CRIME AND RISKY BEHAVIOR IN TRAFFIC: AN EXAMPLE OF CROSS-SITUATIONAL CONSISTENCY

MARIANNE JUNGER ROBERT WEST REINIER TIMMAN

This study looks at the relationship between risky behavior in traffic and criminal behavior. Analyses were based on a random sample of 1531 persons involved in traffic accidents. The data came from two independent police databases: the accident registration system and a national database on offending. Descriptions of the accidents by the police were used to identify individuals who had displayed risky traffic behavior contributing to or causing an accident; evidence of offending was based on a register of contacts with police. This methodology meant that there was no self-selection bias or self-report bias as may occur in survey data. Exposure to traffic accident risk was controlled for. Log-linear analyses, controlling for gender and age, revealed that persons who displayed risky traffic behavior leading to the accident had an odds ratio of 2.6 for having a police record for violent crime; of 2.5 for vandalism, 1.5 for property crime, and 5.3 for having been involved in traffic crime. The results were consistent with the idea of a common factor underlying risky behavior in traffic and criminal behavior. This underlying trait may represent a general disregard for the long term adverse consequences of one's actions and could be labeled risk-taking, impulsiveness, or lack of self-control.

An important issue in the social sciences concerns the extent to which behavior in specific situations can be understood in terms of more general traits or behavioral tendencies. This study examined the issue of cross-situational

The authors gratefully acknowledge M. Diepeveen for the carefully gathering of the data, D. Nagin for reviewing our article and his useful comments, P. Versteegh and A. Visser of the The Hague police department, P. Lourens of the University of Groningen, G.J.J. Vermeulen of the Department of Transport (Ministerie van Verkeer en Waterstaat), and the employees of the Advisory Services Traffic and Transport (Adviesdienst Verkeer en Vervoer) for their friendly cooperation. An important part of the work for this publication was done while the first author was working at the Netherlands Institute for the Study of Crime and Law Enforcement, Leiden, the Netherlands. Correspondence concerning this article should be addressed to Marianne Junger, Department of Developmental Psychology, Faculty of Social Sciences, Utrecht University, Utrecht, P.O. Box 80.140, 3508 TC Utrecht, the Netherlands.

JOURNAL OF RESEARCH IN CRIME AND DELINQUENCY, Vol. 38 No. 4, November 2001 439-459 © 2001 Sage Publications

consistency, specifically with regard to the relationship between criminal behavior and risky behavior in the traffic environment. We hypothesized that both criminal behavior and risky behavior in traffic reflect a general tendency for risk taking, by which we mean not taking appropriate account of the possibility of negative consequences of one's actions. To test this hypothesis, information was used from a random sample of 1,000 accidents registered by the traffic police. Most accidents involve more than one participant. We compared the criminal records of those participants identified from the police report as contributing to the accident by risky driving with those who could be considered passive victims. The study design was unique in avoiding selection bias in the data or in the measures used. The design also controlled for risk of accident purely because of amount of exposure to traffic. Different types of crime were examined, and driving under the influence of alcohol (DUI) was controlled for as a possible intervening variable.

The cross-situational consistency of behavior is a theme that has been discussed not only in criminology but also in related fields such as social psychology, personality research, and traffic research (for reviews, see Bem and Allen 1974; Bem and Funder 1978; Burton 1963; Chaplin and Goldberg 1985; Conley 1984; Epstein and O'Brien 1985; Krahé 1990; Mischel and Peake 1982; Peake and Mischel 1984; Pervin 1989, 1994). In the field of criminology, the debate on the cross-situational consistency of behavior has been formulated mostly as a problem of specialization versus generality of types of crime committed (Gottfredson and Hirschi 1990).

Gottfredson and Hirschi (1990) have argued, within the framework of their self-control theory, that human behavior is consistent across various situations. They propose that individuals with low self-control have a high probability of succumbing to the temptations of short-term pleasures with little regard for the long-term negative consequences. As a result, they are likely to be involved in many forms of risky behavior and suffer from the negative consequences of these behaviors, such as divorce, employment instability, illnesses, and accidents.

Several studies have reported a fair degree of generality in risky behavior consistent with self-control theory (Arneklev et al. 1993; Brownfield and Sorenson 1993; Forde and Kennedy 1997; Gibbs and Giever 1995; Gibbs, Giever, and Martin 1998; Grasmick et al. 1993; Keane and Arnold 1996; Longshore, Turner, and Stein 1996; Nagin and Paternoster 1994; Paternoster and Brame 1998; Paternoster and Simpson 1996; Piquero and Tibbetts 1996; Polakowski 1994; Pratt and Cullen 2000; Sorenson and Brownfield 1995; Tittle 1995; Wood, Pfefferbaum, and Arneklev 1993), including one that investigated driving behavior (Keane, Maxim, and Teevan 1993).

Accident involvement is a potentially useful index of risky traffic behavior, and several studies have reported a relationship between accident

involvement and antisocial behavior. Research in the United States, the Netherlands, Sweden, and Canada has indicated a relatively strong relation between accidents and crime (Farrington and Junger 1995; Glueck and Glueck 1950; Hansen 1988; Junger and Wiegersma 1995; Lawton et al. 1997; Robins 1966; Sivak 1983; Tillman and Hobbs 1949; West 1997; West, Elander, and French 1993; West and Farrington 1977; West et al. 1997; Yeager and Otnow-Lewis 1990). For example, Junger, Terlouw, and van der Heijden (1995) found that among nondelinquent children, only 28 percent reported accident involvement, whereas among the most delinquent children, this figure was 72 percent. The relation was monotonic: The higher the involvement in delinquent behavior, the higher the likelihood of having been involved in an accident. The relation also held after controlling for age, gender, and different types of criminal behavior (violence, vandalism, and property crime).

The problem with these studies is that most of them could not control for alcohol use and for exposure to accident risk (although some controlled for exposure: Soderstrom, Birschbach, and Dischinger 1990; Soderstrom, Dischinger, Ho, and Soderstrom 1993; West 1997; and West, Train, Junger West, and Pickering 1998). It is possible that both of these factors (alone or in combination) might be sufficient to explain the covariation between crime and accidents (Deery and Love 1996; Huizinga and Jacob-Chien 1998; Moskowitz and Burns 1990; Oei and Kerschbaumer 1990; Ross 1992; Soderstrom et al. 1993; Stroebe and Stroebe 1995; Wick 1992).

