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Occupation, driving experience, and risk and accident perception

DONGO RÉMI KOUABENAN*
Université Pierre Mendès France, UFR SHS, Laboratoire de Psychologie Sociale, BP 47, 38040 Grenoble Cedex 9

Abstract

A study on risk perception and causal explanations of road accidents was conducted on 553 subjects with various kinds of experience and knowledge about traffic and automobile driving. Accident and risk perception was studied by means of three independent variables: the subjects' occupation, driving experience, and accident history. The results showed that all categories of subjects were inclined to overestimate the threat represented by the risk of a road accident. Furthermore, all subjects tended to make more external causal attributions that defended their role in traffic safety and accident prevention. Experienced drivers, but also less experienced ones, exhibited a higher level of risk-taking than other subjects, and also made more external and fatalistic causal attributions. Finally, accident history does not seem to have a notable effect on accident and risk perception, but it does appear to result in more cautious behaviour. The findings are discussed in terms of their possible contribution to accident diagnosis and prevention.

KEY WORDS: defensive attribution, expertise, perception, accident, risk

1. Introduction

Research on risk and accidents has shown that knowledge of people's perceptions of risks can be crucial in risk and accident management (Colbourn, 1978; Svenson, 1978; Slovic *et al.*, 1981; Howarth, 1987, 1988; Kouabenan, 1998a, 1999, 2000). Studies on risks and explanations of events have demonstrated that laymen or nonspecialists are not only sensitive to their environment, but also have subjective perceptions and judgments of it that may be fundamental in risk handling. Risks in general, and accidents in particular, elicit an intense cognitive activity in people aimed at finding reassuring explanations and gaining a better sense of control over the situation; in short, at achieving some 'peace of mind' (Heider, 1958; Dejoy, 1994; Kouabenan, 1998b; 1999; Kouabenan *et al.*, 2000).

However, risk perception and causal explanations of accidents differ widely across individuals. For example, 'experts' and 'novices' sometimes have diverging perceptions of risks and of the causes of accidents (Slovic *et al.*, 1981; Kouabenan, 1994). It is not possible or even necessary here to rank these different perceptions, especially since even experts are known to have biased perceptions of safety problems, just like novices (Slovic *et al.*, 1981).

*e-mail : Remi.Kouabenan@upmf-grenoble.fr

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Expertise can be defined as knowledge or specialization in a given domain. It can be acquired through instruction and/or experience. It is not the intention to study the role of expertise *per se* (in the academic sense of the term) in risk perception. The term expertise is understood here in its common usage, found in everyday dictionaries. that is, 'Particular know-how or knowledge acquired through practice or experience (see Caverni, 1988, p. 114). Rather, the goal was to determine how hazards and accidents are perceived by persons whose relationships with road risks differ due to their profession or experience. Occupation and experience are assumed here to give drivers different levels of knowledge about risks and road accidents. For clarity's sake in this study, the term experience is preferred to that of expertise. However, it seems useful to briefly review the research on differences in risk perception across levels of expertise, in order to point out how these two factors are related. Thus, after some of the differences between naive and expert causal explanations are stated, the research dealing with the role of experience in risk perception will be briefly presented. Then a study will be described that attempted to determine the diverging and converging points in the perception of risk and in the explanation of accidents in persons whose road-risk knowledge varied according to their occupation, driving experience, and accident history.

2. Divergence and bias in expert and layman risk perception

One of the reasons why risk control is still an unresolved issue is thought to be – and rightly so – that experts and novices approach risks differently (Fiorino, 1989). Some people take a 'technical' approach based on rationality, efficiency, and expertise; others take a 'democratic' approach based instead on subjective, experiential, and sociocultural considerations. In a recent study, Bouverot and Kouabenan (1998) showed that experts may even pass right over certain risks that operators who experience them daily have no trouble detecting. A French company specializing in the manufacture of glass syringes was having problems getting its machines to meet the standards defined in their quality control programme. The company was facing a rise in accidents in the glass-cutting division where the machines were located. To diagnose the problem and propose protection measures, a certified organization of French safety experts was called in. When these measures failed, they called on us. We chose an analysis method that would take the operators' spontaneous (or naive) causal attributions into account. A comparison of the naive causal attributions to the experts' diagnoses revealed that while the experts and the operators agreed more or less on the risks incurred when running machines with moving parts which are difficult to encase (transmissions, cutting zones, direct blowtorch access, etc.), the experts only noted risks that were directly related to the machinery, failing to perceive any risks connected to the workstation itself (danger of falling on scrap glass, risks linked to handling glass rods, etc.). Inversely, the operators tended to neglect certain risks identified by the experts, usually because they felt they had already found solutions based on their own experience or know-how.

What is more, a number of studies have shown that nonexpert subjects in many cases are inclined to rely more on their own judgment than on that of experts (Prince-Embury and Rooney, 1987; Flynn *et al.*, 1993). Prince-Embury and Rooney (1987) attributed such an attitude to the often contradictory statements made by experts and officials following a catastrophe. They showed, for example, that people living in the vicinity of

Three Mile Island at the time of the disaster trusted the experts less than did people who had settled there afterwards, because their perceived sense of control had been affected. Similarly, Flynn *et al.* (1993) demonstrated not only an increasingly large gap between experts' and laymen's perception of risks, but also that a lack of faith in experts is likely to have an impact on people's participation in potential waste management programs. Finally, Falomir, Mugny and Perez (cited by Butera *et al.*, 1998) showed that 'while being fully aware of the information given out by health experts, smokers do not integrate it into their behaviour system, and do not change their intentions about quitting smoking' (p. 112). According to Butera *et al.* (1998), though, it can even happen that people 'go along with experts simply because they are experts (which presumably guarantees the validity of their knowledge), not because their message or teachings have been assimilated' (p. 111).

But no matter where the expertise originates and what its foundations are, research in psychology has shown that experts and novices alike make biased judgments (Tversky and Kahneman, 1974; Slovic *et al.*, 1981; Kouabenan, 1985a, 1994; Caverni, 1988; Kruglanski and Ajzen, 1983). In fact, it cannot even legitimately be claimed that the 'expert' point of view about risk is more rational or more valid than the more-or-less intuitive, subjective, and apparently irrational judgments of novices (Fiorino, 1989; Fischer *et al.*, 1991; Kruysse and Wijlhuizen, 1992). Besides, as Slovic *et al.* (1981) noted, 'Despite an appearance of objectivity, all forms of risk assessment include a large component of subjective judgement' (p. 17). Knowledge of such biases and their specific characteristics for different types of experience with risks and road accidents is one of the key points in the work presented in this article.

