

Car drivers' attitudes towards non-signalised zebra crossings and their impact on behaviour

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Abstract

In Austria, pedestrians have right of way over cars at non-signalised zebra crossings as soon as they noticeably indicate their intention to cross the street. This rule is in place since 15 years. Within this period however, the number of accidents involving pedestrians at non-signalised zebra crossings has increased continuously.

A recently finished research project focused on the *Not yielding to pedestrians at zebra crossings*. This particular traffic offence was one of three examples, which were suggested for investigation in two focus groups, one consisting of drivers who admitted that they ignored traffic regulations now and then, the other of experts for various traffic issues.

Data collection included 438 in-depth interviews with drivers who admitted exceeding speed limits at least sometimes. They were selected from some 2,000 telephone survey participants from conurbations, outskirts of conurbations and rural areas. The face-to-face interviewees were exposed to series of photos showing a pedestrian using a zebra crossing. With the help of these photos the drivers' knowledge of the respective traffic rules, their attitude to the rules, and the impact of the rules on their behaviour were investigated. Moreover, survey participants were provided with detailed information about the rule to test the acceptance of the information and its impact on the drivers' behaviour.

The results show that the rule is well known and highly accepted in general. However, drivers are uncertain about the detailed interpretation; there was even some disagreement among experts. Most drivers claim they would behave very pedestrian-friendly. Other drivers are at least presumed to obstruct pedestrians, but they are hardly assumed to endanger them knowingly. Endangering pedestrians at zebra crossings is considered a serious offence and a violation of social norms. Mainly for this reason and not for fear of penalties drivers do not want to commit this offence. If pedestrians are being endangered even higher fines than currently meted out seem acceptable, but if pedestrians are only obstructed current fines seem somewhat high.

The absence of a clear objective interpretation makes the drivers' behaviour at zebra crossings dependent on their subjective assessment whether they might obstruct or even endanger a pedestrian. In consequence, the respective regulation should provide clearer objective guidelines for drivers and make penalties for each kind of offence easier to understand.

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Introduction

In Austria, the number of 'non-signalised' zebra crossings, i.e. zebra crossings without any traffic lights, is high. These crossings are characterised by 0.5 m wide longitudinal stripes on the road and the blue and white "zebra crossing road sign" (Figure 1). Frequently, a further road sign is used as an early alert for drivers and additional measures are meant to improve the conspicuity of the zebra crossing, for example a dark frame for the white stripes or the pedestrian's pictogram on the road, but this is not a must. According to the Austrian road traffic regulations (StVO 1960, §9) until 1993 pedestrians had to step onto the zebra crossing (i.e. the road) to assert their right of way over vehicles; since 1994 they have this right even if they only noticeably indicate their intention to cross the street. But still drivers only have to stop at a zebra crossing 'if necessary'. Shortly after this change in law Aust (1997) showed that only every tenth driver let a pedestrian actually cross, who indicated that he wanted to cross the road but had not yet stepped onto the zebra crossing, and roughly every second driver did if the pedestrian had already.



Figure 1 Non-signalised zebra crossing in Austria (minimum standard)

Since the late 1990s, the number of accidents involving pedestrians at non-signalised zebra crossings has increased continuously, from about 600 per year prior to the new law to about 750 nowadays, while the number of accidents at signalised zebra crossings has remained stable at about 350 to 400 per year (Figure 2). The relative difference is even more staggering if one looks at the number of pedestrians killed in road accidents. While about 15 die every year on non-signalised zebra crossings there are only about five deaths per year on signalised crossings. In the whole of Austria about one in seven of all pedestrians killed in traffic accidents dies when using a non-signalised zebra crossing, and one in five of all pedestrians injured is injured there.

The authors are not aware of any systematic investigation of the question why drivers pay little attention to the right of way of pedestrians, nor of any surveys about the effects of enforcements and sanctions upon the safety of pedestrians on zebra crossings. Neither the most recent 25 issues of the Safety Monitor of the European Transport Safety Council (2005-2010) provide any indication, nor does the Enforcement Monitor (ETSC 2004-2006), which reports details about enforcement and sanctions in Europe.

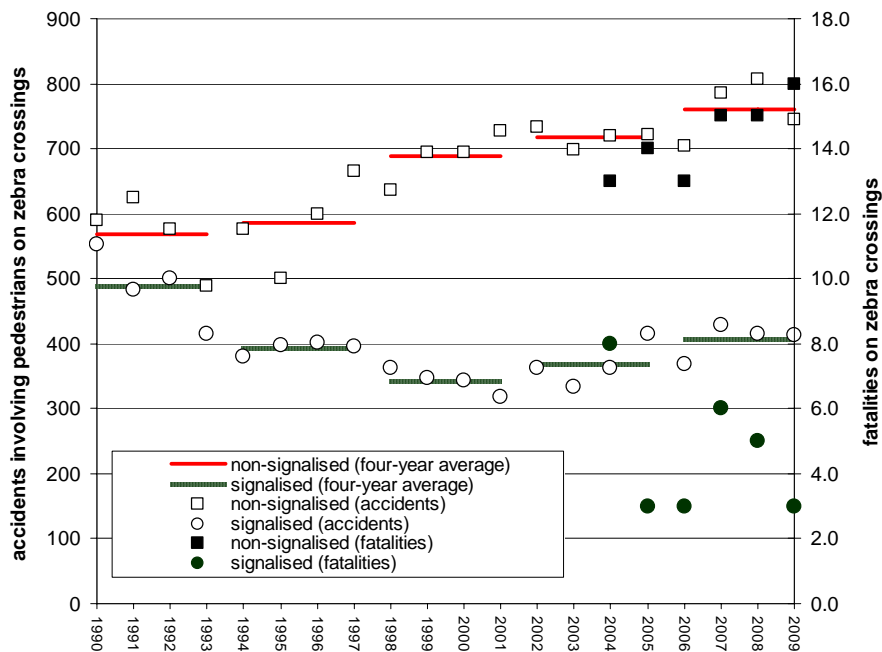


Figure 2 Traffic accidents involving pedestrians on signalised and non-signalised zebra crossings in Austria, 1990 – 2009; (data sources: BMVIT 2009, p. 22; KfV 2009, p. 18; KfV 2010, p. 18)

Obviously the offence of disregarding the right of way of pedestrians is hardly ever punished. In the survey, which is the basis for this article (Hössinger et al., 2009) 1190 of 1596 interviewed car drivers admitted that they had already received some penalty for a traffic offence (excluding parking offences), but disregarding the right of way of pedestrians at zebra crossings was only mentioned eight times (0.7%). The key questions this survey focused on were: How aware are car drivers of the regulation? What is their attitude to this regulation? How do they behave, depending on their attitude to and their assessment of the obstruction or endangering of pedestrians? Is it possible to improve the behaviour with the help of information about the regulation and potential penalties?