Furthermore, the relationship between accidents and crime could also be the result of the differential exposure of criminals to traffic. Thus, the relatively high exposure of criminals to traffic (Agnew and Petersen 1989; Hirschi 1969; Junger and Wiegersma 1995; Paternoster and Brame 1998; West and Farrington 1977) may be sufficient to explain the relationship between crime and accidents.

There were several advantages to the present methodology over previous studies. It controlled for exposure to accident risk by comparing individuals who were both involved in the accident, one as perpetrator and the other as victim.

Second, our study did not rely on self-reports from individuals involved. It therefore avoided bias arising from nonresponse (criminals are harder to reach for an interview; see Junger-Tas and Haen-Marshall 1999). It also avoided a self-presentation bias (Moskowitz 1982; Pervin 1994). Third, the present study was based on two completely separate sources of information so there was no possibility for contamination of the measure of risky behavior with the crime measures.

METHOD

Study Design

A random sample was drawn of 1,000 out of nearly 10,000 accidents in The Hague, the Netherlands, registered in 1994 in the police accident registration system. A search was then made on individuals identified from the accident reports in the separate police National Database on Offenders (NDO). This database records all individuals charged with a criminal offence, whether or not they were subsequently convicted.

A total of 1,843 traffic users¹ were involved in the 1,000 accidents (passengers were not included). Fifty-one persons involved in an accident could not be identified from the accident forms and therefore could not be traced in the NDO. Twenty persons were older than 79 years of age, and 13 were younger than 12 years, and because the NDO only covers people between the ages of 12 and 79, these were excluded. A further 93 hit-and-run drivers could not be identified, and 2 accidents were judged to be caused by dogs. In addition, 4 persons found in the accident registration system could not be traced from the original accident forms (this was necessary for the coding of risky behavior). Overall, this left a total of 1,660 persons for analyses. For 40 of them, their age was unknown; for another 3, gender was unknown; and for 86, both age and gender were unknown. As a result, information on 903 accidents involving 1,181 men and 350 women was used: a total of 1,531 persons.

Measures

Risky behavior in traffic. Risky traffic behavior was defined as behavior immediately preceding the accident and that probably contributed to the accident. It was assessed from the standard forms that police officers complete when they are at the scene of an accident. It includes speeding, right-of-way violations, ignoring traffic signals, DUI, illegal passing, tailgating, cutting in, and driving the wrong way down a one-way street. Information such as not being insured or not wearing a seatbelt was not considered as risky traffic behavior because the risk taken was not a potential cause of the accident.

The risky behaviors were not, in most cases, criminal violations. Thus, driving too fast for the conditions or too close to the vehicle in front were common causes of accidents but not in themselves illegal acts.

An exception to this rule, obviously, was DUI. However, the fact that a police officer mentions alcohol use in the accident registration form means that he suspects alcohol use, but this does not indicate whether the traffic user had a blood alcohol concentration greater than the legal limit of 0.5 percent in the Netherlands.²

In fact, none of the accidents in the data set led to criminal prosecution, even for DUI. Nevertheless, we constructed two scales of risky behavior, one with and one without DUI to be certain that the findings would not be caused merely by DUI, and repeated the analyses for both scales.

Our measure of risky behavior was different from the attribution of legal responsibility. It has been customary for police officers filling in accident registration forms to fill in as the first party involved the name of the, in their view, most responsible person and, as the second party involved, the less responsible traffic user. This leads to an automatic division, at least in cases of accidents with two parties involved, of 50 percent "guilty" and 50 percent nonguilty parties. The logic in this reporting system is the legal system and relates to possible civil law claims and insurance repayments. It does not necessarily relate to the goal of the present study, which was recording risk taking and not legal responsibility. We thought that it was plausible that, in some cases, accidents might be the result of two parties taking risks, whereas many accidents may occur in which none of the parties involved took a risk but might be the result of, for example, lack of experience of one of the parties involved. The present study required a system that would allow for this possibility and that would not be determined by a legal system that generally requires a guilty party.

Discussion with the staff involved in the maintenance of the accident registration system suggests that police officers filling in the accident forms probably tend to underreport risky behavior. In part, this is due to the difficulty of knowing what happened. For example, because the police usually arrive at the scene of the accident after it happened, it is hard to know if one of the parties involved drove too fast. It is known that there is some underreporting of alcohol use (Mathijssen 1997). Hence, the risky behavior measure in all probability underestimates the true amount of risky behavior in traffic.

Two researchers each coded half of the accidents. For a reliability check, both coded 100 accidents, and in these cases there was 100 percent agreement on whether there was evidence of risk taking.

Crime. To measure crime, the NDO was used. A first distinction was made between traffic crime and all other crime. The following measures on criminal behavior were composed. Traffic crime consists of criminal offenses falling under traffic law (excluding joyriding; see below) and includes DUI, hit-and-run accidents, driving after having received a disqualification to drive, refusing a blood test, or failing to stop for a signal of a police officer, causing an accident resulting in serious injury or death, and other traffic crime. This last category consists of various types of traffic crime such as vehicle defects or forgery of driving documents. Traffic violations are not

registered in this system. As a result, the measure of traffic crime does not overlap with the measure of risky behavior, with the exception of DUI. This problem was dealt with by repeating the findings based on the entire sample and on a sample that excludes DUI drivers.

Crimes defined under the criminal law were subdivided into (1) *violent crime*, all crimes involving aggression toward other persons (assault, aggravated assault, murder, attempted murder, verbal violence, robberies) and sexual crime (e.g., rape and incest); (2) *vandalism*, the destruction of property and arson; (3) *property crime*, including fraud, trade in stolen goods and all nonviolent forms of theft, burglary, and joyriding;³ (4) *other crime*, mainly involved with dealing in drugs, the illegal possession of firearms, and a very heterogeneous set of other offenses. All crime measures were dichotomies (0 = no police contacts, 1 = police contacts). These offenses fall under the Dutch criminal law, and, for ease of presentation, we refer to them as "criminal law offenses." It excludes DUI and status offenses (such as curfew offenses and running away from home; status offenses are not defined as a crime in the Netherlands).

