Romanian Journal of Applied Psychology
2025, Volume 27, Issue 1, 104-115

Official journal of West University of Timisoara &
The Euroregional Center for Applied Psychology
DOI: 10.2478/rjap-2025-0010

The Effectiveness of Implementation Intentions Interventions on Speeding Using a Driving Simulator

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Received 22.05.2025; Received revised 12.08.2025; Accepted 13.10.2025;
Available online 13.11.2025

The aim of the present study was to evaluate the effectiveness of an implementation-intentions intervention in reducing speeding behavior using a driving simulator. A total of 78 participants completed both pre-test and post-intervention assessments. The study employed an experimental design with two groups: an experimental group (N = 38) that received the implementation-intentions intervention, and a control group (N = 40) that read a neutral text. Analysis of covariance (ANCOVA) was used to examine whether the experimental group showed lower speed on straight roads and reduced speed at junctions during the post-test phase. The results revealed no significant effect of the intervention on speeding behavior. However, it highlights the need for future interventions to focus on personalized, context-sensitive strategies that target key psychological drivers of speeding. Expanding research to diverse populations and real-world conditions is essential for developing more effective road safety measures.

Keywords: Intervention, implementation intentions, driving, speed, experiment, driving simulator.

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Introduction

Road traffic accidents are recognized as one of the causes of mortality worldwide, with speeding being among their main causes (Elvik et al., 2009). Research has shown that speeding affects the economy and safety, being strongly correlated with the risk of road accidents (Brewster, 2016). Vehicles traveling at much higher speeds than others in traffic are much more likely to be involved in accidents (Aarts & Van Schagen, 2006). These findings underscore the importance of implementing effective interventions to deter speeding behavior.

Some interventions have proven effective in changing driving behavior, with meta-analytic results showing that the most effective ones generally include feedback, training, or motivational strategies. However, the effects may vary depending on the targeted behavior (Tirla et al., 2024). Regarding speed reduction, effective interventions include those based on feedback, with information about the driver's performance as well as the consequences of their behavior (Molloy et al., 2018). Training has also been shown to be effective (Ebnali et al., 2019). On the other hand, there are less effective interventions such as awareness campaigns (Taubman Ben-Ari et al., 2000) or educational interventions (Carcary, 2000). Implementation intention-based interventions have also shown promise (Tirla et al., 2024), with the added benefit of requiring fewer resources than training or feedback-based approaches.

Implementation Intentions Interventions and Speeding Behavior

Implementation intentions interventions have proven effective in various domains, including alcohol consumption (Armitage & Arden, 2012), smoking (Armitage, 2008), and physical exercise (Milne et al., 2002). Implementation intentions facilitate goal achievement by creating "if-then" plans (Gollwitzer, 1993). According to Gollwitzer (1993), clear planning is essential for behavior change. In these interventions, the individual sets a goal they want to achieve and formulates a concrete plan to reach it. To do this, they think of a specific situation in which they will implement a behavior and the strategies they will use to do so. This way, they establish a situation that they link to a response strategy (e.g., "If I am running late, I will remind myself that I do not save much time by speeding").

Participants who form implementation-intentions are more likely to change their behavior compared to those who do not form implementation-intentions (Sheeran & Silverman, 2003). Meta-analytic findings further indicate that implementation intention interventions are effective in changing behaviors, with an effect size of .50 (Gollwitzer & Sheeran, 2006), considered a medium effect according to Cohen (1992).

Given the limited and inconsistent findings in existing research on driving behavior, it is important to examine how implementation intentions influence speed reduction, particularly when considering the number and nature of these strategies. Elliot and Armitage (2006) showed that these interventions effectively reduce drivers' speed when measured with self-reported questionnaires. Brewster et al. (2015) identified significant results using self-reported questionnaires, and Brewster et al. (2016) found similar results using a driving simulator. In contrast, Brewster (2016) did not identify significant results for reducing speed when, during the intervention, participants were asked to form fewer implementation intentions, highlighting the need to establish an optimal number of such strategies. Some authors suggest that up to four implementation intentions lead to favorable outcomes (Elliot & Armitage, 2006). However, research on speeding behavior using objective measures remains limited. Despite the frequent use and contribution of self-reported questionnaires, studies underline the need for objective assessments because self-reported instruments are subject to a high risk of bias due to social desirability (see Qaid et al., 2022; Wåhlberg, 2010).