Methodology

As a first step, a qualitative analysis based on focus groups with car drivers and experts was conducted. The findings were used to design a quantitative survey. In its first phase, telephone interviews were conducted with 1938 people from three specific areas: 'conurbations', 'outskirts of conurbations' and 'rural areas'. About half (812) of the 1596 car drivers admitted that on occasion they did exceed speed limits in such a way that in case of enforcement they would have to expect a fine. A total of 438 of these 'self-proclaimed speeders' participated in the in-depth interactive interviews of the second phase of the survey. Among others, they were asked 12 questions about the regulation governing pedestrian crossings, supported by several information sheets which were used throughout the interview.

The answers of the respondents were doubly weighted. Firstly the respondents of the telephone interviews were weighted by sex and age group within their respective area; then the characteristics of the self-proclaimed speeders included in the in-depth interviews were weighted according to those in the telephone interviews.

The weighted data were analysed with the help of a bivariate Pearson's correlation (it provides the coefficient of correlation $-1 \leq r \leq 1$ and the respective significance level p) or a comparison of means (provides the significance level p). The results were called significant at $p \leq 0.050$ (= 5 percent level of error probability).

The respondents' frequency of speeding, which was asked for in the interviews, shows no significant correlation with the general attitude to pedestrians' right of way ($r = -0.02$, $p = 0.621$) and also not with the respondents' behaviour at zebra crossing as shown in Figure 7 ($r = 0.03$, $p = 0.573$). Therefore the assumption holds that the results are valid also for drivers who claimed that they are never speeding

Results

Findings from the focus groups

In the focus group with drivers (covering the broad subject 'Reasons for obeying or disregarding traffic regulations') not much was said about the right of way of pedestrians on zebra crossings: All participants agreed that they (i) virtually never disregarded the respective regulation because (ii) they felt that it made sense. In the group with experts there was widespread agreement that a disregard of the respective regulation 'rarely happened'. But it was mentioned and criticized that the rule is 'rather difficult to understand and complicated'. This was said to lead frequently to 'a lack of awareness of wrongdoing' among drivers when they obstruct pedestrians and to 'a lack of motivation' among the police force to hand out traffic tickets for such offences.

Awareness of and attitude to the right of way of pedestrians at zebra crossings

All respondents (100%) were well aware of the fact that pedestrians have right of way at zebra crossings, and nearly four out of five support this rule (Figure 3). The average level of agreement is 90% (calculated from a four point scale, with 1 = completely disagree = 0% consent to 4 = fully agree = 100% consent).

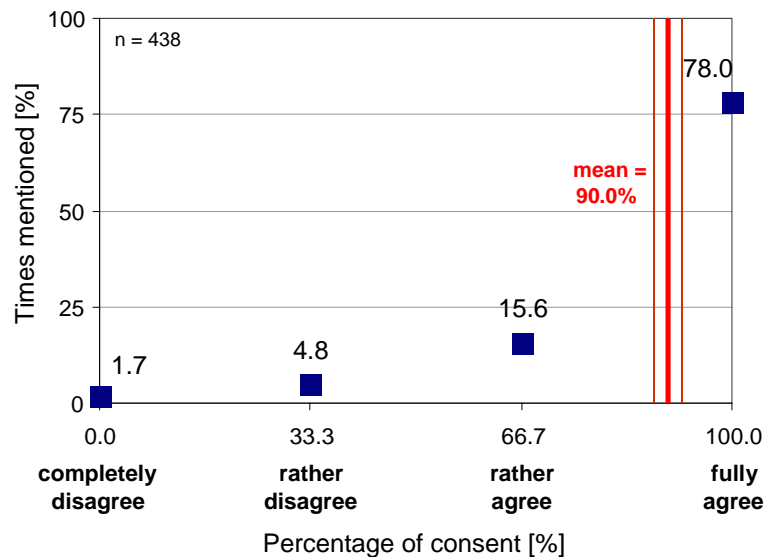


Figure 3 Car drivers' attitude to the right of way of pedestrians at non-signalised zebra crossings (mean and 95% confidence interval of mean)

But two thirds of respondents were not aware of the fact that the law differentiates between obstruction and endangering of pedestrians and that the penalties for these offences differ: If a pedestrian is only *obstructed* a fee of usually EUR 35 has to be paid, if he is *endangered* this fee is higher (usually EUR 72) and additionally the driver's name is entered into the penalty-point system which was introduced in 2005. A grouping of results by the type of area where the respondents live (Figure 4) shows that significantly fewer of those from conurbations are aware of this fact (28%) than of those from rural areas (43%).

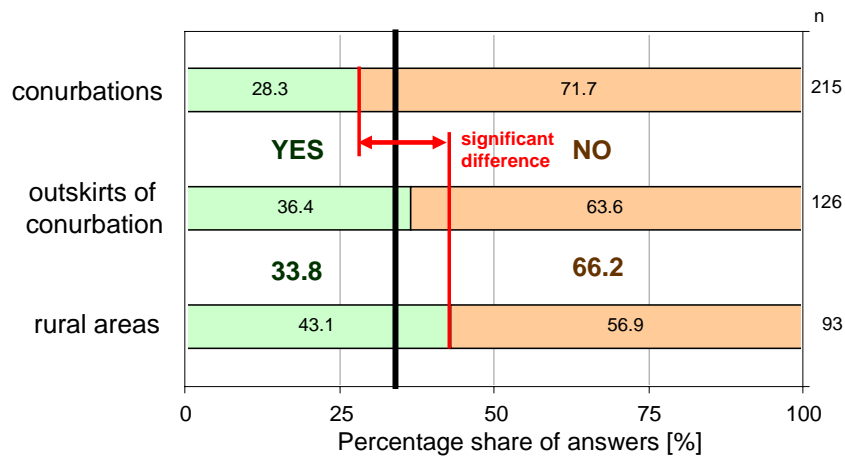


Figure 4 Awareness of the legal distinction between obstruction and endangering of pedestrians and the corresponding penalties

By contrast, respondents from conurbations have a significantly more positive attitude to the right of way of pedestrians (96% consent; Figure 5) than those from the other two areas (84%).