2.1. ROLE OF EXPERIENCE IN RISK PERCEPTION

The main question raised is how does knowledge acquired through work and life experiences affect one's perception and explanation of road accidents. In particular, what kinds of causal explanations of risks and accidents are given by persons who, due to their occupation, are confronted on a daily basis with road accidents and their analysis? And what about other persons who are less directly concerned with these problems? One can assume, for example, that experienced people will have perceptions of risks and accidents that are more accurate than those of less experienced people, and that experienced people will also be less fatalistic and less inclined to take risks. Similarly, the causal explanations supplied by experienced people should have more nuances than those of novices or less experienced people, which are likely to be essentially external and defensive.

Note that studies dealing with experience and how it relates to risk perception are rare, and they have given rise to discrepant and imprecise results that need further verification and support. While the findings on the impact of driving experience on perceptions are consistent for the most part, this cannot be said of the data on accident history. For example, Brown and Groeger (1988) found that inexperienced drivers tend to underestimate the risks in traffic and overestimate their own driving skills. Similarly, Benda and Hoyos (1983) noted that less experienced drivers assess risks by considering the details of the situation, whereas more experienced drivers take a broader view that incorporates different aspects of road traffic. However, some authors have found that accident history tends to lower risk-taking (Parker *et al.*, 1980; Winkel and

Denkers, 1995) while others have obtained the opposite result (Evans and Wasielewski, 1982), or have not found any effect of accident history on risk perception (Gangloff and Ozil, 1992).

3. Method

3.1. MATERIALS

In view of answering the above questions and validating the hypotheses, a questionnaire was devised to assess risk perception and accident explanations. The full version of the questionnaire contains about 20 questions pertaining to the definition of an accident, information about the subjects, perceptions of accidents and their causes, estimates of the prevalence of accidents (frequency and impact on mortality), perceptions of the automobile, risk-taking behaviour, and fatalistic beliefs. Except for a few questions (definition of an accident, estimates of accident prevalence, etc.), answers were given on a 5–point scale. For example, for the question about the causes of accidents, subjects had to estimate the prevalence of 34 different potential causal factors (chosen on the basis of the accident research) by checking the corresponding box ranging from 'very prevalent' to 'not prevalent at all' for each cause.

The questionnaire was organized in such a way that a risk-taking index and an index of fatalistic beliefs could be calculated. The risk-taking index was derived from the 42 items (initially 45)[1] describing driving situations that commonly cause problems or conflicts, and for which the subjects had to state the extent to which they agreed with the solutions proposed. Some examples of risk-taking items are: 'Passing several vehicles at a time is sometimes the only way to get to where you're going on time,' 'One should be able to drive at the fastest speed your vehicle can go,' and 'When a light turns yellow, it means to hurry on through'. The answer choices were ranging from 'fully agree' to 'fully disagree'.

The fatalistic beliefs index was calculated from the nine items (initially 11)[2] describing situations subject to popular beliefs expressing some degree of fatalism, and for which the subjects had to state their level of agreement or disagreement on the same 5–point scale (see Kouabenan, 1998a). Some examples of the fate-related items are: 'Accidents are due to fate; nothing can be done about it,' 'When you do something that customs frown on, you are exposing yourself to an accident,' or 'If a black cat crosses your path while you're driving, you should be twice as cautious.' These two indexes were examined in relation to the subjects' characteristics, especially their occupation, driving experience, and accident history.

3.2. SUBJECTS

The population under study consisted of 553 people of different occupations (city policemen, highway patrolmen, university students, professional drivers, civil engineers, driver trainees, etc.) who, due to their jobs and daily activities, had different amounts of knowledge about road accidents and risks. The engineers were chosen among those whose work involved road transportation or who organized and ran traffic safety campaigns; the policemen and highway patrolmen were individuals who had to deal with traffic and accident write-ups. These three categories of subjects, although not to

be confounded, were deemed to have more knowledge in safety problems than professional drivers who, because of their daily driving, were considered in turn to know a little more than ordinary drivers, driver trainees, and students (none of whom had a driver's licence). The sample was thus designed to contain a mixture of people from different groups, with a balance between the groups. The sample was mostly male (93.5%). The age distribution was nearly normal and ranged between 18 and 55 years, with the peak at 26–30 (26.2%).

The study took place in the Ivory Coast Republic (West Africa). Most subjects were contacted at their workplace: professional drivers were interviewed at their base, students at the university, highway patrolmen at the station or on their patrol site, etc. Interviewing was individual and lasted about 30–40 minutes.

Remember, the main hypothesis was that persons who come into direct everyday contact with traffic or transportation problems on account of their job will have a different perception of risks and accidents than people with little or no knowledge or experience in these areas. More specifically, due to their greater knowledge of road risks, persons with a lot of experience should exhibit less daring risk-taking behaviour, and should make causal attributions that are not as fatalistic and contain finer shades of meaning, compared to individuals with only partial knowledge or little experience.

4. Results

The qualitative data was analysed using the χ^2 test. An analysis of variance (ANOVA) was performed for the dependent measures across all conditions for the quantitative data.

4.1. OCCUPATION AND RISK AND ACCIDENT PERCEPTION

To examine risk and accident perception by occupation, the causal explanations made by the highway patrolmen ($N = 80$), policemen ($N = 62$), civil engineers ($N = 42$), professional drivers ($N = 106$), ordinary drivers ($N = 89$), students ($N = 90$), and driver trainees ($N = 84$) were compared.

4.2.1. Naive definitions of an accident

When subjects were asked to state what they thought an accident was (in general),[3] most of the spontaneous *definitions* given attempted to both characterize accidents (e.g., '*An accident is something unexpected, an involuntary action*') and describe their consequences (e.g., '*It's a phenomenon that leads to more or less serious bodily harm (death or injury) or physical damage*') (16.3%). Then came definitions that gave examples of accidents (15.9%) and descriptions in terms of fate (14.1%). A third of the definitions (33.7%) dealt with the consequences of accidents, either alone (8.3%) or in combination with other considerations. Few of the definitions focused on the causes of accidents (only 2.5%) or on the circumstances under which they occur (1.6%).

