



# Impact of impulsiveness, venturesomeness, and empathy on driving by older adults

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## Abstract

**Problem:** Although personality characteristics such as impulsiveness have been linked to the driving safety and driving habits of young and middle-aged adults, little research has focused on the role of personality in older driver behavior. **Method:** Using the IVE questionnaire in an exploratory study, three personality dimensions (impulsiveness, venturesomeness, and empathy) were measured in 305 older drivers (ages 57–87 years old). In addition, the *Driving Habits Questionnaire* was used to estimate driving exposure, and the *Driver Behavior Questionnaire* (DBQ) was used to estimate driving errors and violations. State-recorded crash data were made available by the state public safety agency. **Results:** Subjects who reported four or more driving errors had higher impulsivity and empathy scores and lower venturesomeness scores. Subjects reporting driving violations were more likely to have high impulsivity scores. Driving six or more places per week was associated with lower levels of impulsivity. **Impact:** These results suggest that a comprehensive understanding of driving problems among older adults should also include a consideration of personality dimensions. In doing so, the challenges faced in the interpretation of self-report instruments on driving behaviors must be acknowledged, with a move in research toward greater reliance on more objective measures of driving behavior when assessing the impact of personality variables.

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**Keywords:** Aging; Driver behavior; Personality; Venturesomeness; Impulsiveness

## 1. Introduction

Over the past two decades, there has been a great deal of focus on understanding the reasons for older drivers' elevated collision rate per mile driven as compared to younger adults. A growing body of research has demonstrated that chronic medical conditions common in older adults and the functional problems they engender are major contributors to their reduced safety on the road and changes in their driving behaviors (Owsley, 2002; Retchin, 1993; Transportation Research Board, 1988). Of particular concern are visual (Owsley & McGwin, 1999) and cognitive impairments (Ball, Owsley, Sloane, Roenker, & Bruni, 1993; Cooper, Tallman, Tuokko, & Beattie, 1993; Duchek, Hunt, Ball, Buckles, & Morris, 1998), as well as deficits in physical capabilities (Marottoli & Drickamer, 1993; McGwin, Sims, Pulley, & Roseman, 2000; Sims, McGwin, Allman, Ball, & Owsley, 2000).

It is interesting that the identified risk factors for crash involvement and driving problems in younger adults are quite different from those for older adults. Whereas chronic medical conditions and functional impairment are central to the etiology of driver safety problems in later life, crash involvement by young drivers has been associated with inexperience on the road, risk-taking behaviors (e.g., speeding), moving violations, and alcohol use (National Highway Traffic Safety Administration [NHTSA], 2001; Phebo & Dellinger, 1998). Personality characteristics such as impulsivity, extraversion, low self-control, and social deviance have also been linked in a variety of studies to driver safety problems in young and middle-aged adults (Evans, 1991; Fine, 1963; Hansen, 1988; Lawton, Parker, Stradling, & Manstead, 1997; McGuire, 1976; Panek & Wagner, 1986; Panek, Wagner, Barrett, & Alexander, 1978; Renner & Anderle, 2000; Schenck & Rausche, 1979; Smith & Kirkham, 1981; West, Elander, & French, 1993). Personality traits are typically very stable throughout life, and thus the question arises as to whether personality features known to be related to driver safety problems in young adults are also related to driver safety problems in older adults. If some risk factors for unsafe driving are shared between young and

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older drivers, the strategies specifically developed to reduce these risks in high-risk young drivers may also be useful when extended to promoting driver safety among high-risk older drivers.

The purpose of this exploratory study is to examine the relationship in older drivers between personality characteristics—specifically, impulsiveness, venturesomeness, and empathy (hereafter IVE)—and aspects of driver safety and behavior, including state-recorded crashes, driver errors, driver violations, and driving exposure. We used the opportunity of an ongoing prospective study on driving mobility in older adults to address this question as described in the following section.

## 2. Methods

### 2.1. Subjects

The sample consisted of older adults previously enrolled in a prospective study on the impact of cataracts on mobility (ICOM) as described earlier (Owsley et al., 2002; Owsley, Stalvey, Wells, & Sloane, 1999; Owsley, Stalvey, Wells, Sloane, & McGwin, 2001). All enrollees were legally licensed to drive in Alabama and were current drivers. We took the opportunity at the third annual follow-up visit in ICOM to explore the relationship between some personality dimensions in older drivers and their crash involvement and driving behaviors. Subjects had been recruited through eye care clinics in the Birmingham, Alabama area. Exclusion criteria included diagnosis of dementia, Parkinson's disease, psychosis, eye conditions other than refractive error or cataract, or any illness that precluded annual follow-up visits for the 3 years of the ICOM project.

