An interactive multimedia computer program was developed to change speed-limit offenders' attitudes with respect to speeding. The computer program is meant to be used during speed controls; the offender may be remitted a part of the fine by completing the program. The objective of the program is to make speeders aware of the negative implications of their behavior and to change their attitude negatively towards offending speed limits. To attain this goal, offenders are confronted with possible negative consequences of speeding while their arguments for speeding are refuted, using small video-clips, demonstrations of counter-arguments and short verbal stories. The effects of this multimedia program were studied in a laboratory evaluation, in terms of knowledge and attitudes, compared with two information conditions, a general leaflet about traffic, and a specific leaflet about speeding. One week after participation in the study subjects were sent a questionnaire, to measure whether changes in knowledge and attitudes were retained afterwards. It appeared that the general attitude towards speeding was changed most in the multimedia program condition, subjects became more negative towards speeding and various related aspects. The specific speeding leaflet appeared to influence the attitude towards driving fun positively and obeying traffic rules negatively, which are unwanted directions. With regard to knowledge of speeding and its consequences the computer program did not do better than the other conditions. However, the subjects considered the program more impressive than the leaflet conditions and indicated that they would consent to participate when being stopped in real speeding conditions.

In assignment of the Regional Traffic Safety Council Groningen (ROG) and the Ministerial Department of Waterworks and Road Maintenance (RWS), the Department of Experimental and Work Psychology developed (together with digitaAL inc.) a multimedia computer program for driving speed enforcement by police and justice. Drivers who violate the speed limit are halted and can choose between the normal fine or participating in the program and a reduced fine. Firstly, this paper will summarize the social-psychological models that are the basis for the program. Secondly, an experiment will be described that evaluated the program in terms of its ability to change an attitude towards speeding in a laboratory set-up, compared with more traditional leaflets. The paper will end with some conclusions and recommendations. As such, this paper describes the first step in a three-phase set-up for the development and implementation of educational means in behavioral change programs: a comparison test of the new program with more traditional treatments. The second phase has to be a field-test and the third phase the more wide-spread implementation.

A literature review was done to find out to what extent multimedia applications may teach a different driving speed choice. It appeared that nothing was found, and this has not changed since then. There are, however, other ways to change traffic behavior, and there are other behavioral goals that were subject to change by multimedia applications. Concerning traffic behavior it appeared that driver improvement courses do not (immediately) change the behavior of problem drivers, because 1) it is difficult to identify these drivers, and 2) the driver improvement programs evaluated had serious flaws. These flaws are: the programs are far and foremost verbal, whereas the goal behavior is sensory-motor, only attitude was the most important goal, thus underestimating external factors, accident involvement is not a personality trait, there were no controls for experimenter effects of placebo effects, and although a large attitude change was established, there was no change in behavior. In spite of this, attempting to influence behavior by influencing attitude is the only way to try to establish a “change from within”, since other and proven more effective methods are politically, technically and/or financially unlivable. Examples are road-infrastructure changes, such as selective
speed-reducing road humps that are only in position when an approaching vehicle is speeding. Other possibilities are in-vehicle, such as information systems that warn in case of speeding\textsuperscript{4} or even selective and automatic speed control and reduction\textsuperscript{5}. However, it has been shown that these “intrusions” are only accepted if they are voluntary and can be overridden\textsuperscript{4,5}. Heavy enforcement and fining campaigns may also bring about a behavioral change, but this is not by motivation “from within”, and will end as soon as the campaigns come to an end\textsuperscript{6}.

The theoretical basis for a multimedia application to change (attitudes towards) speeding behavior comes from Fishbein & Ajzen’s “Theory of reasoned action”\textsuperscript{7}. Behavior is thought to originate from a behavioral intention, which stems from attitudes and subjective norms. Attitudes are modulated by beliefs about the consequences of the behavior in question, and evaluations about these consequences, in this case of speed in terms of driving fun, risks, travel time, etc. The subjective norm is the expected judgement of the social environment and is modulated by normative beliefs about speed and by a personality factor that may be called tendency to comply. Some remarks are in place here. This model implies that drivers constantly have conscious control over their behavior, which is not so. Furthermore, the model implies that behavior is always the consequence of an intention, which is not so. And attitudes are, in this view, rational and objective, only to be changed by rational activities, which is too narrow-minded.

