Type A Behavior Pattern, Risky Driving Behaviors, and Serious Road Traffic Accidents: A Prospective Study of the GAZEL Cohort

Hermann Nabi1,2, Silla M. Consoli3, Jean-François Chastang1,2, Mireille Chiron4, Sylviane Lafont4, and Emmanuel Lagarde1,2

1 Unité 687, Institut National de la Santé et de la Recherche Médicale, Saint-Maurice, France.
2 Institut Fédératif de Recherche 69, Villejuif, France.
3 Hôpital Européen Georges Pompidou/Service de Psychologie Clinique et de Psychiatrie de Liaison, Paris, France.
4 Unité Mixte de Recherche Épidémiologique Transport Travail Environnement, Bron, France.

Received for publication July 19, 2004; accepted for publication December 21, 2004.

The type A behavior pattern (TABP), characterized by impatience, time urgency, and hostility, was originally developed in relation to coronary heart disease. Since 1986, there has been a debate on whether the TABP is also associated with risky driving behaviors leading to increased risks in road traffic accidents (RTAs). The authors examined prospectively the relation among risky driving behaviors, serious RTAs, and the TABP in a cohort of 20,000 French employees of Électricité de France–Gaz de France who were aged 39–54 years in 1993. A total of 11,965 participants were included in this study. The TABP was assessed in 1993 using the French version of the Bortner Rating Scale. Driving behaviors and serious RTAs were recorded in 2001. Sociodemographic and alcohol consumption data were available from the cohort’s annual follow-up. The impact of the TABP on the risk of serious RTAs was assessed using the Cox proportional hazards regression model with time-dependent covariates. After adjustment for potential confounders, the risk for serious RTAs increased proportionally with TABP scores: hazard ratios were 1.29 (95% confidence interval: 1.03, 1.63) for intermediate-level scores and 1.48 (95% confidence interval: 1.16, 1.90) for high-level scores relative to low TABP scores. The authors concluded that type A drivers had an increased risk of RTAs. Implications of this finding for traffic safety are discussed.

accidents, traffic; automobile driving; Cox regression; prospective studies; risk-taking; type A personality

Abbreviations: RTA, road traffic accident; TABP, type A behavior pattern.

The human factor appears in the literature as being the most prevalent contributing factor of road traffic crashes (1–4). This includes both driving behavior (e.g., speeding, drinking and driving, traffic law violations) and impaired skills (e.g., inattention, fatigue, physical disabilities, impaired sensory perception, and so on).

Among the individual variables suspected to increase the risk of road traffic accidents (RTAs), the psychological characteristics of the driver were examined closely. Many personality traits, such as locus of control (5), cognitive failures (6), sensation seeking (7), and behavior pattern, especially the type A behavior pattern (TABP), have been suspected to be related to unsafe driving behavior and involvement in RTAs. In particular, for more than two decades, several authors have assessed and discussed whether individuals with the TABP were more at risk of RTAs.

The TABP was born from the clinical observations of Friedman and Rosenman (8, 9), two cardiologists. They noted that their patients with heart disease were often behaviorally and emotionally different from individuals without heart disease, with a competitive need for achievement, a sense of time urgency, alertness, aggressiveness, and hostility. From these clinical observations, several cohort...
studies tried to show the predictive value of the TABP with reference to the occurrence of coronary heart disease (10–12). Taking into account these characteristics, the TABP was also studied in relation to several fields of everyday life where patience is needed, in particular, automobile control. There are therefore several reasons why one would expect the TABP to be related to motor vehicle driving behavior. For example, a heightened sense of urgency and impatience could be seen as an undesirable quality in a driver, especially in driving situations which require patience (13).

The first demonstration of the link between the TABP and the behavior of motor vehicle drivers emerged from Perry’s study (14) in 1986. The results of this study indicated that drivers exhibiting the TABP tended to be more impatient, reported more traffic accidents, and received more tickets for traffic law violations. Subsequent studies conducted in the United States and India (15), Great Britain (16), Sweden (17), and Italy (18) yielded results that supported this previous finding. However, one study (19) did not find any significant relation between the TABP and either risky driving behaviors or RTAs.

Unfortunately, these studies suffered from low sample size and/or incomplete consideration of confounding factors. In addition, all of them were retrospective, making it difficult to disentangle the temporal relation in the association between RTAs and the TABP. The aim of the present study was to examine prospectively the relation among the TABP, reported risky driving behaviors, and serious RTAs in a large cohort of French employees.