As described in Owsley et al. (1999), information on key variables was obtained over the phone from those who chose not to participate in the ICOM project to facilitate the generalizability of the findings. “Refusers” were more likely to have vision impairment and to have poorer health than those who enrolled (Owsley et al., 1999).

### 2.2. Protocol

The Institutional Review Board for Human Use at the University of Alabama-Birmingham approved the study protocol including that for the third annual visit. After the purpose of the study was explained, each subject was invited to sign a document of informed consent before enrolling. Test examiners were masked to the motor-vehicle collision and violation histories of all subjects. Demographic data were confirmed through interview. A questionnaire was selected that was designed to assess the personality dimension of impulsiveness, which has been shown to be relevant to driving behaviors and safety on the road (Fine, 1963; Hansen, 1988; Lawton, Parker,

Stradling, et al., 1997; Renner & Anderle, 2000; Schenck & Rausche, 1979; Smith & Kirkham, 1981; West et al., 1993). Specifically, the Eysenck and Eysenck (1978) IVE questionnaire was administered and has 63 items consisting of questions that require yes/no answers. Impulsiveness was assessed through items such as “Do you often do things on the spur of the moment? Do you get extremely impatient if you are kept waiting by someone who is late?” In addition to impulsiveness, this questionnaire also examined two other personality variables that appear on face validity to relate potentially to driver behavior: venturesomeness (e.g., Do you sometimes like doing things that are a bit frightening? When the odds are against you, do you still usually think it is worth taking a chance?) and empathy (e.g., Would you feel sorry for a lonely stranger in a group? Can you remain in a good mood even if those around are depressed?). For each dimension, a score was calculated by assigning 1's and 0's to each yes and no response, respectively, and then summing the relevant items for that dimension.

Two driving-related questionnaires were also administered. The shortened version of the Manchester Driver Behavior Questionnaire (DBQ; Lawton Parker, Manstead, & Stradling, 1997; Lawton, Parker, Stradling, et al., 1997) was used to collect information on driving errors and driving violations. The DBQ consists of 16 items on specific driving behaviors that can be subgrouped into driving errors and driving violations (Table 1). The developers of the DBQ (Lawton, Parker, Manstead, et al., 1997) define “errors” as mistakes (i.e., not deliberate) in the execution of safe driving practices such as failure to see a pedestrian crossing, failure to check mirrors before a maneuver, or misjudging the speed of an oncoming vehicle. “Violations” are behaviors that involve deliberate deviations from safe driving practice; violations are associated with crash involvement (Parker, West, Stradling, & Manstead, 1995). Respondents were asked to report how frequently they found themselves engaging in each behavior, on a 6-point scale from 0 = *never* to 5 = *nearly all the time*. The relevant items were summed to create driving error and driving violation scores.

The Driving Habits Questionnaire (Owsley et al., 1999) was used to obtain information about driving exposure. This information was collected in a structured interview in which participants were asked to report the trips they make as a driver in a typical week, the places they travel to, the distance of these trips from home base, and the frequency of these trips. From this information, estimates were generated for miles driven, trips made, places driven, and days driven based on a week. These estimates have previously been found to be reliable and valid measures of driving exposure for older adults (Murakami & Wagner, 1997; Owsley et al., 1999). All questionnaires mentioned above were interviewer administered.

The accident reports stemming from all police-reported crashes over the 8 years prior to the study date of the third

Table 1  
Items on the DBQ

Driving Behavior Questions: “How often, if at all, has this happened to you over ten years?”	Errors	Violations
1. Drive especially close of “flash” the car in front as a signal for that driver to go faster or get out of your way		X
2. Stuck behind a slow-moving vehicle on a two-lane highway, you are driven by frustration to try to pass in risky circumstances		X
3. Angered by another driver’s behavior, you chase them with the intention of giving them a piece of your mind		X
4. Deliberately disregard the speed limits late at night or very early in the morning		X
5. Lost in thought you forget that your lights are on beams until flashed by another car		
6. When turning right, nearly hit a cyclist who has just come up on your right side	X	
7. In a line of vehicles turning left on to a main road, pay such close attention to the oncoming traffic that you nearly hit the car in front of you	X	
8. Drive back from a restaurant or social gathering even though you realize that you may be over the legal blood-alcohol limit		X
9. Easily frustrated by a certain type of driver, you show your hostility toward them when you drive near them		X
10. Misjudge the speed of the oncoming vehicle when passing a car	X	
11. Ignore the yield signs and narrowly avoid colliding with traffic that has the right of way	X	
12. Fail to check your mirrors before pulling out into traffic, changing lanes, turning, etc.	X	
13. Attempt to pass a vehicle that you had not noticed was signaling its’ intention to turn left	X	
14. Fail to notice pedestrians crossing when turning into a side-street from a main road	X	
15. Get involved in unofficial “races” with other drivers		X
16. Brake too quickly on a slippery road and skid	X	

study visit were made available through the Alabama Department of Public Safety.