To counteract these objections the model had to be extended: Ronis, Yates & Kirsch\textsuperscript{8} expanded the ways behavior is created. There are two ways: reasoned and unreasoned influences. Intentions are part of the reasoned influences, whereas habits are part of the unreasoned. Both these influences are subject to modulation by internal and external stimuli (such as infrastructure, weather, time of day, reason for vehicle use, etc.), and behavior that originated from them may be influenced by facilitating factors (such as the availability of a car, driving skill and knowledge, etc.). Hence this model incorporates the possibility for other than rational-conscious factors to influence behavior. Driving habits are very strong behavioral modulators. Furthermore, one may argue that before a trip is taken various social factors may influence behavioral intentions, but once in the “wheeled cage” the possibilities for influencing drivers by social factors diminish strongly (ways to communicate with drivers by other drivers are minimal), and hence within a certain task and environmental context habits take over. Ronis et al.\textsuperscript{8} however, maintain that habit change will only take place when repeatedly conscious information processing takes place. The driver, however, will resist reasons for other behavior. Petty & Cacioppo\textsuperscript{9} incorporate this resistance to change in their “elaboration likelihood model”. This term refers to the extent – i.e., the likelihood – that a person is willing to consciously process information – i.e., elaboration – that is in agreement with the intended direction of behavioral change. There are two routes by which behavior may change. When the driver is willing and able to do conscious and rational information processing, persuasion of the driver towards the wanted behavior is possible by a direct or central route of rational information. He or she can be persuaded by rational information that the usual behavior (in this case speeding) is unwanted for various reasons, and he or she will comply. When the driver is not willing and/or able to consciously process rational information a kind of detour, a peripheral route has to be taken. Instead of a rational approach, a more emotional and associative approach has to be taken. When he or she becomes emotionally convinced of the inappropriateness of the behavior, the behavior may change also.

In case of speeding behavior all attempts to change behavior can be expected to meet certain resistance. Speeders, halted in an enforcement campaign, are expecting beforehand attempts of influence and arm themselves mentally with arguments in favor of their (unwanted) behavior. Influencing them by taking the peripheral route may be more successful, using associations, and emotionally loaded arguments. Using a computerized multimedia program it may be an advantage that the speeder may be actively involved in handling the application (interactive approach), that more or less individual courses through the program are possible, and that the emotional impact may be augmented by using various media (sound bites, short films, pictures of the actual situation of the offence, etc.).

The basis of the actual program is formed by eleven reasons speed offenders may think of for their behavior: I was in a hurry, speeding is fun, I was behind a snail, this speed is best for my car, I was not aware of my speeding, I did not know the actual limit, the speedometer was broken, I don’t accept the local limit, I decide my driving speed myself, all drivers drive more than the limit here, and there is never a speed control. These reasons were provided by the local police authorities. Selection was based on their experience, the selected arguments were the most frequently encountered excuses which were heard from speeders during the reception of a fine. Each of these reasons is counteracted by both ra-
tional and emotional arguments, by short and hefty pictures, films or sounds. Furthermore, the offender is confronted with the negative outcome of speeding behavior by him/herself, by engaging him/her in various tasks, such as a reaction time task, brake distance estimation task and the like.

To find out whether the program is better in changing attitude than traditional leaflets, an evaluation was performed. A situation was invented, a 50km/h road running through a suburban village. The situational specific frames in the program were equipped with pictures and accident information of the location. There were three conditions for the between-subject study: the program, a specific speed-related leaflet, and a general traffic-safety leaflet.

In the specific speed-related leaflet there was information about the annual casualty rate in traffic, the frequency of speeding, the relation between speeding and accidents, the fact that doubling the speed means quadrupling the braking distance, the various reasons people use for speeding and their invalidity, the relative very little gain in time. In the general traffic-safety leaflet the issues addressed were the increase in mobility, the impact on safety and the fact that human error is dominant in accident causation, driving speed, alcohol, use of safety belts, children in traffic and the liability of car drivers when involved in an accident. Both leaflets had about the same amount of text (about 600 words), and were visually similar with one picture of a fancy car on top.

