HHS Public Access

Author manuscript

Aging Ment Health. Author manuscript; available in PMC 2017 November 28.

Published in final edited form as:

Aging Ment Health. 2012 ; 16(1): 75–83. doi:10.1080/13607863.2011.583633.

Examining the aging process through the stress-coping framework: application to driving cessation in later life

Moon Choi[a,*], **Kathryn Betts Adams**[b], and **Briana Mezuk**[a]

[a]Department of Epidemiology and Community Health, School of Medicine, Virginia Commonwealth University, Richmond, VA, USA

[b]Mandel School of Applied Social Sciences, Case Western Reserve University, Cleveland, OH, USA

Abstract

The aging process is marked by a series of transitions that influence multiple domains of well-being. One important transition for older adults is the process of driving cessation. Numerous studies have examined risk factors for driving cessation among older adults to identify at-risk older drivers for road safety. Recent research has focused on the consequences of driving cessation in later life for health and well-being. However, these reports have been largely empirical and are not drawn from a defined conceptual framework. Establishing a theoretical model of 'how driving cessation interacts with other processes and domains of aging' will promote synthesis of seemingly disparate findings and also link the empirical research on cessation to the broader field of gerontology. This article describes a conceptual model for articulating and examining the components of the driving cessation process based on the stress-coping paradigm. This model situates driving cessation within the context of exogenous stressors, individual vulnerabilities and coping strategies, and environmental hazards and buffers over the lifespan. This model could assist in guiding intervention strategies aimed at reducing premature driving cessation in older drivers with ameliorable impairments while assisting at-risk older drivers to reduce or stop driving in a less stressful way.

Keywords

stress; coping; functional status; quality of life/well-being; dementia and cognitive disorders

Introduction

The proportion of older persons has been steadily increasing around the world, from 8% in 1950 to 11% in 2007, and is expected to reach 22% in 2050 (United Nations, 2007). Population aging, resulting from increasing longevity and declining fertility, has profound implications for many facets of human life such as economic growth, labor markets, housing demands, epidemiology, family composition, and living arrangements (United Nations, 2007). Making cities age-friendly is one of the most effective policy approaches for

*Corresponding author. moonchoi365@gmail.com.

responding to demographic aging (World Health Organization, 2011). Accessible and affordable transportation is one of the essential features of age-friendly cities (World Health Organization, 2011), considering that mobility is critical for older adults to access social resources such as health care and to participate in community activities such as volunteering. In developed counties with low population density, such as the US, Canada, and Australia, driving private vehicles is the primary mode of transportation (O'Neill, 2000; Ross, Anstey, et al., 2009). For example, older Americans do 89% of their travels in personal vehicles (Collia, Sharp, & Giesbrecht, 2003). Thus, the ability to drive is a critical determinant of well-being in later life, and driving cessation is a stressful process for many older adults in these countries.

In the US, nearly one million drivers are estimated to stop driving because of poor health each year (Dickerson et al., 2007). As life expectancy increases, particularly the number of years spent living with some functional disability (Freedman, Martin, & Schoeni, 2002), the amount of time for older adults to live without use of an automobile is projected to similarly increase. This uncoupling of mortality from functioning has inspired the concept of a 'driving life expectancy' (Foley, Heimovitz, Guralnik, & Brock, 2002) – a notion that emphasizes the need for research that embraces a life course approach to understand seemingly discrete functional processes in later life, such as transportation utilization.

In the past 30 years, there has been a growing interest in the consequences of mobility limitations for health, particularly driving cessation. Population-based longitudinal studies have demonstrated that driving cessation is associated with elevated depressive symptoms (Fonda, Wallace, & Herzog, 2001; Marottoli, Mendes, Glass, & Williams, 1997; Ragland, Satariano, & MacLeod, 2005), decreased social interaction (Marottoli et al., 2000; Mezuk & Rebok, 2008), worsening health status (Edwards, Lunsman, Perkins, Rebok, & Roth, 2009), and increased likelihood of entering a nursing home (Freeman, Gange, Munoz, & West, 2006). As evidence of the diffuse influence of driving cessation on well-being, Kelley-Moore, Schumacher, Kahana, and Kahana (2006) found that being unable to drive was one of the most important factors that differentiated whether older adults considered themselves 'disabled' or not.

The transition to being a former driver is a process that requires adaptation in multiple domains, both for the individual and his or her social network. This transition is influenced by community resources and policies. Driving cessation is closely associated with health declines such as acquired visual, cognitive, and functional impairments. However, it is unclear whether driving cessation should simply be considered a proxy for or an indicator of these accumulated impairments, or if there are advantages to examining cessation as a unique transitional process in the trajectory of health and functional outcomes in later life. Resolving this issue is important in conceptualizing how driving cessation fits within the broader fields of aging and disability research, as well as developing prevention and intervention strategies to promote well-being throughout the life course.

