

2009 Research Report

**Toward the Development of an Educational Program for
Better Control of Emotions While Driving**

Report

March 2010

Organization for the current study (As of March 2010)

- **Project leader:** Kazuhisa Ogawa (Professor, Center for General Education, Tohoku Institute of Technology)

- **Project members:**
 - Hiro Ota (Professor, Faculty of Life Design, Tohoku Institute of Technology)
 - Marehiro Mukai (Professor, School of Psychology, Chukyo University)
 - Takashi Suzuki (Driving Safety Promotion Center, Honda Motor Co., Ltd.)

- **Secretariat:**
 - Ryuichi Abe (International Association of Traffic and Safety Sciences)
 - Yasutoshi Kojima (International Association of Traffic and Safety Sciences)

Contents

| | |
|--|----|
| Abstract | 1 |
| Chapter 1. Issues and Background | |
| 1-1. Introduction | 3 |
| 1-2. The need for providing education on controlling emotions | 4 |
| 1-3. Educational scenario | 7 |
| 1-4. Purpose of the current study | 8 |
| Chapter 2. Educational program | |
| 2-1. Program structure | 9 |
| 2-2. Introductory step | 10 |
| 2-3. Self-evaluation | 12 |
| 2-4. Understanding stress theory | 14 |
| 2-5. Learning coping measures | 15 |
| 2-6. Setting action goals | 17 |
| Chapter 3. Method | |
| 3-1. Participants in the research project | 19 |
| 3-2. Research design | 19 |
| 3-3. Educational program | 21 |
| 3-4. Questionnaire | 23 |
| 3-5. Research procedures | 27 |
| 3-6. Test equipment | 29 |
| 3-7. Analysis of educational effects | 29 |
| Chapter 4. Results | |
| 4-1. Trainees' evaluation of the educational program | 31 |
| 4-2. Changes in stress reactions and self-efficacy | 38 |
| 4-3. Changes in driving behavior | 47 |
| Chapter 5. Discussion | |
| 5-1. Summary and issues to address | 51 |
| 5-2. To promote more widespread application of educational programs for driving behavior | 53 |
| Glossary | 55 |
| Acknowledgments | 57 |
| References | 57 |
| Appendix | 59 |

Abstract

Controlling one's emotions is a crucial skill for safe driving. In this study, personal experience of negative emotions such as irritation or impatience is treated as a psychological stress reaction, and the "transactional model of stress, appraisal and coping" is used as the theoretical basis of an attempt to develop a driver education program. An educational scenario focused on enhancing self-understanding of participants' emotional experiences and their process of learning coping measures was established. A trial educational program was created with the aim of improving program participants' skills at controlling their emotions. A total of 102 professional drivers engaged in transport and delivery took part in the educational program. The effectiveness of this educational program was examined through an analysis of changes in participants' awareness and driving behavior.

The main findings are: 1) The participants' evaluation of the program shows that they had mostly favorable impressions of the program and that they were highly receptive to the program. 2) A lowering of stress reactions was observed for anger experienced by participants toward unsafe behavior of others and their feeling rushed because pressed for time, together with a rise in their self-efficacy (the sense that one can somehow cope). Changes were particularly noticeable in younger participants' awareness toward their feelings of impatience. 3) Among different personality traits, the more extraverted the person, the more likely it was that their self-efficacy with respect to anger improved after the program. 4) Results were unable to show clear empirical data for quantitative changes in driving behavior such as changes in g-force acceleration.

Certain results were achieved through education, showing that the program was effective, but new issues have also been identified. Possible areas of future research are discussed, including measures for sustaining the effects of the educational program, the means for evaluating changes in driving behavior, and the creation of a manual for disseminating its educational benefits.

Chapter 1. Issues and Background

1-1. Introduction

When a person works with renewed vigor and enthusiasm, it helps to raise not only productivity but also the level of safety in the work environment. Negative emotions such as irritation, impatience, or anger may lead to unsafe behavior such as risk-taking behavior and neglecting to conduct required checks, which could become a causal factor for an accident. This issue has been frequently indicated in various studies on human factors. However, researchers have tended ultimately to handle the issue as erroneous judgment by the person involved in an accident or as a legal violation, so that the issue has barely been examined as a direct topic for driver education. The theme of negative emotions and its impact on driving behavior can thus be considered an unexplored area in the field of safety education. The current study focuses on this educational theme.

The purpose of the study is to develop an educational program for improving drivers' skills in controlling their emotions. The study includes the trial production of an educational program, measuring the program's effectiveness through surveys, and collection of basic data on the educational effects.

Project research started in 2008. Information was gathered regarding psychological stress reactions experienced while driving, which are negative emotions including irritation, impatience, anger and anxiety. Two types of research were conducted to shed light on the driving situations that give rise to negative emotions. One was a survey based on interviews of professional drivers of large vehicles, and the other was a behavioral evaluation that measured drivers' physiological reactions such as their heart rate. The survey research yielded abundant information regarding the situational factors that give rise to negative emotions and effective measures for controlling such emotions. This information was used in creating the teaching materials used in the 2009 educational program. The behavioral evaluation research showed the difficulty in evaluating the effects of emotions on driving behavior on the basis of physiological indicators, leading to the recognition that methods to evaluate driving behavior directly are important. As a result, a method using driving recorders for direct evaluation of driving behavior was adopted in 2009.

In 2009, research is being undertaken to create a concrete, trial educational program and to analyze its educational effects. This trial program consists of two main steps totaling 90 minutes: gaining self-understanding of emotional characteristics and learning coping measures to apply when experiencing negative emotions. In the self-understanding step, specific driving scenes are set up, and self-evaluation processes corresponding to the level of negative emotions (the extent to which the subject experiences negative emotions) and the level of inappropriate driving behavior (the extent to which the subject chooses unsafe behavior when experiencing negative emotions) are added. Participants compare their own emotional characteristics to those

of other participants and attempt to gain insight into the causes of their emotions. As a result, each person gains an understanding of their own characteristics with respect to the relationship between driving and emotions. In the coping step, the second step, participants conduct group discussions and learn specific measures for coping with various situations through these discussions. If such effective measures are lacking, the ability to control one's emotions will likely be limited, making it more difficult to break free of negative emotions. Each participant is asked to find their own answers to the question, "What means of coping will help you calm down and maintain safe driving?" Having a variety of coping measures which fit one's characteristics may be an effective means for enhancing emotional control skills.

Professional drivers were asked to take part in this educational program, which focuses on participants' reactions and changes in their awareness and driving behavior. The program's educational effects were analyzed with the hope of shedding light on the program characteristics and any problems. Basic data for improving the program was obtained as a result.

1-2. The need for providing education on controlling emotions

Controlling one's emotions is a crucial skill for safe driving. According to the hierarchical approach to analyzing driver behavior in traffic, emotional control skills are placed at the highest level along with the dominant functions for other necessary skills for safe driving, such as maneuvering a vehicle and anticipating risks. For example, even if a driver has excellent vehicle maneuvering and risk anticipation skills, inadequate control over emotions that will place the driver in a stressful situation in relation to other people or time pressure could trigger risky behavior such as passing another car with little room for maneuver, exceeding the speed limit, failure to stop, or not keeping sufficient distance from the car in front. To consistently ensure safe driving, it is essential for each driver to master emotional control skills.

The basis of the hierarchical approach is the assertion that excellent vehicle maneuvering skills alone do not lead to safe driving. While improving vehicle operating skills to a high level is certainly an important factor to enable safe driving, such skills by themselves do not result in safe driving. Proof for this assertion can be found in the higher accident rate among young drivers despite the fact that they tend to have superior driving skills compared to other age drivers.

What other skills are, then, needed for safely driving a vehicle? To answer this question, a model for driver behavior has been developed in the field of traffic psychology. This model asserts that the skills to be mastered for safe driving should be categorized into several different types and that these skills constitute a hierarchical structure, called the "hierarchical approach," in which a higher level controls its lower levels. This model, proposed by Keskinen (1996), has been the most widely accepted theory and is expected to have practical application in driver education.

According to the Keskinen model, the required skills for safe driving consist of four different

elements or levels (see Figure 1-1). The lower-level skills start with “vehicle maneuvering” at the first (lowest) level. The skills to operate a vehicle are naturally needed before other skills. In the initial stages of skill training at a driving school, a student driver learns the basic operations of the brakes, the accelerator, the steering wheel, and other vehicle components. These basic operational skills correspond to the skills on the first level of the hierarchical model. The second level consists of “mastering traffic situations, including risk anticipation.” To adapt to a complex traffic environment, a driver needs to correctly “read” the traffic situation and the layout of the road ahead, then pay sufficient attention in a proper, well-balanced way and choose a strategic behavior for maintaining safe driving. Duly carrying out these tasks forms the core of safe driving. Particularly essential are the abilities to anticipate others’ behavior and read ahead how the situation may evolve. A driver is required to master these skills as the skills for anticipating risks.

The third level consists of the “goals and context of driving, including the setting of driving schedules and the selection of safe routes.” Naturally, an unreasonable driving schedule will impose time pressure on a driver. If the driver lacks the ability to envision both efficient scheduling and safety at the same time, the risk of a traffic accident will heighten, even if the driver has already mastered the vehicle maneuvering and risk anticipation skills mentioned above. How a driver makes decisions on matters related to driving schedules, such as the selection of a safe driving route to reach the destination and the time-of-day for driving, has a considerable effect on whether safe driving can be maintained.

The fourth level of this hierarchy is the “goals for life and skills for living, including self-control skills.” This set of skills is related to one’s social life in general, including personal motivations and values and has a substantial effect on adopted behavior, such as taking undue risks. The values that a person brings to the task of driving—a part of the personal development process—generally affects the driving behavior adopted by that driver. For example, if the driver places a high value on saving time through high-speed driving, there is an increased possibility that the driver will take high-risk actions in choosing driving speed when in a hurry. In addition to personal values, personal motives and emotions are also potential risk factors inherent in an individual, which affect the driver’s decision-making process when adopting a given behavior. These inherent factors require self-control; thus, goals for life and skills for living, including emotional control, are placed in this fourth level as the safe driving skills with the most dominant function.

The formation of a hierarchical structure from these four types of skills means that upper-level skills exercise a controlling effect on the functions of lower-level skills. The skills on each hierarchical level are indeed very important skills that every driver should learn and master, but the important matter when learning these skills is to graduate to learning the higher-level skills with more dominant functions, starting from “vehicle maneuvering” and progressing in turn to the “goals for life and skills for living.” To enable this evolutionary learning process, an educational program corresponding to each hierarchical level should be

provided to trainees. Current driver education programs mainly focus on the first and second levels, but there is a shortage of programs providing education for mastering the third and fourth levels. Virtually no educational program at present focuses on the emotional control process in the fourth hierarchical level, for instance. These circumstances led to the planning of the current study.

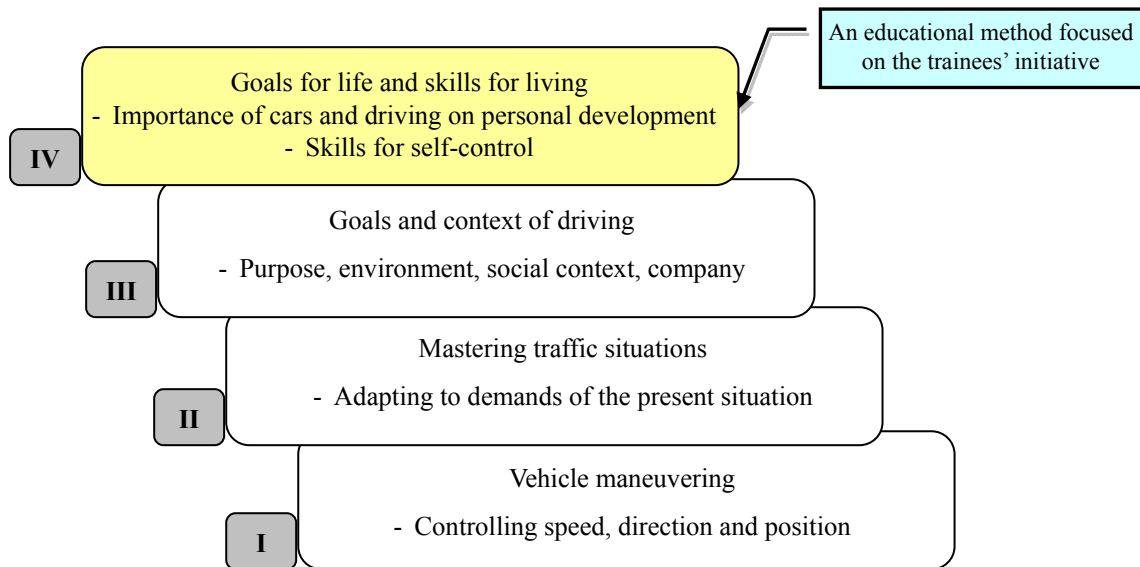


Fig. 1-1. Hierarchical approach to driving behavior (Keskinen, 1996)

Adopting the theme of “controlling one’s emotions,” the educational program is apt to face difficult challenges with its methodology. Vehicle maneuvering is about learning certain actions and behavior, and risk anticipation is about acquiring certain knowledge. For both of these skill sets, the learning content can be clearly defined and established as a program, enabling an instructor to teach trainees by giving specific instructions. In contrast, it is difficult for a third party to design and establish the program content for teaching emotional control because this skill depends on the trainee’s personal characteristics. How to deal with negative emotions is up to each person, and there is no more adequate approach than finding the means on one’s own. What is important for an educational method in this area is to allow the trainees to understand their own emotional tendencies and take the initiative in learning the best-fitting approaches that help them cope with their emotions. This means that an educational method that provides emotional control must focus on the trainees’ own initiative. A trial educational program created as part of the current study attempts to do this by developing teaching materials and a program evolution that elicit participants’ initiative in finding their own coping measures as much as possible.

1-3. Educational scenario

The current study adopts the approach of the “transactional model of stress, appraisal and coping” (Lazarus and Folkman, 1984) as its theoretical background for designing an educational scenario. According to this theory, stress reactions including negative emotions depend on the cognitive appraisal of the situation. How an individual interprets the present situation determines the emotions they will experience. A cognitive appraisal is performed on whether the situation would be harmful to one’s well-being, and if perceived as harmful, whether the situation is controllable or not. If the person interprets the situation as harmful and as one in which they have no ability to control, then strong negative emotions such as anxiety and impatience are evoked. Different people interpret a given situation in different ways, which lead to the individual differences in stress reactions.

The important element for restraining the arousal of negative emotions and reducing stress reactions is to have an awareness that it is possible to control the situation. Obtaining this awareness requires a change in the individual’s perspective of the situation and having a set of persuasive phrases to tell themselves. In other words, it is important to have numerous means of coping and to enrich one’s personal resources.

For example, if a car abruptly cuts in front of a given vehicle, the driver of the vehicle can, regardless of the facts, interpret the situation as follows: “This guy must be in a real hurry, and probably couldn’t bring himself to check what was going on behind him.” Such an interpretation can lower the emotion of the aroused anger to a certain degree. Having a full set of persuasive phrases to tell oneself as personal resources and reinforcing one’s coping measures heightens self-efficacy and provides the sense that “I can somehow cope with the situation.” Self-efficacy consists of the awareness that an individual can perform certain actions and the ability to envision concrete means to effect such actions. The ability to envision specific coping procedures generates a sense of being able to resolve the situation and leads to the recognition that the situation is indeed controllable. The goal of the educational program developed in the current study is to offer opportunities for learning how to change one’s perspective of a situation and to enhance participants’ skills in controlling their emotions.

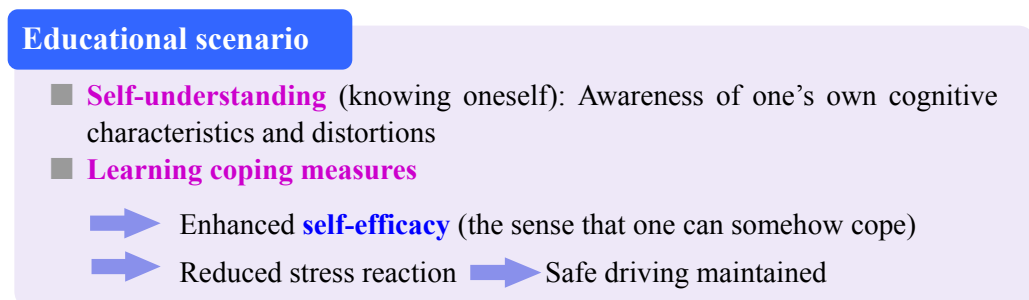


Fig. 1-2. Educational scenario

On the basis of the above-mentioned theoretical background, Figure 1-2 shows the main elements of the educational scenario adopted in the current study, which then developed through a series of steps into a concrete educational program. The key element is learning the self-understanding process and coping measures. Learning and mastering a variety of means to cope with situations helps enhance self-efficacy, reinforcing the awareness that one can somehow cope. This process is posited to lead to reduced stress reactions. Before learning the coping measures, the trainee must know their personal characteristics. Based on self-understanding of the types of characteristics and distortions in one's own cognitive appraisals of a situation, the program aims to evolve this self-understanding into a learning process for the coping measures that fit each participant. .

1-4. Purpose of the current study

The purpose of the current study is shown below.

- (1) To develop an educational program to assist the development of emotional control by focusing on the learning process for self-understanding and coping measures
- (2) To provide education to professional drivers by using a concrete, trial program and to check the educational effects of this program
- (3) To measure changes in awareness, behavior, and other characteristics of program participants as a means of collecting empirical data on the educational effects
- (4) To obtain basic data for improving the program based on the results of effects analysis

Chapter 2. Educational program

2-1. Program structure

The trial educational program consists of five main steps, requiring approximately 90 minutes' total time for the entire program. It was constructed to allow active participation by trainees as the main players in discussions and to promote the exchange of views and opinions among participants. While the instructor provides only minimum information, the educational process focuses on each trainee's initiative.

Figure 2-1 shows the five steps comprising the educational program. In Step 1, the introductory step, the instructor describes the program's aims and briefly explains how participants should be mentally prepared for taking part in the program and why emotional control education is needed, among other topics.

Step 2, self-evaluation, covers the self-diagnosis process for an individual's emotional characteristics. Typical scenes illustrating emotional experiences while driving are presented, followed by a self-evaluation process regarding each participant's emotional tendencies and driving habits. The main aim of this step is to promote the trainees' understanding of their own personal characteristics through comparisons of self-evaluation results with those of other participants.

In Step 3, understanding stress theory, the participants must gain an understanding of the relevant stress theory. The instructor gives a simple explanation of the transactional model of stress, appraisal and coping—the theoretical background for the program—so that the trainees can have a grasp of the model. An understanding of the principles underlying why we harbor negative emotions can be a source of information that is useful for understanding individual characteristics. Therefore, this step is also positioned as a process to promote self-understanding.

In Step 4, learning coping measures, the trainees learn specific means for coping with stress. This step encourages participants to exchange views through group discussions, thereby allowing participants to search on their own initiative for the means of resolving issues. There is no single coping measure that is effective for everyone. Personal differences in stress reactions mean that each individual employs different means for coping. Thus it is crucial that each participant look for their own coping means by exchanging views with others. Step 4 is thus the central part of the current program. By enriching each trainee's internal resources, the step aims to enhance self-efficacy and improve emotional control skills.

In the Step 5, the final step, the challenges to address for controlling one's emotions are set as specific action goals. Each trainee is asked to establish individual goals, so that they can apply program learning to their daily driving behavior for work.

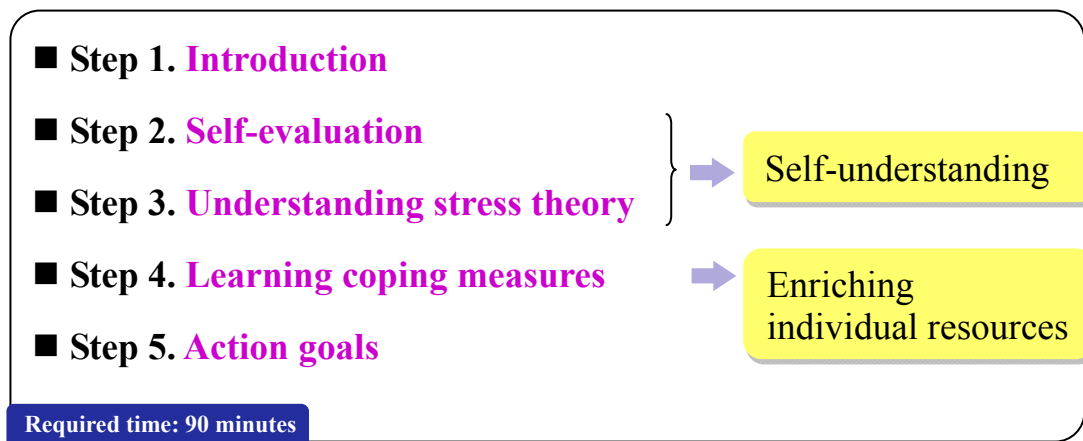


Fig 2-1. Structure of the educational program

The following sections present detailed explanations on the educational processes in each step.

2-2. Introductory step

In the introductory step, the instructor provides a brief explanation of the purpose of the educational program and how it proceeds. It is important to lead participants to understand how to prepare mentally for taking part in the program. Stressing that this program is not one-way education for imparting knowledge and that active participation in discussions will bring more life to the training session, the instructor will emphasize the program's focus on individual initiative, with the trainees themselves as the core players.