### 2.3. Data analysis

For the purposes of this study, each IVE dimension was categorized into two groups based upon the upper 25th percentile of each dimension’s overall distribution. Subjects in the upper quartile of these dimensions would be expected to be more impulsive, venturesome, and empathetic relative to those in the lower 75th percentile. Thus, those in the upper quartile will be heretofore referred to as having high impulsivity, venturesomeness, and empathy, whereas those in the lower quartiles will be referred to as having low impulsivity, venturesomeness, and empathy. Similarly, the upper quartile was also used to classify subjects on the basis of driving exposure, that is, miles driven, trips made, places driven, and days driven per week—subjects in the upper quartile will be those with greater driving exposure. With respect to the crash data, drivers were either defined as crash involved (one or more crashes over the prior 8 years) or crash-free (0 crashes for this period).

The associations among crash involvement, driving behaviors, exposure, and demographic characteristics and each IVE dimension were initially evaluated using *t* tests and chi-square statistics, as appropriate. Logistic regression was then used to calculate odds ratios (OR) and 95% confidence intervals (CI) for the association between the independent variables of impulsiveness, venturesomeness, and empathy and the dependent, driving-related variables. For these analyses, subjects who were crash involved or were in the upper quartile of the driving behavior and

driving exposure variables as described above were considered as “cases.” Non-crash-involved subjects and those in the lower 75th percentile were considered “controls.” Subjects in the upper 25th percentile for IVE dimensions are considered “exposed” for the purposes of this analysis. In these analyses, estimates were adjusted for each of the other IVE dimensions as well as age, gender, and race. All data

Table 2  
Descriptive characteristics of the demographic, personality, and driving variables for the study sample

	Overall ( <i>n</i> = 305)	
	<i>N</i>	%
Race		
White	262	85.9
Black	43	14.1
Gender		
Male	150	49.2
Female	155	50.8
Crash involvement		
No	219	71.8
Yes	86	28.2
	Mean	S.D.
Age	71.8	6.4
Impulsiveness	5.9	4.0
Venturesomeness	5.0	3.9
Empathy	11.7	2.8
Driving errors	2.2	2.6
Driving violations	1.4	1.9
Miles driven per week	143.8	168.6
Days driven per week	5.3	2.0
Places driven per week	4.3	1.9
Trips driven per week	9.6	6.1

Table 3  
Unadjusted associations between the demographic variables and IVE dimensions and the driving variables

	Crash involvement			Driving errors			Driving violations			Miles per week			Days per week			Places per week			Trips per week		
	No	Yes	p	<4	≥4	p	<2	≥2	p	<186	≥186	p	<7	≥7	p	<6	≥6	p	<13	≥13	p
Age	72.0	71.0	.30	72.3	70.4	.02	72.3	70.7	.03	72.6	69.4	.0002	72.8	70.7	.004	72.1	70.7	.10	72.2	70.6	.05
Race																					
White	86.1	85.1	.83	83.8	91.6	.08	84.5	88.6	.33	83.8	92.2	.07	83.1	89.0	.14	84.2	90.9	.14	85.8	86.3	.92
Black	13.9	14.9		16.2	8.4		15.5	11.4		16.2	7.8		16.8	11.0		15.8	9.1		14.2	13.8	
Gender																					
Male	45.8	61.2	.03	45.1	60.2	.02	42.5	61.9	.001	41.2	72.7	<.0001	35.0	64.8	<.0001	43.4	66.2	.001	43.1	66.3	.001
Female	54.2	38.8		55.0	39.8		57.5	38.1		58.8	27.3		65.0	35.2		56.6	33.8		56.9	33.8	
Impulsiveness																					
<8	70.6	70.2	.94	74.8	59.0	.007	77.0	58.1	.001	68.9	75.3	.28	66.9	74.5	.15	65.8	84.4	.002	70.2	71.3	.86
≥8	29.4	29.9		25.2	41.0		23.0	41.9		31.1	24.7		33.1	25.5		34.2	15.6		29.8	28.8	
Venturesomeness																					
<7	69.1	66.7	.71	66.8	73.2	.29	70.2	65.4	.39	72.4	57.1	.01	74.1	62.5	.03	70.7	62.3	.17	71.3	60.8	.08
≥7	30.9	33.3		33.2	26.8		29.8	34.6		27.6	42.9		25.9	37.5		29.3	37.7		28.7	39.2	
Empathy																					
<14	72.2	79.1	.25	76.5	66.3	.07	73.9	73.3	.92	74.0	72.7	.83	69.8	77.9	.11	71.8	79.2	.20	70.5	82.5	.04
≥14	27.9	20.9		23.5	33.7		26.1	26.7		26.0	27.3		30.2	22.1		28.2	20.8		29.5	17.5	

