

# Social forgivingness and vulnerable road users

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## Abstract

Pedestrians and cyclists are especially vulnerable in their interactions with motorized vehicles. The Sustainable Safety vision of road safety has incorporated five principles that help to keep (vulnerable) road users safe. To achieve this, the original vision made use of three principles for the organization of the traffic system: functionality, homogeneity, and recognizability. These principles were to ensure that people commit fewer errors, so that serious injury will be less frequent.

One of the newer principles is 'social forgivingness' which focuses on the interactive aspect of participating in traffic. By anticipating on the developing traffic situation and being 'socially forgiving', road users can prevent another road users' behaviour having undesired consequences. The paper provides an introduction to social forgivingness and explains how it fits into the vision of a sustainably safe road traffic. In addition, some relevant factors from (mainly psychological) literature are discussed. These internal and external factors pertain to being able and willing to act socially forgiving as well as to the impact the setting (road environment in which the interaction takes place) might have on social forgivingness.

In a recent report, SWOV Institute for Road Safety Research has investigated how and when social forgivingness can be found in traffic behaviour. Although the focus was mainly on studying how social forgivingness could be identified based on observable actions of road users, the research also focused on the influence of differently designed road environments.

Two studies were conducted. The first study involved a video analysis of road users interacting in different settings. These settings differed with respect to the degree in which the interaction between road users was regulated by formal traffic elements. An intersection designed according to Shared Space principles was considered less regulated than the previous, more traditional, design of the intersection. The second study involved a questionnaire that showed respondents short video's from a car driver's point of view. Each video portrayed a certain dilemma situation in which a car driver could be inclined to react socially forgiving towards a cyclist or pedestrian. Each dilemma was presented in both a more (traditional) and less (Shared Space) regulated traffic setting.

Besides providing ideas concerning how social forgivingness can be identified, the results of the study also provide insights into the new principle within Sustainable Safety and provide indications how social forgivingness can help to sustain safe participation in traffic for vulnerable road users such as pedestrians and cyclists. The paper addresses the effect of the degree of regulation of the traffic setting on social forgivingness.

## **Biography**

After studying cognitive psychology Maura Houtenbos completed her PhD thesis on interactive driving behaviour at intersections and the role of expectations. Since 2002, Maura has been working for SWOV, participating in studies on social forgivingness, distracted driving, enforcement and credibility of speed limits and safety aspects of new vehicle types.

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## Introduction

### Sustainable Safety

Pedestrians and cyclists are especially vulnerable in their interactions with motorized vehicles. Sustainable Safety is a so-called system approach that helps to keep (vulnerable) road users safe. To achieve this, safety is not seen as dependent on the individual actions of road users, but all the more on the characteristics of the traffic system. The traffic system consists of the components 'people', 'vehicle' and 'road'. A sustainably safe traffic system is designed by taking people as the measure of all things. The original vision (Koorstra et al., 1992) made use of three principles for the organization of the traffic system: functionality, homogeneity, and recognizability. These principles were to ensure that people commit fewer errors, so that serious injury will be less frequent. Functionality focuses on the prevention of unintended use of the infrastructure. Homogeneity intends to prevent large differences in speed, direction and mass at moderate and high speeds. Finally, predictability is directed towards the avoidance of uncertainty. For example, when the layout of the road is recognizable, road users know how fast they are allowed to drive and what behaviour they can expect from other road users. As such, the purpose of these Sustainable Safety principles is to guarantee road safety as early as possible in the chain of system design to final road behaviour.

The updated Sustainable Safety vision introduced two additional principles: state awareness and forgivingness (Wegman and Aarts, 2005). If road users still act unsafely, the principle of forgivingness can nevertheless make it possible for the situation to develop safely. Physical forgivingness contributes to this safety by allowing for room for correction by means of the infrastructure (e.g. by constructing hard shoulders) and by preventing or reducing the risk of serious injury (e.g. by fencing off obstacles). However, an important role is to be played by road users themselves too. If road users notice other people's unsafe actions in time and react to them with social forgivingness (by slowing down, for instance), a crash can be prevented at the last minute, or injury can be limited. To sum up, principles that focus on road users' interaction with the infrastructure encompass functionality, homogeneity, predictability and physical forgivingness, whereas social forgivingness, in combination with state awareness, is mainly oriented on the interaction of road users with each other. This paper will focus on the social aspect of the forgivingness principle.