Looking at which subject groups gave the different types of definitions, it can be seen that fatalistic definitions were proposed especially by persons who had less expertise in road safety but came into direct contact with road traffic risks (professional drivers 24.4%, driver trainees 21.4%). Few fate-related definitions were given by persons assumed to have more road safety expertise, or who were more educated (engineers

7.1%, highway patrolmen 7.5%; students 7.8%). As a whole, then, 'experts' appear to have a less fatalistic view of accidents than do 'nonexperts' ($\chi^2 = 124.3$; df = 119; $p < 0.01$).

4.1.2. Rank of accidents among the causes of death

When the participants were asked to estimate the annual number of deaths from road accidents in the Ivory Coast, a little over 60% of them overestimated the mortality rate. They thought there were more than 1000 deaths per year from traffic accidents, whereas the average yearly number is actually about 700. A non-negligible number of participants (14.4%) estimated as many as 3000 or more deaths per year. Only 26% of the participants gave an estimate in the correct range (between 500 and 1000).[4] Many of the latter were policemen (43.5%) or engineers (40.5%).

The inclination to overestimate road accidents was also encountered when subjects were asked to rank *certain causes of death* (*the 11 leading causes in the Ivory Coast*), one of which was traffic accidents. The following order was obtained (from most to least frequent): road accidents (mean rank (m) = 4.46), malaria ($m = 4.17$), AIDS ($m = 4.12$), cholera and diarrhoea ($m = 3.15$), tuberculosis ($m = 3.05$), witchcraft[5] ($m = 3.05$), and so on down to occupational accidents (in ninth position: $m = 2.36$) and suicide ($m = 1.65$), which lagged far behind. These perceptions are in fact erroneous, and may be rooted in how serious such accidents usually are.[6]

Highway patrolmen ($m = 4.64$) overestimated the prevalence of road accidents as the cause of death more than the other subjects did, to a significantly greater extent than city policemen ($F(1, 140) = 10.37$; $p = 0.002$), professional drivers ($F(1, 184) = 3.79$; $p = 0.05$), and ordinary drivers ($F(1, 167) = 4.43$; $p = 0.03$), and marginally more so than driver trainees ($F(1, 162) = 2.88$; $p = 0.09$). They were followed by driver trainees ($m = 4.55$) and professional drivers ($m = 4.54$). No doubt, the continuous exposure of highway patrolmen to often serious if not deadly accidents on the roads and expressways reinforces their view of accidents as a major cause of death.

4.1.3. Most-dreaded risks according to subjects' occupation

When subjects were asked to choose *the risk or danger they feared* the most from a list of *12 potential risks* they might have to face, the most threatening risks and dangers chosen (in descending order) were road accidents ($m = 4.47$), serious illness ($m = 4.23$), unemployment ($m = 4.05$), and street assault ($m = 3.96$), etc., with occupational accidents in tenth position. Fear of road accidents was the most pronounced in professional drivers ($m = 4.65$); it was equally strong in highway patrolmen and students ($m = 4.54$). Professional drivers dreaded traffic accidents significantly more than did ordinary drivers ($F(1, 193) = 16.21$; $p < 0.0001$), driver trainees ($F(1, 188) = 15.65$; $p < 0.0001$), policemen ($F(1, 166) = 12.77$; $p < 0.0001$), engineers ($F(1, 146) = 5.50$; $p = 0.02$), and highway patrolmen ($F(1, 184) = 3.26$; $p = 0.07$). The latter (highway patrolmen) feared traffic accidents significantly more than ordinary drivers ($F(1, 167) = 4.01$; $p = 0.04$), and driver trainees ($F(1, 162) = 3.48$; $p = 0.06$), and marginally more than policemen ($F(1, 140) = 2.49$; $p = 0.11$). Finally, students were more afraid of road accidents than ordinary drivers ($F(1, 177) = 9.41$; $p = 0.002$), driver trainees ($F(1, 172) = 8.87$; $p = 0.003$), policemen ($F(1, 150) = 7.11$; $p = 0.008$), and engineers ($F(1, 130) = 2.45$; $p = 0.11$). In addition, note that professional drivers feared occupational accidents more than did other subjects, differing the most from driver trainees ($F(1, 188) = 29.55$; $p < 0.0001$), highway patrolmen ($F(1, 184) = 12.98$; $p < 0.0001$), engineers ($F(1, 146) = 6.68$; $p = 0.01$),

and ordinary drivers ($F(1, 1.193) = 5.80$; $p = 0.01$). As a whole, for all risks pooled, professional drivers appear to be more afraid than other subjects; the fact that they are subjected to road risks on a daily basis no doubt contributes to reinforcing their sense of vulnerability (see Table 1).

4.1.4. Causal explanations of accidents according to subjects' occupation

In order to determine the perceived causes of accidents, subjects were given a list of 34 probable causes of road accidents, and then asked to rate them on a 5–point scale according to how frequently they felt they led to accidents. To make it easier to analyse the responses, the causes were grouped into six categories: (1) driver-related factors (speeding, failure to yield right of way, disobeying traffic lights, recklessness, loss of control, disrespect of pedestrian crossings, etc.); (2) vehicle-related factors (mechanical failures); (3) infrastructure-related factors (poor pavement or road condition, lack of sidewalks or shoulders, inadequate pedestrian crossings, intersections without proper road signs, etc.); (4) weather-related factors (inclement weather such as rain, wind, or fog); (5) fate or bad luck; and (6) factors related to a pedestrian or third party.

The analysis showed that the most important factors (in descending order) were ones involving a pedestrian or third party ($m = 3.54$), the weather ($m = 3.46$), the vehicle ($m = 3.39$), and the driver ($m = 3.36$). The same order was not found, though, when the explanations were analysed by occupation (see Table 2).