analyses were conducted using the SAS System software, version 8.0 (SAS Institute, Cary, NC).

### 3. Results

Table 2 presents the demographic characteristics of the study sample as well as the means and standard deviations of the relevant personality, driving behavior, and exposure variables. The majority (85.9%) of the study subjects were

White, with the remaining African American. Subjects were evenly distributed with respect to gender. Eight-six subjects (28.2%) were involved in at least one collision over the preceding 8 years. The average age was approximately 72 years and the range was 57 to 87 years.

Table 3 presents the univariate unadjusted relationships between demographic and IVE personality dimensions and the driving-related dependent variables. Subjects who experienced crashes were significantly more likely to be male compared to those who were not crash involved. There were

Table 4  
Adjusted associations between each personality dimension and the driving variables<sup>a</sup>

	Crash involvement OR (95% CI)	Driving errors OR (95% CI)	Driving violations OR (95% CI)	Miles per week OR (95% CI)	Days per week OR (95% CI)	Places per week OR (95% CI)	Trips per week OR (95% CI)
Age	0.97 (0.93–1.02)	0.94 (0.90–0.98)	0.95 (0.91–0.98)	0.92 (0.87–0.96)	0.94 (0.90–0.97)	0.97 (0.91–1.01)	0.95 (0.91–0.99)
Race							
Black	Reference	Reference	Reference	Reference	Reference	Reference	Reference
White	0.85 (0.38–1.89)	2.22 (0.88–5.56)	1.25 (0.58–2.70)	2.18 (0.81–5.86)	1.54 (0.74–3.19)	1.89 (0.77–4.65)	0.91 (0.41–1.99)
Gender							
Male	1.93 (1.04–3.56)	3.09 (1.66–5.76)	2.84 (1.61–4.99)	4.11 (2.13–7.90)	3.24 (1.90–5.51)	2.17 (1.19–3.96)	2.34 (1.29–4.22)
Impulsiveness							
<8	Reference	Reference	Reference	Reference	Reference	Reference	Reference
≥8	1.06 (0.57–1.99)	2.49 (1.38–4.48)	2.84 (1.63–4.94)	0.74 (0.39–1.42)	0.68 (0.39–1.17)	0.35 (0.17–0.70)	0.99 (0.54–1.81)
Venturesomeness							
<7	Reference	Reference	Reference	Reference	Reference	Reference	Reference
≥7	0.91 (0.49–1.71)	0.41 (0.22–0.78)	0.76 (0.43–1.34)	1.33 (0.72–2.43)	1.24 (0.71–2.17)	1.24 (0.68–2.29)	1.25 (0.69–2.26)
Empathy							
<14	Reference	Reference	Reference	Reference	Reference	Reference	Reference
≥14	0.83 (0.41–1.66)	2.17 (1.14–4.12)	1.25 (0.68–2.29)	1.66 (0.84–3.28)	0.89 (0.50–1.60)	0.86 (0.44–1.69)	0.64 (0.32–1.26)

<sup>a</sup> Adjusted for age, race, gender, and IVE personality dimensions.

no other significant differences between crash- and non-crash-involved subjects. Subjects who reported four or more driving errors were more likely to be younger, male, and have high impulsivity compared to those who reported less than four driving errors. Driving violations demonstrated a similar pattern. Subjects with greater amounts of driving exposure (e.g., miles, days, places, and trips) tended to be younger and male. Subjects with higher mileage and days also had high venturesomeness, whereas those who went more places per week had low impulsiveness. Those who made more trips per week tended to have low empathy.

