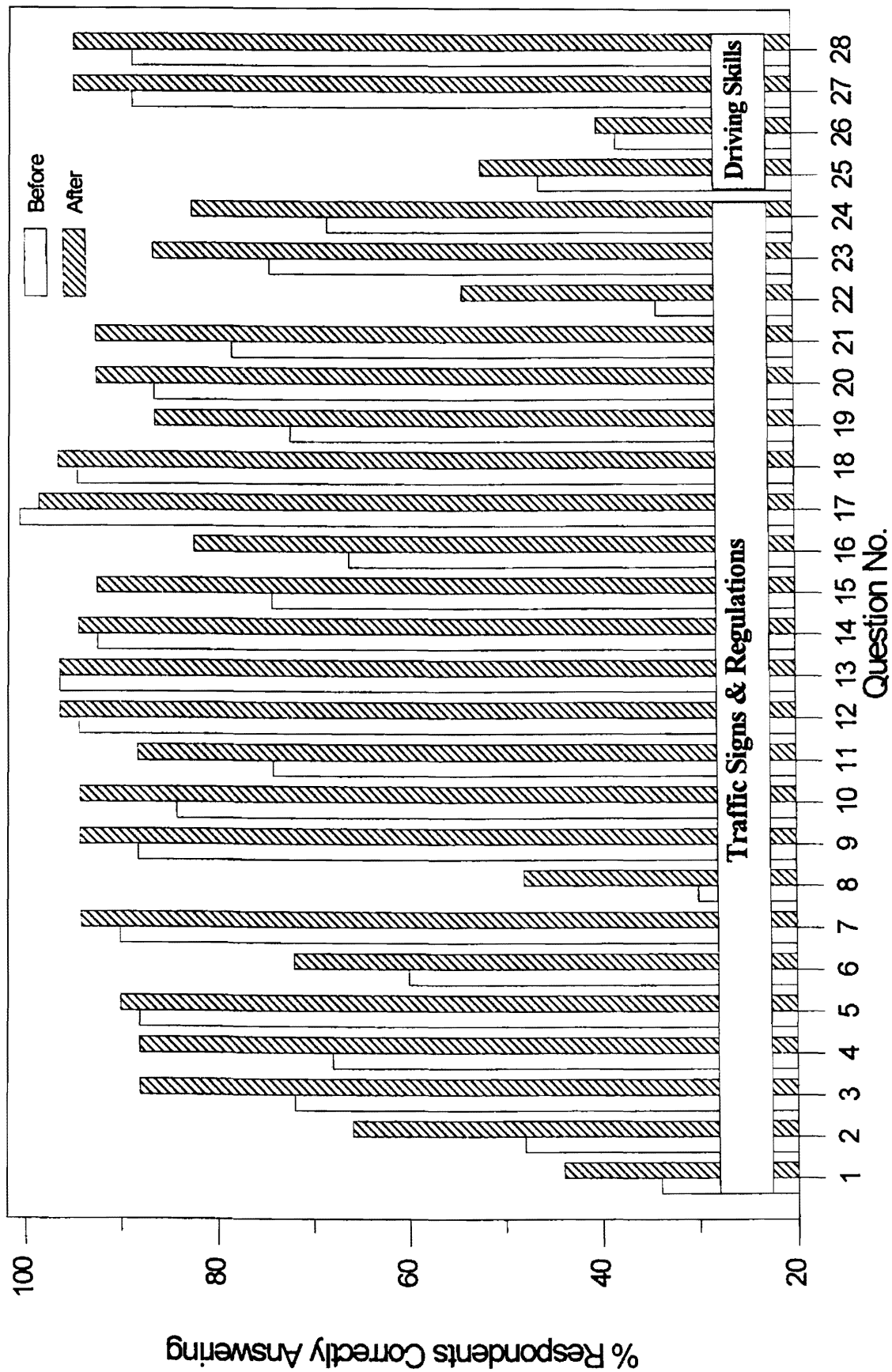
Before
After
Driving Skills
Traffic Signs & Regulations
Question No.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
100
80
60
40
20
% Respondents Correctly Answering

Figure 1.

in the study area and hence personal experience in these issues is limited. For example, questions 25 and 26 deal with issues related to driving in icy or rainy conditions, both of which are quite rare in the area. The same argument of inadequate personal experience can also be extended to questions 8 and 22.

The age distribution of the two samples is shown in Table 2. The questions of the questionnaire were evaluated equally with a score of one and zero given for each correct and incorrect answer respectively. Thus, the maximum score of a respondent was 28.

Differences between different populations were tested using a two stage process [7]:

1. The equality of variances ($H_o : \sigma_i^2 = \sigma_j^2$) was first checked using the "F" test at 95% confidence level.
2. Depending upon the outcome of the first test, a t-statistic was calculated using the following formulas:

(i) if $\sigma_i^2 = \sigma_j^2$:

$$T = \frac{X_i - Xj}{S_p\sqrt{(1/n_i) + (1/n_j)}} \tag{1}$$

(ii) if $\sigma_i^2 \neq \sigma_j^2$

$$T = \frac{Xi - Xj}{\sqrt{(\sigma_i^2/n_i) + (\sigma_i^2/ni)}} \tag{2}$$

where:

X_i, X_j	=	population means
n_i, n_j	=	population sizes
S_p	=	pooled standard deviation
σ_i^2, σ_j^2	=	population variances

The average scores and other relevant statistics of the sample before and after enrolling in the driving school are summarized in Table 2. The table shows no clear difference in the average scores of the three age groups before enrolling in the driving school. These averages ranged from 19.8 (71% correct) to 20.9 (75% correct). This conclusion is also statistically confirmed using the t-statistics as shown in Table 3. The table shows that with at least 95% confidence, there is no statistical difference between the average scores of the three age groups before enrolling in the school. It seems that age has no significant effect on driving knowledge before enrolling in the driving school.