Research on the predictors and consequences of driving behavior among older adults has grown significantly in the past 30 years. The focus of early studies regarding senior drivers can largely be categorized into three areas: (1) safety issues such as screening and

assessment of older drivers or factors for accident involvement (e.g., Carr, 1993; Margolis et al., 2002; Wallace, 1997), (2) predictors for driving cessation (e.g., Edwards et al., 2008; Marottoli et al., 1993), and (3) consequences of driving cessation on psychosocial and physical well-being (e.g., Edwards et al., 2009; Fonda et al., 2001; Marottoli et al., 1997; Mezuk & Rebok, 2008). Some research has also investigated the influence of cognitive impairment such as dementia or Alzheimer's disease on driving behavior (e.g., Adler, Rottunda, & Dysken, 2005; Carr, Shead, & Storandt, 2005). Although useful in articulating the correlates of cessation, the lack of a conceptual framework that integrates factors at the individual, family, community, and policy level limits our comprehensive understanding of the driving cessation process in later life. The influence of particular factors likely varies over the life course, and conceptualizing how those factors intersect with driving behavior will facilitate the development of interventions, from the individual to the policy level, that promote functioning for older adults.

The process of driving cessation shares many characteristics with other major life events (e.g., retirement or divorce). This transition is generally characterized by intermediate changes in driving status: for example, self-imposed restrictions in mobility, such as avoiding driving at night, avoiding driving in poor weather, or driving to only certain destinations (Dickerson et al., 2007). Like these other life transitions, driving cessation likely has consequences for multiple domains in life, including employment, social roles and interactions, and health. Stress-coping models of health suggest that stressors can have positive or negative consequences, depending on individual ability to adapt and cope with stressors (DeLongis & Holtzman, 2005; Taylor & Stanton, 2007). Differences exist between individuals and across environmental contexts in the ability to positively adapt to major challenges; negative consequences attributed to life events, including cessation, may reflect difficulty coping with new mobility limitations or role changes associated with this transition (Davey, 2007; Mezuk & Rebok, 2008).

Early research in gerontology and geriatrics tended to be applied rather than theoretical, seeking solutions for the problems that older adults faced (Hooyman & Kiyak, 2005). Compared to other areas, driving cessation in later life is a relatively new topic, and existing literature about driving behaviors of older drivers illustrates this applied focus. Recently, however, Lindstrom-Forneri, Tuokko, Garrett, and Molnar (2010) developed a model of driving competence and behavior based on Willis' perspective on everyday competence. This model contributed to understanding the dynamic individual-environment interaction associated with driving competence and driving performance. Lindstrom-Forneri et al. defined the outcome of their model as driving performance and focused on factors affecting driving performance. Thus, this approach has not addressed the impact of driving cessation on the quality of life among older adults, a separate and equally important public health issue.

To date, few efforts have been made to embed driving cessation research within a theoretical model that can account for the complexities involved in causes and consequences of driving cessation at both the individual and community level and synthesize these findings under a common framework. A conceptual model of the driving cessation process would explicate these dynamics and also provide a big picture of causes and consequences of driving

cessation to guide future research. This article is an explicit effort to provide a conceptual model of the driving cessation process from the stress-coping paradigm to understanding how older drivers go through the process of giving up their car keys.

The stress-coping paradigm to driving cessation

The stress paradigm has a well-structured framework for understanding life transitions with specific components including stressors, buffering factors, and outcomes. The application of the stress paradigm to the subject of the driving cessation process has the following benefits. First, the stress paradigm has been one of the most widely used conceptual frameworks for understanding psychosocial and physical well-being 'in relation to the environment' (Binstock, 1993). Mobility issues tend to be largely influenced by the residential environment of older adults. For example, older persons in rural areas are likely to experience driving cessation in a different way from those in urban areas; elders in rural areas often have very limited options for transportation other than driving their own vehicles because the low population density makes it difficult to run frequent bus services. On the other hand, older adults living in a few metropolitan areas in the US are able to use buses, subways, or taxies. Thus, driving may not be necessary for transportation mobility among some urban older adults. Second, the structure of the stress paradigm consisting of stressor, buffering factors, and outcomes is well suited to characterizing the driving cessation process. Driving cessation is a complex process wherein multiple elements interact with one another (Dellinger, Sehgal, Sleet, & Barrett-Connor, 2001; Dickerson et al., 2007); thus, this well-organized outline offers a heuristic framework for disentangling this process into specific components. Third, the stress paradigm is focused on the role of personal, environmental, and social resources and can be linked to the development of interventions derived from these resources as they may buffer outcomes of stressful life situations (Binstock, 1993). This aspect of a stress and coping model, with its focus on identifying points of intervention, enables researchers, clinicians, and policymakers to translate the findings of research to the real world (e.g., programs for aging in place such as home visiting services).