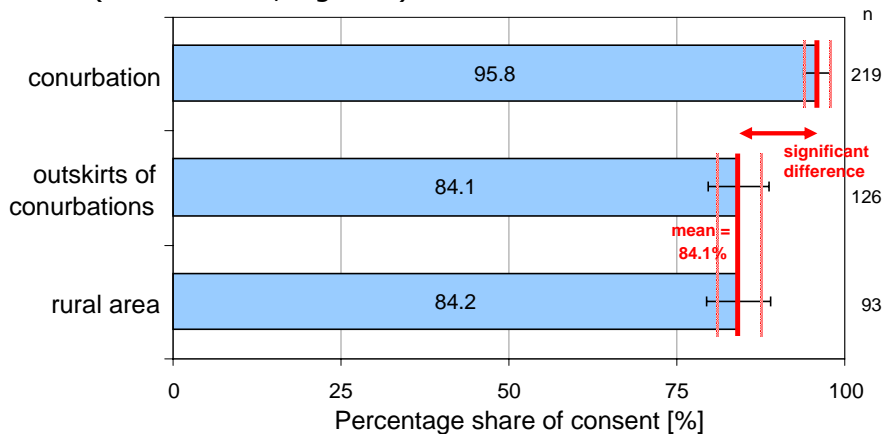


Figure 5 Attitude to the right of way of pedestrians depending on the area where respondents live (mean values and 95% confidence intervals of means)

The results by age group (Figure 6) show somewhat surprisingly that the mean consent in the youngest group (up to 24 years; average agreement rate 97%) and the oldest group (75+ years; average agreement rate 96%) is significantly higher than in the other groups (average agreement rate 89%).

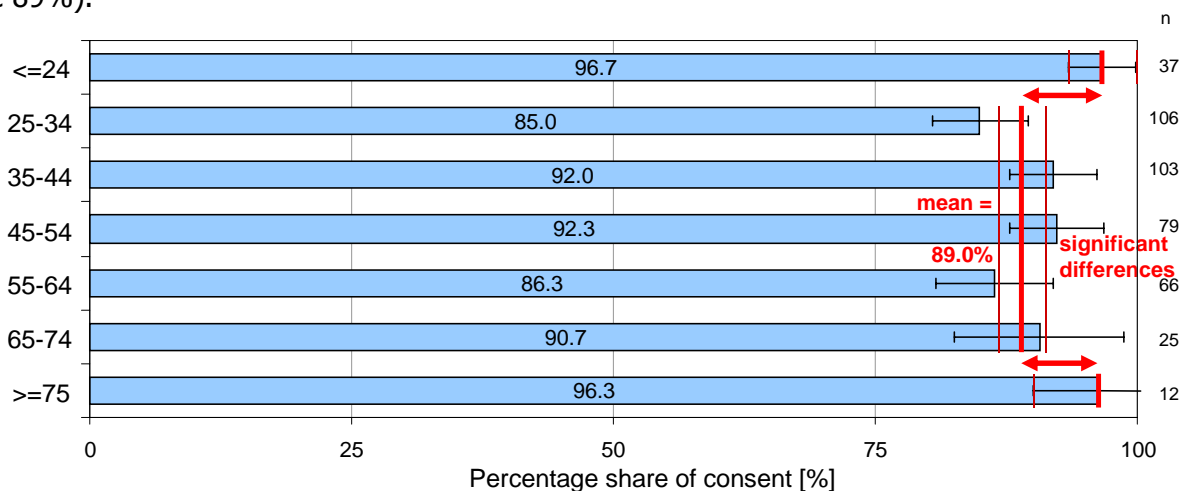


Figure 6 Attitude to the right of way of pedestrians by age group (mean values and 95% confidence intervals of means)

The higher the education level (Figure 7) the higher the average rate of agreement. The mean of all respondents without a higher school diploma (86%) is significantly lower than that of those who have at least such a diploma (93%).

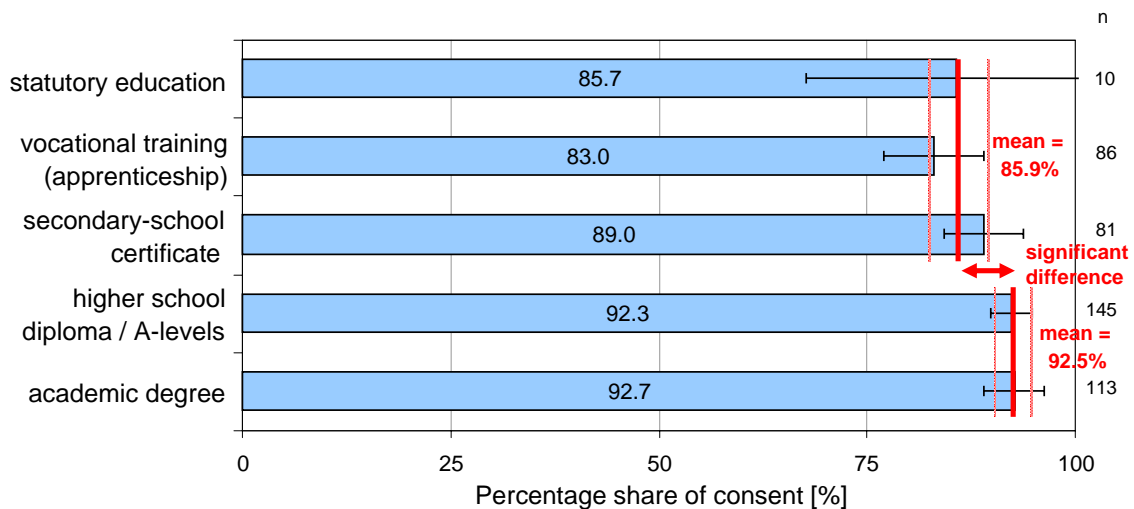


Figure 7 Attitude to the right of way of pedestrians by level of education (mean values and 95% confidence intervals of means)

Moreover, there is a moderate but still significant relationship of the attitude to the right of way of pedestrians with the engine power of the respondents' car. On average, 10 kW more engine power cause a decrease of agreement by 0.7% per cent. None of the other factors checked such as gender, kilometres travelled per year or the number of children per household etc. correlates significantly with the right of way of pedestrians.