In each condition 20 subjects were scheduled: experienced drivers that once or even more often were confronted with a fine for speeding. Fifty-seven subjects actually participated in the study (33 male, 24 female): 18 in the program condition, 19 in the specific leaflet condition, and 20 in the general leaflet condition. After an oral introduction subjects had to finish a questionnaire for assessing their attitude. Then they were confronted with their condition (doing the program or reading the leaflets). Then they had to finish a questionnaire for assessing their attitude again.

The attitude questionnaire consisted of three bi-polar five-point scales (from –2 to +2) anchoring with good-bad, fun-no fun, attractive-unattractive. The composite (summated) score is interpreted as the attitude towards speeding. Table 1 shows these summated scores, separately for each condition and the pre- and post-treatment assessment. As can be seen the attitude in the program group towards speeding is significantly decreased (speeding became worse, less fun and less attractive), whereas for the two other groups there was no (significant) change. Furthermore, the difference between the program group and the specific leaflet group was significant in the post-treatment assessment: the program group became more negative about speeding, whereas the specific leaflet group did not.

There were also questions about motives. The following aspects were assessed: agreeable driving speed for the vehicle, driving fun, having self-control of the speed, the vehicle remains “speedy”, endangering other drivers, traffic rule compliance, lacking time to react on other drivers’ behavior, probability of a speeding fine, incorrect estimation by other drivers of the subject’s speed, gaining time, arriving quickly at the destination. Each of these aspects was expressed as a short statement. Subjects had to indicate their measure of agreement with these statements (from –2 to +2) and their measure of considering this important (also from –2 to +2). The product of these scores provides a score for behavioral motive. Figure 1 presents these values, separate for each motive, treatment group (type of intervention) and pre- or post-treatment assessment. The various panels of Figure 1 give a review of the effects described here.

Subjects in the various treatment groups appeared to differ significantly in their opinion about various aspects. Since this was an indicative study the significance level was placed at 0.10 instead of the usual 0.05. The specific treatment group in the pre-treatment assessment considered driving fun more negative than the program group \( t = 1.70, df = 35, p < 0.10 \). The general leaflet group was more negative about probability of a speeding fine \( t = 2.39, df = 37, p < 0.05 \) and about the vehicle remaining more “speedy” \( t = 1.70, df = 37, p < 0.10 \).
**SPEED REGULATION**

- **Best speed for the car**
  - Multimedia program: Pre-treatment 0.7, Post-treatment 0.8
  - Specific leaflet: Pre-treatment 0.7, Post-treatment 0.8
  - General leaflet: Pre-treatment 1.1, Post-treatment 1.2

- **Having driving fun**
  - Multimedia program: Pre-treatment -0.8, Post-treatment -0.4
  - Specific leaflet: Pre-treatment 0.4
  - General leaflet: Pre-treatment -0.5, Post-treatment 0.4

- **Self determination of speed**
  - Multimedia program: Pre-treatment 1.1, Post-treatment 0.6
  - Specific leaflet: Pre-treatment 0.5, Post-treatment 0.3
  - General leaflet: Pre-treatment 0.2, Post-treatment 0.5

- **Car remains more speedy**
  - Multimedia program: Pre-treatment 1.2, Post-treatment 1.4
  - Specific leaflet: Pre-treatment 1.4, Post-treatment 1.9
  - General leaflet: Pre-treatment 0.3, Post-treatment 0.9

- **Endangering other drivers**
  - Multimedia program: Pre-treatment -0.7, Post-treatment -0.4
  - Specific leaflet: Pre-treatment -0.5, Post-treatment -0.7
  - General leaflet: Pre-treatment -1.1, Post-treatment -0.8

- **Compliance of traffic rules**
  - Multimedia program: Pre-treatment -1.4
  - Specific leaflet: Pre-treatment -1.9
  - General leaflet: Pre-treatment -0.9, Post-treatment -0.8
CHANGING ATTITUDES OF SPEED LIMIT OFFENDERS USING A MULTIMEDIA PROGRAM

F. J. J. M. STEYVERS, A. J. MENTING, K. A. BROOKHUIS

“Lacking time to react to other’s behavior”

**Composite score**

<table>
<thead>
<tr>
<th>Type of intervention</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia program</td>
<td>-0.2</td>
<td>-1.3</td>
</tr>
<tr>
<td>Specific leaflet</td>
<td>-0.9</td>
<td>-0.6</td>
</tr>
<tr>
<td>General leaflet</td>
<td>-1.9</td>
<td>-2.6</td>
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</tbody>
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* = significant difference (P < 0.10) between pre- and post-treatment score