Our conceptual model of the driving cessation process was based on evidence from the literature on older drivers and their driving behaviors as it relates to general mobility (e.g., Dellinger et al., 2001; Fonda et al., 2001; Marottoli et al., 1997; Mezuk & Rebok, 2008). Existing studies have identified the reasons for driving modification (i.e., driving avoidance and cessation), factors contributing to accident involvement of older adults, the impact of driving modification on quality of life, and the influence of alternative transportation on decisions to stop driving. Figure 1 illustrates the conceptual model of the driving cessation process based on the stress paradigm.

Stressors leading to driving cessation

'Stress' refers to life-changing events which require some social and/or psychological adjustment on the part of the individual (Wheaton, 1996). Stress-coping models identify two types of stressors: primary and secondary stressors. In the driving cessation process, primary stressors mainly refer to health and functional declines. Risk of these health and functional declines is influenced by health behaviors over the lifespan (e.g., physical activity, smoking,

maintaining a healthy weight). Three of the major primary stressors involved in driving are cognitive impairment, visual impairment, and functional impairment. Cognitive functioning includes speed of processing, reasoning, and memory (Edwards et al., 2008). Previous studies have used various assessment tools to measure cognitive impairment such as Useful Field of View Test (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008; Edwards et al., 2008), Wechsler Adult Intelligence Scale (Anstey, Windsor, Luszcz, & Andrews, 2006), or diagnosis of Parkinson's diseases (Marottoli et al., 1993) and reported that cognitive impairment is a risk factor for driving cessation. Vision is estimated as 90% of sensory input to the driving task (Cox, Fox, & Irwin, 1988). Unsurprisingly, problems with eyesight were most often cited as a major challenge for driving among older adults (Ragland, Satariano, & MacLeod, 2004). A number of previous studies have examined the relationship between visual functioning (e.g., visual acuity, contrast sensitivity, visual fields, and glare sensitivity) and driving behaviors among older drivers (Freeman, Munoz, Turano, & West, 2005; Gilhotra, Mitchell, Ivers, & Cumming, 2001; Satariano, MacLeod, Cohn, & Ragland, 2004) and reported that older drivers with poor visual function are more likely to modify their driving behaviors. Finally, functional impairment has been reported as a major risk factor for driving cessation among older adults. Existing studies have employed various measures such as the Instrumental Activities of Daily Living, Short Physical Performance Battery, or SF-360 Questionnaire to assess functional impairment of older drivers and reported that poorer physical performance is a risk factor for driving cessation (Campbell, Bush, & Hale, 1993; Carr, Flood, Steger-May, Schechtman, & Binder, 2006; Edwards et al., 2008; Sims, Ahmed, Sawyer, & Allman, 2007).

These primary stressors are likely to produce secondary stressors, both for the individual and their immediate social environment (Pearlin & Schooler, 1978; Pearlin, Mullan, Semple, & Skaff, 1990). In the driving cessation process, secondary 'internal' stressors would include subjective discomfort or anxiety about driving. In a qualitative study of older adults' perspectives on driving, Adler and Rottunda (2006) reported that some former drivers mentioned that they stopped driving because of concern of causing injury to others. Similarly, Ragland et al. (2004) reported that approximately one-fifth of respondents who were asked for their reasons for driving avoidance cited concerns about being in an accident, crime, or getting lost.

Secondary 'external stressors' could be pressures on older drivers to stop driving through either informal networks or formal authorities. Informal networks include family members, friends, or neighbors, while formal authorities refer to Department of Motor Vehicles (DMV) personnel or physicians (Dobbs & Carr, 2005). Decisions to stop driving tend to be influenced by family members (Adler & Rottunda, 2006). Johnson (1995) reported that for more than half of elder former drivers living in rural areas, family played an important role in their decisions to stop driving. Healthcare professionals may also play a role in identifying early functional and health declines that may impair driving ability and bringing these to the attention to family members. In addition, DMV personnel tend to play a key role in older drivers' decisions to stop driving. Dellinger et al. (2001) noted that about one-eighth of elders stated that they stopped driving because of licensing or license renewal problems.

This differentiation of primary and secondary stressors related to driving cessation helps us understand the heterogeneity in the reasons for driving cessation. Older drivers, who are mainly influenced by internal stressors but with limited exposure to external stressors, may be more likely to voluntarily give up their car keys. Conversely, the decision to stop driving may be more involuntary among those more affected by external stressors. Adler and Rottunda (2006) have suggested the concepts of the 'proactives' and the 'reluctant accepters', respectively, to describe these groups. They defined the proactive group as those seniors who made the decision to stop driving on their own and then informed their family and friends of their intent. This proactive group is likely to experience only the internal stressors, subjective perception of difficulties in driving, with the least influence from others when they face health declines. In contrast, the reluctant accepters were conceptualized as those elders whose decision to stop driving was made jointly with family or other influential parties (Adler & Rottunda, 2006). These reluctant accepters would experience both internal stressors (perceived difficulties in driving) and external stressors (social pressure to stop driving) as their health declines.