Behaviour before reaching a zebra crossing

The behaviour of drivers approaching a non-signalised zebra crossing was investigated with the help of a picture series (Figure 8). The photos show a pedestrian in different stages of approaching and crossing the road from the perspective of a car driver at a distance of 25 m. The respondents were asked to imagine themselves as drivers at a speed of 50 km/h and to state from which photo onward

- they themselves would brake or stop to allow the pedestrian to cross the street ('own behaviour'),
- they thought that most other drivers would brake or stop ('behaviour of others') and
- they assumed that it would be an offence to continue driving without braking ('offence').

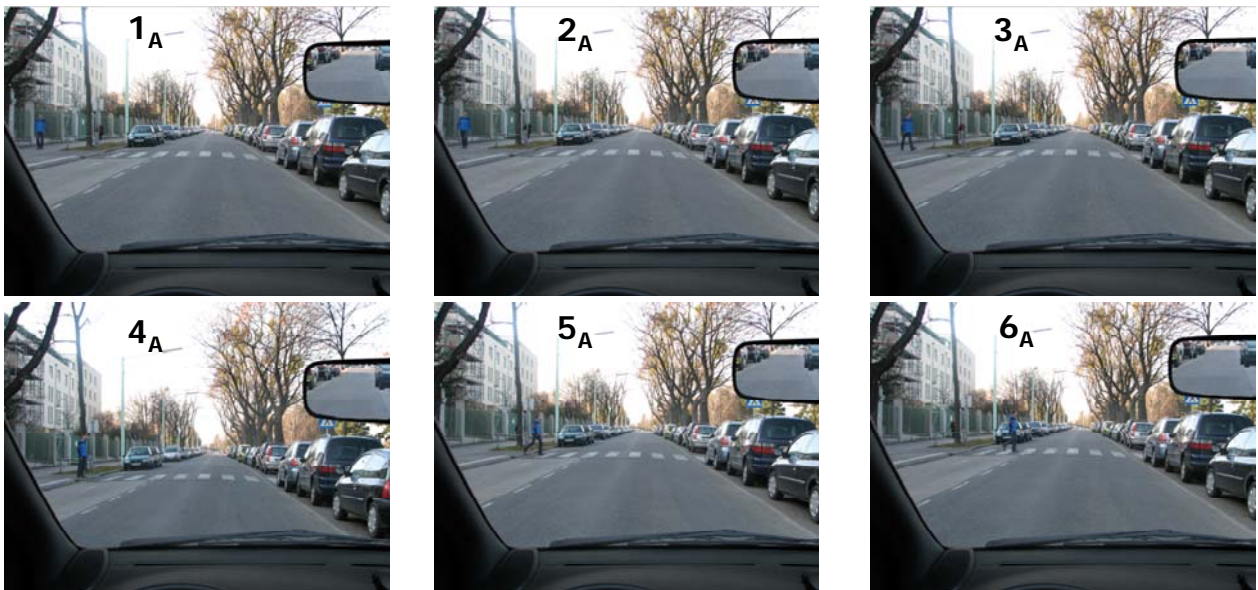
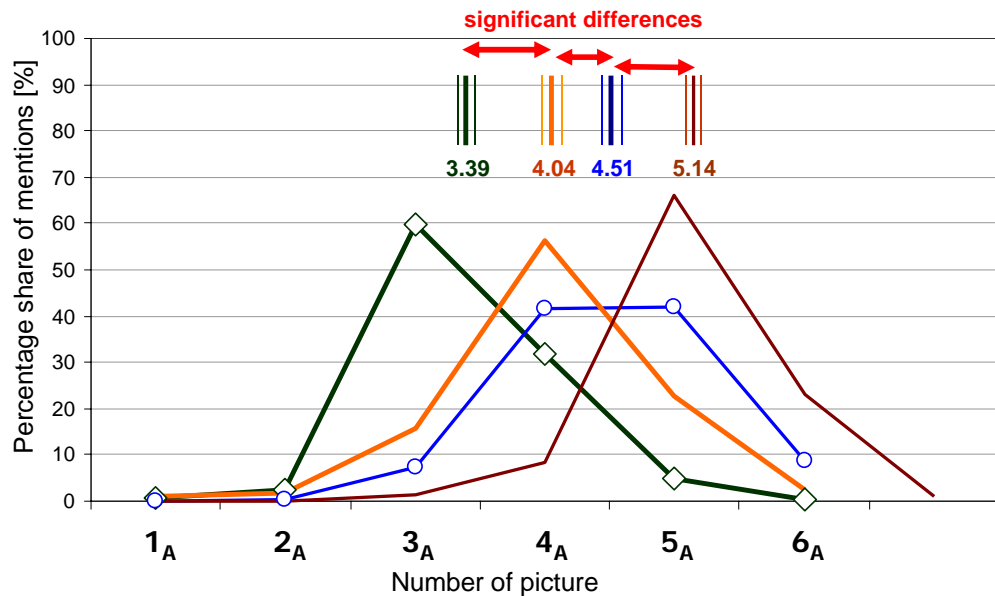


Figure 8 Pedestrian in the process of using a zebra crossing at a distance of 25 m to the car; assumption: speed of 50 km/h (picture series A)

Figure 9 shows the statements to the individual pictures. The difference between respondents' own behaviour as stated (mean number of pictures = 3.4) and the assumed behaviour of others (mean number of pictures = 4.5) is quite striking. According to these statements, 63% of the

respondents would brake or stop in the situation shown in picture 3_A at the latest (the pedestrian is still about 2 m away from the curb), while they assume that only about 8% of other drivers would do so. The respondents suppose that other drivers would only allow a pedestrian right of way from picture 4_A or 5_A onward, i.e. only after the pedestrian has already stepped onto the road.