### Social forgivingness

In a theoretical exploration of this new principle, SWOV has defined social forgivingness as follows (Houtenbos, 2009):

*The willingness to anticipate a potentially unsafe action by another road user and to act in such a way that negative consequences of this potentially unsafe action are prevented or at least limited.*

Thus, this additional principle, in contrast with the three original principles, focuses on the role played by the road users themselves in preventing crashes and/or minimizing injury. Although it remains the first priority to prevent human error by adjusting the traffic system to human limitations, road users will inevitably commit errors or lack certain skills, even if they are highly experienced or motivated. These errors or lacking skills can lead to unsafe traffic situations. To prevent unsafe traffic situations from developing or at least diminish the consequences, other road users can, in turn, react to these errors in a socially forgiving way. For example, by giving their fellow road user time and space to recover from their error. One such example is a cyclist who may be on the brink of taking right of way wrongly. A socially forgiving driver will then slow down.

It should be noted that a socially forgiving reaction actually is not only required when a road user makes an error, but, for example, also in a situation in which somebody crosses the road very slowly because of physical disabilities. Thus, social forgiveness can help to prevent unsafe traffic situations from developing. As pedestrians and cyclists are more vulnerable road users than car drivers, they are likely to benefit most from socially forgiving behaviour of other (motorized) road users.

## Factors influencing social forgiveness

It is as yet unclear in what way social forgiveness works in actual practice, especially because so far the concept of social forgiveness in road user behaviour has not been explored. The objective of SWOV's preliminary research (Houtenbos, 2009) was to distil factors from theory that may possibly determine how and to what extent somebody will act with social forgiveness. After all, only when we know how socially forgiving behaviour comes into being, we will have a lead for encouraging this important behaviour.

Houtenbos made a distinction between internal and external factors that are expected to determine socially forgiving behaviour. Internal factors are defined as 'cognitive' and 'motivational' factors. Cognitive factors influence capability and motivational factors have an effect on willingness. Whether somebody is capable of acting and/or willing to act with social forgiveness therefore depends on internal factors, among other things. However, external factors also have an effect on capability and willingness. One external factor defined by Houtenbos is the setting of the traffic task. This setting comprises the design and function of the traffic system, as well as its use. We may, for instance, think of the way a road has been laid out, the local traffic rules, but also the amount of traffic at a particular moment and the direction from which specific road users are approaching.

The various types of factors will be discussed separately below, even though they cannot always be considered independently. In the end, a combination of various internal and external factors will determine whether a driver will act with social forgiveness.

### *Internal factors*

It is assumed that the following internal factors are significant for drivers to be *capable of* acting with social forgiveness. The road user is therefore required to:

- have the correct expectations of the situations he is in;
- be capable of assessing the intentions of other road users correctly;
- have the capacity to adapt his own behaviour.

In order to be able to anticipate a traffic situation accurately, a driver should be capable of assessing a (potentially) unsafe situation correctly and also have sufficient capacity to react with social forgiveness. The more one is capable of assessing the traffic situation and the other road users' intentions correctly, the higher the chances are that one is able to react socially forgiving and that the situation develops safely. All three factors are directly related to experience. Experienced drivers will have less difficulty in executing their traffic task, so that they are better capable of anticipating other road users' behaviour and, subsequently, acting with social forgiveness.