Consequences of driving cessation

Previous studies have shown that driving cessation is associated with a range of negative outcomes for physical and psychosocial well-being such as increased depressive symptoms (Fonda et al., 2001; Marottoli et al., 1997; Ragland et al., 2005), decreased out-of-home activity levels (Marottoli et al., 2000), and decreased social integration by limiting access to networks of friends among older adults (Mezuk & Rebok, 2008). Moreover, general health was reported to decline more sharply following driving cessation (Edwards et al., 2009). Declines in health are the major risk factors for driving cessation (Campbell et al. 1993; Carr et al., 2006; Edwards et al., 2008; Sims et al., 2007), but driving cessation may further exacerbate health declines over time (Edwards et al., 2009). These existing studies have contributed to our understanding about the relationships between driving cessation and physical and psychosocial well-being; however, few investigations have examined whether outcomes vary as a function of the voluntariness of the decision to stop driving. Future study should examine differences in the effects of voluntary and involuntary driving cessation on the quality of life among older adults.

Coping and buffers

In the stress paradigm, the stressors are seen as directly affecting various outcomes, but important adaptations and buffers between stressors and outcomes may diminish these effects. Costa and McCrae (1989) defined coping as 'a set of concrete responses to a stressful situation or event that are intended to resolve the problem or reduce distress.' Previous literature has distinguished two general coping strategies: emotion-focused coping and problem-focused coping (Lazarus & Folkman, 1984). These concepts can be applied to adaptation to driving-related stressors.

Emotion-focused coping attempts to alleviate the stress of a situation with emotional reactions such as acceptance, denial, or avoidance (Lazarus & Folkman, 1984). Effective emotion-focused coping may include acceptance of the need to curtail or stop driving (Adler

& Rottunda, 2006; Johnson, 1995) or denial of the importance of driving (Ragland et al., 2004). Ineffective emotion-focused coping may include avoidant coping styles, by which older drivers avoid or deny the reality of their inability to drive and continue to drive regardless of their cognitive and/or visual impairments. Avoidant coping styles have been associated with maladaptive thoughts and actions (Knight & Sayegh, 2010), and such coping styles may delay driving cessation among at-risk older drivers.

Problem-solving coping represents attempts to do something active to alleviate stressful situations (Taylor & Aspinwall, 1996). Previous studies have examined several forms of problem-solving coping activities among older adults transitioning to non-driving, such as avoiding driving in challenging situations (e.g., Okonkwo, Wadley, Crowe, Roenker, & Ball, 2007; Ross, Clay, et al., 2009). Many older drivers cope by driving only in familiar areas, driving for short time periods, or driving only in good weather and lighting conditions (Ross, Clay, et al., 2009). Such self-regulatory driving is a strategy for older drivers to delay their driving cessation while maintaining limited mobility (e.g., Ball et al., 1998; Okonkwo et al., 2007). Another way of problem-solving coping with driving-related stressors is to use alternative transportation; older adults receiving a higher number of formal and informal transportation supports are more likely to cease driving (Choi, 2010). In many areas, older adults tend to seek transportation help from their informal networks who can provide door-to-door automobile trips rather than use public transportation due to the expansive nature of rural or suburban communities (Adler & Rottunda, 2006; Johnson, 2008; Kostyniuk & Shope, 1999; Straight, 2003). Finally, driver safety and education programs are available in some communities (e.g., AARP Driver Safety Classes), and older drivers may use these programs to improve their abilities to deal with driving-related stressors (Bao & Boyle, 2009) and to promote limited independent mobility.

The stress paradigm emphasizes the buffering influence of personal, environmental, and social resources on the relationship between stressors and health and well-being (Binstock, 1993) and a handful of studies have applied this framework to the process of driving cessation. Fonda et al. (2001) evaluated the buffering effect of the presence of a spouse who drove on the relationship between driving cessation and worsening of depressive symptoms among older adults and found that having a driving spouse did not mitigate the impact of cessation on depressive symptoms. Mezuk and Rebok (2008) reported that the association between driving cessation and reduced friends network was not mediated by the ability to use public transportation, suggesting that access to transportation alternatives may not buffer the negative consequences of driving cessation on psychosocial well-being. In their analysis of data from a population-based sample of older Australians, Windsor, Anstey, Butterworth, Luszcz, and Andrews (2007) reported that sense of perceived control acted as a social-cognitive mediator linking driving cessation and depressive symptoms; those who stopped driving reported a decreased sense of control over the 2-year period (Windsor et al., 2007). Considering this finding, interventions that promote personal sense of control (e.g., using an alternative vehicle such as an electronic scooter to allow former drivers to autonomously move around the community; opportunities to participate in social activities which do not require depending on others for transportation; or options for shopping though the Internet or phone) might serve as buffers against depressive symptomology. The identification of social resources and activities that alleviate the negative impact of driving cessation on

physical and psychosocial functioning remains an important issue for families, healthcare providers, and policymakers.