As a whole, there were few significant differences between the explanations supplied by professional drivers, ordinary drivers, and driver trainees. However, professional drivers did tend to give a significantly greater number of fatalistic explanations than other types of subjects, whether driver trainees ($F(1, 188) = 3.86$; $p = 0.05$), ordinary drivers ($F(1, 193) = 3.26$; $p = 0.07$), policemen ($F(1, 166) = 3.06$; $p = 0.08$), or engineers ($F(1, 146) = 7.32$; $p = 0.008$). All in all, professional drivers tended more than the other subjects to ascribe accidents to factors beyond the driver's control (infrastructures, the weather, pedestrians or third parties, and especially bad luck). However, they considered accidents to be caused less by vehicle-related factors than did engineers ($F(1, 146) = 16.65$; $p < 0.0001$), policemen ($F(1, 166) = 4.26$; $p = 0.04$), or highway patrolmen ($F(1, 184) = 3.82$; $p = 0.05$), or by factors incriminating the driver. Note that for driver-related attributions, highway patrolmen stood out clearly from all other subjects. They attributed accidents to driver-related factors significantly more than did professional drivers ($F(1, 184) = 4.17$; $p = 0.04$), students ($F(1, 168) = 6.80$; $p = 0.01$), ordinary drivers ($F(1, 167) = 5.85$; $p = 0.01$), or engineers ($F(1, 120) = 3.95$; $p = 0.04$), and did so even more than policemen ($F(1, 140) = 3.47$; $p = 0.06$). Looking closely at the driver-related factors, it can be seen that the major ones concerned the driver's physical and psychological state (overconfidence, drug or alcohol abuse, impatience, underestimation of danger, etc.), failure to yield right of way, and loss of control.

It is also interesting to note that on the average, engineers (all of whom were civil engineers, some in charge of road safety) ascribed road accidents to the vehicle significantly more than did students ($F(1, 130) = 11.75$; $p = 0.001$), driver trainees ($F(1, 124) = 14.10$; $p < 0.0001$), highway patrolmen ($F(1, 120) = 5.49$; $p = 0.02$), policemen ($F(1, 102) = 4.86$; $p = 0.03$), and ordinary drivers ($F(1, 129) = 13.3$; $p < 0.0001$). In contrast, they less often ascribed accidents to infrastructures, differing significantly only from highway patrolmen, who accused infrastructures more than did ordinary

Table 1. Risk perception according to subjects' occupation.

Dreaded risks/ Occupation	*Un-employ-ment*	*Political-dicator-ship*	*Serious illness*	*Assault in the street*	*Robbery*	*Road accident*	*War*	*Occup. accident*	*Pollu-tion*	*Forest fires*	*Drown-ing*	*Witch-craft*
Student	3.98	3.38	4.19	3,62	3.29	4.54	3.8	2.63	3.17	2.38	2.44	2.27
Driver trainee	4.08	2.95	4.17	3.67	3.42	4.38	3.32	2.43	2.64	2.5	2.15	2.71
Professional driver	4.42	3.25	4.39	4.29	3.94	4.65	3.3	3.22	2.66	3.01	2.61	3.16
Highway patrolman	3.89	2.51	4.25	4.2	3.75	4.54	2.66	2.59	2.66	2.79	2.06	3.1
City policeman	3.77	2.94	4.08	3.82	3.58	4.35	3.19	2.73	2.42	2.56	1.94	3.26
Engineer	3.86	3.57	3.71	3.98	3.55	4.4	3.29	2.38	2.45	2.02	1.74	2.31
Ordinary driver	4.06	3.25	4.46	4.03	3.92	4.31	3.34	2.65	2.85	2.89	2.34	3.1
Overall mean	4.05	3.11	4.23	3.96	3.65	4.47	3.29	2.7	2.73	2.65	2.25	2.88

Table 2. Causal explanations of accidents according to subjects' occupation.

Causal factors/ Occupation	*Driver*	*Vehicle*	*Infrastructures*	*Weather*	*Fate*	*Pedestrian or third party*
Student	3.35	3.33	2.9	3.56	1.71	3.40
Driver trainee	3.21	3.28	2.71	3.20	1.59	3.40
Professional driver	3.33	3.38	2.92	3.76	1.92	3.62
Highway patrolman	3.54	3.48	2.75	3.3	1.73	3.84
City policeman	3.42	3.38	2.74	3.56	1.59	3.55
Engineer	3.37	3.71	2.47	3.09	1.45	3.56
Ordinary driver	3.33	3.34	2.67	3.50	1.68	3.44
Overall mean	3.36	3.39	2.77	3.46	1.70	3.54

drivers ($F(1, 167) = 5.07$; $p = 0.02$), engineers ($F(1, 120) = 3.87$; $p = 0.05$), and policemen ($F(1, 140) = 3.46$; $p = 0.06$), but less than did students ($F(1, 168) = 10.41$; $p = 0.002$).

The students, who had purposely been chosen among individuals who did not drive and thus were potential pedestrians, were precisely the ones to attribute accidents less to pedestrians or third parties than all other subjects. However, they only differed significantly in this respect from highway patrolmen ($F(1, 168) = 3.72$; $p = 0.05$) and engineers ($F(1, 130) = 3.86$; $p = 0.05$). The same was true of the driver trainees, who were pedestrians more than they were drivers: they attributed accidents to pedestrians or third parties significantly less than did highway patrolmen ($F(1, 162) = 3.12$; $p = 0.07$) and engineers ($F(1, 124) = 5.44$. $p = 0.02$). Inversely, it was the road and accident professionals (engineers, highway patrolmen, professional drivers) that tended to impute accidents to pedestrians and third parties the most. The engineers' attributions on this factor were not only significantly greater than those of students and driver trainees (see above), but they also exceeded those of policemen ($F(1, 102) = 3.94$; $p = 0.05$), and ordinary drivers ($F(1, 129) = 5.52$; $p = 0.02$). Note, however, that engineers' attributions to the pedestrian factor were not as strong as those of professional drivers ($F(1, 146) = 6.05$; $p = 0.01$) and those of highway patrolmen ($F(1, 120) = 11.02$; $p = 0.001$).

Finally, no significant attribution difference was observed between the different groups on the weather factor; note simply that the professional drivers blamed the weather the most.

As a whole, it is clear that people's occupations and their past exposure to road risks and accident prevention campaigns do indeed affect the explanations they give, and do so in a defensive way: accidents seem to be ascribed less to factors that bring personal responsibility to bear than to external factors.

4.1.5. Occupation and risk-taking

Again, an overall risk-taking index was calculated from the answers given to the risk-taking items (see Appendix 1). This involved computing the means, standard deviations, and correlations between the different items, along with the correlation between each item and the risk-taking scale. The internal consistency and reliability of this index was tested using Cronbach's alpha coefficient. The value obtained ($\alpha = 0.84$) can be considered reliable.