The NDO registers keep offenses in the database for a limited number of years, depending on their seriousness. For example, DUI is kept for 5 years whereas murder is kept for 30 years (I.T. Organisatie 1995). In addition, if an offender stays criminally active, his or her entire record will be kept in the NDO. As a result, the record of individuals in the NDO is a crude measure of criminal activity according to the time since the latest police contact, the seriousness, and the frequency of the offender's criminal activity. For this reason, all crime measures had two versions: an "ever" measure and a measure of crime during the past 5 years.

It should be noted that the accident registration system and the NDO are two completely independent systems that are operated by different departments within the police force. It is almost impossible for information coming from one system to be influenced by information found in the other. Both systems are incompatible, and it took the researchers considerable effort to trace persons recorded in one system (in this case, the accident registration system) and verify whether they were known in the other system (in this case, the NDO). We believe, therefore, that we have two completely independent measures of the tendency to take risks in traffic and the tendency to commit crime.

Control variables. It was anticipated that both sex and age would be related to the occurrence of risky traffic behavior and to crime. For this reason, all the analyses controlled for sex and age. Information on gender, age, and nationality was available from the accident registration system. Age was coded into four categories. The categories were chosen along the quartiles of the age distribution. Information on nationality may be unreliable, as this

seemed to be of less importance to police officers in completing the accident registration form.

Overlap between crime and accidents. It is possible that a particular crime and an accident are both part of the same chain of events. For example, it sometimes happens that a robber leaves the scene of the robbery by car and has an accident or that a youngster steals a car and causes an accident (Tremblay et al. 1995). Such combinations of a crime and an accident in a single chain of events did not occur in this sample.

Analyses. Because we were interested in the relationship between criminal behavior and risky traffic behavior with neither of these representing an outcome measure, log-linear analyses were preferred over logistic regression (while recognizing that the underlying mathematical theory is the same in both cases). In the first step, conditional independence models were estimated in which risky behavior was considered to be independent of criminal activity, controlling for age and gender. Subsequently adding the interaction between risky behavior and criminal activity and higher order models, a best model was selected on the basis of improvements of model fit, assessed with the likelihood ratio chi-square statistic. For the selected log-linear model, odds ratios were derived from the parameter estimates (Agresti 1990; see also the appendix). These are appropriate for skewed frequency of data of this kind (Junger, Terlouw, and van der Heijden 1995).

The analyses were undertaken first of all using the entire sample and then repeated for the Dutch in the sample to control for a possible confounding effect of nationality on driving behavior, criminal activity, or both. They were also repeated for a sample excluding individuals identified in police records of the accident as suspected of DUI (Wilson 1992). The same analyses were also repeated for "crime during the last five years" to control for possible selective loss of information due to the fact that the NDO keeps less serious crimes in the system for five years but keeps more serious crimes in the system for a longer period of time (see above). Finally, for the purpose of illustration, we also computed simple cross tabulations and chi-squared values.

RESULTS

The sample contained more men than women (see Table 1), as might be expected in a traffic accident sample (Baker et al. 1992). Most persons involved were registered as Dutch (72.9 percent). The median age was 33 years. Most traffic users were driving a car (85.7 percent); others were driving a motorcycle (1.0 percent), a moped (5.8 percent), or a bicycle (5.1 percent).

	N	%
Total	1.531	100.0
Gender	.,==.	
Male	1,181	77.1
Female	350	22.9
Age		
12-25	382	25.0
26-33	392	25.6
34-44	380	24.8
45-79	377	24.6
Nationality		
Dutch	1,117	73.0
Surinam	150	9.8
Dutch Antilles	16	1.0
Turkey	74	4.8
Morocco	42	2.7
Other nationality	132	8.6
Type of risky behavior ^a		
No risky behavior	1,348	88.0
Any risky behavior	183	12.0
Driving under the influence of alcohol (DUI)	61	4.0
Driving too fast	36	2.4
Ignoring traffic lights	23	1.5
Incorrect positioning	22	1.4
Other type of risky behavior	58	3.8
Type of crime in police records, ever ^a		
No crime	1,126	73.5
Any crime	405	26.5
Traffic crimes	170	11.1
Driving under the influence of alcohol (DUI)	103	6.7
Hit-and-run accidents	64	4.2
Causing an accident involving serious injury or death	32	2.1
Other traffic crime ^D	28	1.8
Criminal law offenses	342	22.3
Violent crime	177	11.6
Vandalism	96	6.3
Property crime	242	15.8
Other criminal law offenses	57	3.7
Type of crime in police records, last 5 years ^a		
No crime	1,264	82.6
Any crime	267	17.4
Traffic crimes	112	7.3
Driving under the influence of alcohol (DUI)	72	4.7
Hit and run accidents	33	2.2
Causing an accident involving serious injury or death	19	1.2
Other traffic crime	7	0.5
Criminal law offenses	180	11.8

TABLE 1: Characteristics of the Sample

	Ν	%
Violent crime	84	5.5
Vandalism	35	2.3
Property crime	110	7.2
Other criminal law offenses	33	2.2

TABLE 1: Continued

a. Traffic users may be registered in more than one category.

b. The remaining categories (< 0.5 percent) consisted of illegal overtaking, failing to give priority, driving on a street or in a direction that is forbidden, reckless driving, cutting in, and aggressive driving.

There were 1.5 percent pedestrians, and 0.9 percent was other types of traffic users. In most accidents, two traffic users were involved (57.5 percent), but there were also single-vehicle accidents (37.4 percent). In 4.1 percent of the cases, there were three traffic users involved in the crash, and in 1.0 percent, four or five traffic users were involved.

Risky Traffic Behavior

Overall, 12.0 percent of the persons were identified from police reports as having displayed at least one form of risky behavior. Eighteen (1.2 percent) displayed two forms of risky behavior, and for one individual, the police records mention three forms of risky behavior. DUI was the most common form of risky behavior (4.0 percent), followed by driving too fast (2.4 percent), ignoring traffic lights (1.5 percent), and incorrect positioning (1.4 percent; also see Table 1).⁴

Preliminary Analyses

Before continuing to the main analyses, it is worth noting that our sample of road users involved in accidents in general had a high rate of criminal activity (men: 31.0 percent compared with 15.2 percent for the population of The Hague as a whole, $\chi^2(1) = 225.3$, p < .001; women: 11.4 percent versus 3.5 percent, $\chi^2(1) = 63.4$, p < .001). This held for all age groups (see Figure 1).

