

**Improving the Safety *and* the Mobility of Older Drivers:
A Conceptual Framework**

Bonnie M. Dobbs¹, PhD and Allen R. Dobbs², PhD

¹University of Alberta, ² DriveABLE Assessment Centres
Edmonton, Alberta, Canada

Paper to be presented at the 2001: Road Safety Research, Policing and Education Conference,
Australia, November 19-20th.

**Improving the Safety *and* the Mobility of Older Drivers:
A Conceptual Framework**

Mobility is important to the quality of life of older people and the automobile plays a central role in preserving that mobility. In fact, driving has become such an integral part of our lives that many of our decisions (e.g., where to live, social activities) presume we will continue to have access to the private vehicle. Research reveals that the majority of older drivers continue to drive, many into their eighth and ninth decades of life (Jette & Branch, 1992). Research also reveals that many older drivers compensate for age-related declines in abilities by reducing their annual mileage as well as regulating *when* and *where* they drive. For example, studies indicate that many older drivers minimize or eliminate night time driving (Eisenhandler, 1990; Forrest et al., 1997; Holland & Rabbitt, 1992; Kosnik et al., 1990; Mortimer, 1988; Schlag, 1993), restrict or avoid week-end driving (Stutts et al., 1989), avoid driving during rush hours (Ball & Owsley, 1991), and during adverse weather conditions (Eisenhandler, 1990; Forrest et al., 1997; Kosnik et al., 1990; Moritmer, 1988, Schlag, 1993).

However, despite this apparent self-regulation, the crash rates of older drivers rival those of the high risk younger driver when exposure is equated. Clearly, a self-regulation strategy is not sufficient as a public safety strategy. The self-regulation strategy of older drivers is based on the assumption that declines in sensory or psychomotor performance, mobility disability, and/or health status result in appropriate changes in driving behaviors. A critical examination of that literature, however, reveals the lack of a clear relationship with ability declines and driving behavior. For example, in some instances, age-associated changes in sensory and psychomotor

abilities have been associated with alterations in driving behaviors among older individuals (Persson, 1993, Gilley et al., 1991). At the same time, research also indicates that a substantial number of older drivers with similar or identical deficits do *not* show the same pattern of regulatory driving behavior. A recent investigation reveals that although a significant number of elderly people with poor vision discontinued driving, a sizeable proportion (42 percent) continued to drive (Marottoli et al., 1993). Interestingly, results from Owsley et al. (1991) reveal that many older drivers with visual impairments fail to modify their driving behavior on their own accord.

There also is a suggestion, with support from a small, but growing, body of literature, that health status contributes to driving restrictions or driving cessation. In a survey of community based elderly individuals, Campbell et al. (1993) found that six health conditions (macular degeneration, retinal haemorrhage, any condition limiting Activities of Daily Living performance, Parkinson's Disease, stroke related residual paralysis or weakness, and syncope) were associated with about half of all decisions to voluntarily stop driving. In fact, drivers with three or more of the disabling conditions were 60 times more likely to give up driving than someone without any of the conditions. Nevertheless, many of those still driving in the Campbell et al. study also had the same highly disabling conditions. That is, 42 percent of those with two or more of the disabling conditions that were found to be predictive of driving cessation had *not* stopped driving. Sixty-five percent of individuals with episodes of syncope in this same study had *not* stopped driving, despite the fact that this condition mandates a 12-month driving suspension in the participant's jurisdiction. In addition, many individuals with a dementia continue to drive, despite declines in abilities necessary for safe driving. Not surprisingly, as a group, individuals with a dementia have crash rates that far exceed those of non-dementing seniors (Cooper et al., 1993; Drachman & Swearer, 1993; Dubinsky et al., 1992; Friedland et al., 1988; Gilley et al., 1991; Lucas-Blaustein et al., 1988; O'Neill et al., 1992; Tuokko et al., 1995).

Most investigations of possible changes in the driving patterns of older drivers have examined how a person's status on factors such as those reviewed above is related to changes in driving. The straight-forward assumption that changes in relevant factors (e.g., sensory, psychomotor, health status) should be directly related to driving changes led to the collection of a great deal of information and clearly advanced the knowledge base on older drivers. However, a critical examination of that literature makes it clear that the relationships do not allow much beyond modest predictions about which factors may or may not lead to modifications in driving patterns. Sometimes the presence of a condition that should affect driving competence (e.g., cataracts) does result in modifications in where, when, and if the person drives, but other times it does not. The nature of the inconsistencies in the findings suggests that it is the presumption of a direct relationship between ability factors and driving behavior that is a major constraint.