MATERIALS AND METHODS

Participants

The participants are current employees or recent retirees of the French national electricity and gas company, Électricité de France–Gaz de France, who volunteered to participate in a research cohort, known as the GAZEL Cohort. This firm employs approximately 150,000 people of diverse trades and socioeconomic groups throughout France. The GAZEL Cohort has been studied since 1989 by the National Institute of Health and Medical Research (in French, Institut National de la Santé et de la Recherche Médicale (INSERM)) with the main objective of collecting data about the annual prevalence and incidence of chronic health problems. The cohort initially included 20,625 participants in 1989 (15,011 men aged 40–50 years and 5,614 women aged 35–50 years). A comprehensive database has been regularly updated since then with data from the human resources department, the firm’s medical insurance program, the occupational medicine department, and an annual questionnaire mailed to participants at the beginning of each year. The objectives and methods of the cohort have been described in detail elsewhere (20).

Materials

Psychosocial questionnaires. In 1993, the members of the GAZEL Cohort were mailed a set of questionnaires originally designed to evaluate the role of personality traits in morbidity and mortality from cardiovascular disease and cancer. The questionnaires included a French version of the Bortner Rating Scale that made it possible to evaluate the TABP (21). Among the most widely used questionnaire measures of the TABP, the Bortner Rating Scale has the advantage of being brief and not focusing solely on speed (14, 16, 18). The original version consists of 14 bipolar items, each graduated from 1 to 24, whereas the items of the version used with the GAZEL Cohort were graduated from 1 to 6, adding up to scores ranging from 14 to 84.

Driving behavior and road safety questionnaire. In 2001, a driving behavior and road safety questionnaire was mailed to the 19,894 living members of the GAZEL Cohort. This questionnaire was previously pilot tested on 500 randomly selected participants. The answers and comments of the 330 respondents were used to finalize it. It was designed to describe serious traffic accidents over the past decade. The participants were asked to report all of their serious RTAs in the cohort’s follow-up period (1989–2001). A serious RTA was defined as an accident in which someone was injured, that is, required medical care. The medical department of Électricité de France–Gaz de France provided reminders that listed the dates of the participants’ sick leaves for traffic accidents during the period covered by the questionnaire. Every reported serious RTA was investigated with a set of 25 questions about the conditions, injuries, reasons for the accident, and the responsibility of the participant.

Risky driving behaviors were assessed using five questions. The participants were asked to report their maximum speed in built-up areas, on rural roads, and on highways (a circle had to be drawn on a scale for each location with marks labeled with multiples of 10; when the circle was placed between two marks, e.g., 40 and 50, it was coded as 45). Maximum reported speeds were categorized in two groups: under and above the legal limit plus 10 percent; in France, speed limits in built-up areas, on rural roads, and on highways are, respectively, 50 km/hour, 90 km/hour, and 130 km/hour. The variable drinking and driving was assessed with the question: “In the 12 past months, have you ever driven after drinking too much alcohol?” As far as cellular phone use when driving is concerned, participants were considered to have risky behavior when they reported answering a phone call whatever the driving circumstances or when they reported not stopping their vehicle before initiating a phone call. Drivers were also asked how many kilometers they drove a four- or two-wheeled vehicle in the last 12 months, in order to estimate their annual mileage. The type of the principal vehicle owned in January 2001 was noted and further coded in five categories corresponding to increased maximum speed. These categories were as follows: 1) city cars and utilitarian vehicles; 2) small family cars; 3) large family cars, multipurpose vehicles, and 4 × 4 sport utility vehicles; 4) executive and luxury cars; and 5) sports cars. Attitudes towards traffic regulations were assessed by asking participants whether they agreed or disagreed with a set of 12 assertions related to the debate on traffic regulations and enforcement in France in 2001. A score was derived and further categorized in four groups with balanced relative sample sizes. Assertions were
positive or negative and were related to speed limitation (e.g., speed limitation should depend on the driver’s skill), seat belt use (e.g., seat belt use should be up to the driver), drinking and driving (e.g., the maximum blood concentration of alcohol while driving should be reduced to 0 g/liter, or the maximum blood concentration should depend on the driver’s ability to tolerate alcohol), and the overall traffic regulation system (e.g., the points demerit system is useless, or the driving license should be updated regularly).

