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Prediction of On-Road Driving Performance in Patients with Early Alzheimer's Disease

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Abstract

OBJECTIVES—Physicians and family members frequently are asked to provide information about driving ability in patients with Alzheimer's disease (AD), yet there has been little research on the validity of their assessments of driving performance.

DESIGN—Cross-sectional.

SETTING—Participants were recruited from the neurology department of a community hospital affiliated with Brown Medical School.

PARTICIPANTS—Participants included 75 older adults (17 with mild AD, 33 with very mild AD, and 25 elderly controls).

MEASUREMENTS—The participant him/herself, an informant, and an experienced neurologist rated each participant's driving ability on a 3-point rating scale (safe, marginal, unsafe). A professional driving instructor also completed a standardized 108-point on-road driving assessment of each participant and then rated driving ability on the 3-point scale. Ratings were compared with the on-road driving score and with each other.

RESULTS—Only the neurologist's rating of the participants' driving abilities was significantly related to on-road driving score. When related to the instructor's safety rating, the neurologist's ratings were the most sensitive and specific. Mini-Mental State Examination score was a borderline covariate for the neurologist's rating. Overall, the instructor was the most stringent rater of participant driving ability, followed by the neurologist, the informant, and the participant.

CONCLUSION—An experienced neurologist's assessment of driving competence may be a valid predictor of driving performance of patients with early AD.

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Keywords

dementia; driving; assessment; Alzheimer's disease

Increasing attention has been placed recently on evaluating the competence of drivers with early dementia. For an individual with mild dementia, driving cessation is often a difficult and life-changing decision and can lead to problems with adequate transportation, disruption of caregivers' lives, and increased depressive symptoms in the patient.[1–5] The need to balance public safety with the adverse effects of driving cessation underscores the importance and the difficulty of determinations regarding driving competence.

As part of the evaluation of driving ability, patients and their families often are asked to provide information about the patient's ability to operate a motor vehicle. Not surprisingly, patients' poor insight[6,7] is often reflected in their self-assessments of their driving abilities, which frequently differ from their actual driving abilities.[8–12] The value of informants' assessments of a dementia patient's ability to drive a car is more uncertain. Some studies have found that family members may not be good judges of patients' driving skills.[8,13] In contrast, informant ratings of patients' abilities have been linked to motor vehicle accidents in another study, although this study was retrospective.[14] Although a physician's opinion often is a critical factor in a patient's decision to stop driving,[3,15] only one study examined physicians' ability to accurately predict on-road driving ability, finding that, although the physician's prediction (pass, borderline, or fail) of the patient's abilities correlated with total score on the driving test, it was not a significant predictor of final on-road result (pass or fail).[16]

Thus, there are multiple sources of available information regarding a patient's driving abilities: the patient, the informant, and the physician. The present study sought to examine which source provides the best information regarding driving abilities in individuals with Alzheimer's disease (AD). The first step was examination of which raters were the most likely to deem a participant as safe, and examination of variables that contributed to those ratings. The second step examined which rater's assessments relate best to the patient's actual performance on a road test as the index of "true" driving abilities. Finally, the degree to which three types of raters (patient, informant, physician) agreed with the overall rating given by a driving instructor who administered the on-road driving test was examined.

METHODS

Participants

Participants included 75 individuals (25 healthy elderly controls and 50 individuals with AD enrolled in a longitudinal study of driving and dementia. All participants were aged 40 to 90, English speaking, currently driving at least one trip per week, and had a valid driver's license and a family member willing to participate as an informant. Of the participants with AD, 33 were rated as Clinical Dementia Rating Scale (CDR[17]) 0.5 (very mild AD), and 17 were rated as CDR 1 (mild AD), based upon a complete diagnostic evaluation by a neurologist (BRO). Seventeen met criteria for possible AD and 33 for probable AD, based on National Institute of Neurological and Communicative Disorders and Stroke/Alzheimer's Disease and Related Disorders Association[18] guidelines. Some CDR 0.5 participants in the sample also may have met criteria for mild cognitive impairment and have been so designated by other investigators. Diagnosis of AD in these participants was based on current clinical diagnostic criteria, reports documenting their predictable progression over time to greater stages of dementia severity, and the high probability that they had histopathological AD.[19,20] Healthy elderly controls were family members of dementia

patients with no history of dementia and Mini-Mental State Examination (MMSE[21]) scores greater than 26.