The major difficulty with the assumption of a direct relationship between changes in factors relevant to driving and changes in driving behavior seems to be the very real possibility that the changes will not be noticed by the person. That is, many physical and mental changes have very slow progressive changes and these changes may not be noticed. Other changes may themselves impair insight (e.g., dementia), and it is not reasonable to expect the person to be aware of the changes in these cases. It also is possible that people stop driving when they think they are no longer competent when, in fact, they are quite competent. We argue that what is needed is a new

conceptualization which more effectively allows for predicting and accounting for when changes in driving behaviors will occur. A viable alternative is a shift to perceived competency as the relevant determining variable (Dobbs & Dobbs, 2000).

In the proposed *perceived competency* framework, we argue that in order for there to be self-induced changes in driving behavior patterns to accommodate competence changes, there needs to be more than just *changes* in competence. The person (or someone of influence) must first *recognize* that competence has changed *and* that this will affect driving. For this reason, the emphasis in the new framework is on whether the person *perceives* there to have been a change in some aspect of their mental or physical competence which would alter their ability to drive (Dobbs & Dobbs, 2000). If the person does not perceive there to be a change in competence which will affect driving, it is probably unreasonable to presume that driving patterns will change, regardless of whether or not competence has changed. The focus on perception of competence also implies that if the person perceives their competence to have changed, then the driving patterns will change, regardless of whether or not there really was a change in real competence.

Extension of the framework to include the relationship between 'perceived level of competence' and 'real level of competence' helps to advance our understanding of when driving self-regulations/restrictions or driving cessation are appropriate or not. That is, a person's real level of competence tells us whether that person *should* or *should not* modify their driving. The perceived level of competence, it is suggested, tells us whether the person *will* modify their driving. Combining the two, then, provides the marker of whether continuation or modification of driving patterns is appropriate. As can be seen in Table 1, if a person modifies their driving patterns in accordance with their objective level of competence, then the outcome is appropriate. If the person modifies their driving pattern in a way that is discordant with their real level of competence, then the outcome is inappropriate. These suggested relationships are straightforward and probably not contentious. Nonetheless, a framework that includes perceived competency, real competency, and the relation between the two provides the basis for understanding the appropriateness (match/mismatch between perceived and real competency) of the new driving pattern. This, in turn, provides useful information about the need for interventions.

Table 1: The relationship among real and perceived competence matches and mismatches, mobility outcomes, and appropriateness of the outcomes¹.

Competence		Mobility Outcome	Appropriateness of Outcome
Real	Perceived		
Yes	Yes	Continued driving	Appropriate
Yes	No	Driving restriction or cessation	Inappropriate restriction
No	Yes	Continued Driving	At-risk
No	No	Driving cessation	Appropriate restriction

Real Competence - Perceived Competence.

If a person is competent to drive, the most appropriate mobility outcome would be non-restriction of driving activity. Within our framework, the perception of driving competency in the presence of real driving competency results in appropriate non-restrictions in driving activity (Row 1) This cell in the framework most likely represents the majority of the older driver population. That is, research suggests that, on a *per person* basis, most elderly drivers are safe and competent drivers (U.S. DOT, 1993). A major reason advanced for the safety of older drivers is that the changes associated with normal aging are not likely to make drivers incompetent. Moreover, when there are only age-associated changes, older drivers make the necessary adjustments (Cooper & Rothe, 1989; Eisenhandler, 1990; Jette & Branch, 1992; Kosnik et al., 1990; Mortimer, 1988; Retchin et al., 1988).

For all of the three remaining combinations of real and perceived competence, there is something amiss with regard to safety or mobility.

¹ It is recognized that perceived and real competence are continuous variables. However, to more clearly present the essence of the framework, perceived and real competence changes have been forced into a competence-incompetence distinction. Within the real competency-incompetency distinction made here, people who have only age-associated declines, which may lead to some *minor limitations* in their driving, will be considered under the competent label. Real incompetency is identified with abnormal/extreme conditions (e.g., pathologies) which severely affect abilities in sensory, motor, or cognitive domains, and are associated with clear incompetency to drive. Perceived competence similarly will be dichotomized into perceived competence and perceived incompetency. Considering only these dichotomies leaves four combinations of matchings between perceived and real competence. These four matches, the predicted mobility outcome, and the appropriateness of that outcome are shown in Table 1.

Real Competence - Perceived Incompetence.