Relating the risk-taking index to the subjects' occupations, it can be seen that the people most likely to take risks were the ones who drove the least (driver trainees: $m = 91.59$; students: $m = 85.00$) or did not have to manage road hazards (professional drivers: $m = 87.73$), with the lowest risk-takers being the engineers ($m = 76.42$), some of whose job involved road safety. The students said they took significantly more risks than did the highway patrolmen ($F(1, 168) = 9.27$; $p = 0.003$), policemen ($F(1, 150) = 9.07$; $p = 0.003$), and ordinary drivers ($F(1, 177) = 10.56$; $p = 0.001$), but they were less risky than professional drivers ($F(1, 194) = 7.3$; $p = 0.008$). Similarly, the driver trainees were significantly riskier than the students ($F(1, 172) = 8.42$; $p = 0.004$) and engineers ($F(1, 124) = 4.34$; $p = 0.03$). The engineers claimed to be significantly less daring than the highway patrolmen ($F(1, 120) = 4.86$; $p = 0.02$), policemen ($F(1, 102) = 5.07$; $p = 0.02$), ordinary drivers ($F(1, 129) = 5.70$; $p = 0.01$), professional drivers ($F(1, 146) = 3.76$; $p = 0.05$), and driver trainees (see above).

4.1.6. Occupation and fatalistic beliefs

As above for risk-taking, an overall fatalism index was calculated from the answers to the fate-related items. The overall value of this index turned out to be quite reliable ($\alpha = 0.78$) (see Kouabenan, 1998a). The index was then related to the subjects' occupations. The least fatalistic subjects were the engineers, who clearly stood out from the others, whether they were professional drivers ($F(1, 146) = 21.14$; $p < 0.0001$), ordinary drivers ($F(1, 129) = 12.7$; $p = 0.001$), driver trainees ($F(1, 124) = 11.29$; $p = 0.001$), students ($F(1, 1.130) = 8.6$; $p = 0.0004$), highway patrolmen ($F(1, 120) = 7.97$; $p = 0.006$), or policemen ($F(1, 102) = 8.50$; $p = 0.004$). The most fatalistic individuals were the professional drivers, who differed significantly from all other subjects except ordinary drivers: i.e., students ($F(1, 194) = 8.51$; $p = 0.004$), driver trainees ($F(1, 188) = 3.82$; $p = 0.05$), policemen ($F(1, 166) = 3.25$; $p = 0.07$), highway patrolmen ($F(1, 1\,184) = 5.68$; $p = 0.01$), and engineers (see above).

4.2. DRIVING EXPERIENCE AND RISK AND ACCIDENT PERCEPTION

For analysis purposes, seven levels of driving experience were defined. Level 0 was used for subjects who did not have a driver's license ($N = 194$). Then, in ascending order, were individuals who had been driving for 0 to 2 years ($N = 64$), 3 to 5 years ($N = 40$), 6 to 10 years ($N = 106$), 11 to 15 years ($N = 67$), 16 to 20 years ($N = 47$), and more than 20 years ($N = 35$).

4.2.1. Naive definitions of an accident according to amount of driving experience

With the subjects classified in this way, the accident definitions were found to differ across driving experience levels ($\chi^2 = 127.60$; df = 102; $p < 0.05$). The subjects who gave fatalistic definitions were mainly the highly experienced ones (more than 20 years: 25.7%); they were followed by individuals with 6 to 10 years of experience (17.0%) and then by the newest drivers who trailed quite far behind (0–2 years: 14.1%). Definitions characterizing accidents were proposed most often by the new drivers (12.5%).

4.2.2. Driving experience and ranking of accidents among the causes of death

There was no significant difference between experienced subjects and ones with little or no experience, in how road accidents were ranked among the causes of death. The

order was the same for everyone, with road accidents in first place, followed by malaria, then AIDS, and so on down to the lowest-ranking cause, occupational accidents. The biggest disagreement was on the rank of the latter type of accident among the causes of death. Persons with a great deal of driving experience (16–20 years) disagreed with all other subjects on this point, whether they had no driver's license ($F(1, 239) = 7.22$; $p = 0.008$) or had been driving for 0–2 years ($F(1, 109) = 11.60$; $p = 0.001$), 3–5 years ($F(1, 85) = 6.07$; $p = 0.01$), 6–10 years ($F(1, 151) = 7.88$; $p = 0.006$), or 11–15 years ($F(1, 112) = 7.66$; $p = 0.007$).

4.2.3. Most-dreaded risks according to amount of driving experience

As above, the danger dreaded the most by all subjects, no matter how much driving experience they had, was road accidents. However, the most-dreaded risks were not the same for individuals with different levels of experience (see Table 3). Road accidents were found to be highly feared by experienced drivers (16–20 years) and also by novices (0–2 years and unlicensed) to a greater extent than they were by moderately experienced subjects. Among these, individuals with 16–20 years of experience appear to fear road accidents more than individuals who are unlicensed ($F(1, 239) = 6.20$; $p = 0.01$) or have been driving for 3–5 years ($F(1, 85) = 4.36$; $p = 0.04$), 6–10 years ($F(1, 151) = 7.21$; $p = 0.008$), or 11–15 years ($F(1, 112) = 10.18$; $p = 0.002$), and even more so than persons driving for more than 20 years ($F(1, 80) = 11.81$; $p = 0.001$), who are probably less active. Highly experienced drivers seem to fear accidents less than beginners ($F(1, 97) = 10.62$; $p = 0.002$) and unlicensed people ($F(1, 227) = 4.52$; $p = 0.03$). Furthermore, beginners (0–2 years) were found to dread accidents more than the unlicensed ($F(1, 256) = 4.14$; $p = 0.04$) and more than the moderately experienced subjects (3–5 years: $F(1, 102) = 2.80$; $p = 0.09$; 6–10 years: $F(1, 168) = 5.37$; $p = 0.02$; 11–15 years: ($F(1, 129) = 8.64$; $p = 0.004$). Nearly the same tendencies were found for the risk of being attacked in the street ($F(6, 546) = 3.86$; $p = 0.0009$), the risk of unemployment $F(6, 546) = 1.14$; ns), and the risk of being cursed ($F(6, 546) = 4.07$; $p = 0.0005$), which were found to be highly feared by the most experienced as well as the least experienced drivers. Occupational accidents appear to be dreaded more by experienced drivers than by other subjects. The most significant differences on this point opposed the people without a driver's license to the other groups (6–10 years versus unlicensed: $F(1, 298) = 12.53$; $p < 0.0001$; 16–20 years versus unlicensed: $F(1, 239) = 8.07$; $p = 0.005$; more than 20 years versus unlicensed: $F(1, 227) = 3.82$; $p = 0.05$). In contrast, the newest drivers were found to be more afraid, compared to more experienced individuals, of serious illness ($F(6, 546) = 4.30$; $p < 0.0003$), of being robbed ($F(6, 546) = 3.16$; $p < 0.004$), and of pollution ($F(6, 546) = 2.04$; $p < 0.05$). All in all, people with an intermediate amount of experience (between 6 and 15 years of driving) appear to have a very middle-of-the road attitude about these risks. These tendencies were not found for the age variable, which appears to give rise to fewer significant differences than driving experience.