Studies using driving simulators have a high degree of internal validity, and as previously mentioned, some promising results of an implementation-intention intervention using such methodologies have been reported (e.g., Brewster et al., 2016). However, Tekeş and Özkan (2021) tested a similar intervention by measuring speed with the help of a simulator and found that the intervention did not reduce speed, but merely prevented its increase. In any case, both the study by Brewster et al. (2016) and the one by Tekeş and Özkan (2021) present several limitations, such as the subjectivity involved in selecting the strategies for forming implementation intentions, or the use of the same scenario for both baseline and post-test phases, which can lead to learning and familiarity effects.

Additionally, studies in various domains, such as time management (Oettingen et al., 2015) and smoking cessation (Loy et al., 2016), have shown that combining implementation-intention interventions with mental contrasting can enhance their effectiveness. Mental contrasting involves thinking about a future goal (in this case, adhering to the speed limit) and identifying the obstacles that currently prevent one from achieving that goal. This process helps clarify what is realistic and achievable (Oettingen & Gollwitzer, 2010). However, reviews conducted within the fields of education (Hauser,2018) and health (Cross & Sheffield,2019) highlight mixed results regarding the efficacy of this combined approach. In any case, within the context of driving behavior - particularly speeding - there is, to the best of our knowledge, no intervention that combines both implementation intentions and mental contrasting. Therefore, it is relevant to examine whether such a combined approach could make a significant contribution to reducing speeding behavior.

The present study

In the context of speeding, no known studies have investigated the effects of combining implementation-intentions strategies with mental contrasting in a simulated driving environment. Given the mixed findings and methodological limitations of previous research, the current study aimed to extend existing evidence by addressing these gaps. Specifically, it tested an intervention that combined implementation intentions with mental contrasting, assessed using objective indicators within a driving simulator.

We hypothesized that, immediately following the intervention, participants in the experimental group would exceed speed limits less frequently than those in the control group.

Methods

Design

This study had an experimental design with pre-test and post-test measures. Two groups were included: an experimental group that received the implementation-intention intervention and a control group that read a short text.

Participants

Participants were 78 drivers with ages between 19 and 53 years (M = 25.10, SD = 8.18), 34 males (43.6%) and 44 females (56.4%). There were 38 drivers in the experimental group, and 40 drivers in the control group. Participants had on average 6.26 (SD = 7.06) years of driving experience. For the socio-demographic characteristics of the participants, see Appendix A1.

Instruments

Objective speeding behavior. To assess driving speed, we utilized the CarnetSoft Driving Simulator BV, Groningen, Netherlands (https://cs-driving-simulator.com/). The first scenario used to obtain baseline measurements included crossing multi-lane roads with various speed limits, navigating intersections with heavy traffic, as well as unforeseen situations like parked cars in front of you and the sudden appearance of a dog. The second scenario used for the post-test included the following training elements in non-urban areas: Roads where the speed limit is 100 km/h, with sections where the limit decreases to 60 km/h. The lesson involved encountering 10 intersections: 4 required right turns, 4 required driving straight through, and 2 required left turns.

It also included practicing safe following distances, negotiating right turns with oncoming traffic, approaching stop signs with priority rules, navigating no-entry roads, driving on major roads with priority, and identifying various traffic signs.

We gathered four driving performance indicators: instances of exceeding speed limits on straight roads, instances of exceeding speed limits on curves, instances of exceeding speed limits while turning at junctions, and instances of sudden braking.

Demographic characteristics. Participants also supplied information regarding their age, gender, educational background, possession of a driving license, types of licenses held, years of driving experience, how often they drive, and whether their job involves driving a personal or company/institutional vehicle.