With respect to the *willingness* to act with social forgiveness, a distinction can be made between a general and a more specific willingness. Psychologically speaking, the road user's general willingness is called a trait: a permanent personality characteristic. A road user's specific willingness is determined by his state: a temporary psychological condition. It is assumed that it is difficult to influence people's general willingness to act with forgiveness, but that it is possible to encourage their specific willingness. In order to be *willing* to act with social forgiveness, the following internal factors seem to be particularly significant:

- the interpretation of the other road users' unsafe behaviour;
- the degree in which road users are motivated to cooperate with others;
- considering socially forgiving behaviour as the 'standard'.

The first factor implies, for example, that we could either assume that a road user is a bad driver, or that we take it that he has simply made an error due to the busy traffic situation. It also plays a role to what extent we 'feel like' giving way to another road user (the second factor), so that traffic will flow more smoothly and safely. Thirdly, it will make a difference whether socially forgiving behaviour is perceived as the prevailing standard, or whether more aggressive behaviour is considered the standard.

There are also internal factors that affect both 'capability' and 'willingness'. Examples are one's individual driving style and the ability to take different perspectives. The latter is defined as the capability to put oneself into another person's position and to understand the way in which this person will react in the specific situation. The more a driver is capable of doing this and has insight in other drivers' interests and intentions, the better he will be capable of acting with social forgivingness. With respect to the individual driving style, a role is played by the driver's skills, as well as by his personal choices. Research into driving styles tends to categorize them as 'reckless and unobservant, 'insecure' or 'angry and hostile'. A different category of driving style is frequently distinguished in which the emphasis is put on behaviour necessary for acting with social forgivingness (anticipating, polite, patient and careful driving behaviour). However, not much research has been conducted into driving styles in which this positive behaviour plays a specific role.

#### *External factors*

The *setting* of the traffic task also influences the extent to which road users are capable or willing to act with social forgivingness. For example, a junction with a very limited view of the intersecting roads will limit road users in their *ability* to anticipate the behaviour of their fellow road users and subsequently act in a socially forgiving manner. On the other hand, a traffic light at a very busy junction which turns green for only a brief moment can limit the extent to which road users are *willing* to act in a socially forgiving manner. Thus, the setting influences road users expectations.

### **Research**

In their recent study on social forgivingness, SWOV has attempted to determine the extent to which differences in *setting* influence expressions of social forgivingness (Stelling et al., 2010). As social forgivingness is a new principle and has not yet been researched as such, this study's main priority was, however, to investigate the possibilities concerning the observability of expressions of social forgivingness. What does socially forgiving behaviour actually look like, and can we actually see it? Thus, this study used a research question concerning the effect of differences within the setting as the context for researching the observability of social forgivingness.

The study further detailed social forgivingness using two different angles. First the possibilities of investigating the observability of social forgivingness were studied using the research question:

*To which extent can social forgivingness be determined on the basis of observable behaviours?*

Secondly, a first attempt was made to investigate social forgivingness with respect to content. Here the emphasis was on the influence of the setting of the traffic task on (expressions of) social forgivingness. The corresponding research question was:

*To which extent do differences in setting influence expressions of social forgivingness?*

## **Controlledness of the setting**

In this study, the setting was operationalized as differences in the extent to which the setting is controlled or regulated. The interaction between road users can to a greater or lesser extent be explicitly controlled by traffic elements. When a greater number of traffic elements have been applied (e.g., road markings, traffic lights), the setting is considered 'more controlled'. Conversely, when few traffic elements have been applied to control the interaction between road users, the setting is considered 'less controlled'. An example of a less controlled setting would be a setting where only the right hand right of way rule applies. For the traffic situations in a 'less controlled' setting, this study often made use of Shared Space locations (see [www.sharedspace.eu](http://www.sharedspace.eu)). These locations are generally less controlled than locations that have been designed in a more traditional way.

It is important to note that controlledness of a setting should always be considered relative to the controlledness of another setting. In other words, it is a relative concept rather than absolute. Also, not only the number of traffic elements should be taken into account, also the extent to which these elements limit the interaction between road users. For example, a setting with a physical separation of driving directions is considered more controlled than a setting with only a barrier line between lanes.