The mismatch shown in the second row represents the situation where the individual is competent to drive but perceives him/herself as incompetent. This case is one that begins to show the importance of considering the match between real and perceived competence for preserving the mobility of older drivers. This mismatch is likely to result in inappropriate driving restriction or driving cessation because the individual *perceives* him/herself as incompetent. Because of the previous orientation, this possibility has not received much, if any, research attention. However, many older female drivers may provide a good example of inappropriate driving restriction or cessation based on perceived incompetence in the presence of real competence. Importantly, unwarranted restrictions in driving have the potential consequence of inappropriate loss of mobility and the isolation and loss of independence which too often accompanies restricted mobility.

A consideration of rows one and two shows why it is important to consider more than real competence if one is interested in mobility. If only real competence had been considered, no mobility problems would have been anticipated for those who misperceive their competence. Moreover, the need for interventions would not have been evident if one only considered real competence. Such an intervention might involve attitude change to bring perceptions of competence in line with real competence.

Real Incompetence - Perceived Competence.

This cell in the framework represents those individuals who perceive themselves as competent to drive and continue to drive in the absence of real competence (Row 3). In terms of driving, this combination places the person at risk for vehicle crashes. Although there is, again, a paucity of research in this area, this cell is, undoubtedly, the most researched of the framework presented here. For example, studies indicate that many individuals with dementia continue to drive despite a significant deterioration in skill (Dobbs, 1997; Fitten et al., 1995). Crash rates of individuals with dementia are reported to be 3 to 7 times that of healthy older drivers. (Cooper et al., 1993; Drachman & Swearer, 1993; Dubinsky et al., 1992; Friedland et al., 1988; Gilley et al., 1991; Lucas-Blaustein et al., 1988; O'Neill et al., 1992; Tuokko et al., 1995). Results from our research (Dobbs & Dobbs, 1999) reveal that the majority of individuals with a dementing illness fail to recognize their declines in competence. It is not surprising, therefore, that many individuals with a dementia do not appropriately restrict their driving (Dobbs, 1999). Perhaps no other subgroup of the driving population so emphatically underscores the need to shift to a framework that includes self-perceptions of competence as a central variable for determining driving patterns.

Real Incompetence, Perceived Incompetence.

For those individuals who are incompetent to drive, the most appropriate mobility outcome would be cessation of driving activity. In terms of our framework, if an individual perceives him/herself as incompetent in the presence of real incompetence, the result would be an appropriate restriction in driving activity (Row 4). For individuals falling within this category, mobility alternatives need to be considered unless interventions that alter both real competence and self-perceived competence are possible.

In summary, as much as the need to consider the perception of competence may seem obvious once it is pointed out, the advancements to be gained should not be glossed over or left unrecognized. The distinction between perceived competence and perceived incompetence can help to resolve some of the apparent conflicts in the literature. Moreover, an explicit consideration of perceived competence can enhance the predictive/explanatory power for the effect of a wide variety of competence variables on driving status (e.g., physical, mental, fiscal) as well as provide a considerable advancement regarding the need for interventions, and even about the type of interventions that would be warranted.

References

- Ball, K., & Owsley, C. (1991). Identifying correlates of accident involvement for the older driver. *Human Factors*, 33, 583-595.
- Ball, K., & Owsley, C. (2000). Increasing mobility/reducing accidents of older drivers. In K.W. Schaie & M. Pietrucha (Eds.) *Mobility and transportation in the elderly* (pp. 213-250). New York: Springer Publishing.
- Campbell, M. K., Bush, T. L., & Hale, W. E. (1993). Medical conditions associated with driving cessation in community-dwelling, ambulatory elders. *Journal of Gerontology: SOCIAL SCIENCES*, 48, S230-S234.
- Cooper, P. J., Tallman, K., Tuokko, H., & Beattie B.L. (1993). Vehicle crash involvement and cognitive deficits of older drivers. *Journal of Safety Research*, 24, 9-17.
- Cooper, P. J., & Rothe, J. P. (1989). *Elderly drivers' views of self and driving in relation to the evidence of accident data*. Paper Presented at the International Congress of Gerontology, Mexico.
- Dobbs A.R. (1997). Evaluating the driving competence of dementia patients. *Alzheimer Disease and Associated Disorder*, 11(Suppl 1), 8-12.
- Dobbs, A.R., & Dobbs, B.M. (2000). The role of concordance between perceived and real competence for mobility outcomes. In K.W. Schaie & M. Pietrucha (Eds.) *Mobility and transportation in the elderly* (pp. 251-168). New York: Springer Publishing.
- Dobbs, B.M. (1999). *Self-Perceptions of Competence as Determiners of Driving Patterns*. Doctoral dissertation, University of Alberta, Edmonton, Canada.
- Dobbs, B.M. & Dobbs, A.R. (1999). Gender differences in driving patterns among persons with dementia. Paper presented at the Human Factors Workshop *Improving the Safe Mobility for Older Women*, Transportation Research Board 78th Annual Meeting, January 10-14, Washington, DC.
- Drachman, D. A., & Swearer, J. M. (1993). Driving and Alzheimer's disease: The risk of crashes. *Neurology*, 43, 2348-2456.
- Dubinsky, R. M., Williamson, A., Gray, C. S., & Glatt, S. L. (1992). Driving in Alzheimer's disease. *Journal of the American Geriatrics Society*, 40, 1112-1116.
- Eisenhandler, S. A. (1990). The asphalt identikit: Old age and the driver's license. *International Journal of Aging & Human Development*, 30, 1990, 1-14.
- Fitten, L. J., Perryman, K. M., Wilkinson, C. J., Little, R. J., Burns, M. M., Pachana, N., Mervis, J. R., Malmgen, R., Siembieda, D. W., & Ganzel, S. (1995). Alzheimer and vascular