Procedure

We obtained ethical approval from the The Ethics Committee of the West University of Timișoara (Nr. 37017/06.06.2024). Participants were recruited from Psychology students (who received course credit if they or their invitees participated) and online through social media announcements. After registration, participants were contacted and randomly assigned to one of two experimental groups. There were 38 drivers in the experimental group, and 40 drivers in the control group.

Initially, all participants completed informed consent forms and provided demographic information. They were told that they would drive on the simulator and were given

all the instructions on how to use it. In the first phase, they conducted a 5-minute practice session. Subsequently, they drove an 8-minute scenario in the simulator, during which speed-related indicators were recorded to ensure baseline comparability between groups.

Participants in the experimental group received an implementation-intention-based intervention. This began with a mental contrasting phase, where they identified key situations in which they tended to exceed speed limits. Following this, they selected up to four tempting situations from a list of 13 where adhering to speed limits would be challenging. For each selected situation, they chose a strategy they believed would help them comply with speed limits. To reinforce the connection between the situation and the strategy, participants imagined themselves in each scenario. The goal was for participants to develop a specific "if-then" plan to adhere to speed limits. The help sheet was adapted to the Romanian context from Brewster's study (2015), and the strategies were tailored to the simulator scenario they would drive next (Appendix A2).

Participants in the control group read a short text about the negative consequences of speeding and then rated how dangerous they perceived speeding to be on a scale from 1 (not dangerous at all) to 10 (very dangerous). Immediately after the intervention, participants completed another 8-minute driving scenario, during which speed indicators were recorded again.

Data analysis

Data were analyzed using R Studio (RStudio Team, 2021). To determine whether there were significant differences between the experimental and control groups at post-test, we conducted ANCOVA analyses. This analysis allowed us to examine group differences in post-test outcomes while statistically controlling for the corresponding pre-test scores.

Although a priori power analysis is typically used during study planning, it offers limited utility once data collection is complete (Hoenig & Heisey, 2001). Therefore, we conducted a post hoc sensitivity analysis to estimate the smallest effect size that could be reliably detected given our final sample size and model structure. Using G*Power 3.1 (Faul et al., 2009), we modeled our ANCOVA as a fixed-effects analysis with two groups and one covariate. With a total sample size of N = 78, an alpha level of .05, and statistical power set at .80, the analysis indicated a minimum detectable effect size of f = .32, corresponding to $\eta^2 = .09$. According to Cohen's (1988) guidelines, this represents a medium effect size. These results suggest that the study was adequately powered to detect medium or larger effects, but may have lacked sensitivity to reliably detect small effects. Accordingly, non-significant findings should be interpreted with caution, as they may reflect insufficient statistical power rather than a true absence of effect. The moderate sample size is acknowledged as a limitation, and we recommend the use of larger samples in future research to enhance sensitivity to smaller, yet meaningful, effects.

Results

Preliminary analyses

Due to the weak variation in the data (e.g., there were few cases in which the speed limit was violated) regarding speed on curves and sudden braking, these variables could not be used for further analyses. The normality check showed that the speed variables did not follow a normal distribution, exceeding the acceptable limits of [-2, 2] for skewness and [-7, 7] for kurtosis (Byrne, 2010; Hair et al., 2010). Therefore, we applied a square root transformation to improve the approximation of normality. Considering the other remaining variables, there were no differences between the experimental group and the control group at the pre-test (see Table 1).

Table 2 shows correlations between study variables. All speeding variables correlated positively with each other at both times. However, the condition was not significantly correlated with any of the variables.

Table 1. *T-test results of between conditions differences*

	Experimental		Control		*t*	*Df*	*p*
Variable	*M*	*SD*	*M*	*SD*			
1. Age	23.86	7.13	26.28	9.00	1.31	73.62	.19
2. Driving frequency	2.27	1.15	2.18	1.26	-0.71	75.88	.48
3. Driving experience	5.34	6.59	7.13	7.45	1.12	75.62	.27
4. Speed	0.55	0.74	0.35	0.66	-1.29	74.05	.20
5. Speed in junctions	1.17	0.75	1.08	0.80	-0.50	75.98	.61

Notes. N experimental = 38. *N* control = 40.

