Japanese Journal of Applied Psychology
2005, Vol. 30, No. 2, 87-92

Article

The Low-Risk Taking Attitude of Professional Old Drivers:

We Propose to Introduce a Discriminative Reaction Test for Multiple Performance instead of the Test in the Present Mandatory Course for the Elderly

Masabumi TOKORO*

Since 2002, Japanese drivers over the age of 70 who wish to renew their licence have been required to attend a legal traffic safety course for the elderly that includes driving aptitude tests. The aptitude tests in the course are chiefly designed to measure quickness and exactness of reaction towards complicated test subjects. Concerning psychological constructs which the tests can evaluate, it is generally understood that the decline in the performance caused by ageing is unavoidable. The purpose of the aptitude tests is not to find deficiencies and then exclude elderly drivers, but to administer safety education and properly improve their driving behaviour. We think that it is extremely unsuitable to examine only the faults of elderly people in the course. We used the Discriminative Reaction Test for Multiple Performance in this study to estimate both their faults and their strengths. We found by using this test that elderly drivers had a peculiar quality to compensate for the decline in their psychomotor skills caused by ageing.

key words: the legal traffic safety course for the elderly, driving aptitude tests, psychomotor skills, ageing.

INTRODUCTION

The ageing of the Japanese population and the increase in elderly drivers

Japan is a prominent country in the world which has a large ageing population. The Japanese population is ageing faster than any other country in the world, and the situation causes serious problems for society. The percentage of Japan's population aged 65 or over was only at the seven percent level in 1970, but just thirty years later it was above seventeen percent. Ageing studies are understood to be one of the most important research subjects in Japan.

Besides having an ageing population, the decrease in the birth rate has been recognised as a pressing social issue in Japan. It was reported in 2002 that the average number of children which a Japanese woman bears in her lifetime was 1.32. A falling birth rate and a rising average life expectancy will continue to push forward an increase in the percentage of the elderly, and it is projected that in 2015 one in every four Japanese will be 65 or older. After 2006 Japan's population will decline and one hundred years later, it is predicted that Japan's population will become half its present level.

With the rapid onset of an ageing society and also the growth in motor vehicle transport over recent years, more and more senior citizens hold driving licences. The number of senior citizen license holders grew 2.3 times the 1992 figure (3.52 million) to 8.25 million in 2002. Although the rate of license holders (to the overall population in that group) was a low 34.9% compared to the over 16 age group at 70.9%, when compared to the 21.7% of 1992, we can see that it has

* Department of Business Administration, Kokushikan University, 4-28-1 Setagaya, Setagaya-ku, Tokyo 154-8515, Japan.

grown 1.6 times (Management and Coordination Agency, 1993, 2003).

In examining senior citizen licence holders based on gender and age group, we can understand that the rate of males was 1.4 times the 1992 figure in 2002 at 65.4% while the rate of females was 3.5 times the 1992 figure at 12.7%. The increase in female license holders was approximately 2.5 times more than male license holders. Moreover, in seeing driving licence holders in people who are now fifty something or in their late forties, the rate of male licence holders is over 90 percent (to overall population in that age group) and the rate of females is about 70 percent. As they are sure to be elderly people in the future, it is inevitable for Japan to have a great many elderly drivers in the future.

As the number of senior citizen drivers has increased, so have fatalities for motor vehicle occupants in this age group. This trend has been continuing since 1989. In 1995, senior citizen fatalities for motor vehicle occupants at last surpassed the number of pedalcyclists' fatalities to come second to pedestrian fatalities. We are worried that senior citizen fatalities involving motor vehicle occupants will continue to increase in the years ahead.

The legal traffic safety course for elderly drivers

Due to these circumstances, Japanese drivers of 75 years old and older have been legally obligated to undergo a special traffic safety course on the renewal of their driving licence since 1998, and then after 2002 drivers aged 70 or over are subjected to this course.

It is understood that the aim of this course is to let elderly people realise exactly their present driving abilities and also to let them realise some ways for driving safely. It should be mentioned also that this course never aims at finding faults and then excluding them.

We think that driving aptitude tests included in this course are very important psychologically. The aptitude test consists of four tests as follows.

1. Simple reaction test.
2. Choice reaction test.
3. A test of handle operation.
4. A test dealing with complicated subjects.