The annual GAZEL Cohort questionnaire. Sociodemographic data from the cohort database included sex, year of birth, occupational categories, and household income. Participants were defined as episodic alcohol consumers when they reported drinking alcohol a maximum of 2 days a week. They were also asked to indicate the maximum amount of alcohol drunk during 1 day and defined as high-quantity users when this amount exceeded three glasses of wine, 3 pints (1.42 liters) of beer, or two measures of spirits. These two indicators were combined to define a composite time-dependent alcohol consumption variable with the four following categories: low-quantity regular user, high-quantity regular user, low-quantity episodic user, and high-quantity episodic user.

Statistical analysis

We divided the TABP scores into three distinct levels using percentiles (scores below the 25th percentile constituted the low TABP level, those ranging between the 25th and 75th percentiles constituted the intermediate level, and those above the 75th percentile constituted the high level of TABP, defined here as type A individuals). Chi-squared tests were used first to assess differences in proportion for categorical variables, and a Cox proportional hazards regression model with time-dependent covariates (22) was fitted to assess the risk of a serious RTA in the 1994–2001 period in relation to the TABP measured in 1993. For this procedure, the time variable was the year of the follow-up period, and the event was the first serious accident within this period.

To assess the effect of potential confounders, we computed hazard ratios using four different Cox models. In model 1, the TABP was the only independent variable. The hazard ratios in model 2 were adjusted for age (a time-dependent covariate), gender (male/female), occupational category each year (a time-dependent covariate of three categories: unskilled workers/skilled workers/managers), and exposure (mileage in 2001). As recommended by Janke (23), a logarithmic transformation was applied to annual mileage. In model 3, the TABP scores were further adjusted for reported risky driving behaviors such as risky use of a cellular phone (yes/no); drinking and driving (yes/no); driving at a high speed in built-up areas, on rural roads, and on highways (yes/no); and alcohol consumption (a time-dependent covariate with four categories describing quantity and frequency). In model 4, the hazard ratios were also adjusted for the score of negative attitudes toward safety regulations (four categories) and the vehicle category (four categories).

RESULTS

In 1993, 15,049 participants returned their questionnaire on TABP. We received responses in the 2001 driving behavior and road safety questionnaire from 14,226 participants. Some were excluded (n = 26) because of data discrepancies with the general cohort database. Data on occupational category or mileage were missing for another 376 participants. Consequently, after merging the TABP questionnaire data files with the driving behavior and road safety questionnaire data files, 11,965 participants were included in the analysis (60.5 percent of all GAZEL Cohort participants). In the 1994–2001 period, 556 events (first serious RTAs) were counted, including 255 (46 percent) at-fault serious RTAs.

Type A behavior pattern and sociodemographic variables

Women, younger participants, participants from higher occupational categories, and participants with highest reported mileage in 2001 were more likely to have a high level of Bortner’s TABP scores. Similarly, those who reported having powerful vehicles, risky use of a cellular phone while driving, and driving faster on highways and on rural roads, as well as those with high scores of negative attitudes toward road traffic regulations, scored high on the Bortner Rating Scale. Finally, participants who reported a low quantity of episodic and a high quantity of regular alcohol consumption scored lower on the Bortner Rating Scale (table 1).

Type A behavior pattern and serious road traffic accidents

Table 2 provides results from Cox’s proportional hazards regression models fitted to estimate the impact of TABP on the risk of serious RTAs. Unadjusted hazard ratios estimated from model 1 were 1.22 (95 percent confidence interval: 0.98, 1.41) for intermediate type A scores and 1.32 (95 percent confidence interval: 1.05, 1.66) for high type A scores when compared with low type A scores. When adjusted for sex, age, occupational category, and mileage per year (model 2), hazard ratios for intermediate and high type A scores exhibited a slight trend. When adjusted further for behavioral variables (model 3), the hazard ratios increased slightly for both intermediate and high TABP scores, and the hazard ratios did not change notably when results were adjusted for category of vehicle and for attitudes toward traffic regulations (model 4). Finally, similar patterns of associations were found when the same analyses were restricted to at-fault serious RTAs. Because of lower numbers of events, confidence intervals were, however, wider.