To assist group discussion, participants are instructed to observe the four rules of brainstorming: (1) free, uninhibited opinions in which participants feel welcome to express their opinions without restraint; (2) criticism of other participants' opinions is strictly prohibited, regardless of the opinion expressed; (3) favoring quantity over quality, a large number of opinions is welcome on the assumption that a few gems will emerge from the multitude of opinions; and (4) participants are encouraged to build on others' opinions since combining different views can promote idea development. After the brief explanation of the rules, the instructor urges trainees' active participation in discussions.

These explanations are provided at the start of the program, followed by an explanation of why emotional control education is needed and the aim of the training session. Showing statistical data and examples of accidents, the instructor asks participants the following question: "Do negative emotions act as indirect causal factors as the background for accidents?" Using statistics from the 2008 Annual Traffic Accidents Statistics report (Institute for Traffic Accident Research and Data Analysis, 2009), Figure 2-2 shows examples of frequent traffic rule violations that have been identified as occurring together with accidents, accompanied by the number of related accidents. While showing this figure, the instructor asks the trainees, "For the

violations that result in accidents, please think about the driver’s mental state as a background factor. What will cause a driver to exceed the speed limit, fail to stop, not pay enough attention to what’s going on, or neglect to check for safety, among other infractions?” The possibility that negative emotions such as irritation and impatience could lead to such driver behavior in violation of traffic regulations is then suggested.

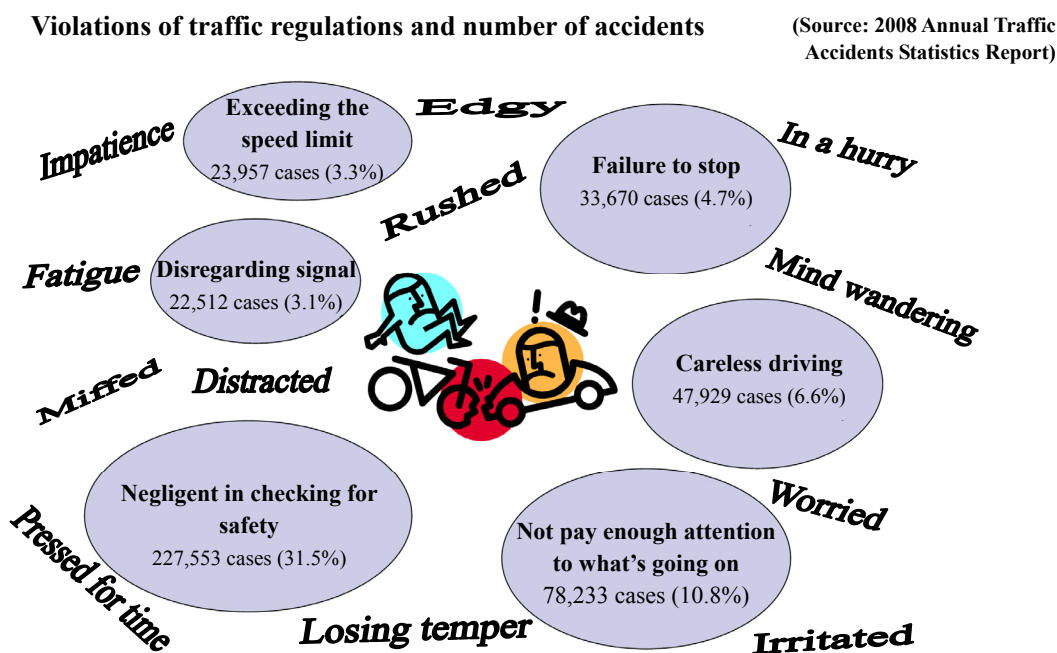


Fig. 2-2. Stress reactions behind traffic accidents and related violations

In this phase of the explanations, the participants may often find themselves in a tense atmosphere in the presence of others. In fact, members of the same group may be meeting each other for the first time. The questions posed in this phase can be used to turn it into an ice-breaking opportunity. For example, the brainstorming method can be used to let members of each group exchange views regarding the possible traffic rule violations related to accidents. Choosing the group leader at the beginning can lead to a smoother process for discussions. It is left up to each group about how to proceed with the discussions, including how to choose the leader and how to present one’s views.

Next, an explanation is provided on the aim of the training session. A suggestion is made to turn the session into an opportunity for self-reflection regarding the question of emotions. This is accompanied by the presentation of three goals (Figure 2-3): 1) to gain self-understanding on each person’s own emotional tendencies, 2) to be more perceptive and aware about one’s emotional condition, and 3) to learn the coping measures for controlling one’s emotions. Correlating these three goals to the three metacognitive elements postulated by Maruyama (1995) results in a correspondence between the first goal and “enriching cognitive information (to have much data for knowing one’s aptitudes), the second goal and “monitoring aptitude

conditions (to let the other self monitor one's own aptitude conditions),” and the third goal and “controlling actions (to have ample means for control).”

The main points of the introductory step have now been stated. The total required time for the proceedings in the introductory step is about 10 minutes.

What to aim for: *Let's think together*

- For **me**, what are the **emotional** factors that could likely lead to an accident?
- How can I be **aware** myself when I'm not sure of my **emotions** and my **driving** is rather rough?
- What can I do **specifically** to **control my emotions and behavior**?

Fig. 2-3. The three goals of the training session

2-3. Self-evaluation

The self-evaluation process is essential for gaining an understanding of a person's own emotional tendencies. This educational program provides the opportunity for such self-understanding through a self-diagnosis test. In this test, 11 driving scenes in which negative emotions can be experienced are shown, and participants are asked to evaluate the level of negative emotions experienced and level of inappropriate driving behavior for each scene presented. For negative emotions, each trainee uses a 4-point self-evaluation scale to assess the extent they would likely harbor similar emotions. Figure 2-4 shows the emotion of anger toward a vehicle that abruptly cuts in front of one's vehicle. By comparing the statements presented with one's own emotional tendencies, each person judges to what degree they would become angry, using the 4-point scale.

For inappropriate driving behavior, the trainee provides an answer about their expected behavior when experiencing negative emotions. A self-evaluation is made by judging the extent, again on a 4-point scale, they would likely assume the aggressive and risk-taking behavior shown in the scene. Figure 2-4 gives examples of behaviors resulting from aggressive reactions to a vehicle cutting in front, such as “warn by honking” and “try not to yield by all means.” Each person is asked to judge whether they tend to react in such ways, using the 4-point scale. Figure 2-5 shows an example of a driving scene in which the driver feels rushed due to being stuck in a traffic jam while in a hurry. Each trainee will judge what their level of negative

emotions experienced and inappropriate driving behavior would be.

These test materials that were used for self-diagnosis were devised with reference to the “iiSA self-control diagnosis test for safe driving” developed by Ota and Ogawa (2005) and are reconstructed for use here.

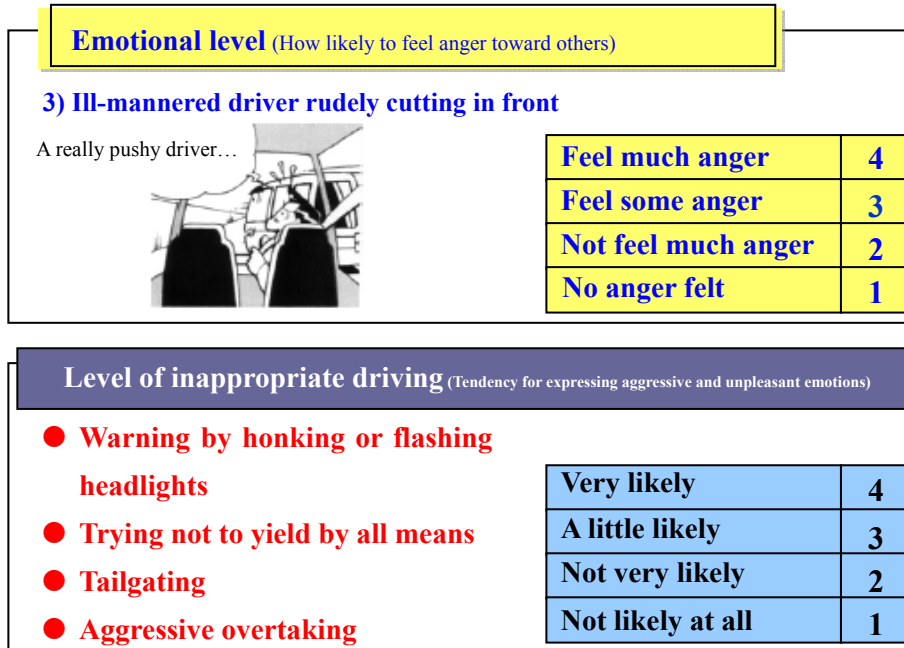


Fig. 2-4. Test materials used for self-evaluation (feeling anger)

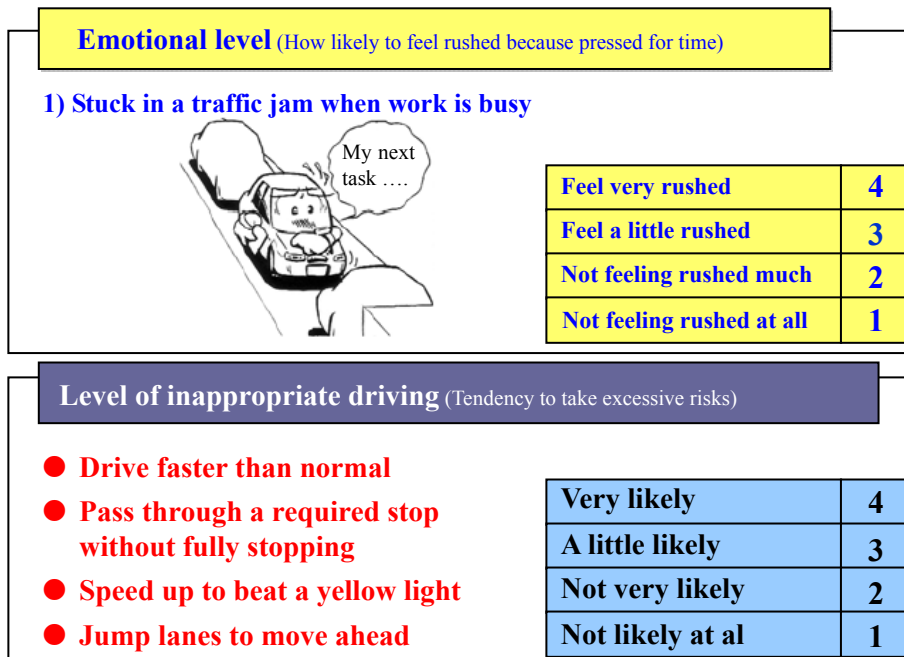


Fig. 2-5. Test materials used for self-evaluation (feeling rushed)

The 11 scenes used for self-diagnosis can be broken down by type of emotion as follows: 5 scenes focus on anger and irritation, 3 scenes focus on feeling rushed because pressed for time, and 3 scenes focus on feeling rushed by unease from awareness of others. These scenes for self-diagnosis are projected on a screen from a slide projector, then each trainee is asked to write their answers on a worksheet handed out in advance.

After the basic self-diagnosis process, the instructor gives participants the following instruction: "Circle any answers with a score of 3 or 4. From the statements with circled answers, please pick one or two that clearly display your characteristics, then add a second circle to create a double-circle." For each trainee, this process becomes an important step in understanding their own characteristics. After the circles and double-circles are marked, the trainees are instructed to cross-check their results in each group. Comparing results with others helps enrich one's knowledge for a better understanding of one's own characteristics.

Time is then set aside for free discussions within each group. Personal views about which scenes drew trainees' attention and why they felt angry or rushed in these scenes should be exchanged freely.

The processes above are the main processes of the self-evaluation step. Total required time is about 20 minutes.

2-4. Understanding stress theory

As stated in Chapter 1, the theoretical background of the current educational program is the transactional model of stress, appraisal and coping (Lazarus and Folkman, 1984). What causes us to experience negative emotions such as irritation or impatience? Knowing the underlying principles at work helps enhance knowledge toward better self-understanding, so an explanation is provided to participants on the meaning of the transactional model, touching on the main points below.

Positive emotions such as joy and happiness give us energy, helping us to work with renewed vigor and enthusiasm, but negative emotions such as irritation and impatience give rise to stress reactions, affecting our activities in unpleasant ways. Negative emotions experienced while driving often lead to a mistake or aggressive reaction, possibly resulting in an accident. Although it is difficult to do away with emotional experiences in this regard, having a grasp of the principles at work behind emotional experiences could help us cope with unpleasant emotions.

The transactional model of stress, appraisal and coping explains that emotional experiences are very much different for each individual. Evaluation of one's personal situation (interpretation and perspective) varies by person, leading to individual differences in emotional experience. The principles at work are illustrated in Figure 2-6. Let's think now about what type of cognitive processes will be involved when a stress reaction is evoked in response to a given situation. For example, suppose a vehicle rudely cuts in front of your vehicle and you feel anger swelling. What kind of interpretation is going on here? If your interpretation is along the lines of "It's because of these people who don't obey rules that accidents happen. Why doesn't this guy observe the rules?" or "Is he giving any thought to the drivers behind him?", wouldn't this lead you to experience emotions of anger and irritation? So let's begin by thinking about our own tendencies in how we interpret events. Thinking about the values, thoughts and beliefs that are at work in the background, each participant is asked to reflect on the characteristics of their own emotional tendencies.

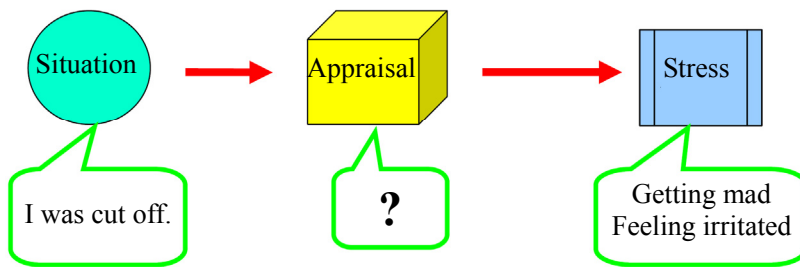
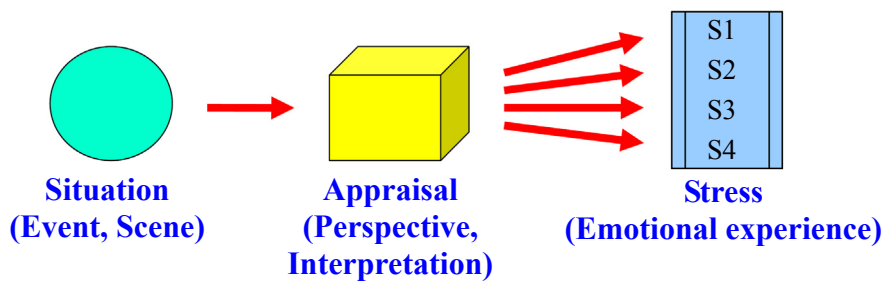


Fig. 2-6. Explanation of stress theory

Explaining the outline of the transactional model of stress, appraisal and coping in this way, the instructor aims to have the participants understand the model. When explaining the model, the instructor should exchange views with participants as necessary, gradually guiding them to active discussions. After the model has been explained, group discussions are conducted, with an exchange of views about group members' awareness and thoughts. During the discussions, the participants are encouraged to jot down notes on their own thoughts on the worksheet.

The time required for the explanation of stress theory is about 10 minutes.

2-5. Learning coping measures

In the next step, specific coping measures are discussed. When experiencing negative emotions as stress reactions, what approaches will be helpful for coping? For this question, the most concrete means possible should be suggested and then participants will exchange their views. This process comprises the main objective of this step. The means for controlling one's emotions presented here is called "self-talk." Self-talk literally involves certain set phrases to tell oneself.

Using the slide shown in Figure 2-7, a brief explanation on self-talk is provided, taking up the following example of a stress reaction: "I was cut off" leads to "getting mad and feeling irritated." It is assumed that the following cognitive appraisal forms the background of this reaction: "Why doesn't this driver obey the rules, while I do?" As long as one interprets the situation in this way, encountering similar situations in the future will lead the person to

experience similar negative emotions repeatedly. The participants are thus asked whether any other interpretation from a different perspective may be possible. This question attempts to change the cognitive appraisal of the situation in which a driver is cut off by another vehicle by having the driver try self-persuasion through use of an interpretation with a consciously shifted viewpoint. For example, regardless of what the facts may be, the driver can come up with persuasive words that interpret the situation in a positive light, such as, “There are all sorts of people in the world” or “Maybe this driver was on urgent business and feeling rushed.” The thinking process and the resulting words can enrich a person’s resources for controlling emotions.

A wide repertoire of self-talk expressions is available, and there may be words and phrases that suit oneself and others that don’t. Trainees conduct discussions in each group to come up with different ideas for self-talk expressions. In the process, each participant searches for the specific coping approaches that they find effective. After the explanation shown on Figure 2-7 is given, a significant slot of time is set aside for these group discussions, as part of the effort to create an active environment in which the trainees themselves will be the main players.

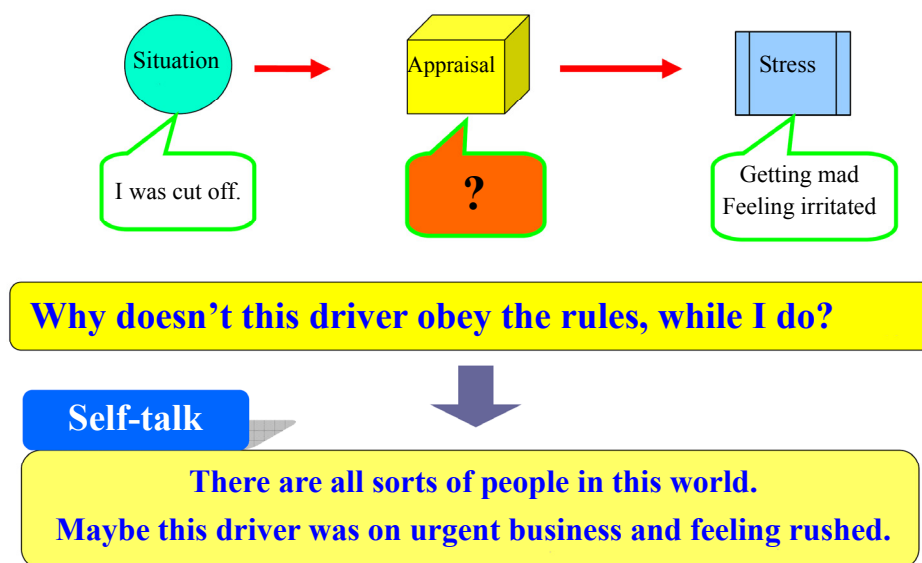


Fig. 2-7. Self-talk as coping measures

Group discussions are conducted for a certain time period, followed by presentations from each group, which will offer an opportunity to know what kind of ideas for coping measures have been suggested in other groups. Afterwards, the instructor presents concrete examples of self-talk expressions that participants can refer to (see Figure 2-8). If group discussions are limited to topics within a narrow scope, these examples may provide hints of the wide range of possible perspectives. However, these are just examples for reference; it should be left up to the each participant’s judgment whether or not a given self-talk expression is an effective coping measure for the person.

| Self-talk Approaches for coping with anger toward others | |
|---|--|
| 1 | Thinking that “I do represent the company” calms me down. |
| 2 | I convince myself that getting mad at such a trivial matter means I’m small-minded. |
| 3 | Rather than “This guy cut in front of me,” I tell myself that “I yielded to let him in.” After all, roads are public space shared by everyone. |
| 4 | I think along the lines of “I can’t change others, but I can change myself.” |

⋮




Fig. 2-8. Self-talk expressions presented by the instructor

After the group discussions and the presentation of examples of self-talk expressions, each participant is expected to find the coping measures that suit best and write them on the worksheet. This sequence of procedures should be repeated for the three types of emotional experiences, “emotions of anger and irritation,” “feeling rushed because pressed for time” and “feeling rushed by unease from awareness of others.” However, if time is tight, it is OK to skip the sequence about “feeling rushed by unease from awareness of others.”

The total time required for the step of learning coping measures is about 40 minutes. Since this step is the most important one in the program, it is desirable to allot as much time as possible to it.

2-6. Setting action goals

The final step provides time for each participant to set their own action goals. The instructor encourages each trainee to sort out what they became aware of, what they thought, and what they have learned through their participation in the educational program, writing down in simple terms the actions they will put into practice to maintain safe driving.

One concrete means for emotional control is to use self-talk. Referring to the self-talk expressions suggested in the group discussions, each participant sets the measures for emotional control that they want to actually put into practice as action goals. If a participant is interested in a certain example of self-talk, they may write it down. Each person writes their thoughts and

visions in the space on the worksheet titled, “My resolution and specific action goals.”

If there is still some time left, the participants can exchange views about each other’s action goals. Asking a number of participants for comments and letting the participants exchange views, the instructor directs the talks toward the conclusion of the training session. The concluding statement by the instructor is along the lines of the following: “What is important in controlling one’s emotions is to have within ourselves a lot of specific means. This helps us keep composure and allows us to look at our mental state from an objective viewpoint.”

The total time required for this final step is about 10 minutes.