## **Approach**

In this study, the emphasis was on how social forgivingness could be identified based on observable actions of road users. Furthermore, the research also focused on the influence of differently designed environments on road users' social forgivingness. Based on a survey of different research methods, a combination of methods was selected: an explorative observation study using video analysis and a questionnaire study with a more experimental design. The different methods were chosen to complement each other and therefore give a more reliable and more complete picture than if only one method were used.

## **Operationalization**

Both studies are mainly focused on discernible socially forgiving behaviour. Going back to the definition presented above, one could say that the focus here is more on the "anticipating" aspect than on the "willingness" aspect, which is likely to be more difficult to discern. Based on literature studied, several operationalizations of social forgivingness were proposed. These included speed behaviour, distance kept, viewing behaviour, gestures and priority behaviour.

## **Observation study**

For the observation study we used two one-hour long films of an intersection in the city of Sneek; one hour of footage before the reconstruction (a more controlled setting) and an hour of footage after the reconstruction according to Shared Space principles (less controlled setting). An asphalt intersection with traffic lights, priority signs, markings, etc., was replaced by a roundabout with less explicit traffic elements. The footage was observed and scored by two observers. To allow the best possible systematic observation relevant for social forgivingness, a coding scheme was drawn up containing aspects like the type of road users involved in each encounter, the configuration between them, and the question whether the situation could be labelled (potentially) unsafe. Then the observed road user actions were coded on, among other things, the type of behaviour that can indicate social forgivingness or its failing to occur.

## **Questionnaire study (Situational Judgement Test)**

For the Situational Judgement-test a number of situations were staged and filmed that were assumed to evoke socially forgiving behaviour. Six scenario's were used, each filmed from the perspective of a car driver, where the car driver would encounter cyclists or pedestrians. The scenario's were selected to elicit uncertainty concerning the behaviour of the cyclist or pedestrian and trigger a feeling of dilemma within the car driver. Will the cyclist or pedestrian create an

unsafe situation? Is it necessary, as the driver of the car, to take action? Using these scenarios, filmed in more and in less controlled or regulated settings (a total of thirty films) respondents were asked about some aspects of their traffic behaviour (speed choice, speed adaptation, and adaptation of the lateral position) that we expected to be relevant for socially forgiving behaviour. In each scenario we tried to stage a dilemma in which the driver had to choose between just continuing as before, or anticipating a potentially unsafe situation involving a vulnerable road user (cyclist or pedestrian).

*Example scenario:*

While you approach a junction, you note a cyclist approaching from the left. The cyclist does not seem to be looking at you and could start to cross the intersection (and consequently wrongfully take right of way). You are then faced with a dilemma: will you continue without reducing speed and take right of way or would you anticipate the possibility that the cyclist will continue crossing the intersection although wrongfully and decrease speed ?

## **Results**

### **Observability**

The research has initially been focused on discernible expressions of social forgivingness. Bearing the proposed definition in mind, it must be noted that not all discernible behaviours can be labelled socially forgiving. For example, someone could also be slowing down due to an animated conversation with their passengers, rather than as a socially forgiving reaction to another road users' behaviour. Conversely, not all expressions of social forgivingness are as easy to identify through observation. So, it is important to determine when observable behaviour can be labelled socially forgiving. The study described in this paper has attempted to do so through a mix of research methods and different operationalisations of social forgivingness.

The observation study revealed numerous instances of behaviour that was considered as a plausible operationalisation of social forgivingness prior to the study. Road users were seen to continuously adapt their speed to other road users and consequently also their distance to others. This results in a great many unsafe situations being prevented. However, it does remain quite difficult to ascertain with certainty whether these behaviours can be labelled as socially forgiving. This research method does not indicate *why* people choose to adapt their speed and distance.