4.2.4 Causal explanations of accidents according to driving experience (Table 4)

With only a few exceptions, experienced but still active subjects (16–20 years of driving) ascribed fewer accidents to driver-related factors than did all other subjects (0–2 years: $F(1, 109) = 3.24$; $p = 0.07$; 6–10 years: $F(1, 151) = 3.38$; $p = 0.06$; 11–15 years: $F(1, 112) = 5.47$; $p = 0.02$; more than 20 years: $F(1, 80) = 5.85$; $p = 0.01$). In addition, subjects

Table 3. Risk perception according to driving experience.

Dreaded risks/ Driving experience	*Un-employ-ment*	*Political-dicator-ship*	*Serious illness*	*Assault in the street*	*Robbery*	*Road accident*	*War*	*Occup. accident*	*Pollu-tion*	*Forest fires*	*Drown-ing*	*Witch-craft*
No driver's licence	3.97	3.08	4.19	3.64	3.36	4.48	3.48	2.47	2.92	2.45	2.25	2.54
0–2 years	4.31	3.36	4.67	4.23	3.95	4.64	3.58	2.84	3.02	3.08	2.70	3.39
3–5 years	4.13	3.35	4.45	4.13	3.98	3.38	3.33	2.68	2.70	2.80	2.42	3.13
6–10 years	3.89	2.80	4.31	3.99	3.74	4.43	3.01	2.86	2.58	2.75	2.06	3.08
11–15 years	4.00	3.39	4.07	4.15	3.70	4.39	3.24	2.60	2.48	2.48	2.12	2.55
16–20 years	4.34	3.09	3.66	4.17	3.83	4.70	2.94	2.98	2.40	2.72	2.06	3.19
More than 20 years	4.03	2.91	4.17	4.23	3.83	4.17	3.03	3.11	2.51	2.80	2.29	3.09
Overall mean	4.05	3.11	4.23	3.96	3.65	4.47	3.29	2.7	2.73	2.65	2.25	2.88

Table 4. Causal attributes of accidents according to driving experience.

Causal factors/ Occupation	*Driver*	*Vehicle*	*Infrastructures*	*Weather*	*Fate*	*Pedestrian or third party*
No driver's license	3.29	3.34	2.77	3.37	1.64	3.42
0–2 years	3.38	3.50	2.72	3.56	1.9	3.56
3–5 years	3.27	3.47	2.81	3.55	1.65	3.42
6–10 years	3.46	3.58	2.86	3.57	1.56	3.63
11–15 years	3.40	3.29	2.69	3.44	1.61	3.62
16–20 years	3.33	3.36	2.60	3.25	1.65	3.74
More than 20 years	3.45	3.05	2.86	3.36	2.31	3.65
Overall mean	3.36	3.39	2.77	3.46	1.70	3.54

who had more than 20 years of experience were more fatalistic in their attributions than most other subjects. They differed significantly from drivers who were beginners ($F(1, 97) = 5.59$; $p = 0.02$) or unlicensed ($F(1, 227) = 13.33$; $p < 0.0001$), and from ones who had been driving for 3–5 years ($F(1, 73) = 6.53$; $p = 0.01$), 6–10 years ($F(1, 139) = 19.44$; $p < 0.0001$), 11–15 years ($F(1, 100) = 14.22$; $p < 0.0001$), and 16–20 years ($F(1, 80) = 7.34$; $p < 0.0001$). Persons with extensive driving experience were also among those who put more blame on pedestrians or third parties, although not significantly so. Apparently, experienced subjects feel that drivers have little control over road risks.

4.2.5 *Driving experience and risk-taking*

When confronted with situations involving traffic conflicts, subjects with no driving experience appeared as a whole to make more risky choices, although the only marginally significant difference opposed these subjects to beginners ($F(1, 256) = 2.60$; $p = 0.10$).

4.2.6 *Driving experience and fatalistic beliefs*

The most fatalistic subjects were the beginners ($m = 21.53$), but the very experienced subjects had fatalistic beliefs too ($m = 21.4$). However, the only differences that approached significance were between beginners and drivers with a moderate amount of experience (6–10 years: $F(1, 168) = 2.93$; $p = 0.08$; 11–15 years: $F(1, 129) = 4.19$; $p = 0.04$), and between beginners and individuals without a license ($F(1, 256) = 3.38$; $p = 0.06$). This supports the externality tendency observed above in the accident explanations given by subjects in these two categories. There was no age-related effect on fatalistic beliefs.

Note that the high correlation between age and experience ($r = 0.73$, $p < 0.001$) suggests that the experience effect might be confounded with the age effect. An analysis of covariance (ANCOVA) showed that the overall experience effect persisted even after the age effect was factored out. There was no main effect of age on the perceived causes of death or danger, or on the causal explanations of accidents. When experience was held constant, the only age effects observed were on the perceived danger of road accidents ($F(1, 545) = 4.11$, $p = 0.01$) and on risk-taking ($F(1, 519) = 3.70$, $p = 0.05$).

4.3 ACCIDENT HISTORY AND RISK AND ACCIDENT PERCEPTION

In order to analyse the effect of 'victimization' on attitudes towards risks and accidents, the perceptions of subjects who had never been in an accident ($N = 330$) were compared with those of subjects who had ($N = 200$).