Chapter 3. Method

3-1. Participants in the research project

A total of 102 drivers took part in the research project; 98 were male, 2 were female, and data is not available on the gender of 2 drivers. The participants' age ranged from 22 to 63 years, with a mean of 37.38 years (standard deviation: 10.38).

The participants are professional drivers working for logistics and transport companies who mainly work in transport and delivery. The current research project was carried out with the cooperation of two companies. Table 3-1 shows the composition of the project participants.

Table 3-1. Composition of research project participants

| | | Co. A | Co. B | Total |
|----------------------------|------------------|-------|-------|-------|
| No. of participants | | 42 | 60 | 102 |
| Gender | Male | 41 | 57 | 98 |
| | Female | 1 | 1 | 2 |
| | (Missing) | | 2 | 2 |
| Age | Mean | 29.31 | 43.03 | 37.38 |
| | Std. dev. | 4.64 | 9.51 | 10.38 |
| | Range | 22–39 | 26–63 | 22–63 |

Participants were not remunerated. (In token of the gratitude for their cooperation with the research project, a small gift of a ballpoint pen was presented to each person.) The educational program was conducted as a part of the in-house safety training programs at the two companies. Before the program, participants received explanations concerning their cooperation with the research project. Because Research Program I (See 3-2, "Research design") was conducted with the results signed by participants, advance explanations were provided on a separate date concerning the aim of the research, and each participant was asked to sign a letter of acceptance.

3-2. Research design

In the current study, two general types of research programs (Research Program I and Research Program II) were conducted. Figure 3-1 shows the research design of these programs.

First, in Research Program I, measurements were conducted by using a driving recorder to record participants' driving behavior while they did their work. Recording periods were set to 2

weeks before training and 1 week after training. It was decided to examine whether there was any change on the behavioral level through a comparison of behaviors before and after the training. At the time of implementing the educational program, a comparison was made between the participants' awareness before taking part in the program and their awareness afterwards, thereby examining if and how their awareness concerning emotional experiences changed through the program. Furthermore, an interview survey was conducted 1 month after the training session. It was decided to directly gather the voices of the participants regarding what they became aware of and what kind of changes they felt in themselves by taking part in the educational program.

Research Program I had 12 participants, divided into 2 groups of 6. A research unit period of about 1 month was set, and the groups went through the process twice.

Research Program II aims to conduct measurements of the participants' changes in their awareness before and after taking part in the educational program and omits measurement of participants' driving behavior. Participants included 60 drivers from Company B and 30 drivers from Company A. The sample data of both research programs were combined to analyze changes in participants' awareness, while driving behavior was analyzed by using only the sample data from Research Program I.

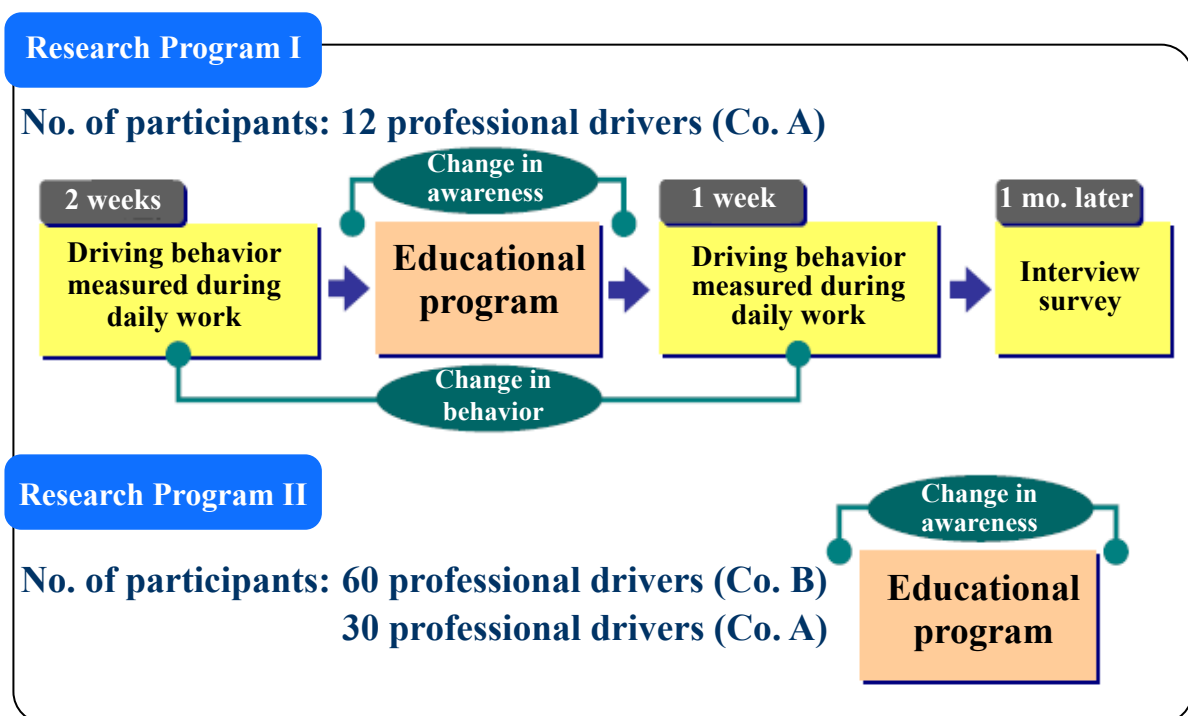


Fig. 3-1. Research design used in the current study

3-3. Educational program

As explained in the preceding chapter, the trial educational program consists of five main steps. The program proceeds in the order of “Introduction,” “Self-evaluation,” “Understanding stress theory,” “Learning coping measures” and “Setting action goals.” The total time required for the whole program is about 90 minutes. The program is experienced firsthand by the participants on the day the training session is conducted. The data from surveys of changes in the participants’ awareness and other sources is gathered before and after the training session.

The program proceeds by focusing primarily on group discussions. Table 3-2 is a simple summary of each step’s contents.

Table 3-2. The 5 steps of the educational program

| Step | Time allocated | Description |
|------------------------------------|----------------|---|
| (1) Introduction | 10 min. | <ul style="list-style-type: none"> • Provide a brief explanation of the purpose of the educational program and how it proceeds. • Indicate to participants that the program is not one-way education for imparting knowledge and that their active participation in discussions will bring more life to the training session. • Show participants statistical data and examples of traffic accidents and ask them whether negative emotions may be indirect causal factors leading to the accidents. • Explain the aim of the training session, stating the following three aims. <ul style="list-style-type: none"> - To gain a self-understanding of one's own emotional tendencies - To develop the means to be more aware of one's own emotional and driving conditions - To learn specific coping measures for controlling emotions |
| (2) Self-evaluation | 20 min. | <ul style="list-style-type: none"> • Use a self-diagnosis test to provide the opportunity for gaining self-understanding. • Show 11 driving scenes where negative emotions such as irritation and impatience may be experienced. When each scene is presented, ask participants to conduct self-evaluation for the level of negative emotions experienced and the level of inappropriate driving behavior. • Ask participants to judge the degree to which the emotional states and unsafe behavior shown in the examples would apply to them. The extent to which emotional states apply is defined as the level of negative emotions experienced and the extent to which the unsafe behavior apply is defined as the level of inappropriate driving behavior. • After the self-diagnosis test, have each trainee choose and mark scenes with high scores, to help obtain a grasp of one's own emotional tendencies. • Have trainees compare the diagnosis results with those of others in the same group for deeper self-understanding. |
| (3) Understanding stress theory | 10 min. | <ul style="list-style-type: none"> • Explain the underlying principles at work for the process of experiencing negative emotions such as irritation and impatience. • Explain the transactional model of stress, appraisal and coping in an easy-to-understand way, touching on these main points. <ul style="list-style-type: none"> - While it is difficult to eliminate negative emotional experiences, having a grasp of the principles at work behind such experiences may help the trainee cope better with unpleasant emotions. - How one interprets and looks at their situation varies from person to person, which leads to individual differences in emotional experiences. - Ask trainees to think about the types of interpretations that arise while stress reactions are being evoked in response to a given situation. - Ask trainees to think carefully about their own values and beliefs at work in the background of how they interpret events, and to reflect on the characteristics of their emotional tendencies. |
| (4) Learning coping measures | 40 min. | <ul style="list-style-type: none"> • Ask trainees to explore how they will cope when experiencing negative emotions as stress reactions, by exchanging views with fellow trainees and developing concrete measures as much as possible. • Describe an example of another vehicle cutting in front and ask participants whether there are other views or interpretations from a different perspective that can control the emotion of feeling irritated. • Have participants think of various self-talk expressions—the words that one tells oneself when necessary to help change the perspective. • Have participants exchange opinions in groups and use discussions to find the self-talk expressions most suitable for controlling own emotions. |
| (5) Action goals | 10 min. | <ul style="list-style-type: none"> • Have trainees sort out what they became aware of and what they thought about through their participation in the educational program and writing down in simple terms what they will put into practice to ensure safe driving. • One concrete means for emotional control is to use self-talk. Encourage each trainee to write on the worksheet the self-talk expressions they want to use, as specific action goals. • Have trainees exchange views in each group about the action goals set by each group member. |

3-4. Questionnaire

(1) Measurements of stress reactions and self-efficacy

The questionnaire used to measure changes in participants' awareness (stress reactions and self-efficacy) presents questions about the conditions that evoke negative emotions and the situational characteristics. A questionnaire has 23 items. Based on the research of Ogawa and Ota (2009), the four dimensions used in the questionnaire are "anger toward others' behavior" (8 items), "feeling rushed because pressed for time" (5 items), "feeling rushed by unease from awareness of others" (5 items) and "irritated in a self-centered manner" (5 items) are used (See Table 3-3).

Table 3-3. Questionnaire items for measurements of stress reactions and self-efficacy

| No. | Item | Dimensions |
|-----|---|------------|
| 1 | Even though I yielded, a driver who doesn't acknowledge my favor is rude. | I |
| 2 | If I get stuck in a traffic jam when busy with work, I feel rushed and irritated. | II |
| 3 | There is no break in oncoming vehicles when I try to turn right. With more and more cars waiting behind my vehicle, I feel rushed thinking I have to turn right as quickly as possible. | III |
| 4 | When I have the right-of-way and a vehicle enters the intersection without making a stop, I feel angry. | I |
| 5 | When the car ahead is keeping a considerable distance from the car in front of it, I get irritated and upset. | IV |
| 6 | When I'm about to attend an important meeting, I feel I shouldn't be late by all means and I drive feeling somewhat rushed. | II |
| 7 | When trying to turn left, pedestrians cross the street one after another; being unable to move, I grow impatient. | III |
| 8 | When a car drives up from behind within a short distance of my vehicle as if to provoke me, I feel angry. | I |
| 9 | When the car ahead is driving at a slow speed and is out of sync with the traffic flow, I get impatient. | IV |
| 10 | When I used my turn signal for squeezing into the next lane, the car in that lane intentionally closed the gap from the car ahead, and so I'm mad. | I |
| 11 | When I'm on my way because of an urgent request from someone, I feel rushed as I drive. | II |
| 12 | When the car ahead stops without any signal or sign, I feel angry. | I |
| 13 | When the car behind me honks at an intersection where a stop is required, I feel hurried and think I have to move forward quickly. | III |
| 14 | When the light has turned green and the car ahead is taking its time to move, I grow impatient. | IV |
| 15 | I can't stand any pedestrian who crosses the street against a red light. | I |
| 16 | When it looks like I'll be late for an appointment, I feel bad for that person and so feel rushed. | II |
| 17 | I'm irritated at any pedestrian who crosses the street slowly as if ignoring my presence. | III |
| 18 | When there is enough distance from the oncoming vehicle, but the car ahead is taking its time to turn right, I grow impatient. | IV |
| 19 | I was driving within the speed limit, but the car behind me flashed its headlights to warn me, "You're in my way," and I feel mad. | I |
| 20 | On a day when my daily schedule is considerably delayed because of unforeseen circumstances, I sit at the wheel feeling rushed. | II |
| 21 | When I'm waiting to turn right and the oncoming vehicle yields to me, I try to quickly turn right in haste. | III |
| 22 | When the bicycle ahead is riding slowly on a narrow road, I can't pass the bicycle easily and I start feeling impatient. | IV |
| 23 | I can't stand any ill-mannered driver who rudely cuts in front of me. | I |

I: Anger toward others' behavior

II: Feeling rushed because pressed for time

III: Feeling rushed by unease from awareness of others

IV: Irritated in a self-centered manner

For Dimension I. “Anger toward others’ behavior,” the scenes where one feels anger toward other vehicles showing unsafe behavior are presented. Examples include another vehicle ignoring the right-of-way and a pedestrian crossing a street against a red light. Dimension II. “Feeling rushed because pressed for time” expresses the emotion of feeling hurried with a sense of urgency due to a lack of time as a background factor. For example, one may feel rushed if receiving an urgent request from someone else, or if the schedule has been delayed due to an unforeseen occurrence. For Dimension III. “Feeling rushed by unease from awareness of others” the scenes where one feels rushed by unease from awareness of others in the traffic situation are shown. Such an emotion could be experienced in a situation such as, “with more and more vehicles waiting behind my vehicle when trying to turn right, I feel rushed that I must turn right as soon as possible.” For Dimension IV. “Irritated in a self-centered manner,” the scenes where one feels irritated toward other vehicles that hinder one’s progress are included. For example, this dimension applies to the emotion of “feeling irritated because of the slow speed of the vehicle ahead.”

Each questionnaire uses illustrations and statements to describe a situation (item). For each item, a format asking for two types of respondents’ answers (Answer A and Answer B) is used (see Figure 3-2). For Answer A, regarding the emotional state being presented, each respondent judges to what degree it applies to their situation. The evaluation is conducted by using a 4-point scale from “4: It applies to me very much.” to “1: It doesn’t apply to me at all.” Figure 3-2 shows an example of a research item. For the emotion of anger as expressed as “Even though I yielded, a driver who doesn’t acknowledge my favor is rude,” each person compares the statement to their own emotional tendencies for an evaluation. In the current study, the evaluation scores for the Answer A questions are used to analyze the measurement levels for stress reactions.

For the Answer B questions, each respondent needs to judge their ability to cope when in the emotional state presented. The evaluation is conducted using a 4-point scale from “4: Probably difficult” to “1: Probably easy.” By asking for a respondent’s own judgment, the degree of the person’s awareness that “I can somehow cope” is measured. In the current study, the evaluation scores for the Answer B questions are used to analyze the measurement levels for self-efficacy.


| | | | | | | | | | | | | | |
|--|---|---|----------------------------|---------------------------------|--------------------------------|--|------------------------|--------------------|---------------|---|---|---|---|
| <div style="border: 2px solid orange; border-radius: 10px; padding: 5px; display: inline-block; background-color: yellow;"> Stress reaction (Emotions) </div> | | Answer A | | | | Answer B | | | | | | | |
| | | How much will this feeling apply to you? | | | | Do you think you'll be able to cope in this situation? | | | | | | | |
| | | It applies to me very much. | It applies to me a little. | It doesn't apply to me so much. | It doesn't apply to me at all. | Probably difficult | Maybe rather difficult | Maybe rather easy. | Probably easy | | | | |
| 1 |  <p>Not saying thanks, uh?</p> | <p>Even though I yielded, a driver who doesn't acknowledge my favor is rude.</p> | | | | 4 | 3 | 2 | 1 | 4 | 3 | 2 | 1 |
| | | <div style="border: 2px solid orange; border-radius: 10px; padding: 5px; display: inline-block; background-color: yellow;"> Self-efficacy </div> | | | | | | | | | | | |

Fig. 3-2. Sample questionnaire

(2) Evaluation questionnaire for educational program

A separate evaluation questionnaire was prepared for measuring participants' reactions to the educational program. This evaluation questionnaire consists of two questions. In Question 1, the respondent is asked to judge which parts of the program were useful for the person's own safe driving and presents six main aspects of the educational program. The respondent is asked to choose three aspects, or only one aspect, that they thought were useful. The six aspects are as follows: (1) In driving scenes where I could become emotionally unstable and my driving become more risky, I evaluated my level of negative emotions experienced and my level of inappropriate driving behavior. (2) When comparing my responses with those of other participants, I thought about my own characteristics for the level of negative emotions experienced and the level of inappropriate driving behavior. (3) I now understood the approach of stress theory to why one gets angry or feels rushed. (4) To help me understand why I get angry or feel rushed, I was able to think about my own characteristics in how I evaluate or look at stressful situations. (5) I thought of concrete means regarding how to control my emotions. (6) I reflected on the training program and established my own action goals. Each respondent is asked to choose the aspects they thought were most useful from these six items. By checking the aspects of the educational program producing the higher level of response, a qualitative analysis of the educational value of the trial program was conducted.

Question 2 consists of the items that ask each respondent about their impressions of the program as a whole. For example, the following items are included:

“The training program was easy to understand.”

“It was fun to take part in the training program.”

“There were many things I became aware of.”

“The length of the program was just about right.”

These items concerning the participants’ understanding of the program contents, the proceedings and procedures, and the participants’ interest and concern were listed to ask about their overall impressions. Each respondent is asked to make a judgment on a 4-point scale, choosing an answer from “4: I agree.” to “1: I don’t agree.”

(3) Psychological measure of personality traits

Among the program participants, some may show strong responses to program contents others may not be that interested. It is possible that the program’s educational effects are influenced to a certain degree by the participants’ personal characteristics. In order to check whether there are differences in the degree of change in awareness experienced by participants depending on their personal characteristics, it was decided to include a personality trait test among the questionnaire items. The test used was the Big Five Scale developed by Wada (1996), and a 60-item questionnaire was created.

The Big Five model is a theory of human personality traits that explains behavior by grouping personality traits into five main dimensions—Extraversion, Neuroticism, Openness, Conscientiousness, and Agreeableness. Through a combination of large or small scores for the five dimensions in a test, an explanation is provided for a person’s personality traits. The characteristics corresponding to the five dimensions are expressed in simple phrases such as a single adjective, and these are used as the items in a test. For example, such phrases as “talkative” and “cheerful” are used as items included in the Extraversion dimension. The Big Five Scale created by Wada uses a very simple test that can be administered in a short time. Drawing on this advantage, it was decided to use this test in the surveys.

In Wada’s original scale, a 7-point scale is used for judgment, but in the surveys conducted for this report, the ease of giving answers was taken into consideration, resulting in the decision to use a 5-point scale instead, ranging from “5: It applies to me very much” to “1: It doesn’t apply to me at all.” Also, for some of the items for which the original wording makes it difficult to understand the meaning, a decision was made to change the wording to a simpler expression.

With respect to research procedures, the questionnaires concerning personality traits were handed out to 42 participants from Company A. Please note that this particular survey does not cover all of the program participants.

3-5. Research procedures

Figure 3-3 illustrates the flow of procedures followed when conducting the educational program with respect to Research Programs I and II. First, a simple explanation was provided on the aim of the current research project. Then the questionnaire survey using the same items was conducted before and after the educational program. From the answers given in these two surveys, stress reactions and self-efficacy of the participants were measured in order to compare changes between before and after the educational program. The same form was used for the questionnaires in both of the surveys, and the participants were instructed to use a black pen to write answers before the program and a red pen after the program. For the survey after the program, the participants were asked to provide answers based on the judgment of the type of changes they became aware of and for which items, in comparison with their awareness before the educational program.

After responses to the second questionnaire were completed, a survey was conducted on the trainees' evaluation of the educational program. Based on their answers in this questionnaire survey, their levels of acceptance and satisfaction of the educational program were analyzed.

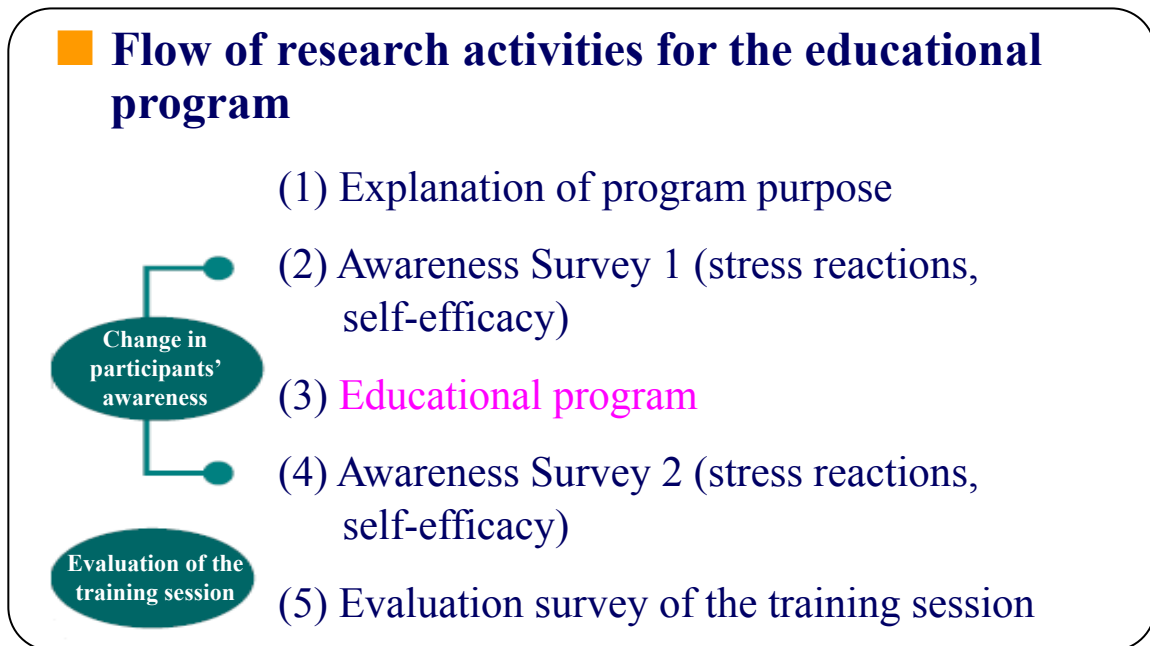


Fig. 3-3. Flow of procedures when running the educational program

Figure 3-4 shows an actual scene from the educational program in progress. Groups of 5 or 6 trainees were formed, and the group organization was adjusted so that, depending on the total number of participants, an appropriate ratio for the number of group members would be established for the groups.