It is also worth noting that traffic crime and criminal law offenses were related relatively strongly. The odds ratio between traffic crime and all criminal law offenses combined was equal to 8.1. Similar findings held for the subscales (the data can be obtained from first author). In general, participation in one type of crime was related to participation in other types of crime.





Risky Behavior in Traffic and Criminal Behavior

The log-linear analysis shows that risky behavior in traffic was related to all measures of criminal behavior (Table 2). Overall, the fact that someone was involved in crime more than doubled the likelihood that he or she would be involved in risky behavior in traffic. The odds ratio for risky behavior and traffic crime was 5.3; for violent crime, it was 2.6; for vandalism, 2.5; and for property crime, 1.5 (Table 2).

The results also suggest that age influenced the odds ratios of risky behavior and crime. Risky behavior was more strongly related to crime in the older age groups (34 and older) compared with the younger age groups. This increase in the odds ratio according to age was found for each type of crime. However, it was statistically significant only in the case of traffic crime. Gender did not have a significant effect on the relationship between risky behavior in traffic and crime.

When the above analysis was repeated for the Dutch individuals only, the odds ratios were almost identical. When the analysis was again repeated on

TABLE 2: Odds Ratios of Risky Behavior in Traffic and Traffic and Criminal Law Offenses, Odds Ratio (95 percent confidence interval)

		Overall	12-25 Years	26-33 Years	34-44 Years	45-79 Years	
Type of Crime	Ν	1,531	382	392	380	377	
Traffic crime	174	5.3*** (3.6-7.8)	4.1* (1.9-8.8)	2.2* (1.0-5.0)	8.6* (3.9-18.9)	10.1* (4.6-22.1)	
Criminal law offenses	341	2.2*** (1.6-3.2)	1.8 (1.0-3.1)	1.5 (0.8-3.1)	2.9 (1.4-6.3)	4.9 (2.4-9.9)	
Violent crime	177	2.6*** (1.8-3.9)	2.1 (0.1-56.6)	1.9 (0.9-3.9)	3.1 (1.4-7.2)	6.4 (0.2-176.2)	
Vandalism	96	2.5*** (1.5-4.1)	1.9 (0.1-41.5)	2.4 (0.1-91.6)	1.4 (0.1-15.4)	7.9 (0.4-175.1)	
Property crime	240	1.5* (1.0-2.2)	1.2 (0.2-5.9)	1.2 (0.6-2.3)	2.4 (1.1-5.2)	2.7 (0.5-13.6)	

NOTE: *N* = 1,531 **p* < .05. ****p* < .001.

the sample excluding all individuals (N = 61) with DUI as risky behavior, the odds ratios between risky behavior and criminal law offenses remained almost identical. There were two interesting exceptions: the odds ratio for traffic crime dropped from 5.3 to 2.1, a value that was approximately the same as the odds ratio for criminal law offenses, which was 2.2 (see Table 3). Another difference was that the age interaction was less pronounced and did not reach statistical significance.

The results for crime recorded during the past five years were generally similar to those of crime ever recorded, but there were a few differences (see Table 4). No significant age or gender interactions were found. The odds ratio between risky behavior and traffic crime was higher, namely, 8.3 instead of 5.3. The odds ratios for criminal law offenses were almost identical, namely, 2.0 instead of 2.2. The odds ratios for the separate forms of criminal law offenses were slightly lower and varying between 1.6 and 2.1 instead of 1.5 and 2.6. The significance levels were somewhat lower. Generally, the same findings held for the selection of drivers who did not drink before the accident: the odds ratio between traffic crimes and risky behavior dropped markedly. The other odds ratios varied between 2.3 for criminal law offenses and 1.9 for vandalism.

Cross tabulations were computed, illustrating the relationships between various forms of crime and risky behavior with and without DUI (Table 5). As neither gender nor age influenced these relationships substantially, these tables represent the associations relatively well. All the relationships between offending and risky behavior were statistically significant, with the exception of having been charged with hit-and-run accidents. For example, if one looks at criminal law offenses, having been registered for a criminal law offense increased the likelihood of risky behavior—including DUI—from 9.4 percent (no record) to 20.8 percent. Having been registered for a criminal law offense increased the likelihood of risky behavior—without DUI—from 6.9 percent (no record) to 14 percent.

DISCUSSION

Controlling for exposure and alcohol use, the findings showed that risky behavior in traffic was related to criminal involvement for the three forms of criminal law offenses included in this study, namely, violent crime, vandalism, and property crime. This supports the idea that behavior is consistent across situations and the idea that there are relatively broad traits underlying diverse forms of behavior including crime (Gottfredson and Hirschi 1990; Osgood et al. 1988; Robins and Wish 1977; Rowe, Osgood, and Nicewander 1990; Tellegen 1991). The evidence from the present study is strong given the

Overall 12-25 Years 26-33 Years 34-44 Years 45-79 Years Type of Crime Ν 1,470 367 382 363 358 Traffic crime 135 2.1* (1.2 - 3.6)0.8 (0.2-2.9) 3.2 (1.0-9.9) 4.9 (1.6-14.9) 1.6 (0.6-4.7) Criminal law offenses 318 2.2*** (1.5-3.3) 1.8 (1.0-3.3) 1.6 (0.8-3.6) 3.8 (1.3-10.6) 4.1 (1.7-9.9) Violent crime 163 2.6* (1.7-4.2)2.1 (0.1-55.0) 1.9 (0.8-4.2) 5.6 (2.1-15.1)5.3 (0.2-146.1) Vandalism 91 3.0* (1.7-5.4) 1.7 (0.1-30.8) 3.6 (0.0-285.6) 1.9 (0.1-47.0) 10.6 (0.6-189.0) Property crime 227 1.5 (0.9-2.3)1.3 (0.2-7.9) 1.3 (0.6-2.9) 2.0 (0.7-5.6) 2.5 (0.4-16.4)

TABLE 3: Odds Ratios of Risky Behavior in Traffic and Traffic and Index Crime; Selection of Traffic Users Who Did Not Drink Prior to the Accident, Odds Ratio (95 percent confidence interval)

p* < .05. **p* < .001.