	1 _A	2 _A	3 _A	4 _A	5 _A	6 _A
own behaviour	0.7	2.3	59.8	31.8	4.9	0.5
behaviour of others	0.0	0.4	7.5	41.5	42.0	8.6
offence	1.0	1.8	15.8	56.4	22.6	2.3
endangering	0.0	0.0	1.4	8.2	66.1	23.2

Figure 9 Number of picture (series A) when respondents themselves would stop, when they assume other drivers would stop, when they assume an offence (i.e. obstruction) is committed or when the pedestrians is even endangered (percentage shares, mean values and 95% confidence intervals of means; n = 436)

The mean number of picture associated with the assumption that the driver's behaviour constitutes an offence is quite in the middle between the respondents' stated own behaviour and the assumed behaviour of others. The majority of respondents (56%) hold the opinion that from picture 4_A onward (the pedestrian is standing at the curb) it would be an offence to continue driving, what corresponds indeed to the statutory interpretation. According to their own claims, 95% would have already braked or stopped in this situation. But 51% assume that other drivers would just go on and thus commit an offence.

About one fifth of respondents (19%) assumed that an offence is already being committed while this is not yet the case (pictures 1_A to 3_A), while one fourth (25%) wrongly assumed that the situation shown in pictures 5_A and 6_A is still legally compliant.

When it comes to an endangering of the pedestrian, two third (66%) of respondents think that this would be the case from picture 5_A onwards, while 23% assume picture 6_A being the first showing an endangering. The result matches well with the circumstance that even experts did not reach an agreement on this issue. While members of an automobile association considered the situation shown in picture 5_A an obstruction, representatives of the police force considered this an endangering.

There is a significant positive correlation of the number of picture mentioned when respondents assume an obstruction or endangering of the pedestrian with their own behaviour as well as the behaviour they expect from others (Table 1). The later the respondents assume that a given constitutes an obstruction or even endangering of a pedestrian, the later they themselves would break or stop, and the later they assume others to do so. The respondent's own behaviour appears to be influenced by his or her subjective assessment when another person might be obstructed or even endangered. The difference between the own stated behaviour and the

assumed behaviour of others reveals the respondents inclination to give a more positive picture of themselves compared to other drivers. However, this bias does not affect the correlations.

Table 1 Correlation of the number of picture corresponding to the respondents' own behaviour and the assumed behaviour of others with the picture from when on a continuation of driving is considered an obstruction or endangering of the pedestrian (n = 434)

	obstruction	endangering
own behaviour	r = 0.27; p = 0.000	r = 0.30; p = 0.000
behaviour of others	r = 0.10; p = 0.037	r = 0.15; p = 0.002

Strong correlations were also found between attitudes and stated behaviour (Figure 10). The higher the respondent's consent to the right of way of pedestrians, the higher his willingness to allow a pedestrian right of way (number of picture, r = -0.29), but, the lower the assumed willingness of other drivers to let the pedestrian cross (high number of picture, r = 0.09). Though the 2nd correlation is lower, the two results draw a clear picture: The more positive a respondent's attitude to the right of way of pedestrians the higher his willingness to respect this right, but the stronger the impression that other drivers behave inconsiderately. The respondents were asked about their attitude before they were asked about the pictures. A 'conditioning' by the photos can be thus excluded, what makes the results more solid.

No correlation was observed between the attitude to the right of way of pedestrians and the assumption that an offence is being committed. The respondents' attitude to the regulation seems to be unrelated to his or her interpretation from when onward a pedestrian is obstructed.

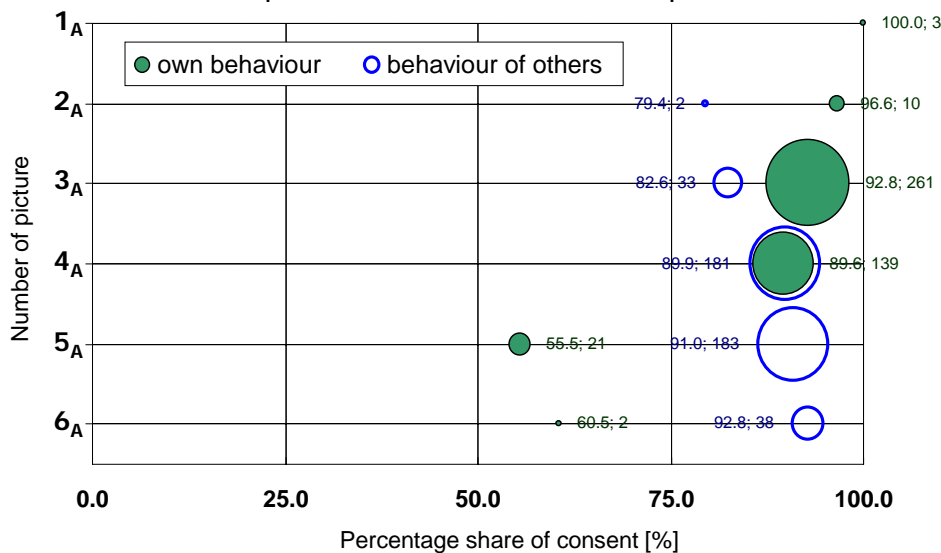
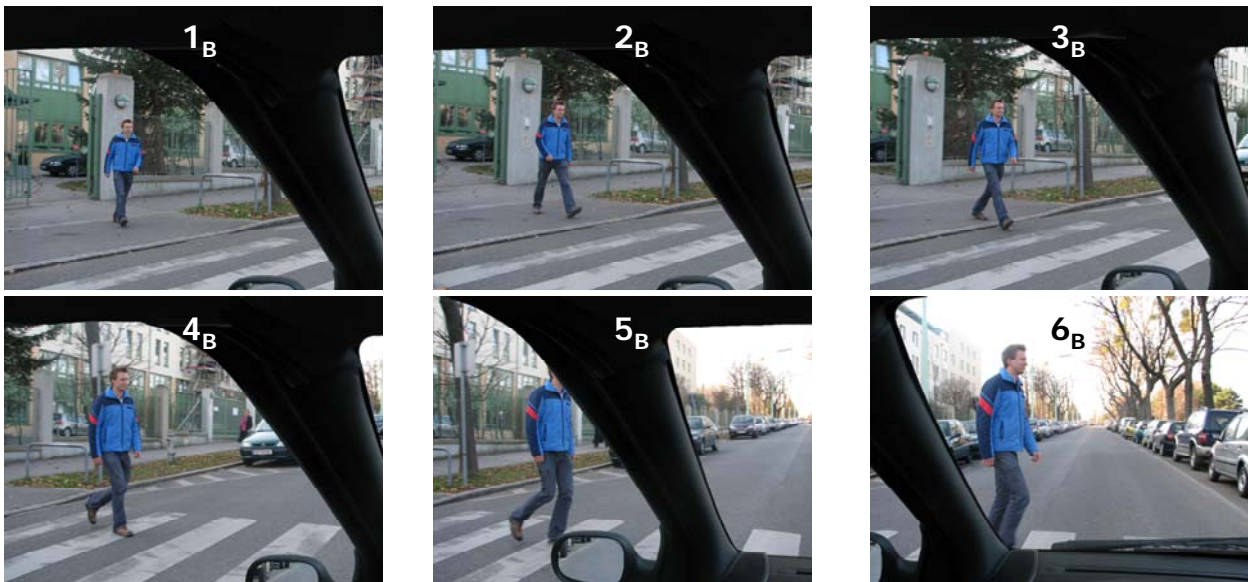