DISCUSSION

Our results demonstrated a robust association between type A behavior pattern and the risk of serious RTAs. A consistent trend in accident risk was found with
TABLE 1. Univariate comparison of type A behavior pattern scores for different variables among men and women in a cohort of French employees of Électricité de France–Gaz de France, 2001

<table>
<thead>
<tr>
<th>Variables</th>
<th>&lt;48 (low)</th>
<th>49–57 (intermediate)</th>
<th>≥58 (high)</th>
<th>( p ) for comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
</tbody>
</table>

Sex
- Male: 2,579 (82.2), 4,105 (76.0), 2,421 (71.5)
- Female: 557 (17.8), 1,296 (24.0), 996 (28.5)

Age category (years) at the time of TABP measurement in 1993
- 50–54: 1,314 (41.8), 2,086 (38.5), 1,262 (37.1)
- 45–49: 1,638 (52.1), 2,837 (52.3), 1,741 (51.2)
- 39–44: 189 (6.1), 500 (9.2), 398 (11.7)

Occupational category in 2001
- Unskilled workers: 383 (12.2), 470 (8.7), 241 (7.1)
- Skilled workers: 1,847 (58.8), 2,876 (53.1), 1,669 (49.1)
- Managers: 909 (29.0), 2,072 (38.2), 1,489 (43.8)

Low quantity regular alcohol user
- Yes: 129 (4.1), 244 (4.5), 150 (4.4)
- No: 3,012 (95.9), 5,179 (95.5), 3,251 (95.6)

Low quantity episodic alcohol user
- Yes: 53 (1.7), 75 (1.4), 30 (0.9)
- No: 3,088 (98.3), 5,348 (98.6), 3,371 (99.1)

High quantity regular alcohol user
- Yes: 1,205 (38.4), 1,958 (36.1), 1,202 (35.3)
- No: 1,936 (61.6), 3,465 (63.9), 2,199 (64.7)

High quantity episodic alcohol user
- Yes: 19 (0.6), 35 (0.6), 15 (0.4)
- No: 3,122 (99.4), 5,388 (99.4), 3,386 (99.6)

Risky use of cellular phone while driving
- Yes: 115 (3.7), 236 (4.4), 259 (7.6)
- No: 3,026 (96.3), 5,187 (95.6), 3,142 (92.4)

Mileage in 2001 (km)
- <10,000: 697 (22.2), 1,213 (22.4), 784 (23.1)
- 10,000–20,000: 1,530 (48.7), 2,482 (45.7), 1,535 (45.1)
- >20,000: 914 (29.1), 1,728 (31.9), 1,082 (31.8)

Type of vehicle owned in 2001
- City and utilitarian cars: 702 (23.8), 1,172 (22.9), 784 (24.2)
- Small family cars: 947 (32.0), 1,589 (31.0), 931 (28.8)
- Large family cars, multipurpose vehicles, and 4 × 4 sport utility vehicles: 1,085 (36.7), 1,924 (37.6), 1,209 (37.4)
- Executive, luxury, and sports cars: 221 (7.5), 439 (8.5), 310 (9.6)

Maximum speed on highways of >145 km/hour
- Yes: 686 (22.2), 1,288 (24.1), 858 (25.6)
- No: 2,404 (77.8), 4,059 (75.9), 2,488 (74.4)

Maximum speed on rural roads of >100 km/hour
- Yes: 1,012 (32.5), 1,870 (34.8), 1,198 (35.7)
- No: 2,098 (67.5), 3,500 (65.2), 2,160 (64.3)

Maximum speed in built-up areas of >55 km/hour
- Yes: 2,146 (68.9), 3,747 (69.8), 2,370 (70.5)
- No: 967 (31.1), 1,622 (30.2), 993 (29.5)

Scores for negative attitudes toward traffic regulations
- 0–2: 359 (11.4), 528 (9.7), 348 (10.2)
- 3–4: 1,035 (33.0), 1,762 (32.5), 1,029 (30.3)
- 5–6: 917 (29.2), 1,649 (30.4), 972 (28.6)
- 7–12: 830 (26.4), 1,484 (27.4), 1,052 (30.9)

* TABP, type A behavior pattern.
increasing Bortner scores when potentially confounding variables were controlled for.