A section of the test apparatus is displayed on a personal computer screen in the form of a car driving simulation.

Doubts about the test battery in this case

Four tests in this course are designed to measure quickness and exactness of reaction. A lot of research results have already shown that the performance on quickness and exactness of reaction declines along with age (Yabuhara, 1978, 1980; Fujita, 1985; Tokoro, 1997).

On the other hand, it is well known that people who are prone to cause accidents have a peculiar property in that their motor reaction is more dominant than their sensory reaction. This is called Drake's theory (Drake, 1940; Nagayama, 1976). Few researchers have yet examined whether these characteristics of Drake's theory apply to the elderly. We should investigate whether elderly drivers possess the characteristics which Drake's theory indicates, as well as measuring the traits that the decline in abilities caused by ageing is inevitable.

So in this study we tested many drivers, including elderly drivers, a Discriminative Reaction Test of Multiple Performance, which can measure the characteristic which Drake's theory puts forward, moreover we examined the effectiveness of this test and now emphasise the importance in measuring these traits in the legal traffic safety course for elderly drivers.

METHOD

Methodology for the Discriminative Reaction Test of Multiple Performance Type

(1) Working procedure

This test is a kind of Choice Reaction Test. The subjects were required to respond in

Table 1 The response guidelines for the test stimulus (Tokoro, 2002)

Stimulus	⇒	Response
Blue Signal	⇒	Push Button A with Right Hand
Yellow Signal	⇒	Push Button B with Left Hand
Red Signal	⇒	Step on the Pedal with Right Foot
Blue or Yellow or Red plus Buzzer	⇒	Don't push any button or pedal

accordance with the guidelines for the test stimulus, which are shown in Table 1. The numbers of trials were 16 including four buzzers.

(2) Psychological constructs which the test can measure

The test was developed by a research group at Tohoku University in the early 1960s. Before developing this test, Ohwaki and other researchers at Tohoku University (1944) had been studying the relationship between accident proneness and choice reaction time in drivers. This test was given birth as the fruit of the study of the Ohwaki research group.

The research group investigated the criterion related validity of this test in cooperation with three hundred railway drivers (Maruyama et al., 1961; Nagatsuka et al., 1961). They found that drivers who caused accidents in the past reacted more quickly than the non-accident driver, and also the accident-drivers had more reaction errors than the non-accident drivers. They suggested that drivers who are prone to accidents have a peculiar property in that their motor reaction is more dominant than their sensory reaction. In short they concluded that the psychological construct which the test could measure was the motor-dominant reaction.

Nagatsuka (1985), one of these research members in particular, paid attention to the situation when both visual stimulus and hearing stimulus were given to drivers at the same time. It is difficult to restrain the motor reaction caused by visual stimulus even though the test guidelines state to the driver hearing stimulus is important, because visual stimulus overrides hearing stimulus. The effectiveness of this test has been investigated, in the later by Yoshida (1990), Tokoro (1994) and so on.

Participants

The participants were 513 male professional drivers from a large transportation firm. Forty-six of them were aged 55 or older, and the rest 467, were under 55. Fifty-seven of them were persons who caused traffic accidents in the past three years, and the rest, 456, had not caused accidents.

RESULTS

We paid attention to the response to a buzzer successively ringing twice. In this

Table 2 The four patterns of the response when a buzzer successively rang twice

	First trial	Second trial
Pattern 1	Right	Wrong
Pattern 2	Wrong	Right
Pattern 3	Right	Right
Pattern 4	Wrong	Wrong

Table 3 Distribution of the four patterns of the accident group and non-accident group (Tokoro, 1994)

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Total
Accident group	21 (36.9)	6 (10.5)	24 (42.1)	6 (10.5)	57 (100.0)
Non-accident group	92 (20.2)	33 (7.2)	284 (62.3)	47 (10.3)	456 (100.0)
All samples	113 (22.0)	39 (7.6)	308 (60.0)	53 (10.3)	513 (100.0)

Note: 1. A significant level based on chi-square test is $p<0.01$.
2. The numerical values in parentheses show the rate.