Exclusion criteria included reversible causes of dementia and physical, ophthalmologic, or neurological disorders other than dementia that might impair driving abilities. Specifically, major physical handicaps such as frozen joints, inadequately healed fractures, monocular blindness, and amputation were exclusionary. Corrected visual acuity was better than 20/50 on eye chart testing, and visual fields were normal on confrontation testing for all participants. Psychiatric disorders were also exclusionary, including mental retardation, schizophrenia, bipolar disorder, or history of alcohol/substance abuse within the previous year. Depression was not exclusionary if it was controlled with medications. Symptomatic antidementia drugs (e.g., cholinesterase inhibitors, gingko, vitamin E, estrogens, nonsteroidal anti-inflammatory drugs) and antipsychotic and anxiolytic medications were permitted, but dosages were required to be stable for at least 6 weeks before entry into the study. Informants were individuals who spent time with the participants more than once weekly and who had accompanied the participant while driving at least once monthly during the preceding 12 months.

All participants but one, an Asian-American participant with AD, were Caucasian. MMSE was significantly different between all three groups (Table 1). Healthy elderly controls were driving significantly more miles per month than AD participants. (The CDR 0.5 and CDR 1 groups did not differ from each other.)

Procedures

Before a road test, participants and informants rated the participant's driving ability on a trichotomous scale: "drives alone with good sense of direction and good driving skills," "driving but with some difficulty," or "unable to drive safely." A research assistant collected driving history from the informant and participant together, including history of accidents and violations over the previous 3 years, miles driven per month, and miles driven with the informant per month (see Table 1). Although the accident and violation information were not cross-checked with state driving records, if reports from the informant and participant did not match, the informant's report was used, given the possibility of underestimation of self-report regarding accidents and violations.[22] Obtaining information from both the informant and participant has been used in previous research on dementia and motor vehicle crashes.[23]

The physician, who was blind to participant and informant ratings and to on-road test results (which occurred after the office evaluation), assessed the participant's ability to drive on the same scale as the informant and participant. His rating was based upon the information in his initial diagnostic dementia examination, including medical history; an interview with the participant and informant as part of the CDR evaluation; administration of the MMSE; neurological, eye, and general physical examinations; review of neuropsychological and laboratory tests; and information obtained from the participant and informant about any history of motor vehicle accidents or traffic violations.

Within no more than 2 weeks after the clinical assessment, a professional, experienced (6 years of licensed, full-time work) driving instructor administered an on-road driving test to participants during daylight hours under good conditions (no precipitation or wet roads). The instructor was blind to the participant's diagnosis and the driving ability ratings made by the informant and physician. A 10- to 15-minute pretest was completed in the parking lot before the actual road test to ensure that the test was safe to perform and to familiarize the participant with the car and the instructor. The driving test was based on a published and reliable driving test, the Washington University Road Test,[24] adapted for comparable streets

in Rhode Island. Although the streets were different, all the same maneuvers and identical scoring procedures were used to produce a comparable test procedure for Rhode Island. Participants received an on-road driving score based on safe completion of each of the required maneuvers, ranging from 0 (best score) to 108 (worst score). The instructor also made a trichotomous global rating of the participant's driving ability, "safe," "marginal," or "unsafe," which was akin to the trichotomous rating made by the participant, informant, and physician. Participants who the driving instructor rated as "unsafe" were allowed to take the driving test again. If they declined retest or failed the retest, they were advised to stop driving. All of the participants who received such advice followed it. Interrater reliability for 20 participants (rated by a second professional driving instructor in the back seat) yielded moderate to substantial agreement for the global rating (kappa = 0.83 for linear weighted ratings to 0.92 for quadratic weighted ratings). The Pearson correlation coefficient between the two raters for the total on-road driving score was 0.87.

RESULTS

On-Road Driving Test

Analysis of variance revealed that on-road driving test scores differed significantly across the three groups (Table 1). Post hoc contrasts (Student-Newman-Keuls) revealed that the normal control group performed significantly better on the road test than either of the AD groups. The very mildly demented and the mildly demented groups did not differ significantly.