TABLE 4: Odds Ratios of Risky Behavior and Crime in the Past Five Years, Odds Ratio (95 percent confidence interval)

Type of Crime	Та	otal Group	Selection of Traffic Users Who Did Not Use Alcohol			
Traffic crime	8.3	(5.4-12.8)***	3.1	(1.6-5.8)**		
Criminal law offenses	2.0	(1.3-3.0)**	2.3	(1.5-3.7)***		
Violent crime	2.1	(1.2-3.6)*	2.4	(1.3-4.3)**		
Vandalism	1.6	(0.7-3.8)	1.9	(0.8-4.8)		
Property crime	1.6	(1.0-2.7)	2.0	(1.2-3.5)*		

NOTE: *N* = 1,531.

p* < .05. *p* < .01. ****p* < .001.

fact that, as mentioned above, the measures of the key variables—crime and risky behavior—come from different registrations systems and therefore do not have the problem of shared-method variance, which has been a point much criticized by authors questioning the value of studies supporting cross-situation consistency but that were based on ratings (Mischel 1968; Mischel and Peake 1982; Nisbett and Ross 1991).

Of course, this study could not address the question of what trait or traits underlay the association observed. It could involve risk seeking (Arnett, Offer, and Fine 1997), conventionality-unconventionality (Donovan, Jessor, and Costa 1991), or sensation seeking (Mawson et al. 1996). It may also involve ability to control impulses (Pulkkinen 1982) or an aversion to delay of gratification (Mischel 1981).

There was an interaction with age: The association between risky behavior and crime was weaker for younger individuals. This trend was similar but nonsignificant for violent and property crime. This could be because younger people are generally more likely to commit crimes than older people, and committing a crime is therefore less related to traits and more related to opportunities. It is also possible that our measure of crime, based on the NDO, is influenced by age. For older persons, the police have had more time to build a criminal record, and if persons commit more serious crimes, they will stay in the NDO for a longer time. If one considers NDO as a crude way of measuring an underlying tendency to commit a crime, NDO may provide a more accurate measure of this tendency in older persons and a less accurate measure for younger persons. This might lead to the present age trend. In other words, we measured crime with relatively less error in older persons and relatively more error in younger persons, and more error reduces relationships. A similar reasoning suggests that self-reported delinquency "ever" measures provide a better measurement of the propensity for crime than "last year" measures (Hindelang, Hirschi, and Weis 1981).

	Risky Behavior Including DUI				Risky Behavior Without DUI			
	No Record		Recorded for a Crime		No Record		Recorded for a Crime	
	Ν	%	Ν	%	Ν	%	Ν	%
Any crime	1,126	(8.1)	405	(22.7)	1,126	(7.0)	405	(12.6)
Traffic crimes	1,361	(9.3)	170	(32.9)	1,361	(8.0)	170	(12.4)
Driving under the influence of alcohol	1,428	(9.5)	103	(45.6)	1,428	(8.1)	103	(14.6)
Hit and run accidents	1,467	(11.6)	64	(20.3)	1,467	(8.6)	64	(6.3) ^a
Causing an accident involving serious injury or death	1,499	(11.4)	32	(37.5)	1,499	(8.1)	32	(25.0)
Criminal law offenses	1,189	(9.4)	342	(20.8)	1,189	6.9)	342	(14.0)
Violent crime	1,354	(10.3)	177	(24.9)	1,354	(7.4)	177	(16.9)
Vandalism	1,435	(11.1)	96	(25.0)	1,435	(7.7)	96	(19.8)
Property crime	1,289	(10.9)	242	(17.4)	1,289	(7.8)	242	(12.0)

TABLE 5: Risky Behavior in Traffic and Traffic Criminal Law Offenses

NOTE: N = 1,531. DUI = driving under the influence of alcohol; all tables: chi-square p < .05. a. Chi-square not significant.

The study also found a positive relationship between risky traffic behavior and traffic crime. This may be interpreted as temporal stability of traffic behavior within the individual. The main traffic crimes in this study namely, DUI and causing an accident involving serious injury or death—are similar to the measures of risk taking. Only a few studies have looked at the stability of drivers' records, accidents, and risky behavior, and these found similar results (Brezina 1969; Burg 1970; Robertson and Baker 1975; Soderstrom, Birschbach, and Dischinger 1990; Soderstrom et al. 1993). These findings are in line with the general finding that there is temporal stability for many forms of social behavior (Mischel 1968; Mischel and Peake 1982).

This study probably provides a lower limit to the true magnitude of the relation between risky behavior in traffic and criminal behavior. The reason is that both concepts were measured crudely and were thus subject to random error. It should also be noted that the data relate to only one country at a particular time. Although we believe that the underlying mechanisms should remain similar over time and geographic region, their manifestation in terms of links between observed behaviors may not. This is an issue that merits further exploration.

APPENDIX Log-Linear Analysis: Principle of the Uniform Association Model

We used the conditional uniform association model. For a two-way table, the uniform association model can be written as the following:

$$\log \pi_{ij} = u + u_{1(i)} + u_{2(j)} + \Phi_{ij},$$

where π_{ij} is the probability for cell (i,j) $(i = 1, ..., I; j = 1, ..., J); u, u_1(i)$. and $u_2(j)$. are marginal effects. Interest extends to the term Φ_{ij} because it is directly related to the log odds ratio as

$$\log (\pi_{ij} / (\pi_{i'j}) / (\pi_{ij'} / \pi_{i'j}). = \Phi(i - i')(j - j').$$

For adjacent cells in the table, the uniform association model states that the log-odds ratio is constant and equal to Φ because for adjacent cells, i - i' = 1 and j - j' = 1. The odds ratio is then equal to exp Φ . The conditional association model estimates separate parameters Φ for each of the eight levels of the stratifying variables, which are here age "a" (four categories) and sex "s." Thus, the parameter Φ_{as} indicates the strength of the association in table (a, s) as measured by the log-odds ratio (for more details, see Agresti 1990).