Table 4 Distribution of the four patterns of the 55 or older group and the under 55 group

	Pattern 1	Pattern 2	Pattern 3	Pattern 4	Total
55 and older	7 (15.2)	10 (21.7)	22 (47.8)	7 (15.2)	46 (100.0)
Under 55	106 (22.7)	29 (6.2)	286 (61.2)	46 (9.9)	467 (100.0)
All samples	113 (22.0)	39 (7.6)	308 (60.0)	53 (10.3)	513 (100.0)

Note: 1. A significant level based on chi-square test is $p<0.01$.
2. The numerical values in parentheses show the rate.

condition the four patterns of the responses which are shown in Table 2 were observed. We believe that the participants included in pattern 1 easily estimated that there was little possibility that a buzzer would ring twice successively. The results showed that the accident group achieved a higher rate than the non-accident group concerning pattern 1 (see Table 3).

The results showed that the older group of 55 years or older achieved a lower rate than the younger group of under 55s concerning pattern 1 (see Table 4).

In addition the results in Table 4 showed that the older group achieved a higher rate than the younger group concerning pattern 3.

DISCUSSION

It was found that persons included in pattern 1 had a peculiar property in that their motor reaction is more dominant than their sensory reaction, because they are easily able to predict the test pattern, and also behave hastily instead of confirming sufficiently. That is to say, we can understand that persons included in pattern 1 possess a characteristic which Drake's theory indicates. It can be inferred that their personality trait causes dangerous behaviours to make them unable to properly deal with an awkward situation, and they are prone to causing traffic accidents.

We would like to emphasize the results relating to the significant difference between the accident group in professional drivers and the non-accident group in pattern 1. Professional drivers travel at least forty thousand kilometers per year. Moreover, participants in this study were put into the accident category even if they only caused one traffic accident in the last three years. Therefore, The DRTMPT can be said to be an excellent driving aptitude test which can discriminate the group that rarely cause accidents from the non-accident group.

Next, it is considered that persons included in pattern 2 have a prudent tendency to be enforced after they have made errors. It can be inferred that their personality trait leads to safe behaviours showing low risk-taking attitudes towards driving, and that they are unlikely to cause traffic accidents.

The results in this study showed that the older group achieved a lower rate than the younger group concerning pattern 1, and that the former achieved a higher rate than the latter concerning pattern 2. We can see that the older drivers don't possess the tendencies which cause traffic accidents, as Drake's theory indicates, and that they have a prudent tendency to show low risk-taking attitudes. Therefore we can assert that older persons with these traits would behave properly while driving.

In addition the results showed that older persons achieved a lower rate than younger persons concerning pattern 3 which is required to deal exactly with complicated situations. It is considered that these results are unavoidable judging from various phenomena of ageing. We have already remarked in the introduction in this paper that a lot of research in the past showed the same results.

On the other hand a low risk taking approach to driving which is shown in pattern 2 is the important factor in compensating

for the decline in psychomotor skills caused by ageing. We believe that it is necessary to let older people realise these facts. It is considered that the present aptitude tests are intended to let older people realise only the inevitable decline in abilities caused by ageing. We have to say that the tests completely lack the viewpoint of letting elderly people recognise their good points, as well as their bad points.

It is well known psychologically that people have to plainly accept their own character traits if they want to change their own behaviour or attitude. For the above reasons, clients in psychotherapy are always asked to be self-accepting (Rogers, 1951, 1977).

Elderly people especially have psychological issues of self-esteem or self-confidence as they are more prone to evaluate the worth of their existence than younger people (Dittman-Kohli, 1990; Ryff, 1991; Shimonaka, 1988; Tokoro, 1993, 2001). Therefore it is necessary to let elderly people acknowledge their good points as well as their faults, in order to let their attitudes or behaviours change towards driving safely.

We can suggest that the Discriminative Reaction Test of Multiple Performance Type, which we used in this study, is an excellent aptitude test in for the purpose of evaluating their good points and bad points for elderly people. It is important for elderly people to recognise that they possess both deficiencies in the decline of their abilities caused by ageing, and positive points for compensating their faults, through counselling after the test is carried out. As mentioned above, we intend to introduce the "Discriminative Reaction Test of Multiple Performance Type" instead of the present aptitude tests in the legal course for the elderly.

REFERENCES

Dittmann-Kohli, F. 1990 The construction of meaning in old age: Possibilities and constraints. *Aging and Society*, **10**, 279–294.