4.3.1. Naive definitions and ranking of accidents among the causes of death

The number of prior accidents did not have a notable effect on the subjects' naive definitions of an accident. Nor did this factor have a major impact on how subjects ranked road accidents among the causes of death. However, compared to individuals who had never been in an accident, accident victims did give significantly higher scores to accidents at work (2.46 versus 2.31; $F(1, 528) = 8.37$; $p = 0.004$) and to heart attacks (2.61 versus 2.39; $F(1, 528) = 4.21$; $p = 0.04$).7

4.3.2 Most-dreaded risks according to accident history

Regarding the most-dreaded risks, it can be seen that subjects who had been involved in one or more accidents were more afraid than ones who had not. As a whole, prior accident victims, more than nonvictims, said they dreaded practically every one of the potential dangers or risks listed. The most significant differences were found on road accidents (4.60 versus 4.40; $F(1, 528) = 6.15$; $p < 0.01$), work accidents (2.88 versus 2.58; $F(1, 528) = 5.83$; $p < 0.01$), and risks as varied as assault (4.11 versus 3.85; $F(1, 528) = 5.69$; $p < 0.01$), robbery (3.86 versus 3.53; $F(1, 528) = 8.50$; $p < 0.004$), political dictatorship (3.30 versus 3.02; $F(1, 528) = 3.98$; $p < 0.04$), unemployment (4.17 versus 3.95; $F(1, 528) = 3.29$; $p < 0.07$), and forest fires (2.80 versus 2.57; $F(1, 528) = 2.98$; $p < 0.08$). Thus, it appears as though accident victims are afraid of future aggression.

4.3.3. Causal explanations of accidents and accident history

Accident explanations were not affected by whether or not the person had been the victim of an accident in the past.

4.3.4. Accident history and risk-taking

Subjects who had never been in an accident tended to feel they would take more risks than persons who had ($F(1, 504) = 4.75$; $p < 0.03$). Prior accident victims are apparently more careful ($m = 82.42$ versus 85.96 on the risk-taking index). This tendency was particularly strong on the speeding and cautious-driving items.

4.3.5. Accident history and fatalistic beliefs

There was no link between the number of prior accidents and fatalistic beliefs.

5 Discussion

5.1. OVERESTIMATION OF THE PERCEIVED THREAT OF ROAD ACCIDENTS

As a whole, it can be said that regardless of occupation or exposure to road accidents, subjects tend to overestimate the importance of accidents as a cause of death and as a threat. On the average, road accidents were mentioned as the leading cause of death and as the most-dreaded risk. However, subjects' perceptions of road accidents varied

across occupations. More specifically, highway patrolmen were at the top of the list among individuals who fear road accidents and overestimate their role in causing death; they were followed by professional drivers and students. Such a great fear of road accidents on the part of highway patrolmen may be due to the fact that they work on the highways and expressways, where accidents often lead to death and, in any case, are usually more serious than accidents occurring in urban areas. The seriousness of these accidents may cause these individuals to sense road accidents as something horrible, and may reinforce their view of accidents as a terrible risk. The professional drivers' perceptions can be accounted for by the fact that for these individuals, road accidents not only represent a bodily danger, but also threaten their work and that, because they are on the roads daily, they are more exposed to this risk. Note also that professional drivers were found to fear occupational accidents more than all other subjects. Finally, the fact that students turned out to be very afraid of road accidents undoubtedly can be explained not only by their status as potential pedestrians (presumably making them more vulnerable), but also by their total lack of a sense of control over accidents, since they had never driven themselves. This looks like a defensive kind of fear aimed at avoiding harm (see Shaw and McMartin, 1977).

5.2. DEFENSIVE EXPLANATIONS OF ACCIDENTS AND RISK-TAKING ACCORDING TO OCCUPATION

If the subjects' explanations are analysed in relation to their exposure to automobile driving and road accidents, it can be seen that their explanations were by and large defensive. Professional drivers, for example, attributed little to the driver's responsibility or lack of skill, tending instead to account for accidents in terms of factors beyond the driver's control, such as poor roads, inclement weather, pedestrians, and fate. On the other hand, compared to all other subjects, highway patrolmen in charge of managing road traffic made the strongest attributions holding the driver accountable, as if they were attempting to justify their contribution to enforcing the law and preventing traffic violations. They also ascribed more accidents to infrastructures than did engineers, thereby tending less to ascribe accidents to driver-related factors and to make persons in charge of the roads share the blame. As for the engineers, whose job involves roads and road-safety management, they seem to defend themselves by accusing the road system less. They ascribed more accidents to vehicle-related factors, and to a lesser extent, to the driver. The students and the people taking driver's training, who themselves were pedestrians more than they were drivers (none of the students had ever driven), were the ones to blame the pedestrians the least. In sharp contrast were the road and accident professionals – namely, the engineers, professional drivers, and highway patrolmen – who ascribed accidents to pedestrians the most.

In summary, these results support the defensive attribution hypothesis (Walster, 1966; Shaver, 1970; Kouabenan, 1985a, 1985b), which stipulates that to maintain self-esteem, people's explanations of accidents will be based mainly on external factors. By making fewer or weaker causal attributions to factors for which they could be held accountable, and more or stronger attributions to factors beyond their control or for which others are responsible, it seems that the subjects in this study were striving to protect themselves against all possible blame or to present themselves positively to the members of their group. Perceptions of accident causality thus appear to be biased by

the respective positions and roles played by the actors. Indeed, by attributing accidents mainly to driver-related factors rather than to other variables like infrastructures, the weather conditions, or a third party, people whose work involves traffic (engineers, highway patrolmen, policemen) seem not only to place responsibility on the driver, but also to justify and protect their own position (see Abdellaoui *et al.*, 1998). A defensive interpretation can also be proposed for professional drivers and students, who appear to accentuate the power of others by ascribing less causality to self-related factors in order to avoid being held accountable for accidents and defend their self-esteem (Kouabenan, 1991).

Finally, note that subjects who can be regarded as novices when it comes to road risks (driver trainees, students without a driver's license), but also professional drivers, appear to be higher risk-takers than traffic and accident professionals (engineers, highway patrolmen, policemen). This greater risk-taking behavior can be ascribed to ignorance for the former (the novices), and to beliefs and feelings of a lack of control for the latter (the professional drivers). Again, professional drivers not only appear to make external explanations, but also seem to be the most fatalistic.

5.3. MORE EXTERNAL ATTRIBUTIONS BY EXPERIENCED DRIVERS AND GREATER RISK-TAKING BY NOVICES

Looking at the impact of driving experience on subjects' perceptions, it can be seen that there was no notable difference in how road accidents were ranked as a cause of death. In contrast, experienced subjects (more than 16 years of driving) gave more fatalistic definitions than did beginners (0–2 years), who defined accidents in a more descriptive way. Similarly, experienced subjects attributed accidents more to fate and to other persons than did moderately experienced drivers (3–15 years). Fatalistic beliefs were also expressed by beginners, however, making for greater fear of road accidents not only in experienced, active drivers (16–20 years) but also in newer ones (0–2 years).