Table 2 also shows that the average scores after completing the course are higher than those obtained before enrollment. The improvement is considerable for age group 2 (22–30 years) and group 3 (31–39 years), but not so much for the first group (17–21 years). Table 4 confirms this observation where it shows that there is a statistical improvement, with at least 95% confidence, in the performance of age groups 2 and 3, but not for group 1. Thus, improvement is statistically evident for individuals older than 21 years old. This improvement is 4.94 (18%) for the second group and 3.37 (12%) for the third group. Furthermore, the average scores for age groups 1, 2, and 3, after completing the course, are statistically different from each other, as can be seen from Table 5. The same table shows that the second age group (22–30 years) has the highest average score after completing the training program, namely, 24.87 (89%).

The average score for both question categories of the questionnaire before and after completing the training program is shown in Table 6. This table shows, with at least 95% confidence, that there is no statistical

difference between the average scores of driving skill questions before and after completing the training program. The improvement in average scores of the traffic sign and regulation questions, on the other hand, is statistically significant.

For the whole sample (50 individuals), the average scores before and after completing the course are 20.24 (72%) and 22.92 (82%), respectively. With at least 95% confidence, this improvement (10%) is statistically significant as established in Table 6.

5. CONCLUSIONS

The study shows that age, per se, seems to have no effect on how much people know about driving before enrolling in the driving school. Generally speaking, the driving school enhances the trainee's knowledge about driving. However, the study indicates that the improvement is mostly attributed to a better understanding of traffic signs and regulations and not to a change in how much the trainees know about driving skills.

The overall improvement is 10% which means that an average of 3 more questions (out of 28) can be expected to be answered correctly as a result of the training program. This improvement was shown to be statistically significant. Nevertheless, the effect of the school on young individuals below 22 years is doubtful and, statistically, could not be proven.

6. RECOMMENDATIONS

A number of studies have indicated that the percentage of young people involved in traffic accidents is higher than that of older people [6, 8, 9]. Ironically, this study has shown that young people do not appear to benefit from the driving school. Therefore, it is recommended that serious attention should be given to young people in terms of driving education and licensing, and that programs specifically directed towards improving the knowledge of young people in this respect should be developed. It is also recommended that the Dammam driving school invests more effort in enhancing all trainee's knowledge of driving skills.

Table 2. Reduced Data of the Experiment.

Age Group No.	Before Enrolling in School				After Finishing School			
	Sample Size n	Variance ς^2	Average Score X	ς^2/n	Sample Size n	Variance ς^2	Average Score X	ς^2/n
1 (17–21 years)	21	9.3269	20.90	0.444	23	9.0791	21.52	0.395
2 (22–30 years)	14	10.3491	19.93	0.739	15	1.6952	24.87	0.113
3 (31–39 years)	10	7.1610	19.80	0.716	12	1.7879	23.17	0.149
Whole Sample	*50	9.3025	20.24	0.207	50	7.0547	22.92	0.141

*Sample contains five persons not revealing their age group.

Table 3. Comparison of Average Scores Among Age Groups Before Enrolling in the School.

H_o: [a] $X_i = X_j$	$X_i - X_j$	T	$t_{0.025}$	Conclusion at 95% Confidence
$X_1 = X_2$	0.97	0.901	2.0357	Cannot Reject H_o
$X_1 = X_3$	1.10	0.973	2.045	Cannot Reject H_o
$X_2 = X_3$	0.13	0.104	2.074	Cannot Reject H_o

[a] X_i = means score for age group i;
$X_1 = 20.90$, $X_2 = 19.93$, $X_3 = 19.80$

Table 4. Testing Improvement of Each Group.

H_o: [a] $X_{iA} = X_{iB}$ [b]	$X_{iA} - X_{iB}$	T	$t_{0.025}$	Conclusion at 95% Confidence
$X_{1A} = X_{1B}$	0.62	0.677	2.019	Cannot Reject H_o
$X_{2A} = X_{2B}$	4.94	5.352	2.110	Reject H_o
$X_{3A} = X_{3B}$	3.37	3.623	2.160	Reject H_o
[c] $X_A = X_B$	2.68	4.686	1.985	Reject H_o

[a] X_{iA}=average score of age group i after school
[b] X_{iB}=average score of age group i before school
[c] Whole sample

Table 5. Comparison of Average Scores Among Age Groups After Finishing the School.

H_o: [a] $X_i = X_j$	$X_i - X_j$	T	$t_{0.025}$	Conclusion at 95% Confidence
$X_2 = X_1$	3.35	4.701	2.037	Reject H_o
$X_3 = X_1$	1.65	2.238	2.037	Reject H_o
$X_2 = X_3$	1.7	3.331	2.060	Reject H_o

[a] X_i = mean score for age group i;
$X_1 = 21.52$, $X_2 = 24.87$, $X_3 = 23.17$

Table 6. Testing Improvement of Each Question Category.

Question Category	Number of Questions	Sample Size	Average Score Before School X_B	Average Score After School X_A	T statistics for $H_o: X_A = X_B$	Conclusion at 95% Confidence
Traffic Signs and Regulations	24	50	17.64	20.12	4.421	Reject H_o
Driving Skills	4	50	2.6	2.8	1.121	Cannot Reject H_o
All Questions	28	50	20.24	22.92	4.686	Reject H_o

ACKNOWLEDGEMENT

The authors acknowledge the help, support, and encouragement of the King Fahd University of Petroleum & Minerals and its personnel in conducting this research.

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Paper Received 5 March 1994; Revised 7 December 1994; Accepted 24 June 1995.