The seat layout was arranged to create an environment that facilitates group discussions. Teaching materials were projected from slides onto the screen in the front, and a single instructor proceeded with the program according to set procedures.



Fig. 3-4. Educational program in progress

The educational program's training sessions were held several times, on the dates shown in Table 3-4.

Training rooms inside offices of the participants' companies and other locations were used. The total time required was about 2 hours (Educational program: 90 minutes + Research activities: 30 minutes)

Table 3-4. Dates when the program and surveys were conducted

| | |
|-----------------------|--|
| • Research Program I | Survey 1: October 22, 2009 (Company A: 6 persons) Survey 2: November 26, 2009 (Company A: 6 persons) |
| • Research Program II | Survey 1: October 17, 2009 (Company B: 24 persons) Survey 2: November 11, 2009 (Company B: 14 persons) Survey 3: November 13, 2009 (Company B: 11 persons) Survey 4: November 18, 2009 (Company B: 11 persons) Survey 5: February 16, 2010 (Company A: 10 persons) Survey 6: February 17, 2010 (Company A: 10 persons) Survey 7: February 18, 2010 (Company A: 10 persons) |

3-6. Test equipment

In Research Program I, the participants' driving behavior in the conduct of their daily work was recorded with a SR-Video driving recorder from Datatec Co., Ltd. (see Figures 3-5 and 3-6). Two weeks before the program, a driving recorder was installed on the vehicle used exclusively by each participant for work, and it was then removed one week after the program. (However, the measurement period did vary according to the participant's circumstances for using the vehicle.) The test vehicles were commercial light-duty cab-over trucks.

The driving recorder kept records on basic data for driving behavior, including g-force acceleration/deceleration/lateral acceleration, driving speed, and driving time. Also, when there was risky driving behavior in which the acceleration exceeded the specified value, the data recording covered images of the view ahead along with the driving behavior before and after the event. However, no sounds were recorded. The driving recorder was installed at the foot of the passenger's seat, and the video camera for recording foreground images was installed on the dashboard in front of the driver's seat.



Fig. 3-5. Driving recorder



Fig. 3-6. Video camera for recording foreground images

3-7. Analysis of educational effects

The analysis of the educational effects was based on Kirkpatrick's (1998) 4-level training evaluation model (see Figure 3-7). This model demonstrates the importance of analyzing educational program effects through a multilateral approach employing four levels of viewpoints—the Reaction, Learning, Behavior, and Results levels.

The Reaction level denotes the trainees' level of acceptance of the program and is based on the assumption that the first step in bringing about meaningful results is the trainees' receptiveness and positive attitude toward the educational program. Such a positive attitude does not necessarily lead to changes in the trainees' awareness and behavior, but it is clear that a negative evaluation of the

educational program will not bring about any changes. To initiate change, it is necessary for trainees to first accept what they are learning. The effects on the Reaction level were analyzed with data from an evaluation survey for the educational program that was conducted immediately after the training session.

For the second level, Learning, the trainees' attainment of knowledge and skills is analyzed. The corresponding learning effects with respect to the program goals of changing how trainees view and perceive stress are observed at a cognitive level, including knowledge acquired, skills improved, and attitudes changed as a result of the program. The educational effects on this second level were examined through an analysis of any changes in the trainees' emotional reactions (stress reactions) and their sense that they can cope (self-efficacy).

The third level, Behavior, focuses on actual changes in trainee behavior as a statistical measure of educational effects. This study hypothesizes that promotion of emotional control will lead to more stable driving performance; therefore, indicators of driving behavior such as g-force acceleration data were measured to examine behavioral changes. For this, driving recorders were used to record the driving behavior of the participants during their daily driving in work.

For the fourth level, Results, a reduction in the number of accidents can be used as an objective indicator of the educational effects. However, the tendency of random factors to sway traffic accident statistics and the current program's small sample size combined with the short research period led to a decision to omit any examination at the Results level.

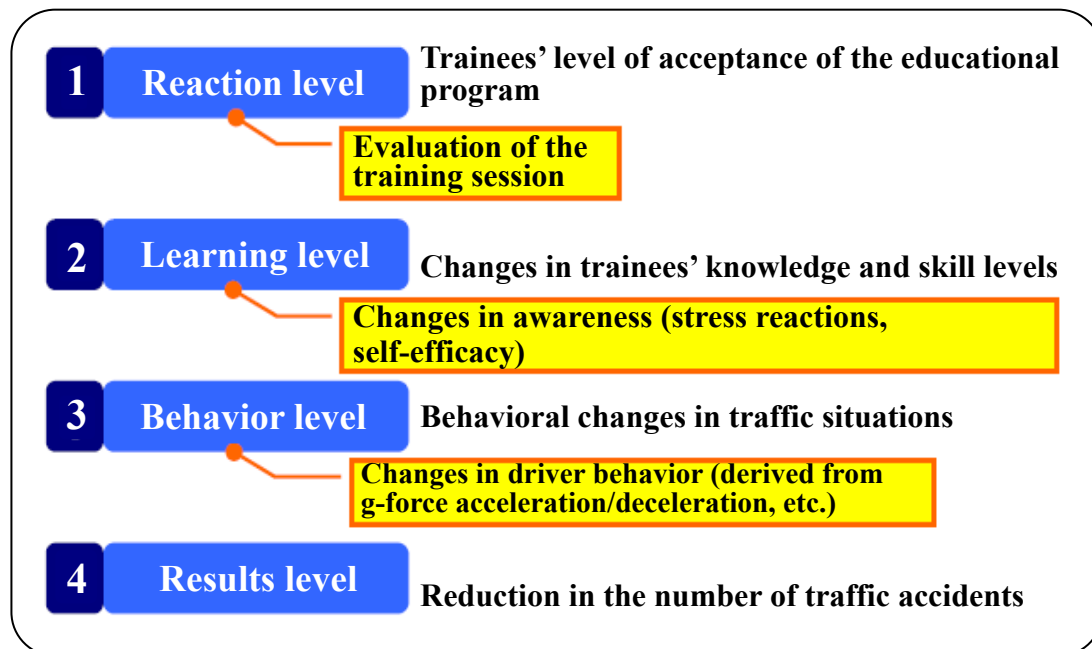


Fig. 3-7. The 4-level training evaluation model (Kirkpatrick, 1998)

Chapter 4. Results

The program's educational effects were verified based on the 4-level model of Kirkpatrick (1998). This section describes the results of the analysis, presented in sequence: Reaction level (the trainees' levels of acceptance and satisfaction toward the educational program), Learning level (changes experienced in stress reactions and self-efficacy), and Behavior level (changes in driving behavior).

4-1. Trainees' evaluation of the educational program

(1) Reactions to the program components

To measure the effects on the Reaction level, a questionnaire survey was conducted after completion of the training session. The questionnaire consisted of items for evaluating the educational program and was used as an indicator of the participants' level of satisfaction toward the program. The questionnaire items were grouped into two questions. In Question 1, the six main aspects of the program were presented to trainees in order to judge which aspects were the most useful. Roughly corresponding to each step of the program, these six aspects were presented in the order in which they appeared in program proceedings. Two types of answers were solicited in Question 1: a) selecting three aspects of training that they thought were useful, in a multiple choice format and b) selecting the one aspect which they thought was most useful.

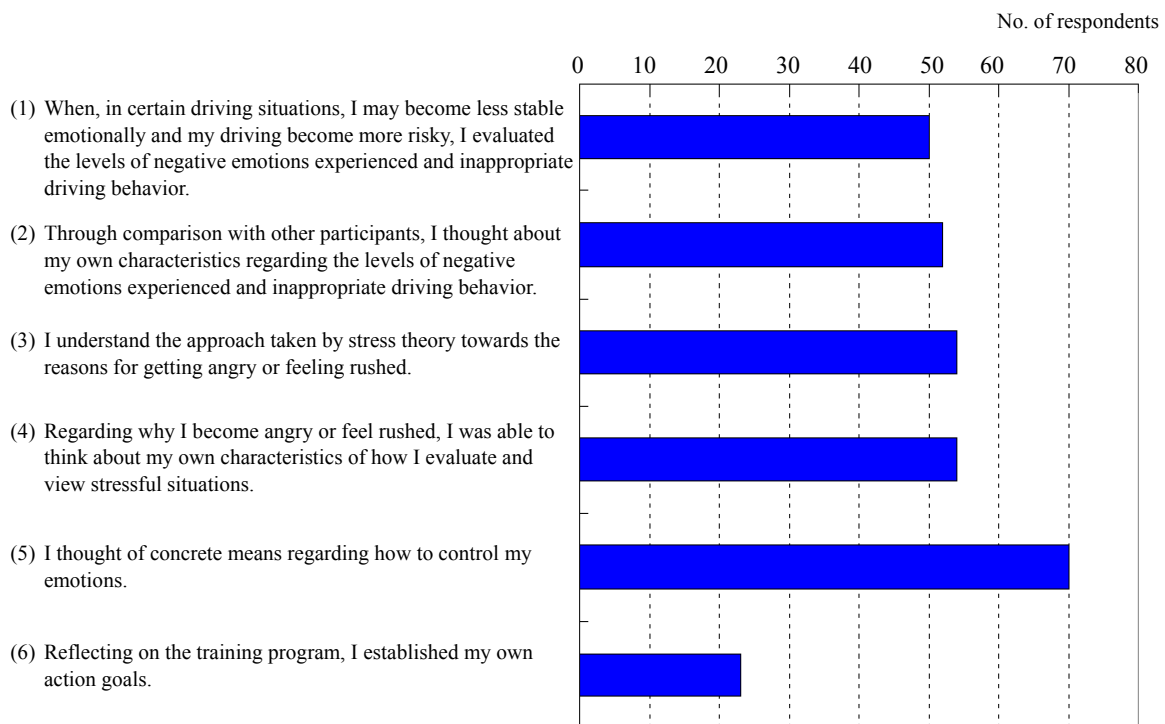


Fig. 4-1. Aspects of the educational program judged by trainees as useful (choice of 3 answers)

Figure 4-1 shows the results of the 3-item multiple-choice selection. The frequency distribution for each main aspect of the program is displayed with the number of respondents shown on the *x* axis. The aspect chosen as the most useful was Item (5) “I thought of concrete means regarding how to control my emotions,” which was selected by 70 participants, or 69.3%, of program participants. In other words, roughly 70% of participants found discussions of concrete measures for controlling emotions to be a valuable learning experience.

Items (1) through (4) were selected as the next most useful, having roughly the same frequency of selection. These items are: (1) “When, in certain driving situations, I may become less stable emotionally and my driving become more risky, I evaluated the levels of negative emotions experienced and inappropriate driving behavior” (chosen by 50 respondents, or 49.5%); (2) “Through comparison with other participants, I thought about my own characteristics regarding the levels of negative emotions experienced and inappropriate driving behavior” (chosen by 52 respondents, or 51.5%); (3) “I understand the approach taken by stress theory towards the reasons for getting angry or feeling rushed” (chosen by 54 respondents, or 53.5%); and (4) “Regarding why I become angry or feel rushed, I was able to think about my own characteristics of how I evaluate and view stressful situations” (chosen by 54 respondents, or 53.5%). These four items all involve the process of thinking about the characteristics of one’s own stress reactions. Learning what stress theory says can help drivers better understand their stress. Comparing responses with others and self-evaluation can enrich one’s knowledge and lead to a better understanding of one’s emotional tendencies. It can thusly be concluded that the above results show that participants placed high value on the current program’s usefulness for promoting self-understanding.

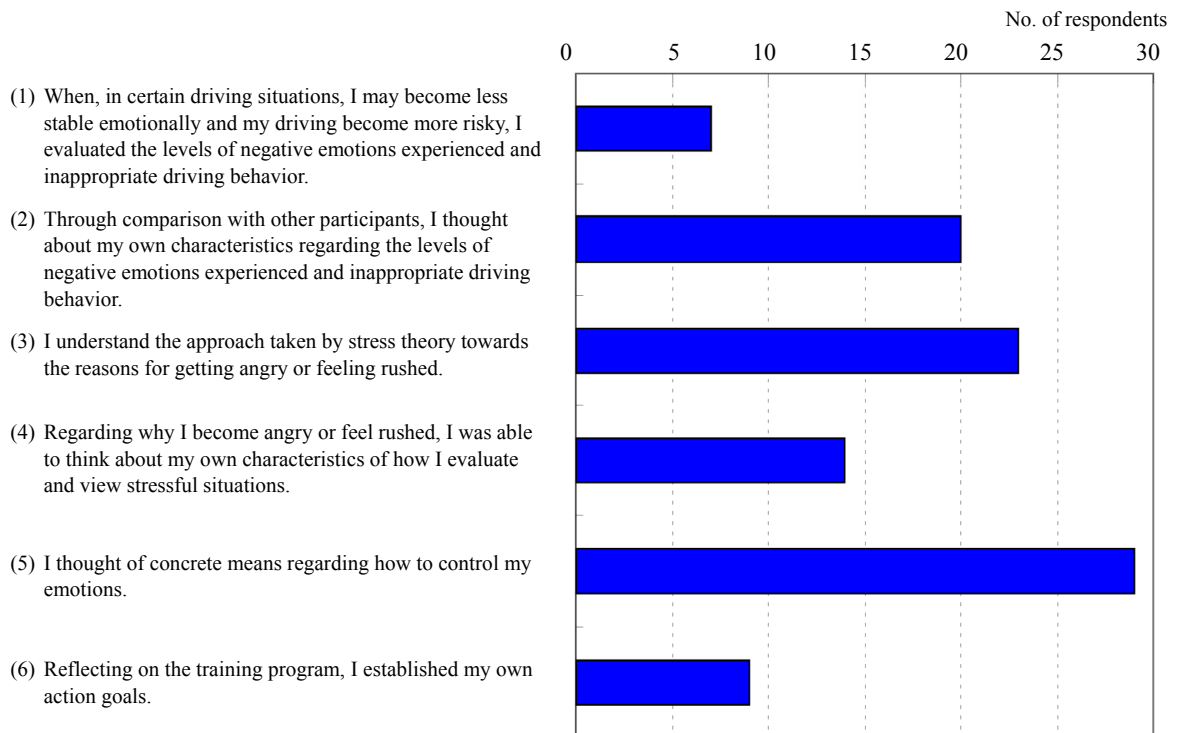


Fig. 4-2. Aspects of the educational program judged by trainees as useful (choice of 1 answer)

Figure 4-2 shows the results of the survey in which respondents chose the one aspect of the program they judged as most useful. As in Figure 4-1, the frequency distribution for each main aspect of the program is displayed with the number of respondents shown on the x axis. Like Figure 4-1, this figure also shows the aspect most frequently cited as useful to be Item (5) “I thought of concrete means regarding how to control my emotions.” This item was evaluated as the most helpful by 29 respondents, or 28.4%. Even after narrowing down the choice to only one of the six main program components, the participants gave high marks for the program’s practical aspects focused on the process of thinking about concrete measures.

When three useful aspects were chosen, Items (1) through (4) were chosen at almost the same frequency, but when only one useful aspect could be chosen, differences emerge among these four items. The selection rate was high for Item (2) “Through comparison with other participants, I thought about my own characteristics regarding the levels of negative emotions experienced and inappropriate driving behavior” and Item (3) “I understand the approach taken by stress theory towards the reasons for getting angry or feeling rushed.” For the frequency of selection, 20 respondents (19.6%) chose Item (2) as useful and 23 (22.5%) chose Item (3). When asked to choose only one item, the participants in effect selected the items among the program components that help promote self-understanding, Items (1)–(4), that concerned comparisons with others and understanding stress theory. A principle that allows the individual to explain their own experience and a clear identification of one’s own characteristics through

comparisons with other people are indeed important educational elements to promote self-understanding. Any educational program designed to promote self-understanding must include these two elements.

Another item of note is that both Figure 4-1 and Figure 4-2 show a low ratio of selection for Item (6) “Reflecting on the training program, I established my own action goals.” This item was selected by 23 respondents (22.8%) as one of the most useful three aspects of the program and by 9 respondents (8.8%) as the single most useful aspect. From the viewpoint of any program’s proceedings, setting one’s action goals means to summarize at the end what one has learned as the fruits of the learning experience. It is therefore an essential component of a program. However, according to the survey results, setting action goals was not considered as a very useful process from the perspective of the trainees. From the standpoint of an educational program’s usefulness, what tends to be important is that the program contain practical elements and lead to a better self-understanding.

(2) Differences in evaluations according to age

Next, an analysis of the participants’ program evaluation that incorporated participant age as a factor was conducted. For this analysis, participants were categorized into two groups divided by the age of 30—younger participants (22–30 years old) and middle-to-senior-aged (31–63 years old). The effective sample size was $n=31$ for younger drivers (30.7%) and $n=70$ persons middle-to-senior-aged drivers (69.3%).

With respect to Question 1 that involved selecting the aspects of the learning processes perceived as useful, it was decided to compare the selection frequency between the age groups. For the multiple-choice selection of the three most useful aspects among six, relative selection ratios were calculated for each of the two age groups. Figure 4-3 compares the frequencies for each of the six program aspects between age groups. The number of respondents selecting an item is expressed as the ratio to the total number in that group. For example, (1) “When, in certain driving situations, I may become less stable emotionally and my driving become more risky, I evaluated the levels of negative emotions experienced and inappropriate driving behavior” was chosen as useful by 14 in the younger group and 36 in the older group, which corresponds to relative ratios of 45.2% and 51.4%, respectively.

To test for differences in the ratios between the groups, a chi-square test was performed on each of the 6 items. The results show a statistically significant difference in the selection ratio between the younger and older groups for Item (2) “Through comparison with other participants, I thought about my own characteristics regarding the levels of negative emotions experienced and inappropriate driving behavior” of 71.0% (22 respondents) for the younger group and 42.9% (30 respondents) for the older group. The ratio of persons choosing this item or aspect as useful was clearly higher among the younger group than the older group ($\chi^2(1)=6.797, p < 0.01$). The participants in the younger group tended to think more that comparisons with other people is an effective process for gaining self-understanding. It is clear that younger people take an

interest in confirming their own position with other people, and that they are interested in comparing the self-evaluation results with others in a group.

The other five items showed no significant difference in the selection ratio according to age.

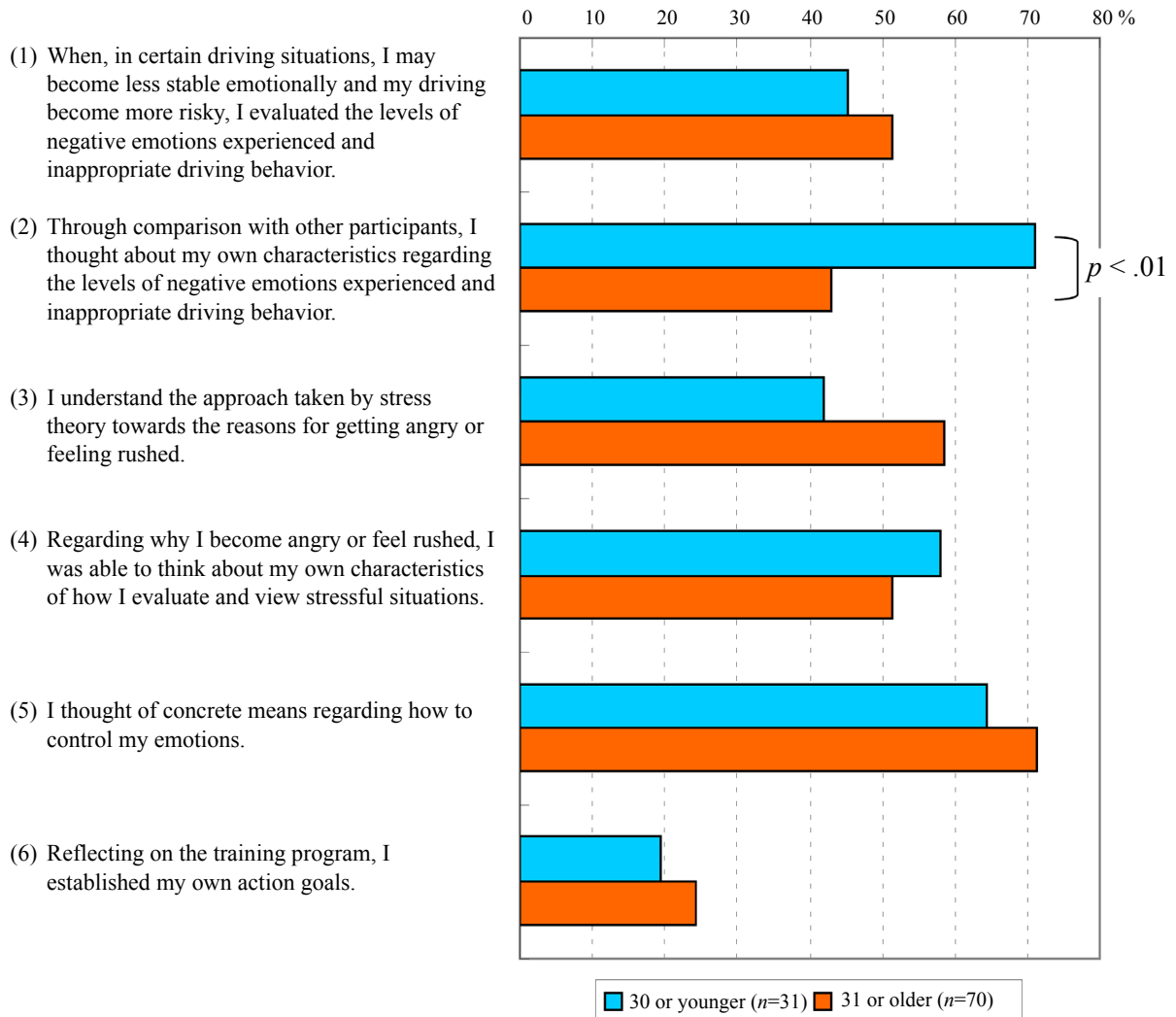


Fig. 4-3. Differences in evaluations according to age

(3) Evaluation of the overall program

The results from Question 2, which consists of 17 items for evaluation, are shown below. Respondents were asked to judge each item on a scale of 4 (4: I agree; 3: I agree somewhat; 2: I don't agree that much; 1: I don't agree). For each item, the selection ratio was calculated for each of the 4 values in the scale, and the results are shown in Figure 4-4. The ratio of choosing "4: I agree" is set as the reference value and the 17 evaluation items are ordered according to their respective ratio of selecting a value of 4. In general, a higher rank in the list of items reflects a higher participant evaluation of the item with a positive answer.