The fact that the experienced drivers were fatalistic and explained accidents in terms of external factors may correspond to a defensive tendency to avoid blame and protect self-esteem. The gist of their causal explanations was that accidents are beyond the driver's control. By contrast, the fact that the beginners had fatalistic beliefs and gave less internal causal attributions can be accounted for by their ignorance of road hazards and of the actions that might be taken to avoid them, in short, by their weak sense of control brought about a lack of knowledge.

In addition, it seems that both total novices (unlicensed) and highly experienced drivers tend to take more risks than subjects with a moderately long driving history. One explanation for the greater risk-taking observed in novices may lie in their lack of knowledge of traffic, or in their probable underestimation of risks and overestimation of their own ability to cope with them (Svenson, 1981; Brown and Groeger, 1988; Rumar, 1988; Kouabenan, 1998a, 1999). On the other hand, the finding that experienced drivers are so daring may stem from both the predominance of professional drivers in this group – who are known to be very fatalistic (Kouabenan, 1998a) – and to the likely presence of a bias towards optimism or an illusion of control via which experienced drivers convince themselves that they are sufficiently more skillful at avoiding accidents than the average driver (see Weinstein, 1980, 1987; McKenna, 1993). Moderately experienced subjects seem to be more realistic than ones in the outer

positions. It would be interesting to compare the actual accident rates of subjects with different amounts of driving experience. Unfortunately, the present data does not allow for such an analysis.

5.4. ACCIDENT HISTORY DOES NOT AFFECT CAUSAL EXPLANATIONS BUT SEEMS TO ELICIT GREATER CAUTION

Let us note finally that, contrary to predictions, prior accidents do not seem to have an impact on drivers' perceptions of risks and their causal explanations of accidents. However, there appears to be a slight tendency for subjects who have been victims of accidents to experience greater fear – compared to individuals with no accident history – of having another casualty, whether caused by a road accident or some other life risk. Furthermore, past accident victims appear to be less inclined to take risks than subjects who have never had an accident. Should this be regarded as a subtle 'victimization' effect on perceived self-vulnerability? It can indeed be reasonably assumed that a prior accident makes a subject more alert and more cautious (Parker *et al.*, 1980; Winkel and Denkers, 1995; Kouabenan, 1999). However, it is not possible to be sure whether an accident history, while arousing its victim's curiosity about risks, will actually increase his or her knowledgeableness. In fact, Evans and Wasielewski (1982) obtained the opposite result, namely, 'accident-involved drivers and drivers cited for violations exhibit higher levels of risk in everyday driving than accident-free and citations-free drivers' (p. 57). This result is in line with Lindell and Perry (1990) who observed that 'experience with a major accident can actually decrease rather than increase perceptions of threat' (p. 393). Gangloff and Ozil (1992) found no effect of accident history on risk perception, but rather an effect of qualifications, which appear to imply better knowledge of risks and hazards. The effect of having had an accident on risk perception and on causal explanations of accidents, while highly plausible, should therefore be studied in greater depth in future experiments.

6. Conclusion

In conclusion, it seems that expertise – viewed as information and know-how gained through instruction, life experiences, or work – is very useful in enhancing knowledge of risks and accidents. The present findings suggest not only that experts and novices differ in their perception and analysis of risks and accidents, but also that this divergence, far from being an obstacle, can help improve risk and accident prevention and management. These two 'points of view' can shed light on each other, and neither truly escapes bias, whether of a cognitive or motivational origin (Slovic *et al.*, 1981). It is found here that subjects explain accidents in a self-defensive way that depends on their occupation, i.e., they tend in their explanations to present themselves positively and decline causal responsibility for accidents, passing the blame onto others or pointing to factors beyond their control. Knowledge of the perceptions of subjects with a variety of occupations and a wide range of experiences may therefore turn out to be valuable for both diagnosis and prevention in the area of traffic accidents. Indeed, it can be foreseen that in addition to adversely affecting their authors' behaviour with respect to safety, such perceptions and causal inferences may also condition adherence to accident prevention programmes (Kelley and Michela, 1980; Kouabenan, 1998b, 1999; 2000).

The participation of everyday individuals in diagnosing the risks to which they are directly subjected in their environment may be an additional source of motivation to increase the will to adhere to safety measures, now better understood (Kouabenan, 1998a, 1998b, 1999). The diagnosis of safety problems and the establishment of effective preventive measures, so long left solely up to safety specialists, could be fruitfully enriched by knowledge of the perceptions and naive explanations of ordinary people, who may not be specialists, but come into contact with risks on a daily basis.

Notes

1. Three items were deleted because they were weakly correlated with the total risk-taking index.
2. Two items were deleted because they were weakly correlated with the total fatalistic beliefs index.
3. This question, which was the first in the questionnaire, was worded as follows: 'In your opinion, what is an accident?'
4. For the reader's information, the road safety bureau of the Ivory Coast recorded 672 deaths from traffic accidents in 1989 (Keïta, 1991).
5. Note that witchcraft is not in fact listed in this country as an official cause of death, but some popular beliefs ascribe it such a power.
6. Framing effects were a possibility here, since most of the questions had to do with traffic accidents. Note, however, that road accidents were mentioned in fifth place in the present question, after tuberculosis, cholera and diarrhoea, malaria, and malnutrition. Note also that in reality, road accidents fall far behind most of the causes of death presented for comparison. It is difficult to obtain recent, reliable health statistics that take into account the various causes compared here. In addition to the many taboos generally associated with the causes of death in Africa, the few statistics that do exist are often partial and imprecise. There is one rather old (1974) survey on the main causes of death in the 21 countries in the Africa region, published by the regional WHO bureau for Africa located in Brazzaville – road accidents was not listed among the top ten causes of death. The first three causes in the Ivory Coast, in decreasing order of prevalence, were measles, malaria, and colitis and diarrhoea.
7. Remember that the participants were asked to estimate the relative prevalence of 11 possible causes of death in the Ivory Coast. The causes included not only road accidents, but also occupational accidents and cardiovascular disease.

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