Drake, C. A. 1940 Accident proneness: A hypothesis. *Character and Personality*, **8**, 335–341.

Fujita, T. 1985 Abilities of elderly people, *Yokohama Keiei Kenkyu* (*Review of Management Studies in Yokohama National Univ.*), **4**(1), 7–24. (in Japanese)

Ohwaki, Y. & Ishiwara, I. 1944 Über individuellen Unterschied in der Reaktionsweise gegen ganz selten auftretenden Reiz. *Tohoku Psychologica Folia*, **11**, 9–26.

Rogers, C. R. 1951 *Client-centered therapy: Its current practice, implications and therapy.* Boston: Hougton-Mifflin.
(Translation by Tomoda, F. 1966 *Seishin-ryoho: Rogers, C.R. sensyu dai 2 kan*, Tokyo: Iwasakigakujyutsu-shuppansha)

Rogers, C. R. 1977 *Carl Rogers on personal power: Inner strength and its revolutionary impact*, New York: Delacorte Press.
(Translation by Hatase, M. & Hatase, N. 1980 *Ningen no senzainoryoku: Kojinsoncho no apurochi*, Tokyo: Sogensha)

Ryff, C. D. 1991 Possible selves in adulthood and old age: A tale of shifting horizons. *Psychology and Aging*, **4**, 195–210.

Shimonaka, J. 1988 *Personalities of elderly people: A process on life span development of self concept*, Tokyo: Kawashima-shoten. (in Japanese)

Tokoro, M. 1993 Driving aptitude of the middle-aged analysed from personality factors. *Japanese Journal of Applied Psychology*, **18**, 1–12. (in Japanese with English summary)

Tokoro, M. 1994 A analysis on accident proneness made use of discriminative reaction test of multiple performance type: A study that professional drivers were subjects. *Japanese Journal of Applied Psychology*, **19**, 33–43. (in Japanese with English summary)

Tokoro, M. 1997 *A study on driving aptitude of the middle-aged.* Tokyo: Hakutou-shobou. (A publication of a doctoral dissertation by Tokoro, M. [Doctorate from Waseda Univ.]) (in Japanese)

Tokoro, M. 2001 An overconfidence approach on driving attitude of older drivers: We propose to include estimations of personal traits about safe driving in the legal driving aptitude tests for the elderly people,

Japanese Journal of Traffic Psychology, **17** (1), 58–62.

Tokoro, M. 2002 A low-risk-taking approach: Helping the elderly drive safer, CD-ROM containing the abstracts presented at the XXV ICAP (International Congress of Applied Psychology) 2002.

Management and Coordination Agency. 1993 *White paper on traffic safety in Japan.* (in Japanese)

Management and Coordination Agency. 2003 *White paper on traffic safety in Japan.* (in Japanese)

Maruyama, K. & Kitamura, S. 1961 Speed anticipation test: A test for discrimination of accident proneness in motor driver. *Tohoku Psychologica Folia*, **20**, 13–20.

Nagatauka, Y. & Kitamura, S. 1961 Discriminative reaction test of multiple performance type: A test for discrimination of accident proneness in motor driver. *Tohoku Psychologica Folia*, **20**, 21–34.

Nagatsuka, Y. 1985 Relationship between accident proneness, fatigue and monotony and reaction time. *The Japanese Journal of Ergonomics*, **21**, 71–79. (in Japanese)

Nagayama, Y. 1976 Relationship between motor reaction and sensory reaction concerning accident proneness: Introduction on an old study by Drake, C. A., *Journal of Traffic Science Society of Osaka*, **6**, 39–42. (in Japanese)

Yabuhara, A. 1978 Change on psychological function caused by ageing (No. 1), *Tetsudou Roudou Kagaku* (*Bulletin of Railway Labour Science Research Institute*), **32**, 189–215. (in Japanese)

Yabuhara, A. 1980 Change on psychological function caused by ageing (No. 4), *Tetsudou Roudou Kagaku* (*Bulletin of Railway Labour Science Research Institute*), **34**, 131–140. (in Japanese)

Yoshida, S. 1990 Problems of aptitude tests: Thirty year development of SART research. *IATSS* (*International Association of Traffic and Safety Science*) *Review*, **16**, 249–258. (in Japanese with English summary)