It is clear that for all items, the ratios are high for the generally affirmative values of "4: I

agree” and “3: I agree somewhat” as their combined ratio exceeds 80% for all 17 items. This result implies that the educational program was generally evaluated affirmatively.

Among the highly valued items were (17) “It was good that I was able to exchange views with other participants,” (15) “I want to apply what I’ve learned to my driving from now on,” (6) “The explanations were easy to understand,” (3) “There were many things I became aware of,” and (1) “The training program was easy to understand.” One characteristic of the program is the active involvement of program participants. The items with high evaluation scores lead to the inference that the exchange of views with others helps promote participants’ awareness and understanding, and that this has led to the positive evaluations. A learning method focused on the initiative of the participants themselves, who exchanged views and opinions with fellow workers while thinking about safe driving, may lead to favorable reactions with regard to the explanations provided, the participants’ understanding, and the conditions of their participation.

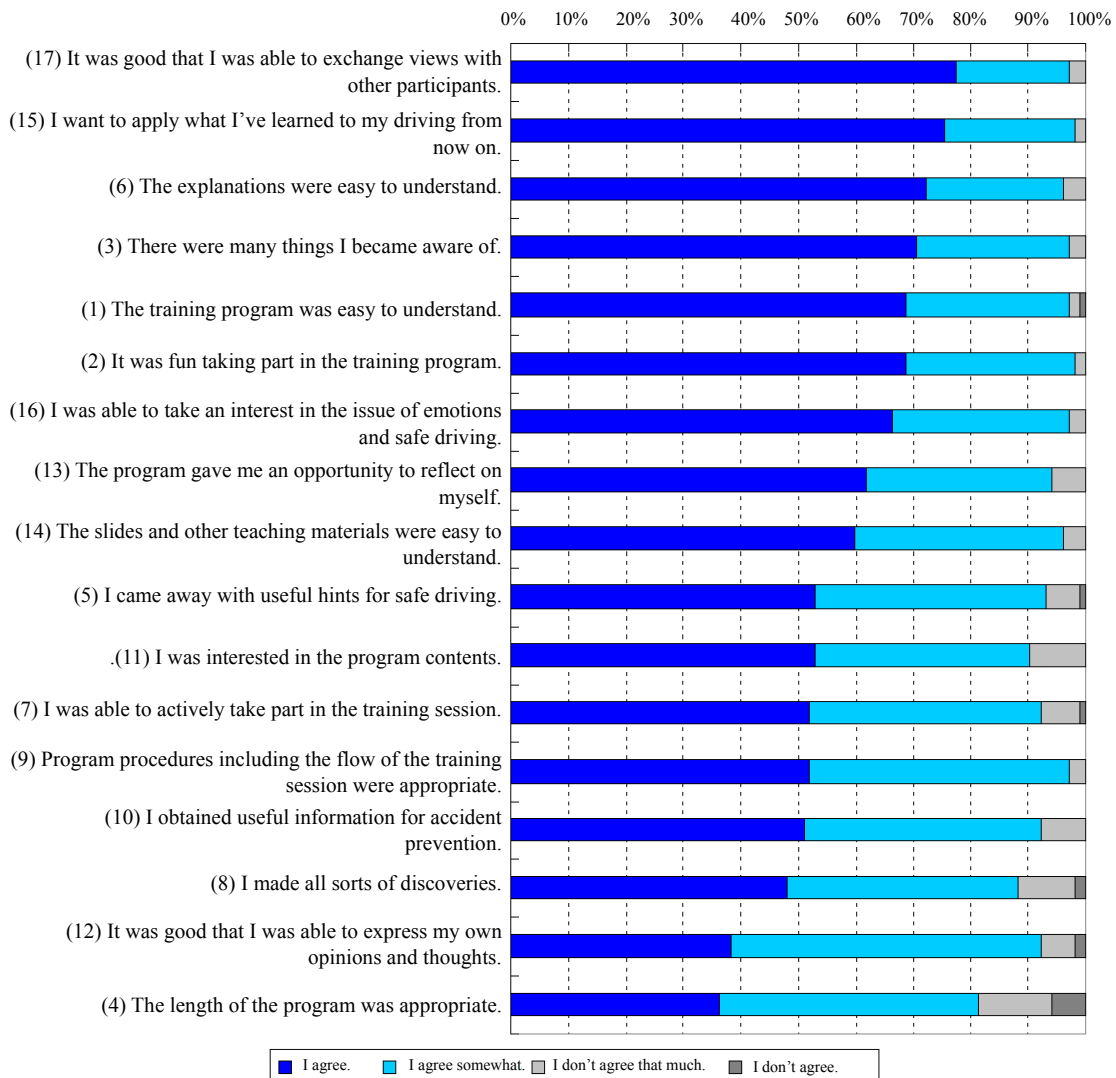


Fig. 4-4. Evaluation of the overall program

As shown in Figure 4-4, positive evaluations were given on the whole, but among the generally high marks, the items requiring future examination were also indicated by the respondents' answers. The items given a lower ranking as shown in Figure 4-4 are interpreted as having somewhat critical opinions from the participants. Cases in point include (4) "The length of the program was appropriate" and (12) "It was good that I was able to express my own opinions and thoughts." These items concern program proceedings, such as the required time and method of group discussions. It is believed there is room for improvement in the conditions set for the program proceedings, such as reducing the time required.

(4) Summary

Based on the results of the evaluation surveys conducted after the training session, the participants' reactions to the educational program were analyzed as described above. The results are summarized as follows.

- (1) The evaluations for the current educational program were positive on the whole, showing the participants' high level of acceptance of the program.
- (2) Among the six main aspects of the educational program, participants gave high marks for usefulness to those aspects concerning thinking through concrete measures for controlling emotions and those aspects that enabled understanding of the characteristics of their own emotional tendencies through comparisons with others. These aspects correspond to the aims of the current educational program to enrich the personal resources of each individual and to help trainees gain self-understanding. The implications are that the participants are receptive to the goals of the educational program, and that they actively address the themes through such means as self-evaluation and group discussions.
- (3) Younger participants placed high value on the process of comparing self-evaluation results with others. Thus, comparisons with other participants may be an effective educational process when providing younger trainees an educational program to promoting self-understanding.
- (4) The overall program received positive evaluations for each of the 17 items on the evaluation question. Favorable reactions were observed with regard to the explanations given, the level of understanding gained, and the state of participation in the program.
- (5) A number of areas were identified as needing improvements concerning the procedural conditions of the program, including the time required and the method of group discussions.

4-2. Changes in stress reactions and self-efficacy

(1) Overall changes

To examine the educational effects at the learning level, an analysis was conducted for changes in trainee awareness, i.e., how the participants view and think about stressful situations, concerning stress reactions and self-efficacy. If participants are led to an awareness that stressful situations are controllable, then the interpretation can be made that the skills in controlling their emotions have improved, as part of their cognitive skills.

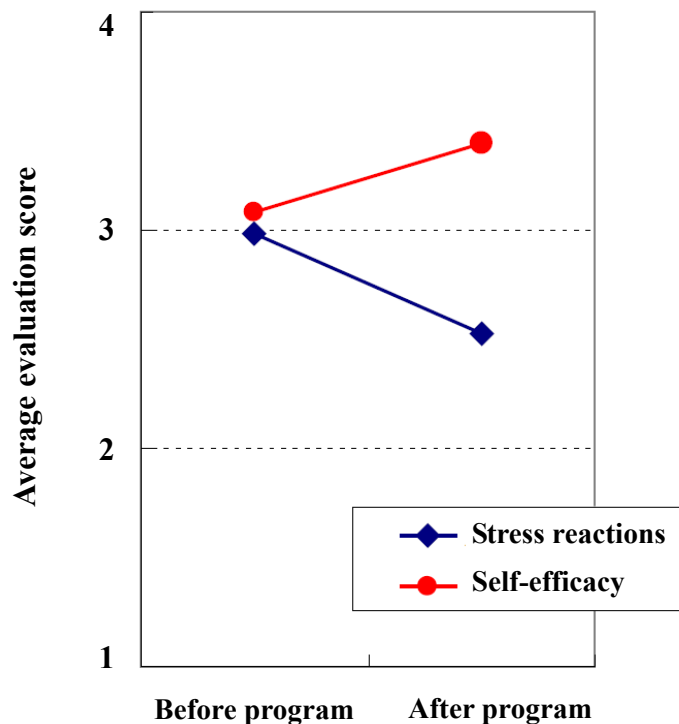


Fig. 4-5. Changes in stress reactions and self-efficacy
(Anger toward others' behavior)

A comparison was made of trainees' answers before and after the program to the self-evaluation questionnaire for stress reactions and self-efficacy. First, to examine overall tendencies, the scores for each of the 4 dimensions of emotions covering the 23 survey items were calculated to obtain the total score for each dimension, and then the changes in scores analyzed. (The 4 dimensions of emotions are "Anger toward others' behavior" - 8 items, "Feeling rushed because pressed for time" - 5 items, "Feeling rushed by unease from awareness of others" - 5 items, and "Irritated in a self-centered manner" - 5 items).

Figure 4-5 shows the changes for the dimension of "Anger toward others' behavior" in a graph. Total scores were calculated for each trainee for the 8 items covered by this dimension,

and then the overall averages were calculated. The values in the graph are based on the equivalent average values for each item. The scores for stress reactions show that larger values are associated with stronger awareness of negative emotions. Self-efficacy scores show an opposite trend for raw evaluation scores converted into averages—larger values are associated with stronger awareness that “I can somehow cope.”

As is clear in Figure 4-5, the comparison of the results before and after the program shows a reduction in stress reactions and a rise in self-efficacy. A corresponding *t* test shows that the changes in both of the measured values were statistically significant ($t(98)=9.166, p<.001$; $t(98)=9.845, p<.001$, respectively). This means that the participants experienced changes in their awareness, becoming less conscious of emotions of anger within themselves and coming to feel more strongly that they can somehow cope.

A similar analysis was also conducted for scores for the emotion dimension of “Feeling rushed because pressed for time.” For the five items to which this dimension is applicable, the average total scores were converted into average values for each item and shown as a graph in Figure 4-6. The *t* test results showed significant changes in both of the measured values for stress reactions and self-efficacy ($t(99)=9.990, p<.001$; $t(99)=11.321, p<.001$, respectively). For the emotions of feeling rushed, there were also changes in awareness after the program, with a reduction in stress reactions and a rise in self-efficacy. This means that the trainees came to think they do not need to be very conscious about emotions of being rushed, and they became more aware that, even if they are in a hurry, they can likely cope somehow.

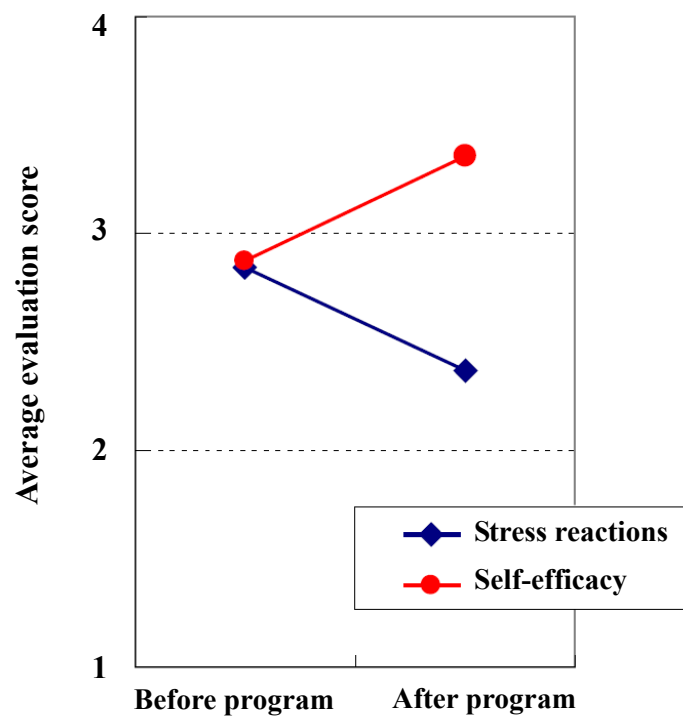


Fig. 4-6. Changes in stress reactions and self-efficacy (Feeling rushed because pressed for time)

A similar analysis was conducted for the remaining two dimensions of “Feeling rushed by unease from awareness of others” and “Irritated in a self-centered manner.” Student’s *t* tests for stress reactions and self-efficacy showed statistically significant changes. Stress reactions were reduced (“Feeling rushed by unease from awareness of others”: $t(99)=7.272, p<.001$; “Irritated in a self-centered manner”: $t(99)=9.185, p<.001$), and self-efficacy increased (“Feeling rushed by unease from awareness of others”: $t(99)=7.310, p<.001$; “Irritated in a self-centered manner”: $t(99)=8.189, p<.001$ respectively). However, unlike the dimensions for anger and impatience, the self-evaluation levels for stress reactions were relatively low before the program regarding the dimensions of “Feeling rushed by unease from awareness of others” and “Irritated in a self-centered manner,” and self-efficacy levels also relatively high before the program. The “Feeling rushed by unease from awareness of others” and “Irritated in a self-centered manner” may not be real issues that match educational needs. Results that do show changes in awareness should be interpreted with reservations about this question.

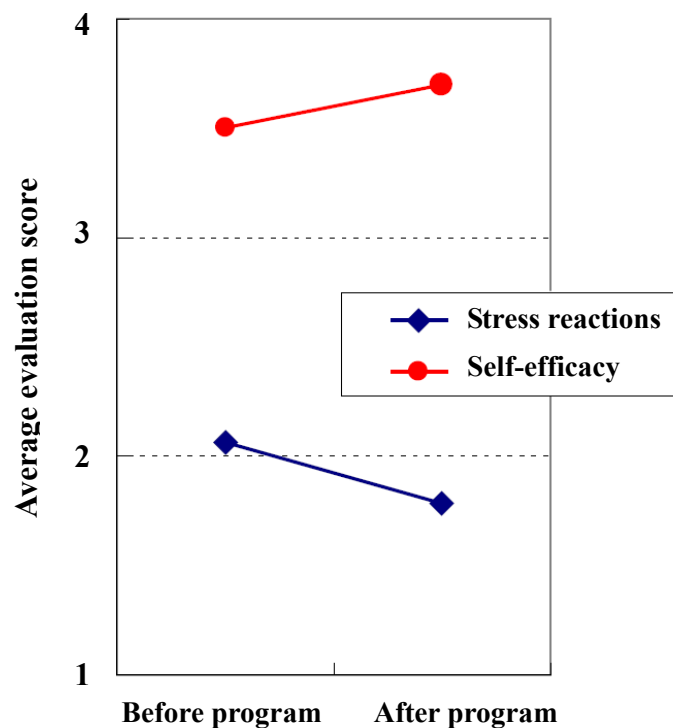


Fig. 4-7. Changes in stress reactions and self-efficacy (Feeling rushed by unease from awareness of others)

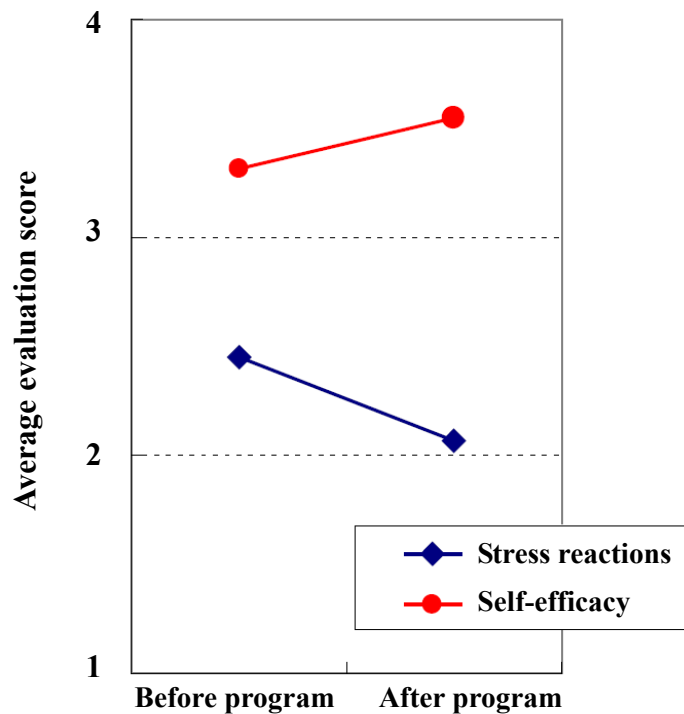


Fig. 4-8. Changes in stress reactions and self-efficacy
(Irritated in a self-centered manner)

(2) Age factor

The results concerning changes in participants' awareness were analyzed with respect to age. The participants were classified into the two groups divided by age 30: younger drivers (30 or younger) and middle- and senior-aged drivers (31 or older). For each of these age groups, the changes in stress reactions and self-efficacy were plotted on graphs. Figure 4-9 shows changes in the awareness for each age group regarding the dimension of "Anger toward others' behavior," and Figure 4-10 shows the changes in the awareness for each age group regarding the dimension of "Feeling rushed because pressed for time." Figure 4-11 shows similar changes for the dimension of "Feeling rushed by unease from awareness of others" and Figure 4-12 shows similar changes for the dimension of "Irritated in a self-centered manner."

An analysis of variance was conducted for each dimensions using age (younger group vs. middle- and senior-aged group) and implementation of the educational program (before vs. after the program) as factors, and produced the following results. Interaction effects for stress reactions were not statistically significant for the dimensions of "Anger toward others' behavior," "Feeling rushed by unease from awareness of others" and "Irritated in a self-centered manner" ($F(1,96)=2.297, ns$; $F(1,97)=0.075, ns$; $F(1,97)=1.086, ns$, respectively). Only the

dimension of “Feeling rushed because pressed for time” ($F(1,97)=5.317, p<.05$) had interaction effects that were statistically significant. As shown in left graph in Figure 4-10, changes in the same direction were observed for both age groups, but the change is clearly more prominent for the younger group. This means that for the younger group, stress reactions from feeling rushed were stronger compared with the middle- and senior-aged group before the program, but there was a considerable reduction in stress reactions after the program.

The interaction effects for self-efficacy are as follows. Similar to the results for stress reactions, no significant interaction effects were observed for the 3 dimensions of “Anger toward others’ behavior,” “Feeling rushed by unease from awareness of others” and “Irritated in a self-centered manner.” ($F(1,96)=0.522, ns$; $F(1,97)=0.024, ns$; $F(1,97)=0.750, ns$, respectively). The interaction effects were only statistically significant for the dimension of “Feeling rushed because pressed for time” ($F(1,97)=6.151, p<.05$). The right graph in Figure 4-10 shows changes in the same direction after the program for both age groups, but the magnitude is larger for the younger group. Although self-efficacy was lower in comparison with the middle- and senior-aged group before the program, it changed and rose considerably after the program.

These results show that the age factor influenced educational effects only for the emotions of feeling rushed because pressed for time. The educational program clearly led to more substantial changes in awareness in this regard among younger participants than middle- and senior-aged participants. One implication is that the trial educational program to help control emotions had considerable effects on stress reactions from being pressed for time, as younger drivers in particular showed more awareness, and on the awareness for controlling such stress reactions. Although adjustment when pressed for time is one educational need for younger drivers, the current program includes learning content that addresses this issue, a probable cause of the observed change in awareness described above.