Regarding intervention, the most frequently selected situations were `If I'm tempted to speed after following a slow-moving vehicle` (14.31%) and `If I'm tempted to speed when I see a speed limit sign changing from 100 km/h to 60 km/h` (13.85%). The least frequent selected situations were `If I'm tempted to speed when feeling the need to show off or stand out` (2.77%) and `If I'm tempted to speed when driving through intersections` (2.77%). The most frequently selected strategies were `Then I will remember that there are people in my life who encourage me to respect speed limits ` (22.44%) and ` Then I will drive in a lower gear to help me drive slower` (17.83%). The least frequent selected situations were `Then I will tell myself that society is becoming less accepting and tolerant of speeding violations

Table 2. *Correlations between studied variables*

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
1. Speed pre-test	0.45	0.71								
2. Speed post-test	0.73	0.80	.47**							
3. Speed junction pre-test	1.13	0.77	.45**	.46**						
4. Speed junction post-test	0.66	0.77	.36**	.61**	.39**					
5. Age	25.10	8.18	-.03	-.05	.13	.02				
6. Gender	1.56	0.50	-.04	-.14	.07	-.16	-.06			
7. Driving frequency	2.27	1.20	.05	.01	.04	.14	-.09	.07		
8. Driving experience	6.26	7.06	.00	-.00	.16	.09	.97**	-.10	-.12	
9. Condition	0.49	0.50	.15	.05	.06	-.05	-.15	.18	.08	-.13

Note. * $p < .05$. ** $p < .01$

`(1.00%) and `Then I will try to avoid putting myself in this situation again in the future ` (1.25%). See Appendix A3 for percentages of each situation and strategy. Appendix A4 lists the obstacles mentioned by participants during the mental contrast stage. The most frequent situations were related to scenarios in which participants were in a hurry, felt stressed or were frustrated because of other drivers.

The effect of the intervention

Analysis of Covariance (ANCOVA) was used to test if there was an effect of the intervention on speed on a straight road at the post-test, when controlling for speed on a straight road in the pre-test, and to determine whether there was an effect on speed in junction at post-test when controlling for speed in junction in the pre-test. There were no differences between groups regarding speed on a straight road at post-test when controlling for speed at pre-test, F (1, 75) = .02, p = .88. There also were no differences between groups regarding speed in junctions when controlling for speed in junctions at pre-test, F (1, 75) = .51, p = .48. The results are presented in Table 3.

Table 3. *ANCOVA results for post-test scores, controlling for pre-test.*

Scale	*Group*						*F*	*Partial η²*
Scale	Control (n = 40)			Experimental (n = 38)				
	EM	*M*	*SD*	*EM*	*M*	*SD*		
Speed Post	.74	.69	.77	.71	.77	.83	.02	.00
Speed Pre							20.56*	.22
Speed Junc Post	.71	.70	.74	.60	.62	.80	.51	.01
Speed Junc Pre							14.20*	.16

Notes. EM = Estimated Mean, *M* = observed mean; *SD* = standard deviation; *η²* = partial eta squared. Pre-test values were used as covariates in ANCOVA. Values marked with * indicate statistically significant effects of the pre-test covariate (p < .001). No statistically significant group differences (condition effects) were observed.

Discussion

Intervention

This study aimed to assess the effectiveness of an implementation intentions intervention in reducing speeding behavior. In contrast to findings in other studies (e.g., Brewster et al., 2016), our research did not observe a significant reduction in speeding behavior following the intervention.

One possible reason for the lack of significant effects is the limited exposure to the intervention, specifically that it included a single session. Previous research (Milne et al., 2002) suggests that repeated sessions of implementing intentions can lead to stronger behavioral changes. However, this explanation alone cannot fully account for the obtained results. For example, Brewster et al. (2016) reported significant outcomes using a single-session design and a similar sample size. This discrepancy suggests that session frequency is not necessarily the decisive factor in all cases. Instead, other moderating factors likely influence the observed effects, such as the amount of time spent in the simulator. It's possible that the 8 minutes they spent driving weren't enough time for them to develop a tendency to exceed the speed limit. Future studies could include driving time as a moderating variable.