In the multivariable analysis where associations were adjusted for demographic variables and personality dimensions, significant associations between the personality dimensions and driving variables emerged for only three of the driving variables (Table 4). Subjects who reported four or more driving errors were nearly 2.5 times (OR 2.49, 95% CI 1.38–4.48) and 2.2 times (OR 2.17, 95% CI 1.14–4.12) to have high impulsivity and high empathy, respectively, as compared to those who reported less than four driving errors. Subjects who reported four or more driving errors were also 60% (OR 0.41, 95% CI 0.22–0.78) less likely to have high venturesomeness. With respect to driving violations, subjects who reported two or more violations were 2.8 times (OR 2.84, 95% CI 1.63–4.94) more likely to have high impulsivity. Finally, the only driving exposure variable related to the personality dimensions was places driven per week. Subjects who drove six or more places per week were 65% (OR 0.35, 95% CI 0.17–0.70) less likely to have high impulsivity.

#### 4. Discussion

Research on older driver safety has primarily focused on the role of functional impairment in their crash involvement and on-road behaviors (Owsley, 2002; Retchin, 1993; Transportation Research Board, 1988). This approach makes a great deal of sense because chronic medical conditions such as eye disease, dementing diseases, and musculoskeletal disorders are prevalent among the elderly, and at the same time effective control of a vehicle depends critically on visual, cognitive, and physical skills. Research has made substantial progress in the past two decades in identifying specific functional deficits that elevate crash risk, hamper on-road performance, and decrease highway sign legibility among older adults (as summarized in Owsley, 2002). These include contrast sensitivity and visual acuity loss, slowed visual processing speed, visual field loss, selective and divided attention problems, cognitive declines associated with Alzheimer's disease, and problems with physically performing daily tasks. The implications of the present study, summarized below, are that a comprehensive understanding of driving problems among older adults must also include consideration of the personality the older adult brings to the driving task.

Specifically, our results, after adjustment for demographic characteristics, suggest that older drivers who report that they commit driving maneuver errors and violations of traffic laws are more impulsive, which some previous studies suggest is also true for young and middle-aged drivers (Beirness, 1993; Hansen, 1988; Loo, 1978; Mayer & Treat, 1977; William, Henderson, & Mills, 1974). Impulsive people, regardless of age, are more likely to act spontaneously, and sometimes even reckless, and be less likely to comply with regulations.

Interestingly, older adults in our sample who report that they commit driving errors were less venturesome. This finding presents a challenge for interpretation in that one might expect that people more likely to feel comfortable in new experiences may also be more carefree on the road with respect to following the rules. However, because of the self-report nature of the DBQ instrument, a possible explanation of this finding may be that venturesome drivers are also quite willing to protect their adventurous style by "rationalizing away" or denying driving errors they commit. Finally, those who report that they have errors tend to have more empathetic personalities. Again, this finding may stem from the self-report nature of the DBQ with respect to driving mistakes in that empathetic persons (i.e., those who place great emphasis on understanding and relating to others) may feel the need to be more candid when making disclosures to others about the quality of their driving.

Collectively, these associations suggest that (a) the behavior of older drivers appears to be influenced by the person's personality dimensions of impulsivity, venturesomeness, and empathy; (b) these results may also imply that these personality dimensions influence how candid older drivers are in divulging information about potentially unsafe driving practices; or (c) both of these interpretations may have some validity. The difficulty in interpreting the DBQ data underscores the challenges of using self-report measures in studying personality characteristics in relation to driving practices, regardless of the target population's age. It is important to acknowledge that in this study, the likelihood of being a crash-involved driver in recent years, which was objectively determined in this study, was unrelated to the personality dimensions evaluated. This could be viewed as supporting the interpretation that our DBQ data more strongly reflect self-disclosure tendencies than actual driver safety. Future studies on the role of personality in older driver behavior may more fruitfully focus on the evaluation of actual on-road driving performance rather than self-reported errors and violations (whose validity will be highly influenced by personality) and crash involvement (which is a rare event).

A strength of this study is the use of driving behaviour questionnaires that have been previously psychometrically evaluated and also the availability of crash data from state records rather than the reliance on self-reported accidents. Although the study was not originally designed to address the relationship between personality characteristics and

older driver behavior, this large sample cohort of older drivers lent itself to the exploration of this mostly ignored issue in older driver safety research. As mentioned above, future research on personality and older driver behaviors should include more objective evaluations of driving behaviors and should also look at how personality interacts with functional impairment in understanding older driver behavior. A hypothesis worthy of further scrutiny is whether functionally impaired drivers are more likely to embrace interventions that could improve their driver safety depending on their personality characteristics.

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