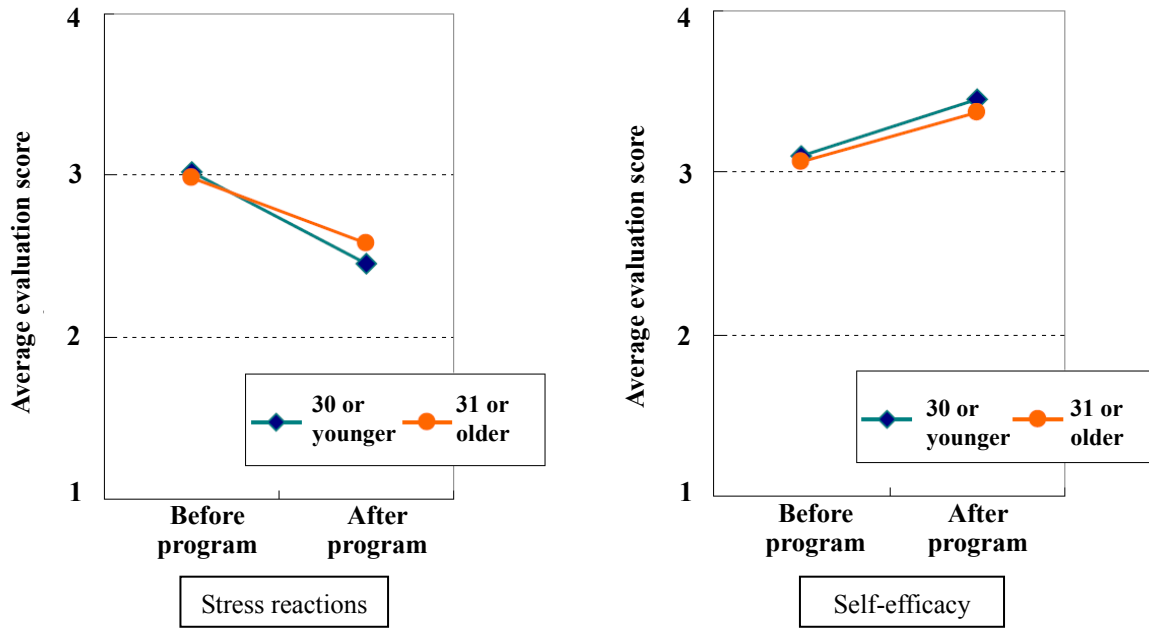


Fig. 4-9. Changes in stress reactions and self-efficacy versus age
(Anger toward others' behavior)

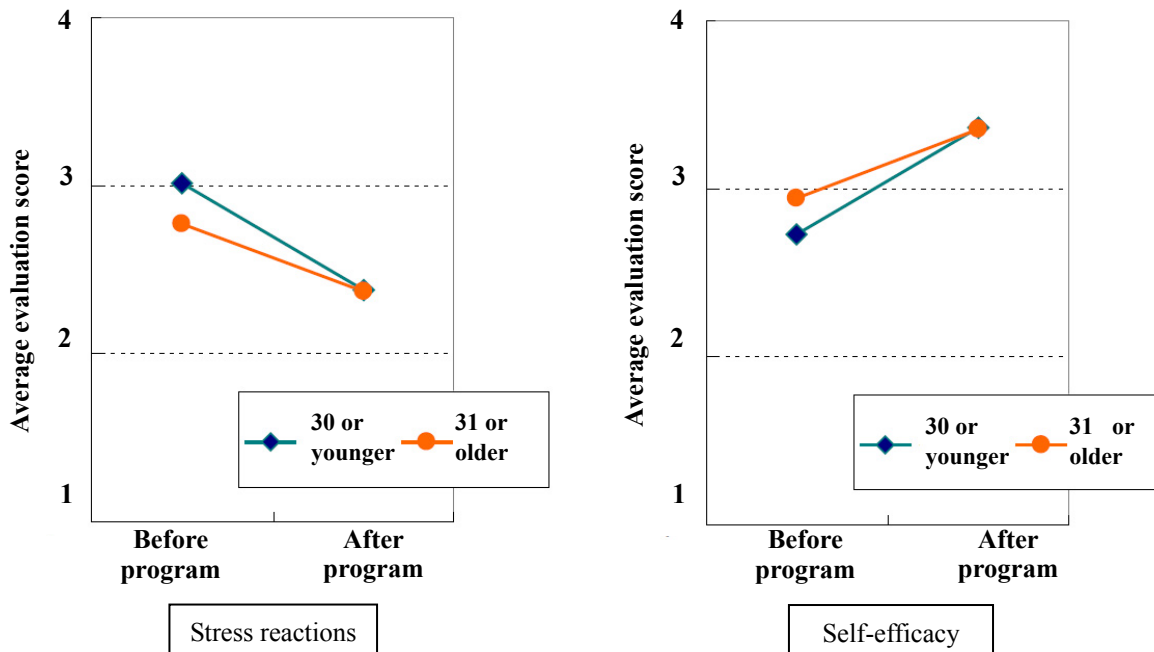


Fig. 4-10. The changes in stress reactions and self-efficacy versus age
(Feeling rushed because pressed for time)

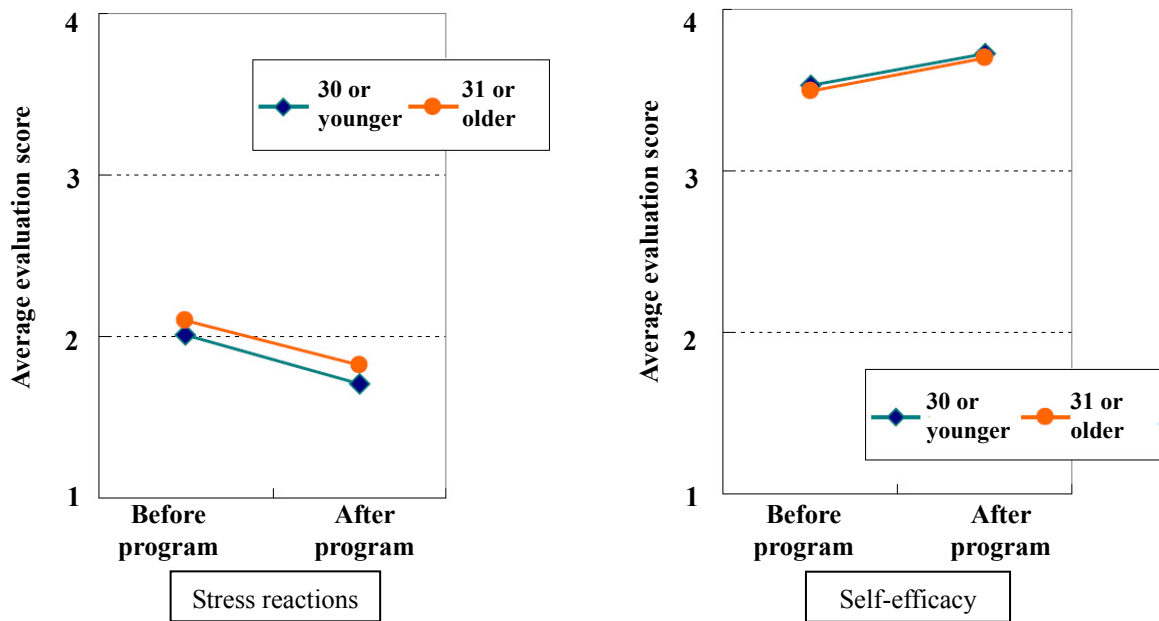


Fig. 4-11. The changes in stress reactions and self-efficacy versus age
(Feeling rushed by unease from awareness of others)

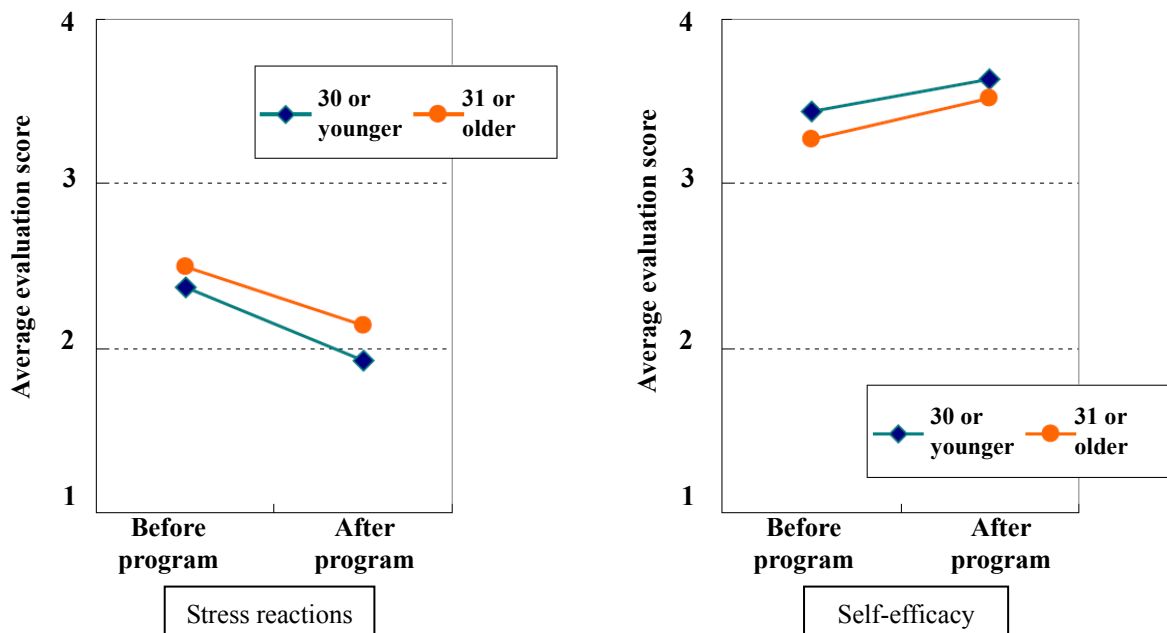


Fig. 4-12. Changes in stress reactions and self-efficacy versus age
(Irritated in a self-centered manner)

(3) Personality traits as a factor

Next, the relationship between the personality traits factor and changes in the participants' awareness was analyzed. The sample data came from questionnaires concerning the Big Five personality traits that were administered to 42 participants. A two-way analysis of variance was conducted on the scores for the five personality traits of Extraversion, Neuroticism, Openness, Conscientiousness and Agreeableness and on the scores for stress reactions and self-efficacy.

The analysis of variance was used to explore the data for combinations that showed statistically significant interactions. The analysis of variance was conducted for both "Anger toward others' behavior" and "Feeling rushed because pressed for time," dimensions that clearly correspond to educational needs, and used the factors of change in awareness (before and after the program) and scores on the Big Five scale. Significant results were found for the interactions between "Anger toward others' behavior" (self-efficacy) and the Extraversion score ($F(1,40)=4.146, p<.05$). Otherwise, no significant correlations were found for interactions between these two emotion dimensions and the scores on the Big Five scale.

Figure 4-13 shows the relationship between self-efficacy and the Extraversion score for "Anger toward others' behavior." Participants were classified into two groups, High Extraversion and Low Extraversion, based on whether the Extraversion score was above or below the average score, and then changes in awareness before and after the program were compared for each group. This figure clearly shows more extensive changes due to the educational program for participants in the Extraverted group (the tendency for one's mental energy to be directed outwards rather than inwards). Before the program, the High Extraversion group had lower levels of self-efficacy than the Low Extraversion group with respect to the awareness of the difficulty in controlling emotions. However, after the program, there was a clear change in the High Extraversion group's awareness as participants moved toward the feeling that they are well capable of controlling emotions of anger.

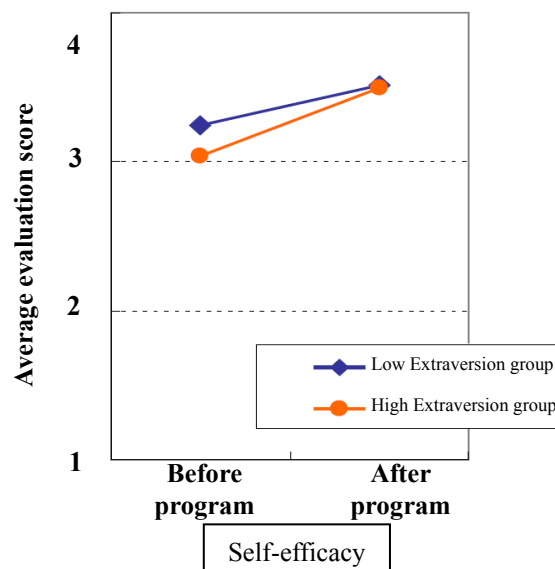


Fig. 4-13. Changes in stress reactions and self-efficacy versus personality traits (Anger toward others' behavior)

(4) Summary

The results of the analysis of observed changes in awareness are summarized as follows.

- (1) The overall changes observed were declines in the level of awareness for stress reactions and improvements in self-efficacy. In particular, distinct changes were observed with regard to anger toward others' behavior and the emotion of feeling rushed because pressed for time.
- (2) The effects of the age factor were found for changes in awareness. Compared to the group of middle-to-senior-aged participants, younger participants were more acutely aware before the educational program of the emotion of feeling rushed because pressed for time. This awareness declined after the program. The extent of the rise in the awareness of self-efficacy after the program was larger for younger participants as a group compared with middle-to-senior-aged participants. The program under study in this report has a substantial effect on the awareness of impatience among younger people.
- (3) The personality traits factor was shown to be associated with Extraversion scores. Participants with higher levels of Extraversion showed greater improvements in the awareness of self-efficacy for the dimension of "anger toward others' behavior."

4-3. Changes in driving behavior

Next, the analysis results of changes in driving behavior are reported below. Under the assumption that the arousal of negative emotions will make driving rougher, driving recorder data on changes in g-force acceleration were collected before and after the program to examine whether there were any changes in driving behavior.

The ratio of samples with g-force acceleration of 0.2 or higher, as measured by the maximum g-force acceleration over a 1-second interval, was created as the g-force acceleration index. Figure 4-14 shows the average values of this index, compiled from data for the 12 Company A participants in Research Program I. Higher values on the vertical axis (ratio of samples with g-force acceleration of 0.2 or higher) indicate a higher proportion of rough driving behavior out of all driving behavior. Using the average value during the 10 days before the program as the reference value, the average value for each day is presented to show the changes during post-program Week 1. (The results for Day 1 are based on the driving data that was collected during work immediately after the training session—the drivers attended the program from 8:30–10:30 a.m. and then performed their daily work. Therefore, Day 1 means the day of the training session, not the day after.)

This graph does not reveal any clear changes after the program, i.e., major changes from the reference value are not noticeable for any of the days covered. The ratio of high-acceleration samples does show a slight declining trend following the training session, but there are days on which the values are actually higher than the reference value. Neither of these changes is statistically significant.

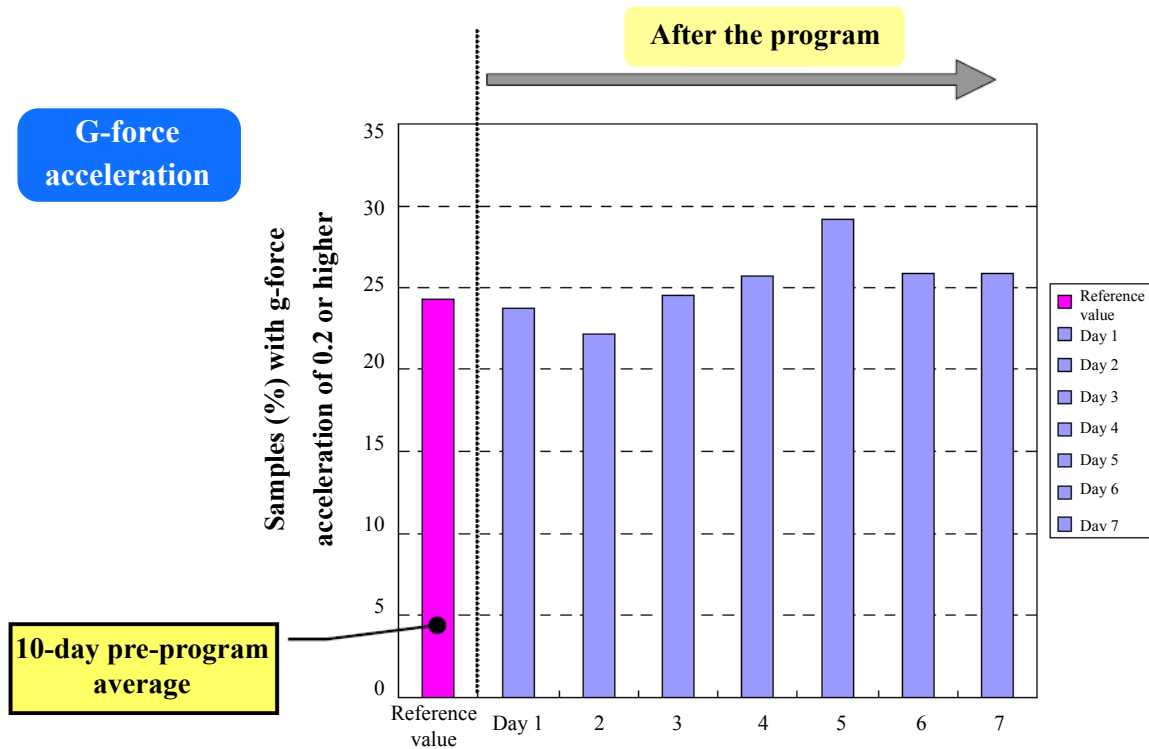


Fig. 4-14. Changes in g-force acceleration

An index was also prepared for the ratio of samples with g-force deceleration of 0.2 or higher. Changes in this index during post-program Week 1 are shown in Figure 4-15, which is similar to Figure 4-14. Like g-force acceleration, the index data on g-force deceleration show no significant changes from the reference value for any day.

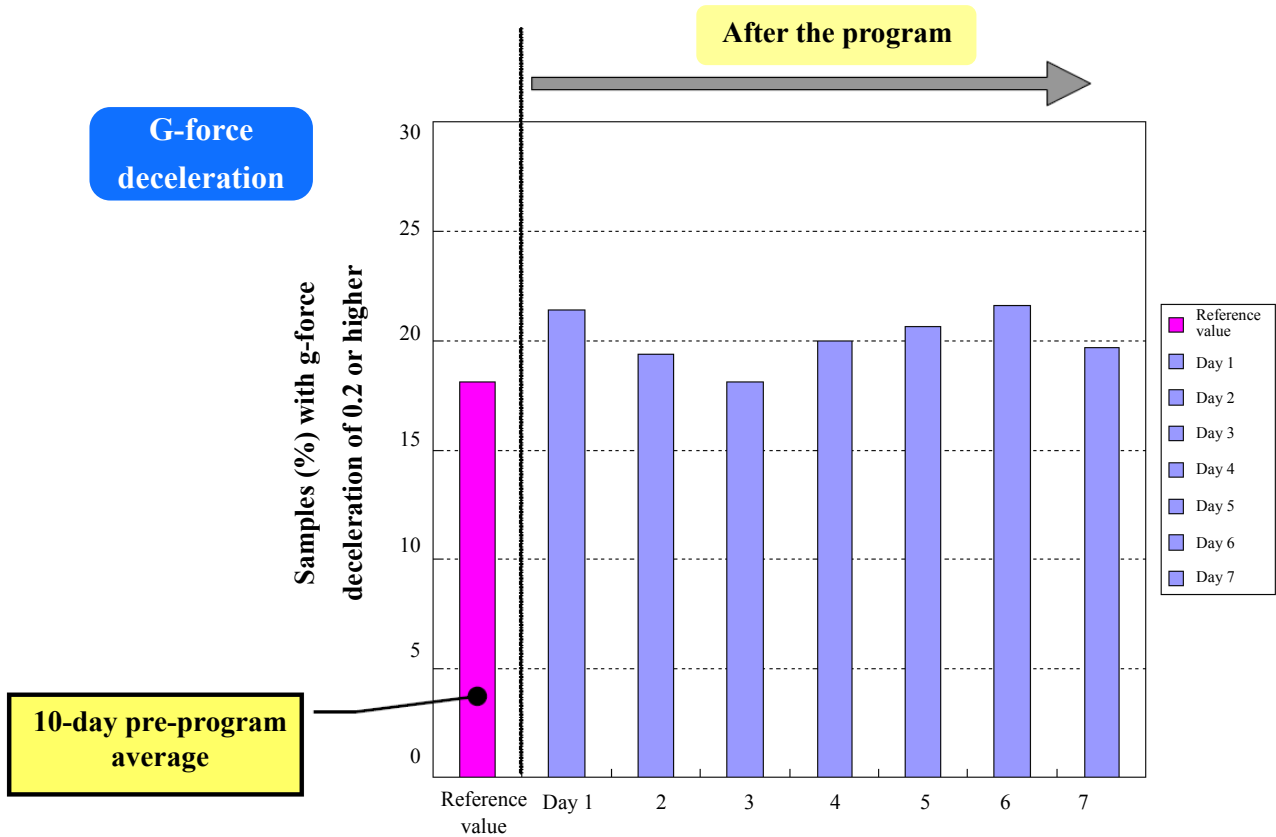


Fig. 4-15. Changes in g-force deceleration

Figure 4-16 shows the results of a similar analysis conducted for indexes of lateral acceleration. The data for the first 2-3 days after the program show a declining trend. For both right- and left-lateral acceleration, the ratio of samples was significantly lower than the reference value on Day 3 ($t(9)=3.629, p<.01$; $t(9)=4.715, p<.01$, respectively). Left-lateral acceleration shows a statistically significant lower ratio on Day 7 as well ($t(9)=2.613, p<.05$). On all other days, the difference from the reference value is not recognized as statistically significant.