These data confirm previous findings suggesting that type A drivers are more likely to have a serious RTA. Unlike authors of previous studies, we were able to assess incident serious RTAs as outcomes and to include in the analysis a wide range of potential confounders (annual mileage, driving behaviors, alcohol consumption, age, gender, socio-professional category, category of vehicle, attitudes toward traffic regulations) to control for potential differences between type A and non-type A drivers. The large sample size of our prospective study provided accurate estimates for associations and allowed for subgroup analyses (at-fault/all serious RTAs). TABP scores were measured in 1993 while we assessed the risk of serious RTAs during the 1994–2001 period, which may suggest that TABP levels could have changed with time. However, several studies have demonstrated relative long-term stability of the TABP (24, 25); therefore, it seems reasonable to assume that the TABP remained constant during the period covered by the study. Underreporting of accidents was minimized because the medical department of the French national electricity and gas company provided reminders that listed dates of the participants’ sick leaves for serious RTAs during the period covered.

TABLE 2. Relation between type A behavior pattern scores and risk of serious road traffic accidents among men and women in a cohort of French employees of Électricité de France–Gaz de France, 1994–2001*

<table>
<thead>
<tr>
<th>Model</th>
<th>Type A score</th>
<th>No. of events (accidents)</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low (≤48)</td>
<td>3,141</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Intermediate (49–57)</td>
<td>5,423</td>
<td>1.22</td>
<td>0.98, 1.41</td>
</tr>
<tr>
<td></td>
<td>High (≥58)</td>
<td>3,401</td>
<td>1.32</td>
<td>1.05, 1.66</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>11,965</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 1†

<table>
<thead>
<tr>
<th>Type A score</th>
<th>No. of events (at-fault accidents)</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (≤48)</td>
<td>255</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate (49–57)</td>
<td>1.03</td>
<td>0.75, 1.41</td>
<td></td>
</tr>
<tr>
<td>High (≥58)</td>
<td>1.31</td>
<td>0.94, 1.81</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11,744</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 2‡

<table>
<thead>
<tr>
<th>Type A score</th>
<th>No. of events (at-fault accidents)</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (≤48)</td>
<td>252</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate (49–57)</td>
<td>1.08</td>
<td>0.78, 1.48</td>
<td></td>
</tr>
<tr>
<td>High (≥58)</td>
<td>1.44</td>
<td>1.03, 2.01</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11,460</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 3§

<table>
<thead>
<tr>
<th>Type A score</th>
<th>No. of events (at-fault accidents)</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (≤48)</td>
<td>247</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate (49–57)</td>
<td>1.09</td>
<td>0.79, 1.51</td>
<td></td>
</tr>
<tr>
<td>High (≥58)</td>
<td>1.45</td>
<td>1.03, 2.04</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10,901</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Model 4¶

<table>
<thead>
<tr>
<th>Type A score</th>
<th>No. of events (at-fault accidents)</th>
<th>Hazard ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (≤48)</td>
<td>237</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Intermediate (49–57)</td>
<td>1.12</td>
<td>0.80, 1.56</td>
<td></td>
</tr>
<tr>
<td>High (≥58)</td>
<td>1.45</td>
<td>1.02, 2.05</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10,901</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Cox’s proportional hazards regression model analysis.
† Model 1: unadjusted hazard ratio.
‡ Model 2: hazard ratio adjusted for sex (male/female), age (a continuous time-dependent covariate), occupational category (a time-dependent covariate of three categories: unskilled workers/skilled workers/managers), and driving mileage per year (logarithmic transformation).
§ Model 3: model 2 plus adjustments for alcohol consumption (a four-category, time-dependent covariate describing quantity and frequency); maximum speed above the legal limit plus 10% in built-up areas (yes/no), on rural roads (yes/no), and on highways (yes/no); risky use of cellular phone (yes/no); and drinking and driving in the last 12 months (yes/no).
¶ Model 4: model 3 plus adjustments for vehicle categories (four categories) and scores of negative attitudes toward traffic regulation (four categories).
by the questionnaire. At the time of TABP measurements, the participants in our study were between 39 and 54 years of age, which could bring into question the generalizability of our results. However, previous studies were carried out on samples of undergraduate and graduate college students aged 17–25 years and on people up to 70 years of age. Therefore, it is not impossible that type A drivers of all age groups may be at greater risk of serious RTAs.

In our study, type A drivers were more likely to engage in risky driving behaviors, such as risky use of a cellular phone while driving and exceeding speed limits. Type A individuals may drive faster because they typically have a sense of urgency, constantly struggling against the clock and thus walking, eating, and performing activities more rapidly. They are more likely to become impatient with delays and unproductive time, and they schedule commitments too tightly (26). Perry (14) has indicated that, according to his findings, the sense of urgency was the main contributor to the deficit in driving performance that led to RTAs and violations. Type A individuals may be more likely to use a cellular phone while they drive, because they have a competitive need for achievement, are ambitious, and try to do more than one thing at a time (26). McNally and Stone (26) found that the competitive achievement orientation of type A individuals was an important component of their personality that determined their behaviors.