Table A1 gives the results of log-linear analyses for the uniform association model for the relation between risky behavior and traffic crimes. The fit of the models is determined by the likelihood ratio chi-square. The advantage of this chi-square over Pearson's chi-square is that models can be compared by subtracting the likelihood chi-squares and degrees of freedom of the models. If an added effect yields a significant difference with a model without that effect, it means that the adding of that effect improves the model. The difference between models 1 and 2 is significant, $G^2(1) - G^2(2) = 66.9$; df(1) - df(2) = 1; p = .000, indicating that there is a relation between risky behavior and nontraffic crimes. Also, the difference between models 4 and 2 is significant, $G^2(2) - G^2(4) = 9.6$; df(2) - df(4) = 3; p = .022, which means that there is also a significant age effect. However, the difference between model 3 and model 2 is not significant, $G^2(2) - G^2(3) = 0.001$; df(2) - df(3) = 1; p = .975, so adding the gender factor to the model does not improve the model significantly.

TABLE A1:	Risky	Behavior	and	Traffic	Crimes
-----------	-------	----------	-----	---------	--------

				Differences in			
Model	G ²	df	р	Model	G ²	df	р
(1) = no relation	79.0	8	.000				
(2) = relation	12.1	7	.098	(1)-(2)	66.9	1	.000
(3) = (2) + gender effect	12.1	6	.060	(2)-(3)	0.0	1	.975
$(4) = (2) + age effect^{a}$	2.5	4	.652	(2)-(4)	9.6	3	.022
(5) = (3) + age effect	2.3	3	.522	(3)-(5)	9.8	3	.020
(6) = (4) + gender effect	2.3	3	.522	(4)-(6)	0.2	1	.648
(7) = (5/6) + interaction	0.0	0	1.000	(6)-(7)	2.3	3	.522

NOTE: G^2 = likelihood ratio chi square.

a. Best model.

NOTES

1. This includes pedestrians, motorists, motorcyclists, cyclists, or persons otherwise involved in a traffic accident.

2. It was very unusual at the time of the data collection for police officers to have a Breathalyzer to determine whether the blood alcohol concentration was greater than the legal limit (0.5 percent). Therefore, the mentioning of alcohol use reflects an educated guess on the part of the police officer who filled in the form.

3. Joyriding is usually defined as a property crime in criminological research (Junger-Tas, Terlouw, and Klein 1994). There were nine cases of joyriding. Analyses with and without joyriding as a measure of property crime produce almost identical results. Finally, as mentioned elsewhere, it should be mentioned that in no case was joyriding confounded with an accident registered in the present sample.

4. A study of patients treated at an emergency unit in a hospital (Groningen, the Netherlands) over the past 20 years shows that 8.0 percent of all patients involved in crashes were under the influence of alcohol (Kingma and Klasen 1993). In the present study, this percentage is 4.0. This supports the view, as mentioned above, that alcohol use is underreported on the standard forms completed by the police. This difference, however, could also be (partly) caused by the fact that

alcohol does increase the likelihood of becoming injured in an accident (Simpson and Mayhew 1991) and accordingly to be transported to an emergency unit of a hospital.

REFERENCES

- Agnew, Robert and David M. Petersen. 1989. "Leisure and Delinquency." Social Problems 36:332-50.
- Agresti, Alan. 1990. Categorical Data Analysis. New York: John Wiley.
- Arneklev, Bruce J., Harold G. Grasmick, Charles R. Tittle, and Robert J. Bursik. 1993. "Low Self-Control and Imprudent Behavior." *Journal of Quantitative Criminology* 9:225-47.
- Arnett, Jeffrey Jensen, Daniel Offer, and Mark A. Fine. 1997. "Reckless Driving in Adolescence: 'state' and 'trait' factors." Accident Analysis and Prevention 29:57-63.
- Baker, Susan P., Brian O'Neill, Marvin J. Ginsburg, and Guohua Li. 1992. The Injury Fact Book. Oxford, UK: Oxford University Press.
- Bem, Daryl J. and Andrea Allen. 1974. "On Predicting Some of the People Some of the Time: The Search for Cross-Situational Consistencies in Behavior." *Psychological Review* 81:506-20.
- Bem, Daryl J. and David C. Funder. 1978. "Predicting More of the People More of the Time: Assessing the Personality of Situations." *Psychological Review* 85:485-501.
- Brezina, E. H. 1969. "Traffic Accidents and Offences: An Observational Study of the Ontario Driver Population." Accident Analysis & Prevention 1:373-95.
- Brownfield, David and Ann Marie Sorenson. 1993. "Self-Control and Juvenile Delinquency: Theoretical Issues and an Empirical Assessment of Selected Elements of a General Theory of Crime." *Deviant Behavior: An Interdisciplinary Journal* 14:243-64.
- Burg, Albert. 1970. "The Stability of Driving Record over Time." Accident Analysis and Prevention 2:57-65.
- Burton, Roger V. 1963. "Generality of Honesty Reconsidered." *Psychological Review* 70:481-99.
- Chaplin, William F. and Lewis R. Goldberg. 1985. "A Failure to Replicate the Bem and Allen Study of Individual Differences in Cross-Situational Consistency." *Journal of Personality* and Social Psychology 47:1074-90.
- Conley, James J. 1984. "Relation of Temporal Stability and Cross-Situational Consistency in Personality: Comment on the Mischel-Epstein Debate." *Psychological Review* 91:491-96.
- Deery, Hamish A. and Anthony W. Love. 1996. "The Effect of a Moderate Dose of Alcohol on the Traffic Hazard Perception Profile of Young Drink-Drivers." Addiction 91:815-27.
- Donovan, John E., Richard Jessor, and Frances M. Costa. 1991. "Adolescent Health Behavior and Conventionality-Unconventionality: An Extension of Problem-Behavior Theory." *Health Psychology* 10:52-61.
- Epstein, Seymour and Edward J. O'Brien. 1985. "The Person-Situation Debate in Historical and Current Perspective." *Psychological Bulletin* 98:513-37.
- Farrington, David P. and Marianne Junger. 1995. "Illnesses, Injuries and Crime, Accidents, Self-Control and Crime." Criminal Behavior and Mental Health 5:255-478.
- Forde, David R. and Leslie W. Kennedy. 1997. "Risky Lifestyles, Routine Activities, and the General Theory Of Crime." Justice Quarterly 14:265-94.
- Gibbs, John J. and Dennis Giever. 1995. "Self-Control and its Manifestations among University Students: An Empirical Test of Gottfredson and Hirschi's Theory." Justice Quarterly 12:231-55.