However, our study aligns with that of Tekeş and Özkan (2021), who also did not find significant effects of the intervention. Although the differences between groups were not statistically significant, they observed that the control group, but not the experimental group, showed an increase in speed at post-test, suggesting the intervention may have helped prevent speed increases. The authors attributed the non-significant results to participants' familiarity with the same scenario used at both pre-test and post-test. They suggested that, being accustomed to the route, participants in the control group increased their speed during the second drive. We addressed this limitation by using different scenarios for each test. Nevertheless, our results also remained non-significant. This may be explained by other factors such as individual differences in speed limit compliance preferences, which appeared to have a strong impact on driving behavior regardless of intervention. For instance, participants who self-identified as non-compliers tended to increase speed and acceleration variability over time, even under experimental conditions. This suggests that pre-existing behavioral intentions or readiness to change, as discussed in Bamberg's (2013) Stage Model of Self-Regulated Behavioral Change, may moderate intervention effectiveness. Therefore, participants' willingness and readiness for change should also be taken into consideration.

Although no significant differences were identified, the distribution of selected situations and strategies suggests a possible mismatch between the implementation intentions and the driving simulator context. Even though the most frequently selected situations by participants (`If I'm tempted to speed after following a slow-moving vehicle` and `If I'm tempted to speed when I see a speed limit sign changing from 100 km/h to 60 km/h`) were present in the driving scenarios, the strategies most often chosen (`Then I will remember that there are people in my life who encourage me to respect speed limits` and `Then

I will drive in a lower gear to help me drive slower`) may not have been sufficiently relevant in the simulator context. The absence of real danger may have led participants to disregard these strategies when encountering the situations in the simulator. Knowing there was no real traffic and that accidents couldn't occur, drivers may have cared less about respecting speed limits. Furthermore, the time spent in the simulator or the abstract or general nature of some strategies may have acted as moderating variables that influenced the effectiveness of the implementation intentions. Additionally, analyzing the obstacles mentioned by participants in implementing their intentions suggests that they are more tempted to exceed speed limits when they are in a hurry to get somewhere or feel a certain pressure. Other factors such as stress levels, impulsivity, and intolerance to frustration could be explored in future studies.

It is also worth noting that the control group received an informational text about the negative consequences of speeding. Such information could itself influence participants' intentions or awareness, potentially reducing observable differences between the groups. Future studies should test the intervention by comparing it with a control group that performs a task unrelated to driving.

Culture may also contribute to this non-significant result. Leandro et al. (2012) introduced several covariates due to cultural reasons. Specifically, in their cultural context, driving in a manner that results in a noisy car is deemed shameful and socially unacceptable. As a result, the authors considered this cultural aspect. Although the cultural aspect discussed by Leandro et al. (2012) may not be directly applicable to our study, since the cultural context is quite different, culture is still an important factor to consider. In Romania, many drivers think speed limits aren't well justified (Havârneanu & Havârneanu, 2012), and even with stricter punishments, speeding is still common (Holman & Havârneanu, 2015). Especially young drivers often believe speeding is only sometimes dangerous and that they shouldn't always be punished for it (Gheorghiu & Havârneanu, 2013). These views show that many people don't fully accept the rules, which can make motivation-based interventions, like implementation intentions, less effective. Future interventions could first focus on changing attitudes so that drivers become more aware of the importance of respecting speed limits, as well as understanding the necessity of speed limits and the consequences of breaking them. The focus could also include emotional components to make the goal more meaningful for participants.

Another possible reason for the lack of significant differences between the pre-test and post-test regarding speeding behavior may be the relatively low initial level of this behavior, particularly on straight road segments. Only 32.05% of participants were recorded exceeding the speed limit in this context before the intervention, suggesting a potential floor effect. Participants did not demonstrate high levels of speeding at baseline, which limited the room for measurable improvement and may have made the effects of the intervention harder to detect. Future research should consider including participants who display higher levels of speeding at pre-test to better evaluate the effectiveness of such interventions. In intersections, where speeding behavior was more frequent at pre-test (75.64% of participants exceeded the speed limit), the intervention was expected to be more effective. However, the absence of significant effects suggests that other factors may have influenced the results, such as the duration or intensity of the intervention or contextual factors that were not controlled for in the study.