Driving Ability Ratings

Table 2 provides the frequencies of ratings of driving abilities for each type of rater (self, informant, physician, and instructor) across the three participant groups. Six informant ratings of driving ability were missing: one for a control participant, four in the very mild AD group, and one in the mild AD group. Two physician ratings were missing: one in the very mild AD group and one in the mild AD group. The vast majority of participants with AD rated their driving ability as safe (93% of those with a CDR of 0.5, and 94% of those with a CDR of 1), as did all of the control participants (100%).

Covariates and Driving Ability Ratings

For the remaining analyses, only participants with AD (CDR 0.5 and 1) were included because of the lack of variability in driving ability ratings in the CDR 0 group (see Table 2). To look for effects of covariates on ratings of driving abilities, the presence of residual between-participant variability was tested for after adjusting for on-road driving score. This effect was significant ($P = .001$), and whether any measured participant-level covariates could be used to explain it was explored. Forward selection indicated that CDR, age, miles driven, accidents, violations, years of driving experience, and sex did not relate significantly to ratings of driving abilities (all $P > .10$). There was a borderline significant result for MMSE being related to physician ratings ($P = .07$).

Stringency of Ratings of Driving Ability

Three regression equations were calculated to separate and contrast differences in the overall stringency of the raters (captured by the intercepts) from their ability to discriminate between participants based on measured covariates (captured by the slopes). Adding random effects to the cumulative odds ordinal regression mode, as implemented in SAS PROC NLMIXED version 8.2 (SAS Institute, Inc., Cary, NC), partly accommodated residual between-participant heterogeneity.

This analysis yielded point estimates, 95% confidence intervals (CIs), and *P*-values for the parameters of a random effects model in which ratings made by each type of rater were regressed on the road test total score; these point estimates were the probabilities of assigning one of the three ratings to a participant with an on-road score equal to the sample average. This model was arrived at by first checking for driver-by-driver interactions, which were not significant ($P = .92$).

Results indicate that the driving instructor ($P = .30$, 95% CI = 0.11–0.57) was less likely than the physician ($P = .73$, 95% CI = 0.51–0.87) or the informant ($P = .73$, 95% CI = 0.51–0.87) to award a safe rating to an average participant. The probability of a participant with an average on-road driving score receiving an unsafe rating was low for the driving instructor ($P = .01$, 95% CI = 0.00–0.09) and the physician ($P = .002$, 95% CI = 0.00–0.03). No informants used the rating of "unsafe" for any participant.

Relationship Between Ratings of Driving Ability and On-Road Driving Score

To determine which rater was the best predictor of performance on the road test, a cumulative odds ordinal regression model was used. This analysis yielded the odds ratio (OR) of participants receiving a high rather than a low rating when their on-road driving score increased one standard unit above the sample mean (if they had performed worse on the road test). Because high ratings (0 = safe, 1 = marginal, 2 = unsafe) and high on-road driving scores correspond to poorer levels of driving ability, it was expected that increases in the on-road driving score would be positively associated with higher ratings. This was indeed the case, with participants whose on-road driving score was one standard unit above the mean being 33 times more likely to receive a marginal/unsafe pass from the driving instructor than a participant with an average score (OR = 33.35, 95% CI = 6.27–177.42; $P < .001$). Although still positive, the relationship was weaker for the physician ratings (OR = 6.33, 95% CI = 1.88–21.32; $P < .01$), with the driving instructor being more than five times as sensitive to differences in this objective measure of driving performance. The informant's ability to discriminate based on the road test score was weaker in magnitude (OR = 2.43, 95% CI = 0.81–7.35) and failed to attain statistical significance ($P = .11$).

Predictive Value of Categorical Ratings

Finally, again based on the 50 individuals with dementia, classification accuracy by participant, informant, and physician was examined for the categorical rating of driving safely on the road test according to the instructor. As seen in Table 3, the physician had the highest percentage of correct classifications (74%), followed by informants (64.4%) and participants (53.2%). Two subanalyses were conducted with each of the dementia groups (CDR 0.5 and 1). The patterns of results were the same as in the preceding analysis; the physician was the most accurate, followed by the informant, and the participant self-rating was the least accurate. Specifically, in the CDR 0.5 group, overall correct classification was 72.7% for the physician, 61.2% for informants, and 51.6% for participants. In the CDR 1 group, overall correct classification was 76.5% for the physician, 68.7% for informants, and 56.2% for participants.