“Probability of speeding fine”

**Composite score**

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<th>Post-treatment</th>
</tr>
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<tbody>
<tr>
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<td>-2.1</td>
</tr>
<tr>
<td>Specific leaflet</td>
<td>-3.3</td>
<td>-3.6</td>
</tr>
<tr>
<td>General leaflet</td>
<td>-2.1</td>
<td>-3.3</td>
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</tbody>
</table>

“Incorrect speed estimation by others”

**Composite score**

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<th>Post-treatment</th>
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</thead>
<tbody>
<tr>
<td>Multimedia program</td>
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<td>-1.2</td>
</tr>
<tr>
<td>Specific leaflet</td>
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<td>-1.1</td>
</tr>
<tr>
<td>General leaflet</td>
<td>-0.9</td>
<td>-0.7</td>
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</table>

“Gaining time”

**Composite score**

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<th>Post-treatment</th>
</tr>
</thead>
<tbody>
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<td>0.2</td>
</tr>
<tr>
<td>Specific leaflet</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>General leaflet</td>
<td>0.2</td>
<td>0.6</td>
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</tbody>
</table>

“Arriving at destination more quickly”

**Composite score**

<table>
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<tr>
<th>Type of intervention</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia program</td>
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<td>1.0</td>
</tr>
<tr>
<td>Specific leaflet</td>
<td>0.8</td>
<td>0.6</td>
</tr>
<tr>
<td>General leaflet</td>
<td>0.5</td>
<td>0.7</td>
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</table>
Subjects of the program group considered the aspect arriving quickly at the destination more positive than subjects from the general leaflet group \((t = 2.05, df = 36, p < 0.05)\). In the post-treatment assessment subjects of the specific leaflet group considered the vehicle remaining more “speedy” a more positive aspect of speeding than the subjects of the general leaflet group \((t = 1.80, df = 36, p < 0.10)\).

Then the change between pre- and post-treatment assessments were compared. Subjects in the program group became less positive about the aspect of gaining time \((t = 1.80, df = 17, p < 0.10)\). Subjects of the specific leaflet group considered the aspect of driving fun in speeding more positive \((t = 2.09, df = 18, p < 0.10)\) and traffic rule compliance more negative \((t = 2.52, df = 18, p < 0.05)\). They became more negative about the time to react to other drivers’ behavior \((t = 2.51, df = 18, p < 0.05)\), and about the incorrect estimation by other drivers of the subject’s speed \((t = 2.05, df = 18, p < 0.10)\). Subjects of the general leaflet group considered driving fun more positive \((t = 2.01, df = 19, p < 0.10)\), as well as probability of a speeding fine \((t = 3.01, df = 19, p < 0.01)\) and gaining time by speeding \((t = 1.76, df = 19, p < 0.10)\).

There were questions concerning the specific situation that was well known to all subjects. They considered the speed limit of 50km/h quite sensible, and they thought that traffic safety would increase when all drivers would comply with that limit. The statement “I comply with a limit earlier when accompanied in the vehicle than when alone” gave varied levels of agreement. In the post-treatment assessment subjects of the specific leaflet group more often were totally opposed to the statement \((\chi^2 = 13.85, df = 8, p < 0.10)\), compared to the other groups. Subjects from the general leaflet group and the program group considered police speeding control more sensible than subjects from the specific leaflet group. This was found both in the pre- and post-treatment assessment (respectively \(\chi^2 = 15.11, df = 6, p < 0.05\) and \(\chi^2 = 11.44, df = 6, p < 0.10\)). In the post-treatment assessment the difference became smaller. All subjects estimated the probability of a speeding fine on the specific location rather small. Unnoticed, one tends to drive faster than allowed. A speeding fine was considered very unpleasant. Subjects reacted variously when asked whether they would drive faster if speed controls were certainly not to be held.