Limits and future research directions

While this study has notable strengths, it also faces several limitations. Firstly, the small sample size limits the generalizability of the findings, suggesting that future research should replicate the study with a larger and more diverse group of participants. Another limitation is the study design. Relying on an immediate post-test after the intervention may not fully capture long-term effects. Future studies would benefit from a longitudinal approach to better assess impacts over time. The participants' initially low average for speeding behavior may create a potential floor effect. Future studies should consider including participants who exhibit high levels of speeding behavior at baseline.

Moreover, despite implementing an advanced intervention involving mental contrasting and imagery, there remains some uncertainty about whether participants engaged with these techniques as intended. While efforts were made to ensure participants' understanding of the instructions, it is unclear if participants consistently engaged in mental contrasting and vividly imagined the scenarios provided. Future research could explore alternative methods to enhance intervention effectiveness, such as integrating additional strategies, like cognitive exploration or incorporating feedback.

Theoretical and practical implications

The intervention based on implementation intentions did not effectively reduce speeding behavior. Further research is necessary to assess the long-term effectiveness of interventions on a larger and more diverse sample to ensure reliable conclusions. It is important to consider additional covariates, such as cultural influences. Moreover, exploring the specific determinants of speeding behavior in greater depth is essential to identify alternative factors that could be targeted in intervention strategies.

Conclusion

This study found that the implementation intentions intervention did not significantly reduce speeding behavior in a simulated driving context. Nevertheless, it provides important evidence on the application of combined techniques, such as implementation intentions and mental contrasting, assessed through objective driving measures. The results deepen our understanding of the challenges involved in modifying speeding behavior and underscore the value of using rigorous, simulation-based methods to evaluate intervention effectiveness in driving safety, while highlighting the need for further research to advance this field.

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Appendix A1: Sociodemographic Characteristics of Participants at Baseline

Baseline characteristic	Experimental group		Control group		Full sample	
	N	M ± / %	*N*	M ± / %	*N*	M ± / %
Gender						
Female	18	56.3	20	58.8	44	56.4
Male	14	43.8	14	41.2	34	43.6
Age	38	23.87 ± 7.13	40	26.28 ± 9.00	78	25.10 ± 8.18
Studies						
High-school studies	27	71.1	25	62.5	52	66.7
University studies	11	28.9	11	27.5	22	28.2
Postgraduate studies	0	0	4	10.0	4	5.1
Driving experience (years)	38	5.34 ± 6.59	40	7.13 ± 7.45	78	6.26 ± 7.06
Driving frequency						
Daily	11	28.9	17	42.5	28	35.9
4-5 times a week	9	23.7	7	17.5	16	20.5
2-3 times a week	13	34.2	11	27.5	24	30.8
Once a week	3	7.9	2	5.9	5	6.4
Less than once a week	2	5.3	3	7.5	5	6.4
Drive personal/ company car at work						
No	10	26.3	17	42.5	27	34.6
Yes, personal car	3	7.9	6	15.0	9	11.5
Yes, the company car	1	2.6	3	7.5	4	5.1
Not working	24	63.2	14	35.0	38	48.7
Gearbox						
Manual	30	78.9	33	82.5	63	80.8
Automatic	8	21.1	7	17.5	15	19.2

Note. $N = 78$ ($n = 38$ for the experimental group; $n = 40$ for the control group). Participants were on average 25.10 years old ($SD = 8.18$). The mean age for the experimental group was 23.87 ($SD = 7.13$) and for the control group was 26.28 ($SD = 9.00$).