Incorporating spatial and temporal context into the stress paradigm

The driving cessation process takes place within spatial (e.g., residential environment, living arrangements) contexts. Urban environments are tightly associated with proximity to social resources (e.g., community centers, churches, and stores) and availability of public transportation, which may influence driving behaviors among older adults. Kington, Reuben, Rogowski, and Lillard (1994) reported that older adults in urban counties were more likely to stop driving after the age of 50 relative to those living rural counties. Johnson (2002) explored the reasons why rural older adults continued to drive against the advice of health professionals, family, or friends and found that self-reliance and the fear of losing independence strongly influenced this decision. Living arrangements are another influential aspect of spatial context for older adults during this process. Kington et al. (1994) reported that the number of adults in a household was positively associated with driving cessation.

Research on older drivers has focused on the individual level, and few studies have attempted to examine the influence of social policy on driving cessation, yet public policy on the driving environment may influence driving behaviors among older adults. For example, the Federal Highway Administration has recognized the importance of improving roads and highways for the safety of older drivers and published a handbook entitled ‘Highway Design Handbook for Older Drivers and Pedestrians,’ which contains recommendations for highway design elements such as at-grade intersections, inter-changes, or roadway curvature (Staplin, Lococo, Byington, & Harkey, 2001). This type of initiative may influence driving behaviors among older adults in relation to changes in driving environments.

Furthermore, policy level factors may affect the temporal context or timing of driving modification. Koulikov (2005) examined the impact of state licensing and renewal policies on driving behaviors among older Americans. In states with less-developed relicensing policies and no provisions for restricted licensing, older drivers tended to stop driving altogether without a transitional stage of restricted driving such as limiting their driving to short trips (Koulikov, 2005). Nasvadi and Wister (2009) tested whether restricted licenses (e.g., daylight driving only) lowered crash risk and reported that restricted drivers retained a license for a longer period of time and continued to drive crash-free longer than unrestricted drivers. Communities will be interested in developing transportation policies that reflect the mobility needs and risks of older adults (e.g., improvements in road design or new forms of public transportation), and future studies should examine how such policies influence the decision to stop driving and its influence on the quality of life of older adults.

The influence of sociodemographic characteristics

Some aspects of the driving cessation process may differ or are more pronounced for particular sociodemographic groups. The oldest-old (those aged 85 and older) and women are more likely to change their driving behaviors (e.g., restrict where they will drive, avoid driving at night) than younger elders and men (Anstey et al., 2006; Bauer, Adler, Kuskowski,

& Rottunda, 2003; Brayne et al., 2000; Carr et al., 2006; Okonkwo et al., 2007). Traditional gender roles help explain this gender difference in driving cessation among older adults. Older adults grew up in the era when classical gender roles, which provided distinct tasks to women, were highly valued. These gender roles tend to influence their driving behaviors. For example, gendered daily activities such as more home-oriented hobbies (Davey, 2007) might help older women in adjusting to lives without driving private vehicles. Siren and Hakamies-Blomqvist (2005) also reported that women had limited driving experiences and travel patterns, adhering to social appropriateness and cultural norms. They suggested that women's willingness to stop driving in old age is constructed by the gender regime throughout the life course.

Previous studies of the relationship between marital status and driving cessation have produced varied results. Some studies have reported that current drivers were more likely to be married than non-drivers (e.g., Chipman, Payne, & McDonough, 1998; Siren, Hakamies-Blomqvist, & Lindeman, 2004), while others have reported that marital status was not associated with driving cessation (e.g., Edwards et al., 2008). Differences in study population characteristics (e.g., proportion of women, age range) may contribute to these conflicting results. The prevalence of widowhood in later life is substantially higher in women relative to men, and this gendered aging may moderate the relationship between marital status and risk of driving cessation. More research is needed to understand how marital status influences mobility processes in later life.

Driving a private vehicle requires financial resources to maintain a car and purchase auto insurance, and consequentially an individual's financial status tends to influence the dynamics between driving-related stressors, driving cessation, and negative outcomes in the quality of life. Older adults with lower income are more likely to stop driving (Marottoli et al., 1993) and the costs of keeping an automobile is cited as one of the main reasons to stop driving among older adults (Dellinger et al., 2001). Policies and programs aimed at promoting mobility for older adults should reflect the differing needs and resources of these groups to mitigate the influence of such disparities on the process and outcomes of driving cessation.

Conclusion

Drawing from recent empirical work and the well-established stress paradigm, this conceptual model puts forth a comprehensive framework of driving cessation as a process akin to other life events and highlights a number of factors that potentially mediate or moderate the relationship between cessation and well-being for older adults. The conceptualization presented here offers a synthetic model to motivate future research regarding factors that will promote functioning and mobility for older adults with implications for both policy and practice. The model suggests three areas in need of attention from researchers, healthcare professionals, and policymakers: (1) the identification of buffering and coping strategies beyond individual behavior that influence the driving cessation process, including the role that new technologies may play (Coughlin, 2009); (2) the adaptation of established coping strategies into models of preventive care that promote mobility for older adults; and (3) the development of novel partnerships between healthcare

professionals, non-profits, private businesses, local communities, and state agencies to identify shared goals and balance risks regarding shaping transportation alternatives that reflect the needs of the aging population. These three areas are particularly relevant in areas throughout the US, Canada, Australia, and many other countries where large numbers of older adults are aging in place while, concurrently, geography, low population density and limited public transportation options mean that driving in private automobiles continues to be the most convenient and practical mode of transportation.