In the interview survey conducted 1 month after the training session, many participants reported the following: For a few days after the program, what they learned through the program was on their minds while driving, but thereafter, being occupied with their daily work led to a gradual fading of this awareness. The results shown in Figure 4-16 tend to agree with this assessment; however, the sample size should be increased to conduct a more detailed analysis of the awareness and mindset that affect lateral acceleration and related issues. Even if the changes are a result of the program effects, they were only temporary changes; sustaining the effects of the program on a continuous basis remains an issue to address.

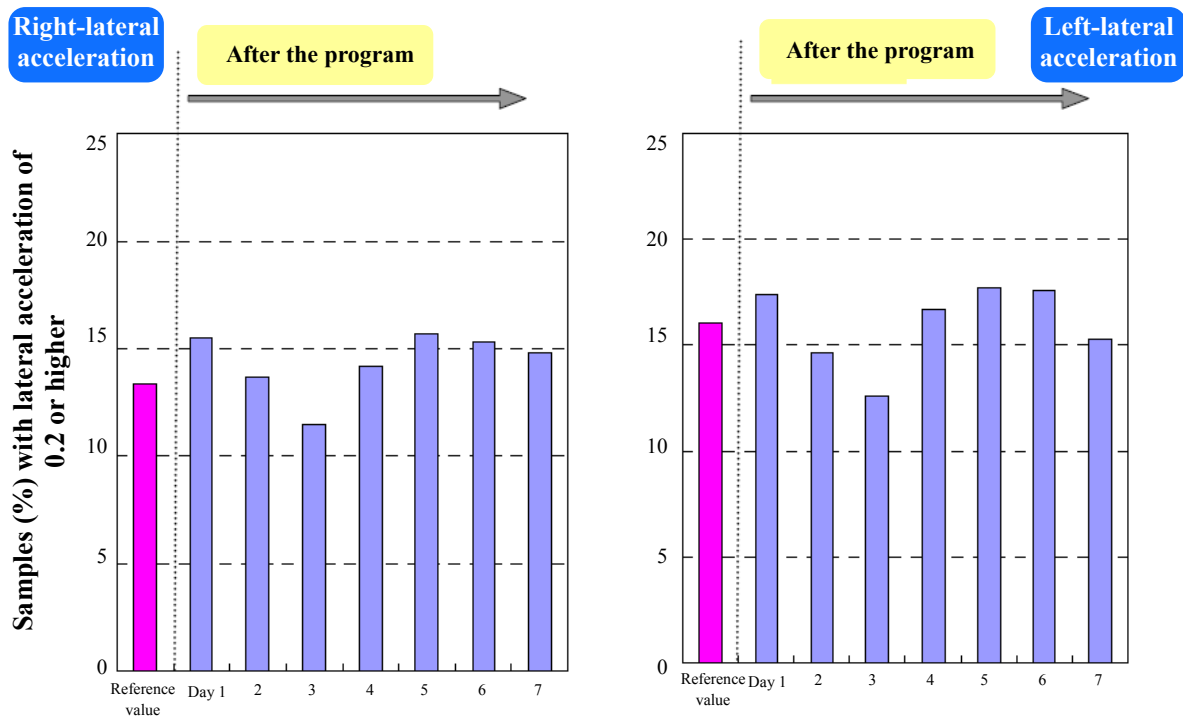


Fig. 4-16. Changes in lateral acceleration

The results for the analysis of driving behavior changes are as follows.

- (1) The indexes for g-force acceleration/deceleration show no significant change after the program in the ratio of samples with high g-force acceleration/deceleration (0.2 or higher).
- (2) Lateral acceleration did show a statistically significant decline in the ratio of samples with high acceleration (0.2 or higher) for post-program Day 3. These results appear to agree with the changes in awareness reported by the participants 1 month after the program, but a more detailed analysis with a larger sample size needs to be conducted.

Chapter 5. Discussion

5-1. Summary and issues to address

A summary of the results found in the current research project is as follows.

(1) Evaluation of the educational program

Participants had generally favorable impressions of the program and were highly receptive to it. Reactions to the program contents for promoting self-understanding and learning specific coping measures were favorable. Evaluations included comments that the program was easy to understand and that exchanging views with other participants was helpful. On the other hand, certain parts of the program were identified as requiring improvements, such as the time required.

(2) Changes in stress reactions and self-efficacy

There was a decline in stress reactions and a rise in self-efficacy after the program for anger toward the unsafe behavior of others and feeling rushed because pressed for time. These changes were particularly noticeable regarding the awareness of younger participants about the emotions of feeling rushed. It was also found that more extraverted trainees tend to have more substantial improvement in self-efficacy after the program.

(3) Changes in driving behavior

There was no evidence of quantitative changes in driving behavior, such as changes in g-force acceleration, resulting from the program.

Based on observations of the reactions from program participants, it can be concluded that most of the participants were actively involved in the process although the program was not to everyone's liking. The changes observed in the measurements of stress reactions and self-efficacy suggest that the trial educational program in this study induced changes and achieved educational effects to a certain degree. However, the following issues must be resolved for future training.

First, the measurement indexes for changes in driving behavior need to be examined further. The program is based on the assumption that a program aimed at improving emotional control will lead to more careful driving and thus smaller changes in g-force acceleration. However, because changes in g-force acceleration are affected by numerous factors including workload and weather conditions, this approach to measuring changes in overall driving at work may offset measurement of actual changes in driving behavior as a result. One possible step would be to adopt a new evaluation method that focuses on specific actions such as safety checks and stopping the vehicle. Evaluating the actions a driver takes in response to a given event would be

another possible approach. The means of improving the evaluation method will thus be examined in future research.

The second issue to address is how to sustain the educational effects achieved. It is possible that the educational effects identified in the surveys of the current program will only be temporary. In the interview survey conducted 1 month after the training session, a participant commented, "For a few days after attending the program, the need to control emotions was on my mind as I drove at work, but this awareness gradually faded after about a week, because I was busy with my work." Clearly devising effective means for follow-up education that helps participants keep practicing the measures for controlling emotions in daily work is required. One possible measure would be to paste the self-talk expressions near the driver's seat in a location where the driver's eyes will naturally be drawn, such as the sun visor, so that drivers will keep reminding themselves of their new awareness. Confirming self-talk expressions before the start of work each day may also be an effective approach. What is required is to come up with specific means for sustaining the program effects and to conduct research on the duration of their effectiveness.

The third issue is whether the training topics are really in line with participants' educational needs. The interactions found between the age factor and educational effects for the problem of feeling rushed because pressed for time make clear that this problem of dealing with time pressure is a major concern for younger drivers in particular. Given the commitment to perform their work duties according to schedule, younger people might be very conscious of the difficulty of adapting their own mental state to different situations while performing their driving work according to strict rules and restrictions. In contrast, middle- and senior-age drivers generally do not find the mental pressures arising from time limits to be a major concern. It may be surmised that the main focus of a driver's stress likely shifts with age. A survey conducted last year found that middle- and senior-age professional drivers are highly conscious of the stresses from fatigue, sleepiness, and anxiety about accidents. These themes are not covered by the trial program in this report. To address the stress-related issues faced by each age group as a part of future driver education programs, it will be necessary to design program contents and organize the program in a way that fits specific educational needs.

Stress reactions are also affected by the nature and type of work that the driver must carry out. Transport and delivery work may include work with very strict time constraints and which places greater emphasis on quality (safe and sure transport without fail) rather than time. Such differences in work requirements would affect the intensity of the stress reactions that a driver becomes aware of. It is important to take into account such types and styles of work, so that the program contents can always match educational needs.

5-2. To promote more widespread application of educational programs for driving behavior

Even though emotional control is a major theme to address in driving safety, it has rarely been taken up as an educational theme in concrete ways until now. Furthermore, the level of interest in this issue is relatively high among those engaged in driving safety education and training, so may be surmised that considerable educational needs exist in this area. To perform safe driving, a driver needs to learn and master a wide range of skills. For this purpose, it would be desirable to have a diversified menu of educational programs available. It is hoped that having more items on the menu and a wider selection of programs will lead to improvements in addressing and fulfilling wider educational needs.

Also, as a part of program improvement measures, manuals for promoting education in this field need to be prepared. The precondition for furthering such educational programs is to have an ample supply of instructors who are well-versed in the underlying principles of the programs and who have mastered the procedures for effectively implementing each program. For this purpose, manuals and other instructional tools will be necessary. In addition, one of the necessary steps for obtaining basic data is research on the type of problems the instructor actually faces in training situations when using the educational program in this report. Plans for the future include identifying and organizing instructional issues and then preparing a manual that includes descriptions of how to resolve these problems. In this way, the conditions to help further education and training in this field will be established.

Glossary

Hierarchical approach

A theory proposed by Esko Keskinen (1996) for explaining traffic behavior. This theory postulates that the required skills for safe driving consist of four elements. Starting at the lowest level of the hierarchy, the skill levels are: 1) vehicle maneuvering; 2) mastering traffic situations, including risk anticipation; 3) goals and context of driving, including the setting of driving schedules and the selection of safe routes; and 4) goals for life and skills for living, including the skills for self-evaluation and emotional control. The fact that driving skills form a hierarchical structure means that the upper-level skills have controlling effects on the functions of lower-level skills. For example, even if a person has mastered vehicle maneuvering skills, if their risk anticipation skills are insufficient, the risk of causing an accident is naturally still high. Risk anticipation skills are indispensable for ensuring safe driving. It is important, therefore, to gradually learn the skills on higher levels with their more dominant functions, and thus curricula and educational programs for this learning process are necessary. The opportunity to learn the skills relevant to 4) goals for life and skills for living is likewise necessary, as these are the skills at the highest level of the hierarchy, but there is currently a shortage of educational programs that offer the opportunity to master these skills. These circumstances have led to the planning of the current study.

Stress reaction

The concept of stress is typically discussed by first making a distinction between the *stimulus* (*stressor*) from the environment and the *reaction* (*strain*) to this stimulus. In this context, reactions are further classified into physiological reactions, such as an increase in the heart rate or a rise in blood pressure, and psychological reactions, such as anxiety or anger. In the current study, negative emotions that may be experienced while driving, including impatience and irritation, are considered stress reactions to environmental stimuli, such as a traffic jam, and are handled as a concept classified under psychological reactions.

Transactional model of stress, appraisal and coping

A theory of stress put forward by Richard Lazarus and Susan Folkman (1984). The transactional theory explains stress as the product of an interaction between the environment and an individual and as something that invokes the cognitive appraisal process. Cognitive appraisal is applied to the various pressures and demands received from the environment and assesses whether or not they are harmful to one's well-being. If such pressures and demands are recognized as harmful, the cognitive appraisal assesses whether the situation is controllable and whether coping is possible. If the cognitive appraisal finds that the pressures and demands are indeed harmful and that coping will be difficult, then stress reactions and negative emotions will be aroused. The assessment of the situation differs from person to person, which results in individual variances in stress reactions.

Self-efficacy

A concept proposed by Albert Bandura (1997), self-efficacy is the sense that one is capable of carrying out an action. In other words, it is the awareness that a person can “somehow cope” with a challenge that they currently face. Self-efficacy also involves the ability to envision specific procedures that are needed to achieve the goals of a challenge, which provides the motivation for taking action to tackle the challenge. Self-efficacy is a resource that an individual needs for coping with stress. The sense that the challenge can be overcome gives the individual a positive attitude in dealing with stress.

Four-level training evaluation model

Donald Kirkpatrick (1998) proposed an approach for evaluating the results of an educational or training program that categorizes the whole process into four levels for analyzing whether and how the education was effective. The first level is the level of Reaction of the trainees to the program, which corresponds to the commonly used “level of satisfaction” Indicator. Favorable reaction and evaluation by trainees will be associated with their motivation to learn, and will be a factor for enhancing the educational effects. The second level is the Learning level. The changes in a person’s behavior and level of knowledge and skills are an important indicator of the educational effects of a program, increasing the possibility of changes in personal conduct. The third level is the Behavior level. When a learner’s conduct changes in specific ways, this will be an objective indicator of the educational effects that have been achieved. The fourth level is the Results level. This is an index for the eventual results accomplished, such as improved productivity, cost reductions, or a decline in the rate of absence from work or the divorce rate. In the case of traffic safety, a corresponding index would be a decline in the number of accidents or the number of traffic violations. Because random factors often influence the occurrence of traffic accidents, using accidents as an index is not suitable for a research project conducted over a short period with a small number of samples. Therefore, an analysis of the educational effects of the current study was conducted concerning the Reaction, Learning, and Behavior levels.

Big Five personality traits

A model put forward in recent years to explain personality traits. The broad spectrum of characteristics related to people’s personalities is classified into five dimensions: Extraversion, Neuroticism, Openness, Conscientiousness, and Agreeableness. The Big Five model explains people’s personalities as combinations of large or small scores for these dimensions. In the current study, survey questionnaires were prepared based on the Big Five Scale created by Sayuri Wada (1996).

Acknowledgments

We would like to express our heartfelt thanks to everyone involved at DHL Japan, Inc. and Kanda Holdings Co., Ltd., who were very helpful in cooperating with the process of conducting this study. We would also like to express our thanks again to Kumiko Takada and Yukari Suzuki of the School of Psychology at Chukyo University, who have kindly helped us with the work of collecting and organizing the research data.

References

Ogawa, K. and Ota, H. (2009). Analysis of age-specific differences in stress responses while driving [in Japanese]. *Traffic Science*, Vol. 40, 60–68.

Institute for Traffic Accident Research and Data Analysis (2009). *Annual traffic accident statistics report for 2008* [in Japanese].

Maruyama, K. (1995). The education of metacognition for aptitude management [in Japanese]. In Maruyama, K. (author and editor), *The psychology of aptitude, accidents and driving* [in Japanese] (pp. 242–249). Osaka: Kigyo-KC.

Lazarus, R.S. and Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer. In Motoaki, H., Haruki, Y., and Oda, M. (translators and general editors), *Psychology of stress: Study of cognitive appraisal and coping* [in Japanese]. Tokyo: Jitsumukyoiku-Shuppan.

Ota, H. and Ogawa, K. (2005). *iiSA self-control diagnosis test for safe driving* [in Japanese]. Osaka: Kigyo-KC.

Kirkpatrick, D. L. (1998). *Evaluating training programs*. Berrett-Koehler Publishers, Inc., San Francisco.

Keskinen, E. (1996). Why do young drivers have more accidents? Junge Fahrer und Fahrerinnen. Referate der Esten Interdisziplinären Fachkonferenz 12-14. Dezember 1994 in Köln. Berichte der Bundesanstalt für Strassenwesen. Mensch und Sicherheit, Heft M 52.

Wada, S. (1996). Big Five Scale [in Japanese]. In Hori, H. (general editor) and Yamamoto, M. (editor). *Collected psychological measurement scales I* (pp. 123–128). Tokyo: Saiensu-Sha.

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: W.H. Freeman.

Appendix

H184

Project Report Meeting for 2009 Research April 16, 2010

Toward the Development of an Educational Program for Better Control of Emotions While Driving

Organization for the current study

■ Project leader:

Kazuhisa Ogawa (Tohoku Institute of Technology)

■ Project members:

Hiro Ota (Tohoku Institute of Technology)

Marehiro Mukai (Chukyo University)

Takashi Suzuki (Driving Safety Promotion Center,
Honda Motor Co., Ltd.)

■ With the cooperation of:

DHL Japan, Inc.

Kanda Holdings Co., Ltd.

Research Goals

2008

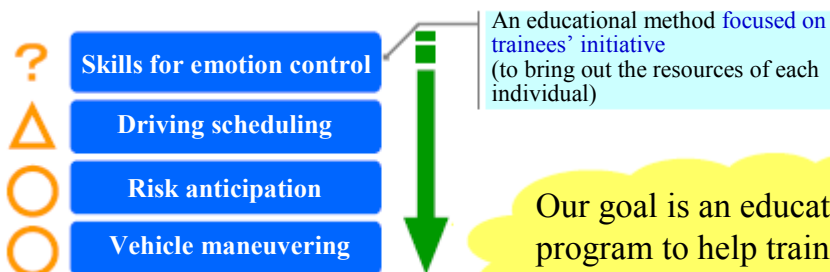
- To gather information on stress reactions (emotions) while driving and coping measures, and to create useful educational materials

2009

- To develop an educational program for trainees to learn emotion control skills
- To implement the program developed and measure its effects

Issue raised **Hierarchical Approach (Keskinen, 1996)**

- Skills for safe driving form a hierarchical structure.
- Upper-level skills in the structure have dominating effects on the lower-level skills.



Our goal is an educational program to help trainees control their emotions.

Stress Theory

Transactional model of stress, appraisal and coping (Lazarus & Folkman)

Stress reactions (Emotions)

- Individual differences ← How we view and interpret the situation
- Recognizing that control is possible → Decline in negative emotions

Educational Scenario

- **Self-understanding** (knowing oneself): Awareness of one's own cognitive characteristics and distortions
- **Learning coping measures**
 - ➔ Enhanced **self-efficacy** (the sense that one can somehow cope)
 - ➔ Reduced stress reactions ➔ Safe driving maintained

Structure of the Educational Program



- Step 1. **Introduction**
- Step 2. **Self-evaluation**
- Step 3. **Understanding stress theory** } ➔ **Self-understanding**
- Step 4. **Learning coping measures** ➔ **Enriching individual resources**
- Step 5. **Action goals**

Required time: 90 minutes

“How Much Anger You Feel” towards Others

Emotional level (How likely to feel anger toward others)

3) Ill-mannered driver rudely cutting in front

A really pushy driver...



| | |
|----------------------------|----------|
| Feel much anger | 4 |
| Feel some anger | 3 |
| Not feel much anger | 2 |
| No anger felt | 1 |

Level of inappropriate driving (Tendency for expressing aggressive and unpleasant emotions)

- **Warning by honking or flashing headlights**
- **Trying not to yield by all means**
- **Tailgating**
- **Aggressive overtaking**

| | |
|--------------------------|----------|
| Very likely | 4 |
| A little likely | 3 |
| Not very likely | 2 |
| Not likely at all | 1 |

“How Much You Feel Rushed” Because Pressed for Time

Emotional level (How likely to feel rushed because pressed for time)

1) Stuck in a traffic jam when work is busy



| | |
|----------------------------------|----------|
| Feel very rushed | 4 |
| Feel a little rushed | 3 |
| Not feeling rushed much | 2 |
| Not feeling rushed at all | 1 |

Level of inappropriate driving (Tendency to take excessive risks)

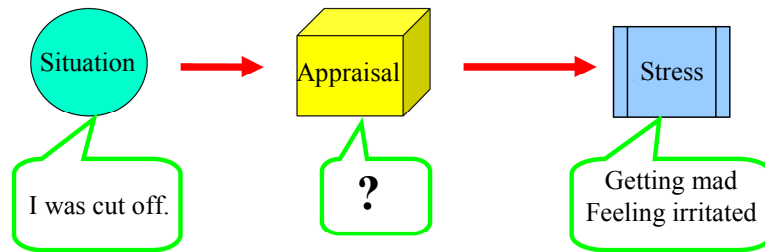
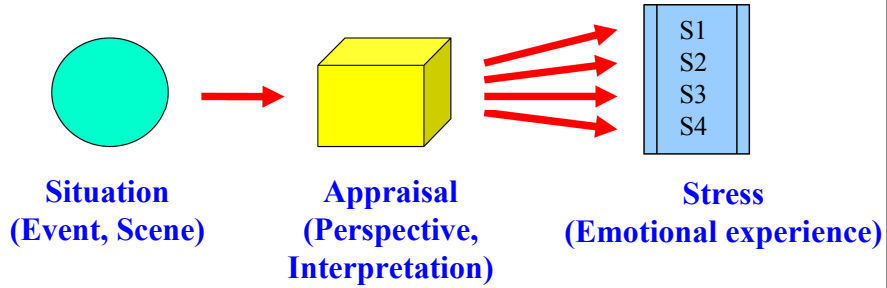
- **Drive faster than normal**
- **Pass through a required stop without fully stopping**
- **Speed up to beat a yellow light**
- **Jump lanes to move ahead**

| | |
|--------------------------|----------|
| Very likely | 4 |
| A little likely | 3 |
| Not very likely | 2 |
| Not likely at all | 1 |

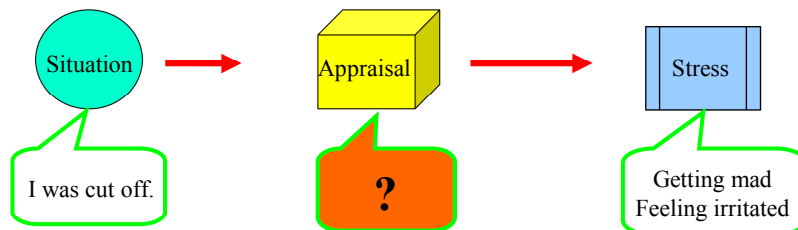
| Emotions | Item | Level of negative emotions experienced | Level of inappropriate driving behavior | Why do these emotions arise? |
|---|---|--|---|------------------------------|
| How much anger you feel towards others | 1) A pedestrian crossing the street against a red light | | | |
| | 2) When driving on a road and having the right-of-way, another vehicle enters the intersection without stopping | | | |
| | 3) Ill-mannered driver who rudely cuts in front | | | |
| How much you feel rushed because pressed for time | 1) Stuck in a traffic jam when really busy with work | | | |
| | 2) Driving because of an urgent request from someone | | | |
| | 3) Considerably behind the day's schedule because of unforeseen events | | | |

| Emotions | Item | Level of negative emotions experienced | Level of inappropriate driving behavior | Why do these emotions arise? |
|---|---|--|---|------------------------------|
| How much anger you feel towards others | 1) A pedestrian crossing the street against a red light | 4 | 2 | |
| | 2) When driving on a road and having the right-of-way, another vehicle enters the intersection without stopping | 4 | 3 | |
| | 3) Ill-mannered driver who rudely cuts in front | 4 | 4 | |
| How much you feel rushed because pressed for time | 1) Stuck in a traffic jam when really busy with work | 2 | 1 | |
| | 2) Driving because of an urgent request from someone | 3 | 2 | |
| | 3) Considerably behind the day's schedule because of unforeseen events | 1 | 2 | |

Transactional Model of Stress, Appraisal and Coping
(Lazarus and Folkman, 1984)



A Car Abruptly Cuts in Front



Why doesn't this driver obey the rules, while I do?