dementias and driving A prospective road and laboratory study. *Journal of the American Medical Association*, 273, 1360-1365.

Forrest, K. Y. Z., Bunker, C. H., Songer, T. J., Cohen, J. H., & Cauley, J. A. (1997). Driving patterns and medical conditions in older women. *Journal of the American Geriatrics Society*, 45, 1214-1218.

Friedland, R. P., Koss, E., Kumar, A., Gaine, S., Metzler, D., Haxtby, J. V., & Moore, A. (1988). Motor vehicle crashes in dementia of the Alzheimer type. *Annals of Neurology*, 24, 782-786.

Gilley, D. W., Wilson, R. S., Bennett, D. A., Stebbins, G. T., Bernard, B. A., Whalen, M. E., & Fos, J. H. (1991). Cessation of driving and unsafe motor vehicle operation by dementia patients. *Archives of Internal Medicine*, 151, 941-946.

Holland, C. A., & Rabbitt, P. M. A. (1992). People's awareness of their age-related sensory and cognitive deficits and the implications for road safety. *Applied Cognitive Psychology*, 6, 217-231.

Kosnick, W.D., Sekuler, R., & Kline, D.W. (1990). Self-reported visual problems of older drivers. *Human Factors*, 32, 596-608.

Jette, A. M., & Branch, L. G. (1992). A ten year follow-up of driving patterns among the community-swelling elderly. *Human Factors*, 34, 25-31.

Lucas-Blaustein, M. J., Filipp, L., Dungan, C., & Tune, L. (1988). Driving in patients with dementia. *Journal of the American Geriatrics Society*, 36, 1087-1091.

Marottoli, R. A., Ostfeld, A. M., Merrill, S. S., Perlman, G. D., Foley, D. J., & Cooney, L. M. Jr. (1993). Driving cessation and changes in mileage driven among elderly individuals. *Journal of Gerontology: SOCIAL SCIENCES*, 48, S255-S260.

Mortimer, R. G. (1988). Headlamp performance factors affecting the visibility of older drivers in night driving. *Transportation in an aging society*, 2,379-403.

O'Neill, D., Neubauer, K., Boyle, M., Gerrard, J., Surmon, D., & Wilcock, G. K. (1992). Dementia and driving. *Journal of the Royal Society of Medicine*, 85, 199-202

Persson, D. (1993). The elderly driver: Deciding when to stop. *The Gerontologist*, 33, 88-91.

Retchin, S. M., Cox, J., Fox, M., & Irwin, L. (1988). Performance-based measurements among elderly drivers and nondrivers. *Journal of the American Geriatrics Society*, 36, 813-819.

Tuokko, H., Tallman, K., Beattie, B. L., & Cooper, P. e. al. (1995). An examination of driving records in a dementia clinic. *Journals of Gerontology Series B-Psychological Sciences & Social Sciences*, 50B, S173-S181.

Schalg, B. (1993). Elderly drivers in Germany: fitness and driving behavior. *Accident Analysis & Prevention*, 25, 47-55.

Stutts, J.C., Waller, P.F., & Martell, C. (1989). *Older driver population and crash involvement trends 1974-1986*. Paper presented at the 33rd Annual Proceedings of the Association for the Advancement of Automotive Medicine, October 2-4, Baltimore, Maryland.

U.S. Department of Transportation (1993). *Addressing the safety issues related to younger and older drivers*. A report to Congress January 19, 1993 on the Research Agenda of the National Highway Traffic Safety Administration. Washington, DC: U.S. Department of Transportation.