In pre- and post-treatment assessments also knowledge was tested by asking questions about the following aspects: proportion of drivers that complied with the speed limit at the specific (fake) location, liability in case of an accident with a bicyclist, insurance policies in this case (loss of no-claim reductions), braking distance at 50km/h, braking distance at 80km/h, physical impact of a collision with 50km/h in terms of a free-fall jump, meaning of traffic sign “end of built-up area” for speed limit, estimation of time gained by a speed of 20km above the limit at a stretch of 10km, magnitude of the fine in case of a speed of 15km above the limit, speed over the limit that may cause the driver’s license to be withdrawn. In the pre-treatment assessment there were no differences in knowledge between the three treatment groups. In the post-treatment assessment there were two differences. The subjects of the specific leaflet group and (less pronounced) of the program group responded more often that the driver’s license might be withdrawn at speed limit violations between 31 and 60km/h \((\chi^2 = 13.24, df = 6, p < 0.05)\). Forty-five percent of the respondents in the general leaflet group thought (correctly) that a non-guilty collision with a bicycle would cause the loss of the no-claim insurance reduction, whereas in the program group and the specific leaflet group this was 17% and 33% respectively \((\chi^2 = 8.23, df = 4, p < 0.10)\). All respondents underestimated in both pre- and post-treatment assessments the proportion of drivers complying with the speed limit. Most drivers were aware of the liability in case of a non-guilty collision with a bicycle, but that this would mean the loss of the no-claim reduction of the insurance was not common knowledge. The meaning of the sign “end of built-up area” in terms of a speed limit of 80km/h unless otherwise stated was common knowledge. And subjects estimated the time gained by speeding, and the fine in case of a speed limit violation of 15km/h quite accurately. Furthermore, there was a systematic underestimation of braking distances for speeds of 50 and 80km/h. Finally subjects underestimated the speed limit violation at which police officers may withdraw the driver’s license.

To gain information about the medium, especially the multimedia program, immediately after the treatment a questionnaire was filled in. Subjects had to rate on a five-point scale (good-bad) the following aspects of the topics treated: educational-not educational, understandable-not understandable, clear-unclear, making sense-not making sense, good-bad, boring-exciting, realistic-unrealistic, fun-no fun. They had to rate the way the topics were presented with: fun-no fun, understandable-not understandable, making sense-not making sense, good-bad, real-artificial. Subjects were more positive about the program than about the leaflets \((\chi^2 = 12.30, df = 6, p < 0.10)\). Furthermore, subjects of the program group tended to-
wards a more positive judgement about the contents of the program. They considered it more understandable, exciting, and realistic. On other aspects the program scores as good as the leaflets, with the one exception that the general leaflet was more “making sense” than the other treatments. This positive rating of the program was also found for the aspects of treatment of the topics. The specific leaflet however, was found to be more understandable than the other two treatments. In general, the multimedia program was appealing to the subjects. About the length subjects were divided. Two considered it too long, nine neither too long nor too short, and seven too short, one remarking “a punishment in terms of time is horrible for speeders”. Using the computer was no problem. Given the choice between the program and the full leaflet brought about that subjects became less negative about the gain of time.

The results of this evaluation may be summarized as follows. The multimedia computer program for educational enforcement of speed limit offenders did bring about a change in attitude towards driving too fast. It became significantly more negative; the rating score changed from 0.0 to −1.1 on a scale ranging from +2 to −2. Subjects treated with a more traditional medium – specific or general leaflets – did not show such an attitude change. Subjects in the general leaflet group even showed a slightly more positive attitude towards speeding, and subjects in the specific leaflet condition remained more or less positive. Furthermore, opinions about various aspects of speeding were assessed. The program caused subjects to be less positive about the gain of time by speeding. Subjects are now aware that speeding does not automatically result in gain of time. The specific leaflet brought about that subjects became less negative about driving fun by speeding, and less positive about complying with traffic rules. This is in contrast with what one would want to achieve in such treatments.

The program group did not gain more knowledge about the consequences of speeding, compared to the other two treatment groups. It appears that subjects already possess quite some knowledge in this respect. However the way the various topics are treated was judged more positive for the program than for the other treatments. This was the case in this laboratory experiment. In a real-life setting the advantage of the program over leaflets may become even larger. In this experiment subjects were actually reading the leaflets, whereas in real life people take the leaflet, put it away in order to drive on, and forget its existence.

Therefore, one may conclude that the program may contribute to a change in attitude towards driving speed violations in general, and about the “myth” of time gained by speeding in particular. The question whether this treatment will cause a change not only in attitude but also in driving behavior is the next step in the evaluation of the program. Field trials are planned on both 50 and 80km/h roads.