- Gibbs, John J., Dennis Giever, and Jamie S. Martin. 1998. "Parental Management and Self-Control: An Empirical Test of Gottfredson and Hirschi's General Theory." *Journal of Research in Crime and Delinquency* 35:40-70.
- Glueck, Sheldon and Eleanor Glueck. 1950. Unraveling Juvenile Delinquency. New York: Commonwealth Fund, Oxford University Press.
- Gottfredson, Michael R. and Travis Hirschi. 1990. A General Theory of Crime. Stanford, CA: Stanford University Press.
- Grasmick, Harold G., Charles R. Tittle, Robert J. Bursik, and Bruce J. Arneklev. 1993. "Testing the Core Empirical Implications of Gottfredson and Hirschi's General Theory of Crime." *Journal of Research in Crime and Delinquency* 30:5-29.
- Hansen, Curtiss P. 1988. "Personality Characteristics of the Accident Involved Employee." Journal of Business and Psychology 3:346-65.
- Hindelang, Michael J., Travis Hirschi, and Joseph G. Weis. 1981. *Measuring Delinquency*. Beverly Hills, CA: Sage.
- Hirschi, Travis. 1969. Causes of Delinquency. Berkeley: University of California Press.
- Huizinga, David and Cynthia Jacob-Chien. 1998. "The Contemporaneous Co-Occurrence of Serious and Violent Juvenile Offending and Other Problem Behaviors." Pp. 47-67 in Serious & Violent Juvenile Offenders, edited by R. Loeber and D. Farrington. Thousand Oaks, CA: Sage.
- I. T. Organisatie. 1995. "HKS Tabellen: Landelijk Beheerde Tabellen (National Database on Offenders)." Korps Landelijke Politiediensten, Driebergen, the Netherlands.
- Junger, Marianne, G. J. Terlouw, and Peter G. M. van der Heijden. 1995. "Crime, Accidents and Social Control." Criminal Behavior and Mental Health 5:386-410.
- Junger, Marianne and Auke Wiegersma. 1995. "The Relations between Accidents, Deviance and Leisure Time." Criminal Behavior and Mental Health 5:144-74.
- Junger-Tas, Josine and Ineke Haen-Marshall. 1999. "The Self Report Methodology in Crime Research: Strength and Weaknesses." Pp. 291-367 in *Building a Safer Society: Strategic Approaches to Crime Prevention*. Vol. 25, *Crime and Justice*, edited by M. Tonry and D. P. Farrington. Chicago: University of Chicago Press.
- Junger-Tas, Josine, Gert-Jan Terlouw, and Malcolm W. Klein. 1994. Delinquent Behavior among Young People in the Western World: First Results of the International Self-Report Delinquency Study. Amsterdam, the Netherlands: Kugler.
- Keane, Carl and Robert Arnold. 1996. "Examining the Relationship between Criminal Victimization and Accidents: A Routine Activities Approach." *Canadian Review of Sociology and Anthropology* 33:457-79.
- Keane, Carl, Paul S. Maxim, and James J. Teevan. 1993. "Drinking and Driving, Self-Control, and Gender: Testing a General Theory of Crime." *Journal of Crime and Delinquency* 30:30-46.
- Kingma, J. and H. J. Klasen. 1993. "Alcoholgebruik bij Verkeerslachtoffers." Academisch Ziekenhuis Groningen, Groningen, the Netherlands.
- Krahé, Barbara. 1990. Situation Cognition and Coherence in Personality: An Individual-Centered Approach. Cambridge, UK: Cambridge University Press.
- Lawton, Rebecca, Dianne Parker, Stephen G. Stradling, and Anthony S. R. Manstead. 1997. "Predicting Road Accidents: The Role of Social Deviance and Violations." *British Journal* of Psychology 88:249-62.
- Longshore, Douglas, Susan Turner, and Judith A. Stein. 1996. "Self-Control in a Criminal Sample: An Examination of Construct Validity." *Criminology* 34:209-28.
- Mathijssen, M.P.M. 1997. "Rijden onder Invloed in Nederland, 1995-1996 [Driving under the Influence of Alcohol in the Netherlands, 1995-1996]: Ontwikkeling van het alcoholgebruik

van automobilisten in weekendnachten." Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, Leidschendam, the Netherlands.

Mawson, A. R., J. J. Biundo, D. I. Clemmer, K. W. Jacobs, V. K. Ktsanes, and J. C. Rice. 1996. "Sensation Seeking, Criminality, and Spinal Cord Injury: A Case Control Study." *American Journal of Epidemiology* 144:463-72.

Mischel, Walter. 1968. Personality and Assessment. New York: John Wiley.

------. 1981. Introduction to Personality. New York: CBS College.