Figure 10 Attitude to the right of way of pedestrians related the respondents' own behaviour and the assumed behaviour of other drivers according to picture series A (left score = percentage share of consent; right score = number of respondents, illustrated by the size of the bubbles)

To measure the effect of giving objective information about the right of way of pedestrians the respondents were shown the picture series B (Figure 11). It shows what the situation will be like two seconds after the respective situation of series A at a speed of 50 km/h. In addition to the pictures, the respondents were given some 'objective' information. Following the above mentioned disagreement of experts, the respondents were divided into two randomly assigned groups, which were in turn provided with different information about picture 4_B and 5_B.



Pictures	group 1	group 2	group 1	group 2
1 _B – 3 _B	no offence		no penalty	
4 _B	obstruction		fee of EUR 35	fee of EUR 60
5 _B	obstruction	endangering	fee of EUR 72	fee of EUR 72 plus penalty point
6 _B	endangering		fee of EUR 72 plus penalty point	

Figure 11 Pedestrian approaching or walking on the zebra crossing immediately in front of a car, two seconds after the respective situation in picture series A as shown in Figure 8

The information of respondents about what constitutes an offence and the respective penalty had a remarkable effect. Initially only one third of respondents knew the difference between obstructing and endangering at all (see Figure 4), but after the explanation 83% stated that they understood the difference (Figure 12). The effectiveness of the explanation differed considerably depending on the area where the respondents live. The share of respondents from conurbations (this group was initially least informed) who understood the difference tripled from 28% to 89%. On the other hand, the reaction of rural respondents to the given information was comparatively low. The share of those who knew the rule just slightly increased from the initially high share of 43% to 67%. A possible interpretation is that drivers from conurbations – who are exposed far more frequently to pedestrians crossing the road – find it easier to relate the situations shown in the picture series to real life situations.

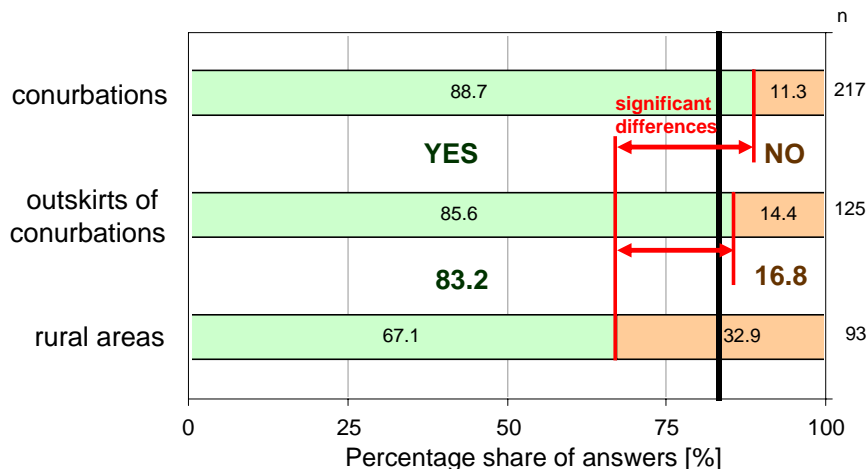


Figure 12 Understanding of the legal distinction between obstructing and endangering of a pedestrian after receiving 'objective' information

In a next step respondents were asked if they agree with the explanation for the pictures or, if they disagreed, to explain why. The agreement rate was generally at a high level (Figure 13), in particular for unambiguous situations as shown in picture 3_B (no offence) and 6_B (endangering). In

case of the less obvious situations, i.e. pictures 4_B and 5_B, it should be noted that respondents tended to consider the situation more serious than the provided information suggested:

- 8% of respondents did not agree that picture 4_B shows an 'obstruction'. Only one fifth of them considered the situation to be no offence at all, while four out of five thought that it shows already an endangering.
- The information given to picture 5_B differed according to the two groups mentioned above. Group 1 was told that it shows an 'obstruction' (less serious interpretation), but 27% of respondents claimed that it shows already an endangering. Group 2 was told that it shows an 'endangering' (less serious interpretation), and only 4% disagreed in terms that it shows only an 'obstruction'.