The method used in the questionnaire study could provide more insight in the considerations people have when deciding on a particular course of action in traffic. Verbal responses to particular (manipulated) scenario's can provide clues for assumptions concerning the relevant considerations prior to their (reported) behaviour. Particularly the respondent's option to indicate their reasons for their chosen speed- and position adjustment holds promise. However, when interpreting these results, it should be kept in mind that the social desirability bias could have affected the answers. Also, it is not certain if the self-reported behaviour would match their behaviour in the actual situation. The results of the analysis of these explicit motivations were not included in the abovementioned study, but will be included in SWOV's next report on social forgivingness. Further research may provide more insight in the less visible elements related with social forgivingness like motivation, intended gaze allocation and increased attentiveness.

### **Controlledness**

This study also focused influence of differently designed environments and in particular on the effects of a more (traditional) and less (Shared Space) controlled traffic setting on the interaction between car drivers and more vulnerable road users such as pedestrians and cyclists. The results of the questionnaire study indicated that respondents reported – on average - a slightly lower speed in the less controlled settings. This effect was dependent on the particular scenario presented to them. Some scenario's turned out to overrule any effects of manipulated aspects of the setting.

The observation study revealed an effect of controlledness in the characteristics of the encounters between road users. For example, the setting influences the configuration of the encounter: e.g., in the more controlled setting most encounters were found between traffic travelling in the same direction, rather than with intersecting traffic as the traffic lights prevented the latter type of encounter from occurring. Also, relative differences in speed were found to be affected by controlledness.

Overall, it seems that subtle differences in the setting may have an influence on the 'basic behaviour' (such as speed behaviour) and the expectations in a specific setting. This finding is especially relevant for research into traffic behaviour at so-called Shared Space locations.

## **Conclusions**

### **Significance of social forgivingness**

Traffic participation is practically inevitable in our society nowadays, but it may occasionally be almost too complex a task for specific groups of more vulnerable road users like children, the elderly, the disabled or novice drivers. Therefore, these groups will regularly need socially forgiving reactions from other, more capable road users. Nevertheless, more capable road users will occasionally make errors too. As unsafe road behaviour is inevitable, it is of the highest importance that road users take each others' shortcomings into account. Socially forgiving behaviour can prevent unsafe actions from resulting into injuries. Broadly speaking, social forgivingness can contribute to a traffic system that is safe and permanently accessible to all road users.

Social forgivingness is a new principle of Sustainable Safety that, in contrast with earlier principles, focuses on the role played by road users themselves in the prevention of crashes. For as yet, it is too soon to arrive at conclusions about the possible safety benefits of this principle. A theoretical exploration has indicated various internal and external factors that may have an effect on the extent in which road users act with social forgivingness, such as experience, motivation, driving style and the setting of the traffic task. Follow-up research has focused on the problem of observing social forgivingness. Further research may provide more insight in the less visible elements related with social forgivingness like motivation, intended gaze allocation and increased attentiveness. The more we get to know about social forgivingness, the closer we can get to determine the ways in which socially forgiving behaviour can be encouraged, while taking the other Sustainable Safety principles into account at the same time.

### **Social forgivingness and controlledness of the setting**

There is probably less need to act in a socially forgiving manner when the encounters between road users are more regulated (e.g. by means of traffic lights). On the other hand, in a less controlled setting, in which various kinds of encounters may occur, there probably is a greater need for socially forgiving behaviour. This latter situation occurs in many Shared Space environments. Here, encounters between road users are organized less explicitly by formal rules. It is therefore assumed that road users are encouraged to take each others' interests into account and to feel greater responsibility for their own individual behaviour. Driving behaviour may be less predictable in a less well-regulated environment, which may be compensated for by social forgivingness.

However, no direct relations with road safety can be made on the basis of the differences in socially forgiving behaviour. It cannot be argued that a situation in which road users act more socially forgiving is by definition safer than a situation in which this occurs to a lesser degree. Hence, in a regulated setting (as a result of traffic regulations) it is to be expected that road users do not act with the same social forgivingness. Nevertheless, such a situation may turn out to be as safe as a less well-regulated setting in which, for example, speed is limited and road users are encouraged to make allowances for other road users and to show socially forgiving behaviour in

the absence of explicit traffic regulations. Thus, social forgivingness cannot be separated from the other Sustainable Safety principles in the context of road safety.

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