DISCUSSION

To the authors' knowledge, the present study is the first to examine ratings of driving ability in people with AD made by different types of raters, including self, informant, experienced neurologist, and driving instructor. Of central interest to this study, it was found that the neurologist's assessments were significantly related to an on-road driving score, the primary index of driving ability. When related to instructor ratings of safety, the experienced neurologist's ratings were the most sensitive and specific. Taken together, these findings

support the idea that physicians with considerable experience in dementia may be able to approximately gauge driving abilities in patients with dementia.

The neurologist in this study was a dementia specialist who made his judgments based on an extensive clinical interview, including specific questions regarding any recent history of driving problems, as well as the multiple tests included in his diagnostic dementia evaluation. It remains to be seen whether other physicians (who may use different assessment methods or have less experience or knowledge regarding driving in dementia) are also valid predictors of driving abilities. For example, further validation of the assessment methods suggested in the recent publication from the American Medical Association, *Physician's Guide to Assessing and Counseling Older Drivers*, which may be used by a broad range of physicians to assess older drivers, is warranted.

This finding is somewhat consistent with findings from the only other study to examine physician ratings of driving abilities, in which it was found that the physician's prediction (pass, borderline, or fail) of the patient's abilities correlated with total score on an on-road driving test.[16] In the present study, only MMSE score appeared to influence the physician's ratings, in the expected direction. Research findings suggesting that MMSE score correlates with driving abilities somewhat supports this, but this relationship may be weaker at the higher end of the scale (≥27).[26,27] Furthermore, MMSE score has not been found to be a significant predictor of future crashes or violations.[15,16]

The findings from the current study also suggest that an experienced driving instructor makes more stringent assessments of driving abilities in people with AD than other types of raters, despite being blinded to AD status. That is, the instructor was more likely than the neurologist or the informant to deem driving abilities as marginal or unsafe. To some degree, these findings may not be surprising, because the driving instructor had specific information about the person's driving abilities, having just completed an on-road evaluation, and therefore may have felt more comfortable making such a determination, particularly given his or her expertise in this area. Alternatively, only the neurologist and the informant had information about the patient's diagnosis of AD, and the informant had extensive experience with this individual as a driver.

Previous results regarding informant ratings of driving abilities in individuals with dementia have been mixed. The present findings suggest that, although they are more stringent than the individual with AD in deeming driving abilities safe, the informants' ratings do not relate significantly to performance on an on-road driving test. Informants may not be aware of the effect of AD on driving abilities. Alternatively, the effect of driving cessation may extend beyond the individual with AD to family members who, for example, may feel uncomfortable with being the primary driver or may have to supply alternative transportation. Thus, another possibility is that informants may be motivated, consciously or unconsciously, to deny any driving impairment in the individual with AD, despite indicators to the contrary. This may place physicians in a difficult position if family members do not adopt a truly honest and collaborative stance.

The results of this study must be investigated with other types of physicians; to that end, further research is being conducted to define the training and experience as well as the components of a physician's accurate prediction. Additional research should also address prospective prediction of other important measures of driving competence in those rated as safe or marginal on road tests, such as future crashes or violations (which may be considered by some as better index of "true" driving abilities).[28] Finally, given the known progression of AD, and specifically the documented longitudinal decline of driving abilities in dementia,[29] tests of driving abilities must also be examined using multiple measurements

over time. This would enhance knowledge about the long-range predictive value of ratings by a physician or informant.