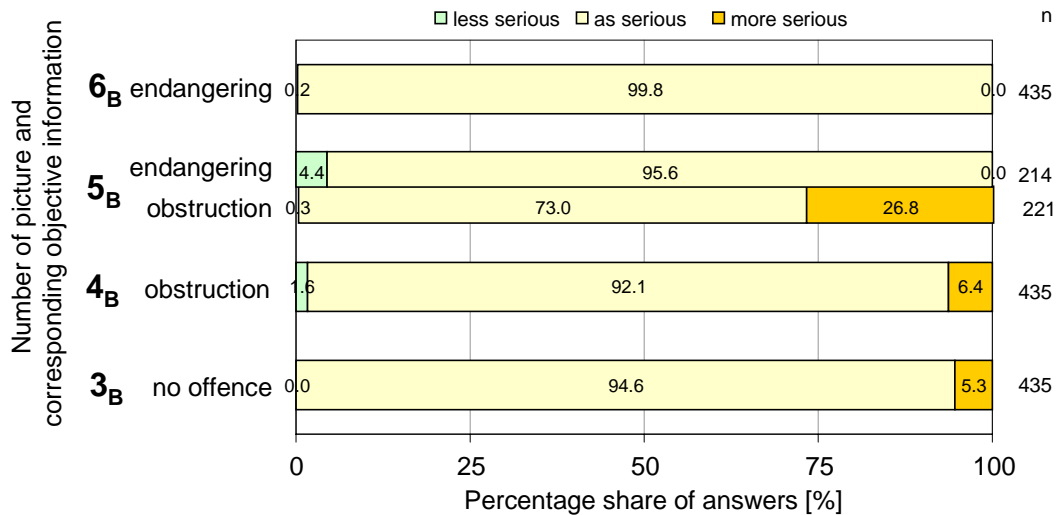


Figure 13 Assessment of the information given to the picture series B:

the adverse effect on pedestrians is considered less serious, as serious as or more serious

Likewise, agreement with the given information on penalty is high. Independent of the group and number of picture, at least three quarters of the respondents considered the suggested penalty appropriate (Figure 14). But the opinions of those who disagreed differ considerably:

- The bar for picture 4_B is divided in 2 parts, corresponding to the two groups, which received different information. Group 1 was told the fee for the situation in picture 4_B is EUR 35. 10% of respondents disagreed, one half opted for a higher fee and the other half for a lower. Group 2 was told that the fee is EUR 60. One quarter of respondents disagreed, most of them considered it too high.
- Regarding picture 5_B one group was told that it is an 'obstruction' and the other that it is an 'endangering'. However, both groups were told that this offence results in a fee of EUR 72. 83% of respondents considered this appropriate. Two thirds of the remaining 17% opted for a lower and one third for a higher fee.
- The penalty for the offence shown in picture 6_B (unquestionable an 'endangering') was told to be EUR 72 plus penalty point. Again, 83% of respondents agreed. However, from those who disagreed only 7% voted for a lower fee and 11% for a higher (EUR 130 on average).

Evidently, an obstruction of a pedestrian is commonly considered an offence, but a 'minor' one and this should be reflected in a moderate penalty. An endangering of pedestrians, at least an obvious one, is considered a serious offence and should be punished much more severely.

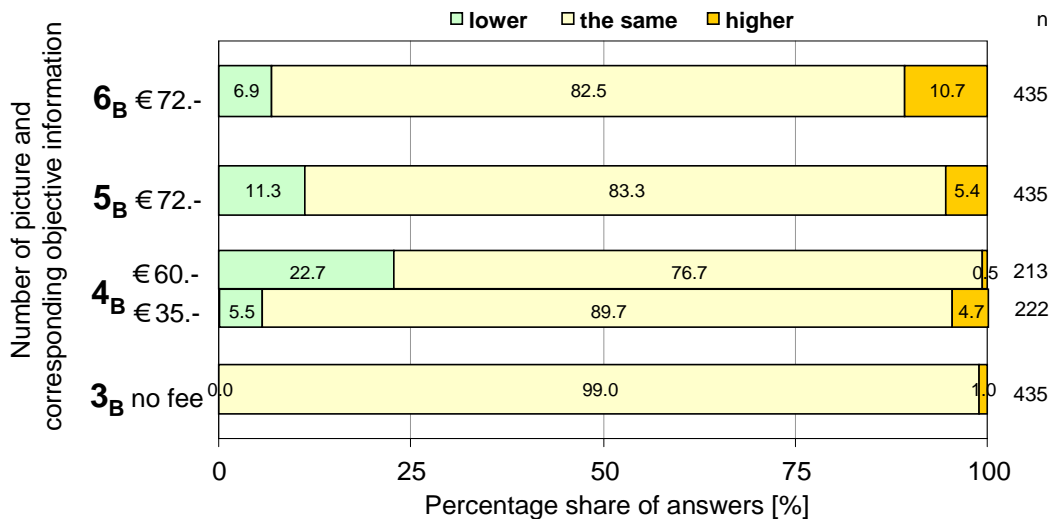


Figure 14 Reactions to the suggested penalties in the 'objective' information: the penalty should be lower, as high as or higher

The picture series A and B were afterwards again shown to the respondents and they were asked from which picture onward they would now (in the light of the given information) stop to allow the pedestrian to cross the road. 22% of the respondents stated a change compared to the previous statement: Figure 15 shows for every picture the share of respondents who would now stop earlier, at the same time or later than before receiving the information:

- The majority of respondents still claim that they would stop in the situation shown on pictures 3_{AB}, i.e. in a situation where they might drive on without obstructing the pedestrian.
- Of those few who would have stopped too early, i.e. in the pictures 1_{AB} or 2_{AB}, 21% stated that they would now stop in the situation shown in pictures 3_{AB}.
- 30% of respondents who previously stated to stop in the situation shown on pictures 4_{AB} (the first pictures showing an offence) claimed that they would now stop earlier.
- The biggest relative change takes place among those respondents who previously stated to stop rather late (not before the situation in pictures 5_{AB}). 40% of them would now stop earlier and nobody later.