- Mischel, Walter and Philip K. Peake. 1982. "Beyond Déjà vu in the Search for Cross-Situational Consistency." *Psychological Review* 89:730-55.
- Moskowitz, D. S. 1982. "Coherence and Cross-Situational Generality in Personality: A New Analysis of Old Problems." *Journal of Personality and Social Psychology* 43:754-68.
- Moskowitz, Herbert and Marcelline Burns. 1990. "Effects of Alcohol on Driving Performance." Alcohol Health and Research World 14:12-14.
- Nagin, Daniel S. and Raymond Paternoster. 1994. "Personal Capital and Social Control: The Deterrence Implications of a Theory of Individual Differences in Criminal Offending." *Criminology* 32:581-606.
- Nisbett, Richard E. and Lee Ross. 1991. *The Person and the Situation: Essential Contributions of Social Psychology*. Philadelphia: Temple University Press.
- Oei, Tian P. and D. M. Kerschbaumer. 1990. "Peer Attitudes, Sex, and the Effects of Alcohol on Simulated Driving Performance." American Journal of Drug and Alcohol Abuse 16:135-46.
- Osgood, Wayne D., Lloyd D. Johnston, Patrick M. O'Malley, and Jerald G. Bachman. 1988. "The Generality of Deviance in Late Adolescence and Early Adulthood." *American Sociological Review* 53:81-93.
- Paternoster, Raymond and Robert Brame. 1998. "The Structural Similarity of Processes Generating Criminal and Analogous Behaviors." Criminology 36:633-69.
- Paternoster, Raymond and Sally Simpson. 1996. "Sanction Threats and Appeals to Morality: Testing a Rational Choice Model of Corporate Crime." Law & Society Review 30:549-83.
- Peake, Philip K. and Walter Mischel. 1984. "Getting Lost in the Search for Large Coefficients: Reply to Conley (1984)." *Psychological Review* 91:497-501.
- Pervin, Lawrence A. 1989. "Persons, Situations, Interactions: The History of a Controversy and a Discussion of Theoretical Models. Special Issue: Theory Development Forum." Academy of Management Review 14:350-60.
- Piquero, Alex and Stephen Tibbetts. 1996. "Specifying the Direct and Indirect Effects of Low Self-Control and Situational Factors in Offenders' Decision Making: Towards a More Complete Model of Rational Offending." *Justice Quarterly* 13:481-510.
- Polakowski, Michael. 1994. "Linking Self- and Social Control with Deviance: Illuminating the Structure Underlying a General Theory of Crime and Its Relation to Deviant Activity." Journal of Quantitative Criminology 10:41-78.
- Pratt, T. C., and F. T. Cullen. 2000. "The Empirical Status of Gottfredson and Hirschi's General Theory of Crime: A Meta-Analysis." *Criminology* 38:931-64.
- Pulkkinen, Lea. 1982. "Self-Control and Continuity from Childhood to Late Adolescence." Life-Span Development and Behaviour 4:64-105.
- Robertson, Leon S. and Susan P. Baker. 1975. "Prior Violation Records of 1447 Drivers Involved in Fatal Crashes." *Accident Analysis and Prevention* 7:121-28.
- Robins, Lee N. 1966. Deviant Children Grown Up. Baltimore: Williams and Wilkins.
- Robins, Lee N. and Eric Wish. 1977. "Childhood Deviance as a Developmental Process: A Study of 223 Urban Black Men from Birth to 18." *Social Forces* 56:448-73.
- Ross, H. Laurence. 1992. Confronting Drunk Driving: Social Policy for Saving Lives. London: Yale University Press.

- Rowe, David C., D. Wayne Osgood, and W. Alan Nicewander. 1990. "A Latent Trait Approach to Unifying Criminal Careers." *Criminology* 28:237-70.
- Simpson, H. M. and D. R. Mayhew. 1991. "The Hard Core Drinking Driver." Ottawa: Traffic Injury Research Foundation of Canada.
- Sivak, Michael. 1983. "Society's Aggression Level as a Predictor of Traffic Fatality Rate." Journal of Safety Research 14:93-99.
- Soderstrom, Carl A., Jane M. Birschbach, and Patricia C. Dischinger. 1990. "Injured Drivers and Alcohol Use: Culpability, Convictions, and Pre- and Post-Crash Driving History." *Journal of Trauma* 30:1208-14.
- Soderstrom, Carl A., Patricia C. Dischinger, Shiu Man Ho, and Margaret T. Soderstrom. 1993. "Alcohol Use, Driving Records, and Crash Culpability among Injured Motorcycle Drivers." *Accident Analysis and Prevention* 25:711-16.
- Sorenson, Ann and David Brownsfield. 1995. "Adolescent Drug Use and a General Theory of Crime: An Analysis of a Theoretical Integration." *Canadian Journal of Criminology* 37:19-38.
- Stroebe, W. and M. S. Stroebe. 1995. Social Psychology and Health. Duckingham, UK: Open University Press.
- Tellegen, Auke. 1991. "Personality Traits: Issues of Definition, Evidence, and Assessment." Pp. 10-35 in *Personality and Psychopathology*, Vol. 2, *Thinking Clearly about psychology*, edited by W. M. Grove and D. Cichetti. Minneapolis: University of Minnesota Press.
- Tillman, W. A. and G. E. Hobbs. 1949. "The Accident-Prone Automobile Driver." American Journal of Psychiatry 106:321-31.
- Tittle, Charles R. 1995. Control Balance: Toward a General Theory of Deviance. Boulder, CO: Westview.
- Tremblay, Richard E., Bernard Boulerice, Marianne Junger, and Louise Arseneault. 1995. "Does Low Self-Control during Childhood Explain the Association between Delinquency and Accidents in Early Adolescence?" Criminal Behaviour and Mental Health 5:439-51.
- West, D. J. and D. P. Farrington. 1977. *The Delinquent Way of Life*. London: Heineman Educational.
- West, Robert J. 1997. Cross-Cultural Generalisability of Relationship between Anti-Social Motivation and Traffic Accident Risk. Crowthorne Berkshire, UK: Transport Research Laboratory.
- West, Robert J., James Elander, and Davina French. 1993. "Mild Social Deviance, Type-A Behaviour Pattern and Decision-Making Style as Predictors of Self-Reported Driving Style and Traffic Accident Risk." *British Journal of Psychology* 84:207-19.
- West, Robert, Helen Train, Marianne Junger, Alan Pickering, Eric Taylor, and Anne West. 1997. Childhood Accidents and Their Relationship with Problem Behaviour. London: St. George's Hospital Medical School.
- West, Robert, Helen Train, Marianne Junger, Anne West, and Alan Pickering. 1998. "Accidents and Problem Behaviour." *The Psychologist* 12:395-97.
- Wick, Robert L. 1992. "Alcohol and Pilot Performance Decrements." Alcohol, Drugs and Driving 8:207-15.
- Wilson, R. J. 1992. "Convicted Impaired Drivers and High-Risk Drivers: How Similar Are They?" Journal of Studies on Alcohol 53:335-44.
- Wood, Peter B., Betty Pfefferbaum, and Bruce J. Arneklev. 1993. "Risk-Taking and Self-Control: Social Psychological Correlates of Delinquency." *Journal of Crime and Justice* 16:111-30.
- Yeager, C. A. and D. Otnow-Lewis. 1990. "Mortality in a Group of Formally Incarcerated Juvenile Delinquents." *American Journal of Psychiatry* 147:612-14.