Self-talk

**There are all sorts of people in this world.
Maybe this driver was on urgent business and feeling rushed.**

Self-talk Approaches for coping with anger toward others


4 Thinking that “I do represent the company” calms me down.

4 I convince myself that getting angry at such a trivial matter means I’m small-minded.

4 Rather than “This guy cut in front of me,” I tell myself that “I yielded to let him in.” After all, roads are public space shared by everyone.

4 I think along the lines of “I can’t change others, but I can change myself.”

⋮



Survey Method Number of participants 102

- Gender: Male - 98, Female - 2, Missing value - 2
- Age: 22–63 years old (Mean = 37.38)

Research Program I

No. of respondents: 12 professional drivers (Co. A)

```

    graph LR
      A[2 weeks  
Driving behavior  
measured during  
daily work] --> B[Educational  
program]
      B --> C[1 week  
Driving behavior  
measured during  
daily work]
      C --> D[1 mo. later  
Interview  
survey]
      B -- Change in awareness --> A
      B -- Change in awareness --> C
      B -- Change in behavior --> C
  
```

Research Program II

No. of respondents:
60 professional drivers (Co. B)
30 professional drivers (Co. A)

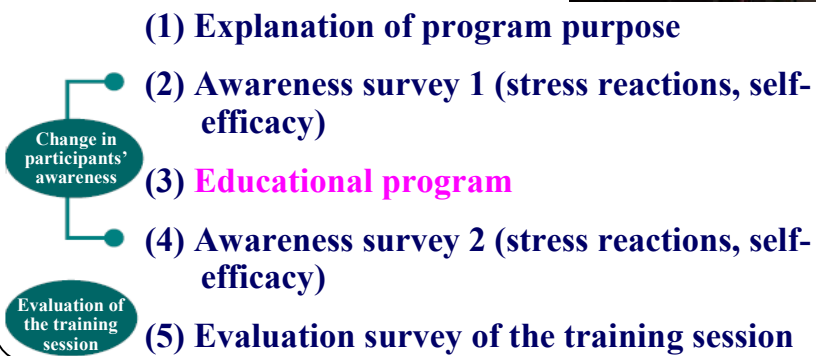
```

    graph TD
      E[Educational  
program] -- Change in awareness --> F[Change in awareness]
  
```

Survey Method

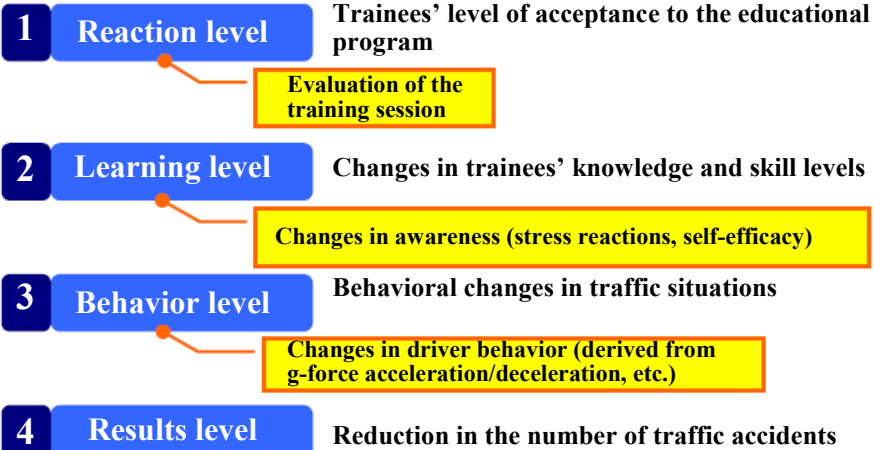


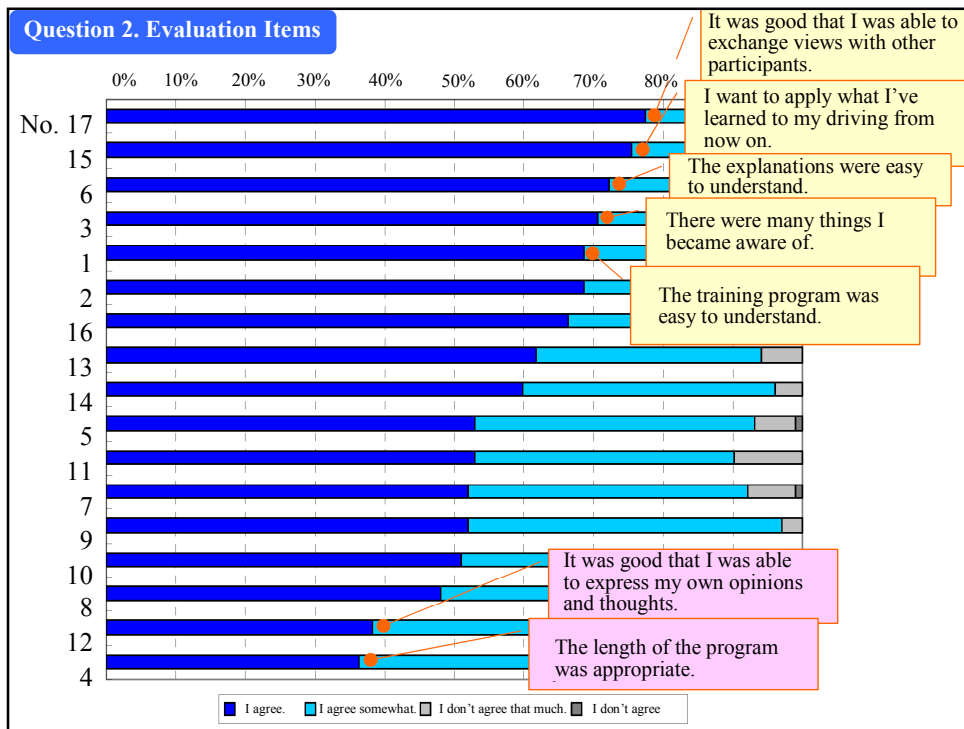
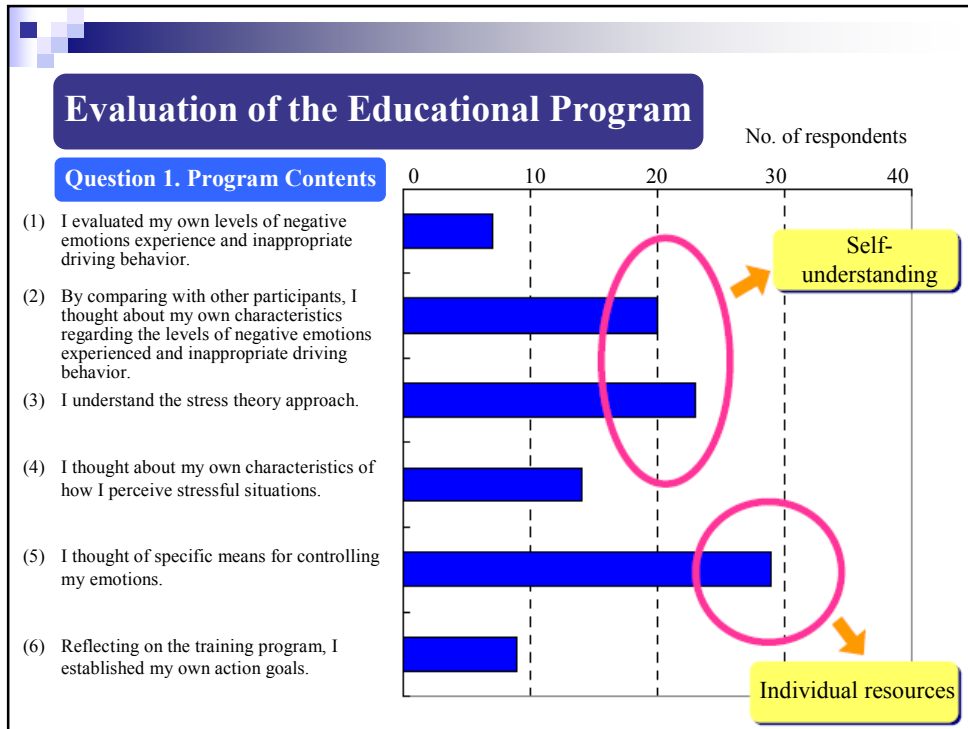
Flow of the training session



Analysis of educational effects


Four-level Training Evaluation Model (Kirkpatrick, 1998)





Stress reaction (Emotions)

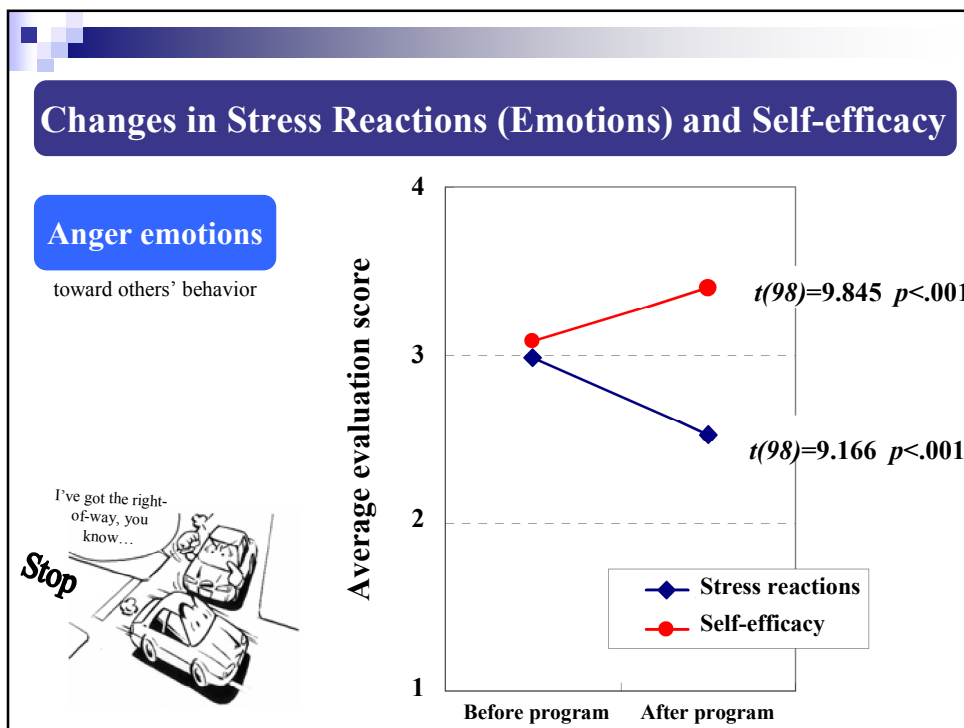
1 Not saying thanks, uh?



Even though I yielded, a driver who doesn't acknowledge my favor is rude.

| Answer A | | | | | Answer B | | | | |
|--|----------------------------|--------------------------------|--------------------------------|---|--|------------------------|--------------------|---------------|--|
| How much will this feeling apply to you? | | | | | Do you think you'll be able to cope in this situation? | | | | |
| It applies to me very much. | It applies to me a little. | It doesn't apply to me so much | It doesn't apply to me at all. | | Probably difficult | Maybe rather difficult | Maybe rather easy. | Probably easy | |
| 4 | 3 | 2 | 1 | → | 4 | 3 | 2 | 1 | |

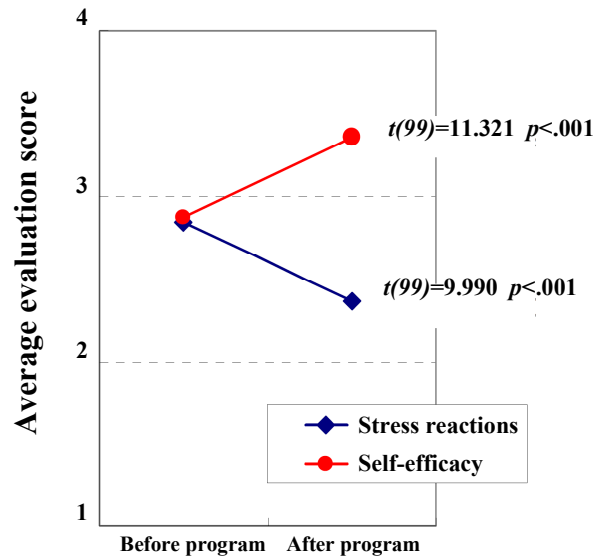
Self-efficacy



Changes in Stress Reactions (Emotions) and Self-efficacy

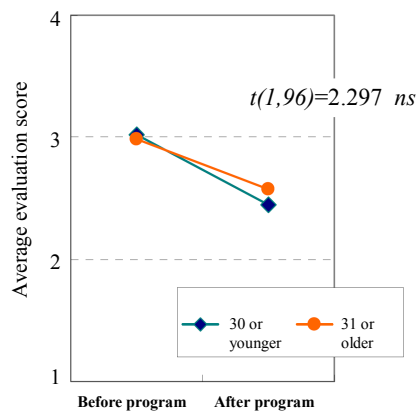
Emotions of feeling rushed

because pressed for time

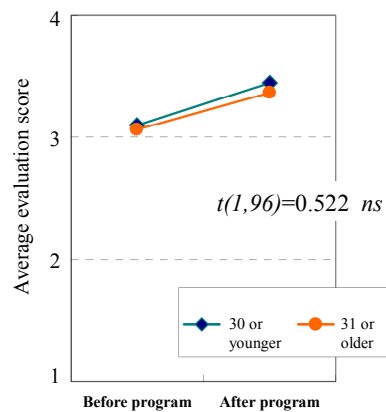


Age vs. Changes in Stress Reactions and Self-efficacy

Anger Emotions



Stress reactions

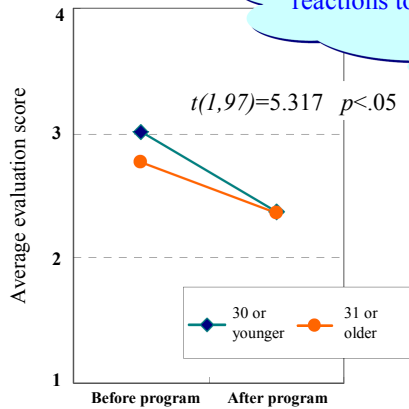


Self-efficacy

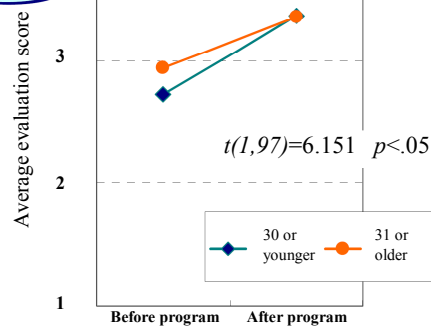
Age vs. Changes in Stress Reactions and Self-efficacy

Emotions of feeling rushed

Significant interaction effects
For younger people, a larger decline in stress reactions to impatience and greater improvement in self-efficacy



Stress reactions

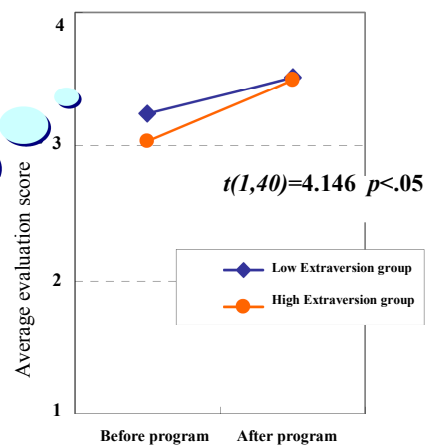


Self-efficacy

Personality Traits vs. Changes in Self-efficacy

Anger emotions

Significant interaction effects
Greater extraversion associated with greater improvement in self-efficacy for anger emotions

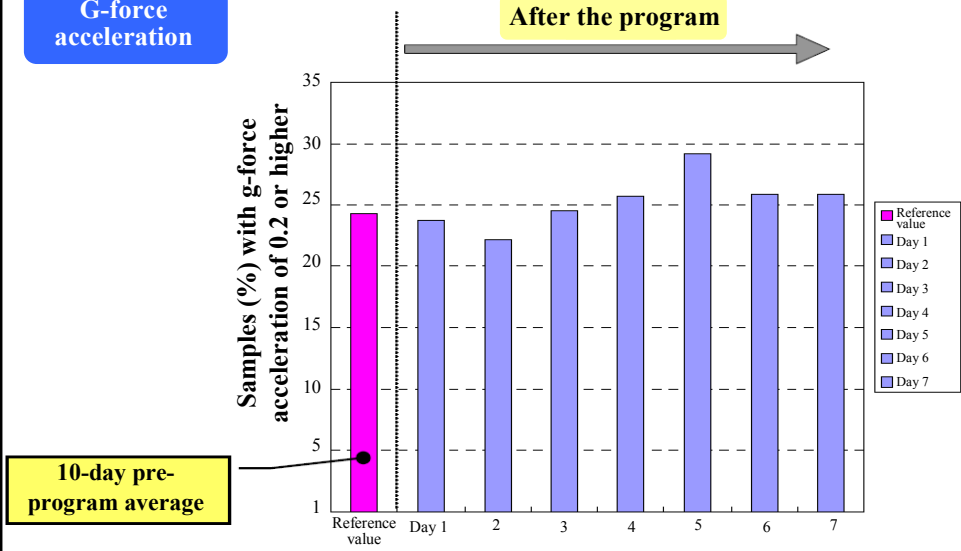


Self-efficacy

Changes in Driving Behavior

G-force acceleration

After the program

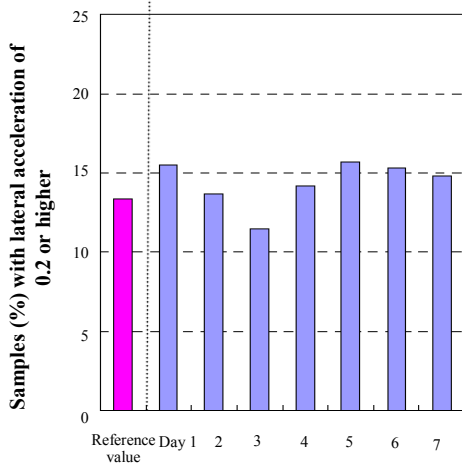


10-day pre-program average

Changes in Driving Behavior

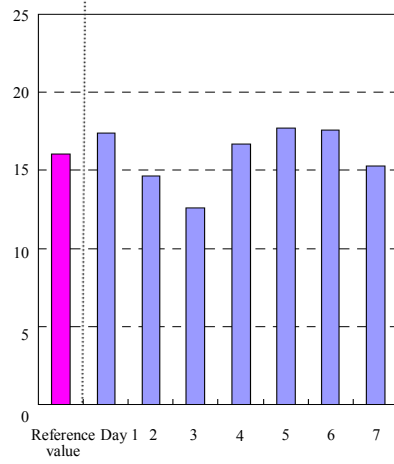
Right-lateral acceleration

After the program



After the program

Left-lateral acceleration



Educational Effects: Summary

Reaction level

- High level of acceptance to the educational program

Learning level

- Decline in stress reactions to anger and impatience, and a rise in self-efficacy
- For **younger people**, a larger decline in the emotions of **feeling rushed**, with more improvement in self-efficacy
- **Greater extraversion** is associated with greater improvement in self-efficacy for **anger**

Behavior level

- Quantitative changes such as changes in g-force acceleration not verified for this report

Issues to Address

- To reexamine the evaluation indexes for driving behavior
 - Can driver behavior other than changes in g-force acceleration, such as checking for safety, be measured?
 - An evaluation method focused on specific actions (Making a stop, etc.)
 - Grasp of how much Self-talk messages are put into practice and other measures
- How to sustain educational effects for lasting effectiveness
- To promote more widespread provision of educational programs:
 - Train instructors
 - Prepare manuals and other measures



Not for sale

**Toward the Development of an Educational Program
for Better Control of Emotions While Driving**

Report

Publication date: March 2010 (Translation date: December 2010)

Publisher: International Association of Traffic and Safety Sciences
6-20, 2-chome, Yaesu, Chuo-ku, Tokyo 104-0028 Japan

Tel.: +81-3-3273-7884 Fax: +81-3-3272-7054

Further reproduction prohibited without permission.