Acknowledgments

An earlier version of this article was presented at the 11th International Conference on Social Stress Research, Santa Fe, NM on June 1, 2008. B. Mezuk is supported by the Building Interdisciplinary Research Careers in Women's Health (BIRCWH) program (5K12-HD055881). M. Choi and B. Mezuk are supported by award number UL1RR031990 from the National Center for Research Resources and NIH Roadmap for Medical Research, National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center for Research Resources or the National Institutes of Health. The authors have no financial support for research, consultantships, speakers' forums, or other holdings that might be in conflict of interest with respect to this study.

References

Ackerman ML, Edwards JD, Ross LA, Ball K, Lunsman M. Examination of cognitive and instrumental functional performance as indicators for driving cessation risk across 3 years. The Gerontologist. 2008; 48:802–810. [PubMed: 19139253]

Adler G, Rottunda S. Older adults' perspectives on driving cessation. Journal of Aging Studies. 2006; 20:227–235.

Adler G, Rottunda S, Dysken M. The older driver with dementia: An updated literature review. Journal of Safety Research. 2005; 36:399–407. [PubMed: 16226768]

Anstey KJ, Windsor TD, Luszcz MA, Andrews GR. Predicting driving cessation over 5 years in older adults: Psychological well-being and cognitive competence are stronger predictors than physical health. Journal of the American Geriatric Society. 2006; 54:121–126.

Ball K, Owsley C, Stalvey BT, Roenker DL, Sloane ME, Graves M. Driving avoidance and functional impairment in older drivers. Accident Analysis and Prevention. 1998; 30:313–322. [PubMed: 9663290]

Bao S, Boyle LN. The influence on the road performance of older drivers. Transportation Research Record: Journal of the Transportation Research Board. 2009; 2096:76–80.

Bauer MJ, Adler G, Kuskowski MA, Rottunda S. The influence of age and gender on the driving patterns of older adults. Journal of Women and Aging. 2003; 15:3–16.

Binstock RH. Stress and aging: The journey from what, to how, to why. The Gerontologist. 1993; 33:423–425.

Brayne C, Dufouil C, Ahmed A, Dening TR, Chi LY, McGee M, Huppert FA. Very old drivers: Findings from a population cohort of people aged 84 and over. International Journal of Epidemiology. 2000; 29:704. [PubMed: 10922348]

Campbell MK, Bush TL, Hale WE. Medical conditions associated with driving cessation in community-dwelling, ambulatory elders. Journal of Gerontology: Social Sciences. 1993; 48:S230–S234.

Carr DB. Assessing older drivers for physical and cognitive impairment. Geriatrics. 1993; 48:46–48. 51.

Carr DB, Flood K, Steger-May K, Schechtman KB, Binder EF. Characteristics of frail older adult drivers. Journal of the American Geriatrics Society. 2006; 54:1125–1129. [PubMed: 16866686]

Carr DB, Shead V, Storandt M. Driving cessation in older adults with dementia of the Alzheimer's type. The Gerontologist. 2005; 45:824–827. [PubMed: 16326665]

Chipman ML, Payne J, McDonough P. To driver or not to driver: The influence of social factors on the decisions of elderly drivers. Accident Analysis and Prevention. 1998; 30:299–304. [PubMed: 9663288]

Choi, M. Doctoral dissertation. 2010. The role of transportation support in the driving cessation process among community-dwelling older adults. Retrieved from ProQuest Dissertations and Theses database (UMI No. 3417554)

Collia D, Sharp J, Giesbrecht L. The 2001 national household travel survey: A look into the travel patterns of older Americans. Journal of Safety Research. 2003; 34:461–470. [PubMed: 14636668]

Costa, PT., Jr, McCrae, RR. Personality, stress, and coping: Some lessons from a decade of research. In: Markides, KS., Cooper, CL., editors. Aging, stress and health. New York: John Wiley & Sons; 1989. p. 269-285.

Coughlin J. Longevity, lifestyle and anticipating the new demands of aging on the transportation system. Journal of Public Works Management and Policy. 2009; 13:301–311.

Cox JL, Fox MD, Irwin L. Driving and the elderly: A review of the literature. Physical and Occupational Therapy in Geriatrics. 1988; 7:7–12.

Davey JA. Older people and transport: Coping without a car. Ageing and Society. 2007; 27:49–65.