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References

1. Post SG, Whitehouse P. Fairhill guidelines of the care of people with Alzheimer's disease: A clinical summary. J Am Geriatr Soc. 1995; 43:1423–1429. [PubMed: 7490397]
2. Reuben DB, Silliman RA, Traines M. The aging driver. Medicine, policy, and ethics. J Am Geriatr Soc. 1988; 36:1135–1142. [PubMed: 3057052]
3. Persson D. The elderly driver: Deciding when to stop. The Gerontol. 1993; 33:88–91.
4. Taylor BD, Tripodes S. The effects of driving cessation on the elderly with dementia and their informants. Accid Anal Prev. 2001; 33:519–528. [PubMed: 11426682]
5. Marottoli RA, Cooney LM, Wagner R, et al. Predictors of automobile crashes and moving violations among elderly drivers. Ann Intern Med. 1994; 121:842–846. [PubMed: 7978696]
6. Ott BR, Lafleche G, Whelihan WM, et al. Impaired awareness of deficits in Alzheimer disease. Alzheimer Dis Assoc Disord. 1996; 10:68–76. [PubMed: 8727167]
7. Green J, Goldstein FC, Sirockman BE, et al. Variable awareness of deficits in Alzheimer's disease. Neuropsychiatry Neuropsychol Behav Neurol. 1993; 6:159–165.
8. Hunt LA, Morris JC, Edwards D, et al. Driving performance in persons with mild senile dementia of the Alzheimer type. J Am Geriatr Soc. 1993; 41:747–753. [PubMed: 8315186]
9. Dobbs AR. Evaluating the driving competence of dementia patients. Alzheimer Dis Assoc Disord. 1997; 11(Suppl 1):8–12. [PubMed: 9194961]
10. Cotrell V, Wild K. Longitudinal study of self-imposed driving restrictions and deficits awareness in patients with Alzheimer disease. Alzheimer Dis Assoc Disord. 1999; 13:151–156. [PubMed: 10485574]
11. O'Neill D, Neubauer K, Boyle M, et al. Dementia and driving. J R Soc Med. 1992; 85:199–202. [PubMed: 1433058]
12. Wild K, Cotrell V. Identifying driving impairment in Alzheimer disease: A comparison of self and observer reports versus driving evaluation. Alzheimer Dis Assoc Disord. 2003; 17:27–34. [PubMed: 12621317]
13. Bedard M, Molloy DW, Lever JA. Factors associated with motor vehicle crashes in cognitively impaired older adults. Alzheimer Dis Assoc Disord. 1998; 12:135–139. [PubMed: 9772014]
14. O'Neill D. Predicting and coping with the consequences of stopping driving. Alzheimer Dis Assoc Disord. 1997; 11(Suppl 1):70–72. [PubMed: 9194972]
15. Trobe JD, Waller PF, Cook-Flannagan CA, et al. Crashes and violations among drivers with Alzheimer's disease. Arch Neurol. 1996; 53:411–416. [PubMed: 8624215]
16. Fox GK, Bowden SC, Bashford GM, et al. Alzheimer's disease and driving: Prediction and assessment of driving performance. J Am Geriatr Soc. 1997; 45:949–953. [PubMed: 9256847]
17. Morris JC. The Clinical Dementia Rating: Current version and scoring rules. Neurology. 1993; 43:2412–2414. [PubMed: 8232972]
18. McKhann G, Drachman D, Folstein M, et al. Clinical Diagnosis of Alzheimer's Disease. Report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. Neurology. 1984; 34:939–944. [PubMed: 6610841]
19. Morris JC, Price AL. Pathologic correlates of nondemented aging, mild cognitive impairment, and early-stage Alzheimer's disease. J Mol Neurosci. 2001; 17:101–118. [PubMed: 11816784]
20. Storandt M, Grant EA, Miller JP, et al. Rates of progression in mild cognitive impairment and early Alzheimer's disease. Neurology. 2002; 59:1034–1041. [PubMed: 12370458]
21. Folstein, MF.; Folstein, SE.; McHugh, PR. Mini-Mental State Examination (MMSE). Lutz, FL: Psychological Assessment Resources, Inc; 2002.

22. Marottoli RA, Cooney LM, Tinetti ME. Self-report versus state records for identifying crashes among older drivers. J Gerontol A Biol Sci Med Sci. 1997; 52A:M184–M187. [PubMed: 9158561]

23. Friedland RP, Koss E, Kumar A, et al. Motor vehicle crashes in dementia of the Alzheimer type. Ann Neurol. 1988; 24:782–786. [PubMed: 3207361]

24. Hunt LA, Murphy CF, Carr D, et al. Reliability of the Washington University Road Test. Arch Neurol. 1997; 54:707–712. [PubMed: 9193205]

25. Wang, CC.; Kosinski, CJ.; Schwartzberg, JG., et al. Physician's guide to assessing and counseling older drivers. Washington, DC: National Highway Traffic Safety Administration; 2003.