Surprisingly, the adjustment of self-reported maximum speeds, drinking and driving, and cellular phone use did not affect the association between TABP scores and risk of serious RTAs. The risky driving behaviors reported in this study did not completely account for the association between TABP and serious RTAs, even if individuals with the TABP were more prone to these behaviors. It seems that the questionnaire was not exhaustive because it measured only the most common risky driving behaviors, such as speeding, drinking and driving, and cellular phone use while driving. There are certainly some aspects of driving behaviors that were not measured that mediated the relation between TABP and RTAs. For example, because type A individuals are characterized by excessive impatience, time urgency, and hostility, it would have been interesting to measure variables such as tailgating, dangerous overtaking, running red lights, number of moving violations or number of parking tickets, carelessness on the road, and so on. It is also possible that type A individuals underreported their risky driving behaviors because of denial, a coping mechanism widely used by type A subjects. Indeed, it is well established that individuals with the TABP are more likely to minimize or to deny the risks they take (27). As far as the responsibility of TABP drivers in serious RTA occurrence is concerned, one would expect the hazard ratio for an at-fault serious RTA to be higher than the hazard ratio for all serious RTAs. This was not observed in our study. Here again, we may suspect an effect of denial bias given that responsibility in accidents was self-reported. Perry and Baldwin (13) suggested that researchers should attempt to control for dissimulation by participants, but we were not able to assess this in our study. Finally, the 1-year retrospective nature of the driving behavior questions could have led to substantial recall bias.

Another explanation of how persons with TABP were at greater risk of RTAs could be related to driving performance. It has been suggested that type A individuals may have greater response latencies than non-type A individuals in both simple and complex choice-reaction time performance tasks (13, 14). Type A individuals may be slow discriminators because their tension level is increased when they are facing situations calling for patience (13). Moreover, it seems that subjects classified as type A are more aggressive and free-floating hostile than the average when dealing with competitive tasks such as trying to change lanes or making it through a yellow light (13, 14). Those characteristics, combined with their great difficulty in responding slowly in tasks that require a delayed response, may lead type A individuals to engage in risk-taking behaviors on the road and/or to commit traffic law violations.

Finally, because data on the components of the TABP were not available, we focused only on the relation between the global TABP and RTAs and did not include its underlying subscales. Studying specifically the effect of the TABP components on RTAs would have made it possible to assess the impact of time urgency, hostility, and hard driving on serious RTAs and to disentangle sporadic behaviors from stable personality traits.

Although it is difficult to recommend modification of individuals’ behavior patterns, our findings could have implications for road safety. We agree with Horswill and Coster (28) who encourage understanding and taking account of the characteristics of type A individuals in the development of driver-assistance systems. For example, embarked navigation aids would make it possible for drivers to avoid congested areas and undue stress and to minimize their likelihood of becoming aggressive or prone to road rage. In addition, repeated tests based on interviews of TABP subjects led Denollet (29) to notice that people with a TABP are more likely to present physical manifestations, that is, facial tension, rapid speech, prolepsis (interruption of others’ speech), tongue and teeth clicking, and the audible forced inspiration of air. If his findings are confirmed, it would help to detect type A drivers at the time of their driver training. As suggested by Beirness (30) and by Perry and Baldwin (13), this may have applications in terms of pre-licensing assessment. Educational programs may incorporate personality issues with the purpose of encouraging drivers to recognize the effects of certain traits and emotions that could put them and others at risk for serious RTAs. Information on alternative methods for dealing with impatience, frustration, anger, and intolerance on the roads could be provided. In France, training sessions are mandatory for repeat traffic offenders and for drivers whose driving license is withdrawn. These sessions could be optimized if the trainers were made more aware of the problem of the TABP and if they had simple procedures to identify type A drivers.

ACKNOWLEDGMENTS

The project was funded by Renault, Électricité de France–Gaz de France, and Fondation MAIF.
The authors thank all those who supported this study and, in particular, the staff of unit 687 of INSERM. Very special thanks go to Sébastien Bonenfant, Nadine Kaniewski, Nathalie Lopes, and Marie Zins for their valuable help throughout the study.

REFERENCES