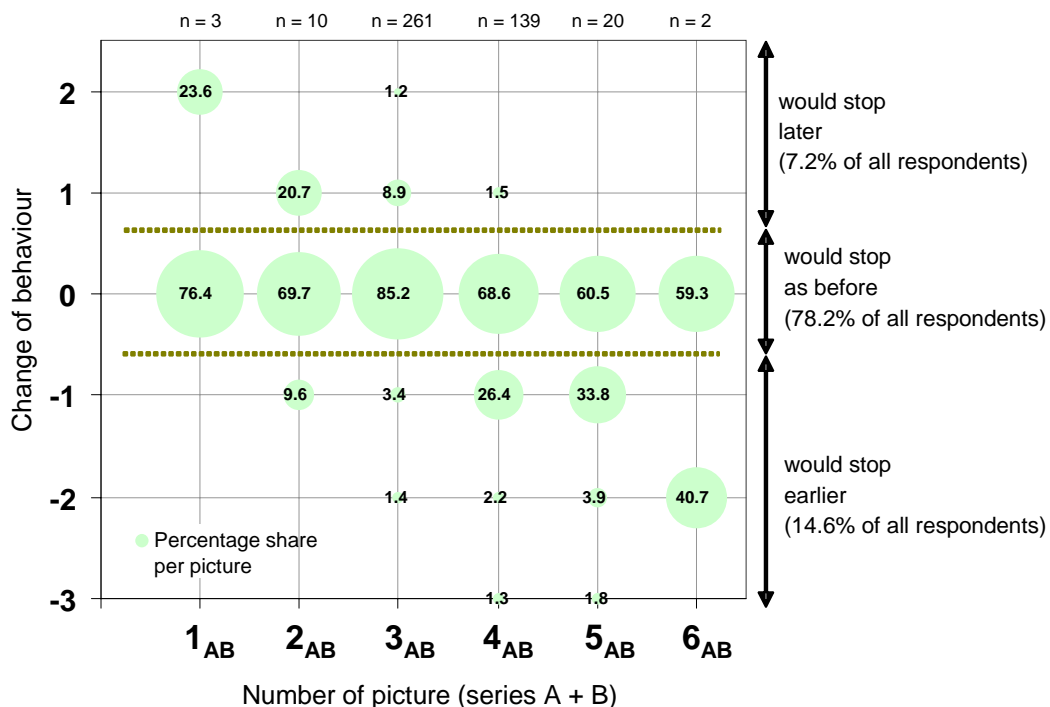


Figure 15 Behaviour after receiving 'objective' information (I would now stop earlier / in the same situation / later than before) for every number of picture mentioned before receiving information

The results make obvious that the provision of information and education can significantly affect the behaviour of car drivers in the desired direction, i.e. to pay more attention to the pedestrians' right of way.

Discussion and Conclusions

Austrian drivers are well aware of the rule that pedestrian have right of way at non-signalised zebra crossing and most of them fully accept this. The highest level of acceptance is found among

- (i) people living in conurbations, maybe to the 'mere exposure' effect (Zajonc, 1968), since they are used to cope with pedestrians crossing the street; additionally, the lower speed makes braking less bothering and virtually all people cover some distances on foot themselves, so that they understand the needs of pedestrians better;
- (ii) very young drivers; this may be due to the lasting positive effect of fairly recent driving lessons;
- (iii) rather old drivers, who drive more defensively in general and might have more sympathy for the 'worries and concerns' of pedestrians crossing roads; and
- (iv) among people with a higher level of education.

The more positive the attitude of drivers to the right of way of pedestrians is, the higher their stated willingness to respect this rule. As for other traffic offences, a positive connection can be observed between normative agreement with a particular traffic regulation and the willingness to obey it (e.g. Haglund & Åberg, 2000; Lawton et al., 1997).

Respondents described their own behaviour very pedestrian-friendly. Hardly anyone wants to deliberately obstruct or even endanger a pedestrian crossing the road. This stated own behaviour is probably better than in real life, and definitely better than the assumed behaviour of other drivers. The latter are hardly suspected to endanger pedestrians, but at least to obstruct them. This result confirms Baxter et al. (1990) who emphasised our inclination to forgive ourselves 'bad driving' (since we know the factors leading to it), while we are far more critical about other drivers we observe doing the same.

The willingness to stop at a zebra crossing depends to a large degree on the subjective interpretation from which situation on a pedestrian is obstructed or even endangered. People assess fairly well when an offence (in terms of obstruction) is given, but only few know the difference between obstruction and endangering. This is no surprise, given that even experts differ in the interpretation of when a situation is *still* an obstruction or *already* endangering, so that two versions of 'objective interpretations' were tested.

Both interpretations are more or less comprehensible, though drivers from conurbations find it somewhat easier to get the details of the regulation than drivers from rural areas. The reason is probably the same as above, i.e. urban drivers are more used to pedestrians crossing a street. Both versions are accepted by the majority of drivers, confirming once again that objective information, if presented in a trustworthy way, is well accepted (O'Connell, 2002) and can elicit a desired behavioural change. The penalty for the comparatively small offence of obstruction seems appropriate to most drivers. But when it comes to a more severe endangering of pedestrians, more drivers opt for a higher fee than for a lower. This finding confirms an experience already made in the preceding focus groups: endangering pedestrians

- is considered a 'serious' offence,
- committing the offence is seen as a violation of social norms,
- which one would avoid for that particular reason (and not for fear of a penalty),
- and one assumes that most other drivers would not commit as well,
- and for which a severe penalty seems appropriate, maybe even a more severe than currently practiced in Austria.

Most important is the need of clearer and comprehensible criteria for the statutory interpretation of the Austrian regulation of the right of way of pedestrians at zebra crossings. As long as no such criteria are in place (e.g. distance of the car from the pedestrian less than x metres) and no clear behavioural instructions are given (e.g. the driver 'must stop' instead of 'has to stop if necessary'),

the drivers' behaviour mainly results from their own assessment of the situation. Despite the broad acceptance of the right of way of pedestrians, drivers are encouraged to use the room for interpretation in their own interest, i.e., to make progress while driving. It is possible that many do so without bad intentions. Nevertheless, this is not the kind of considerate and respectful interaction desirable for road traffic.

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