Appendix A2: Intervention help sheet with critical situations and goal directed responses

Critical situations 'If I am tempted to speed…')	***Goal directed responses ('Then…')***
... to keep up with surrounding traffic	... I will remind myself that I don't save much time by speeding
... when driving on quiet roads with low or no traffic	... I will make a concerted effort to ignore the urge/pressure to accelerate
... after following a slow-moving vehicle	... rather than speed, I will try to relax and drive more carefully/calculated/responsibly
... when driving on roads that I believe should have higher speed limits	... I will tell myself that I can adhere to speed limits if I choose to
... when feeling stressed	... I will try to avoid putting myself in this situation again in the future
... when feeling the need to show off or stand out	... I will remind myself that although it may be easy and enjoyable, speeding is a harmful and dangerous habit
... when feeling that the car "asks" to go faster	... I will remember that speeding contradicts the vision I have of myself as a cautious person
... when driving past a children's park	... I will tell myself that society is becoming less accepting and tolerant of speeding violations
... when driving through intersections	... I will remind myself of what a skilled driver I am to respect the speed limit
... when I see a speed limit sign changing from 100 km/h to 60 km/h	... I will remember that there are people in my life who encourage me to respect speed limits
... when making a right turn and seeing oncoming traffic	... I will think about how disappointed I would be in myself if I were to exceed the speed limit
... when I see a no-overtaking sign	... I will remind myself to consider that I am a good driver if I do not speed
... when approaching a road where I have right of way	... I will drive in a lower gear to help me drive slower

Appendix A3: Percentages of each critical situation and goal-directed response included in the intervention help sheet

Critical situations 'If I am tempted to speed…')	***%***	***Goal directed responses ('Then…')***	***%***
... to keep up with surrounding traffic	4.15%	... I will remind myself that I don't save much time by speeding	3.12%
... when driving on quiet roads with low or no traffic	7.69%	... I will make a concerted effort to ignore the urge/pressure to accelerate	5.74%
... after following a slow-moving vehicle	14.31%	... rather than speed, I will try to relax and drive more carefully/calculated/responsibly	11.22%
... when driving on roads that I believe should have higher speed limits	11.08%	... I will tell myself that I can adhere to speed limits if I choose to	5.49%
... when feeling stressed	10.77%	... I will try to avoid putting myself in this situation again in the future	1.25%
... when feeling the need to show off or stand out	2.77%	... I will remind myself that although it may be easy and enjoyable, speeding is a harmful and dangerous habit	10.47%
... when feeling that the car "asks" to go faster	11.85%	... I will remember that speeding contradicts the vision I have of myself as a cautious person	2.62%
... when driving past a children's park	3.69%	... I will tell myself that society is becoming less accepting and tolerant of speeding violations	1.00%
... when driving through intersections	2.77%	... I will remind myself of what a skilled driver I am to respect the speed limit	5.61%
... when I see a speed limit sign changing from 100 km/h to 60 km/h	13.85%	... I will remember that there are people in my life who encourage me to respect speed limits	22.44%
... when making a right turn and seeing oncoming traffic	3.38%	... I will think about how disappointed I would be in myself if I were to exceed the speed limit	2.74%
... when I see a no-overtaking sign	3.69%	... I will remind myself to consider that I am a good driver if I do not speed	10.47%
... when approaching a road where I have right of way	10.00%	... I will drive in a lower gear to help me drive slower	17.83%

Appendix A4: The obstacles mentioned by participants during the mental contrast stage

`Outside urban areas, on the highway, overtaking`
`At night, when there are no other cars`
`On expressways`
`Outside urban areas`
`When the car in front is too slow, when I'm in a hurry when I'm upset, nervous, or sad`
`When I change speed, when I become a little more stressed, and when the road is empty`
`On the highway`
`In some overtaking on narrow roads, on bridges, and in some free areas in the city, where the limit is 30`
`In the locality when the road is traffic-free, on the highway`
`When I'm in a hurry when I need to get to the hospital in an emergency situation if someone has suffered something and I need to get there very quickly`
`When I'm in a hurry`
`On the known and open road, without curves, someone reliable who has a permit to be with me`
`When I need to get somewhere, when someone is going too slow`
`When someone goes too slow`
`Entering high-speed roads (eg., highways)`
`When the road is free, there are no cars in front of me`
`When I am outside the city`
`On familiar roads, when someone is driving too slowly in front of me, when I am in a hurry, on roads with favorable traffic conditions (no potholes and good visibility)`
`On the highway - because you have a higher speed`
`Possibly on a long, open stretch like a national road`
`Highway, express road`