Dellinger AM, Sehgal M, Sleet DA, Barrett-Connor E. Driving cessation: What older former drivers tell us. Journal of the American Geriatrics Society. 2001; 49:431–435. [PubMed: 11347787]

DeLongis A, Holtzman S. Coping in context: The role of stress, social support, and personality in coping. Journal of Personality. 2005; 73:1633–1656. [PubMed: 16274448]

Dickerson AE, Molnar LJ, Eby DW, Adler G, Bédard M, Berg-Weger M, … Trujillo L. Transportation and aging: A research agenda for advancing safe mobility. The Gerontologist. 2007; 47:578–590. [PubMed: 17989400]

Dobbs B, Carr DB. Screening and assessment of medically at-risk drivers. Public Policy and Aging Report. 2005; 15:6–13.

Edwards JD, Lunsman M, Perkins M, Rebok GW, Roth DL. Driving cessation and health trajectories in older adults. Journal of Gerontology: Medical Sciences. 2009; 64:1290–1295.

Edwards JD, Ross LA, Ackerman ML, Small BJ, Ball KK, Bradley S, Dodson JE. Longitudinal predictors of driving cessation among older adults from the ACTIVE clinical trial. Journals of Gerontology: Series B: Psychological Sciences and Social Sciences. 2008; 63B:P6–P12.

Foley DJ, Heimovitz HK, Guralnik JM, Brock DB. Driving life expectancy of persons aged 70 years and older in the United States. American Journal of Public Health. 2002; 92:1284–1289. [PubMed: 12144985]

Fonda SJ, Wallace RB, Herzog AR. Changes in driving patterns and worsening depressive symptoms among older adults. Journals of Gerontology: Series B: Psychological Sciences and Social Sciences. 2001; 56:S343–S351.

Freeman EE, Gange SJ, Munoz B, West SK. Driving status and risk of entry into long-term care in older adults. American Journal of Public Health. 2006; 96:1254–1259. [PubMed: 16735633]

Freedman VA, Martin LG, Schoeni RF. Recent trends in disability and functioning among older adults in the United States: A systematic review. The Journal of the American Medical Association. 2002; 288:3137–3146. [PubMed: 12495394]

Freeman EE, Munoz B, Turano KA, West S. Measures of visual function and time to driving cessation in older adults. Optometry and Vision Science. 2005; 82:765–773. [PubMed: 16127343]

Gilhotra JS, Mitchell P, Ivers R, Cumming RG. Impaired vision and other factors associated with driving cessation in the elderly: The Blue Mountains eye study. Clinical and Experimental Ophthalmology. 2001; 29:104–107. [PubMed: 11446445]

Hooyman, NR., Kiyak, HA. Social gerontology: A multidisciplinary perspective. Boston, MA: Allyn and Bacon; 2005.

Johnson JE. Rural elders and the decision to stop driving. Journal of Community Health Nursing. 1995; 12:131–138. [PubMed: 7561991]

Johnson JE. Why rural elders drive against advice. Journal of Community Health Nursing. 2002; 19:237–244. [PubMed: 12494744]

Johnson JE. Informal social support networks and the maintenance of voluntary driving cessation by older rural women. Journal of Community Health Nursing. 2008; 25:65–72. [PubMed: 18449832]

Kelley-Moore JA, Schumacher JG, Kahana E, Kahana B. When do older adults become “disabled”? Social and health antecedents of perceived disability in a panel study of the oldest old. Journal of Health and Social Behavior. 2006; 47:126–141. [PubMed: 16821507]

Kington R, Reuben D, Rogowski J, Lillard L. Sociodemographic and health factors in driving patterns after 50 years of age. American Journal of Public Health. 1994; 84:1327–1329. [PubMed: 8059898]

Knight BG, Sayegh P. Cultural values and caregiving: The updated sociocultural stress and coping model. Journal of Gerontology: Psychological Sciences. 2010; 65B:5–13.

Kostyniuk, LP., Shope, JT. Choice of transportation mode among older drivers and former drivers (No. UMTRI-99-45). Ann Arbor, MI: The University of Michigan Transportation Research Institute; 1999.

Koulikov, E. Doctoral dissertation. 2005. Why older Americans stop driving: Effects of state licensing policies on reduction and cessation of driving. Retrieved from ProQuest Dissertations and Theses database (UMI No. 3186479)

Lazarus, RS., Folkman, S. Stress, appraisal, and coping. New York: Springer; 1984.

Lindstrom-Forneri W, Tuokko HA, Garrett D, Molnar F. Driving as an everyday competence: A model of driving competence and behavior. Clinical Gerontologist. 2010; 33:283–297.

Margolis KL, Kerani RP, McGovern P, Songer T, Cauley JA, Ensrud KE. Risk factors for motor vehicle crashes in older women. Journals of Gerontology: Series A: Biological Sciences and Medical Sciences. 2002; 57:M186–M191.