26. Fitten LJ, Perryman KM, Wilkinson C, et al. Alzheimer and vascular dementias and driving: A prospective road and laboratory study. JAMA. 1995; 273:1360–1365. [PubMed: 7715061]

27. Lesikar SE, Gallo JJ, Rebok JW, et al. Prospective study of brief neuropsychological measures to assess crash risk in older primary care patients. J Am Board Fam Pract. 2002; 15:11–19. [PubMed: 11841134]

28. Odenheimer GL, Beaudet M, Jette AM, et al. Performance-based driving evaluation of the elderly driver: Safety, reliability, and validity. J Gerontol. 1994; 49:M153–M159. [PubMed: 8014389]

29. Duchek JM, Carr DB, Hunt L, et al. Longitudinal driving performance in early-stage dementia of the Alzheimer's type. J Am Geriatr Soc. 2003; 51:1342–1347. [PubMed: 14511152]

Table 1

Participant and Informant Driving Characteristics

Characteristic	Control (CDR = 0) (n = 25)	Very Mild AD (CDR = 0.5) (n = 33)	Mild AD (CDR = 1.0) (n = 17)	F/Chi-Square	*P*-value
Age, mean ± SD	72.4 ± 10.2	77.1 ± 5.3	73.2 ± 8.3	2.81	.07
Sex, M/F	10/15	21/12	10/7	3.36	.19
Education, mean ± SD	14.7 ± 3.0	13.6 ± 3.5	12.5 ± 3.4	2.14	.13
Mini-Mental State Examination score, mean ± SD*	29.1 ± 1.2	24.9 ± 3.6	21.5 ± 3.9	31.15	.00
Driving miles/month, mean ± SD	133.8 ± 96.9	65.4 ± 60.7	75.7 ± 83.4	5.45	.01
≥1 accidents/3 years, n†	1	8	4	5.22	.27
≥1 traffic violations/3 years, n†	3	2	1	3.04	.52
Total driving score, mean ± SD‡	5.2 ± 5.2	13.8 ± 8.4	13.1 ± 9.7	9.54	.00
Informant sex, M/F	3/19	9/28	3/13	3.36	.19
Miles driven with informant/month, mean ± SD	31.7 ± 66.0	36.5 ± 59.5	16.8 ± 18.5	0.73	.48

*Range 0 (worst) to 30 (best).

†Number of participants who had one or more accidents/violations over the previous 3 years.

‡Range 0 (best) to 108 (worst).

AD = Alzheimer's disease; SD = standard deviation; M = male; F = female; CDR = Clinical Dementia Rating Scale.

Table 2

Ratings of Driving Ability by Participant, Informant, Physician, and Driving Instructor

	Normal Control			Very Mild AD			Mild AD		
	Safe	**Marginal**	**Impaired**	**Safe**	**Marginal**	**Impaired**	**Safe**	**Marginal**	**Impaired**
Rater	**Frequency (Percentage)**								
Participant	24 (100)	0 (0)	0 (0)	31 (94)	2 (6)	0 (0)	16 (94)	1 (6)	0 (0)
Informant	24 (100)	0 (0)	0 (0)	22 (76)	7 (24)	0 (0)	8 (50)	8 (50)	0 (0)
Physician	25 (100)	0 (0)	0 (0)	22 (69)	9 (28)	1 (3)	9 (56)	6 (38)	1 (6)
Instructor	21 (84)	4 (16)	0 (0)	15 (46)	13 (39)	5 (15)	7 (41)	6 (35)	4 (24)

AD = Alzheimer’s disease.

Table 3

Predictive Value of Ratings by Participant, Informant, and Physician for the Categorical Rating of “Safe” by Driving Instructor

	Participant Self-Rating	Informant Rating	Physician Rating
Rater Characteristic		**%**	
Sensitivity	100	81.8	90.9
Specificity	10.7	47.8	60.7
Positive predictive value	46.7	60.0	64.5
Negative predictive value	100	73.3	89.5
Correctly classified	53.2	64.4	74.0