Marottoli RA, Mendes dL, Glass TA, Williams CS. Driving cessation and increased depressive symptoms: Prospective evidence from the new haven EPESE. Journal of the American Geriatrics Society. 1997; 45:202–206. [PubMed: 9033520]

Marottoli RA, Mendes de Leon CF, Glass TA, Williams CS, Cooney LM, Berkman LF. Consequences of driving cessation: Decreased out-of-home activity levels. Journal of Gerontology: Social Sciences. 2000; 55B:S334–S340.

Marottoli R, Ostfeld A, Merrill S, Perlman G, Foley D, Cooney L. Driving cessation and changes in mileage driven among elderly individuals. Journal of Gerontology: Social Sciences. 1993; 48:255–260.

Mezuk B, Rebok GW. Social integration and social support among older adults following driving cessation. Journal of Gerontology: Social Sciences. 2008; 63B:S298–S303.

Nasvadi GC, Wister A. Do restricted driver’s licenses lower crash risk among older drivers? A survival analysis of insurance data from British Columbia. The Gerontologist. 2009; 49:474–484. [PubMed: 19491357]

Okonkwo OC, Wadley VG, Crowe M, Roenker DL, Ball K. Self-regulation of driving in the context of impaired visual attention: Are there gender differences? Rehabilitation Psychology. 2007; 52:421–428.

O’Neill D. Safe mobility for older people. Reviews in Clinical Gerontology. 2000; 10:181–191.

Pearlin LI, Mullan JT, Semple SJ, Skaff MM. Caregiving and the stress process: An overview of concepts and their measures. The Gerontologist. 1990; 30:583–594. [PubMed: 2276631]

Pearlin LJ, Schooler C. The structure of coping. Journal of Health and Social Behavior. 1978; 19:2–21. [PubMed: 649936]

Ragland DR, Satariano WA, MacLeod KE. Reasons given by older people for limitation or avoidance of driving. The Gerontologist. 2004; 44:237–244. [PubMed: 15075420]

Ragland DR, Satariano WA, MacLeod KE. Driving cessation and increased depressive symptoms. Journals of Gerontology: Medical Sciences. 2005; 60:399–403.

Ross LA, Anstey KJ, Kiely KM, Windsor TD, Byles JE, Luszcz MA, Mitchell P. Older drivers in Australia: Trends in driving status and cognitive and visual impairment. Journal of American Geriatrics Society. 2009; 57:1868–1873.

Ross LA, Clay O, Edwards JD, Ball K, Wadley VG, Vance DE, … Joyce J. Do older drivers at-risk for crashes modify their driving over time? Journal of Gerontology: Psychological Sciences. 2009; 64B:163–170.

Satariano WA, MacLeod KE, Cohn TE, Ragland DR. Problems with vision associated with limitations or avoidance of driving in older populations. Journals of Gerontology: Series B: Psychological Sciences and Social Sciences. 2004; 59:S281–S286.

Sims RV, Ahmed A, Sawyer P, Allman RM. Self-reported health and driving cessation in community-dwelling older drivers. Journals of Gerontology: Series A: Biological Sciences and Medical Sciences. 2007; 62A:789–793.

Siren A, Hakamies-Blomqvist L. Sense and sensibility. A narrative study of older women's car driving. Transportation Research Part F: Traffic Psychology and Behaviour. 2005; 8:213–228.

Siren A, Hakamies-Blomqvist L, Lindeman M. Driving cessation and health in older women. Journal of Applied Gerontology. 2004; 23:58–69.

Staplin, L., Lococo, K., Byington, S., Harkey, D. Highway Design Handbook for Older Drivers and Pedestrians. Washington, DC: Federal Highway Administration; 2001.

Straight AK. Public policy and transportation for older people. Generations. 2003; 27:44–48.

Taylor, SE., Aspinwall, LG. Mediating and moderating processes in psychosocial stress. In: Kaplan, HB., editor. Psychosocial stress: Perspectives on structure, theory, life-stress, and methods. New York, NY: Academic Press; 1996. p. 71-110.

Taylor SE, Stanton AL. Coping resources, coping processes, and mental health. Annual Review of Clinical Psychology. 2007; 3:377–401.

United Nations. World population ageing 2007. New York: Author; 2007.

Wallace RB. Cognitive change, medical illness, and crash risk among older drivers: An epidemiological consideration. Alzheimer Disease and Associated Disorders. 1997; 11:31–37. [PubMed: 9194966]

Wheaton, B. The domains and boundaries of stress concepts. In: Kaplan, HB., editor. Psychosocial stress: Perspectives on structure, theory, life-course, and methods. New York: Academic Press; 1996. p. 29-58.

Windsor TD, Anstey KJ, Butterworth P, Luszcz MA, Andrews GR. The role of perceived control in explaining depressive symptoms associated with driving cessation in a longitudinal study. The Gerontologist. 2007; 47:215–223. [PubMed: 17440126]

World Health Organization. Global network of age-friendly cities. 2011. ©. Retrieved from http://www.who.int/ageing/age_friendly_cities_network/en/index.html

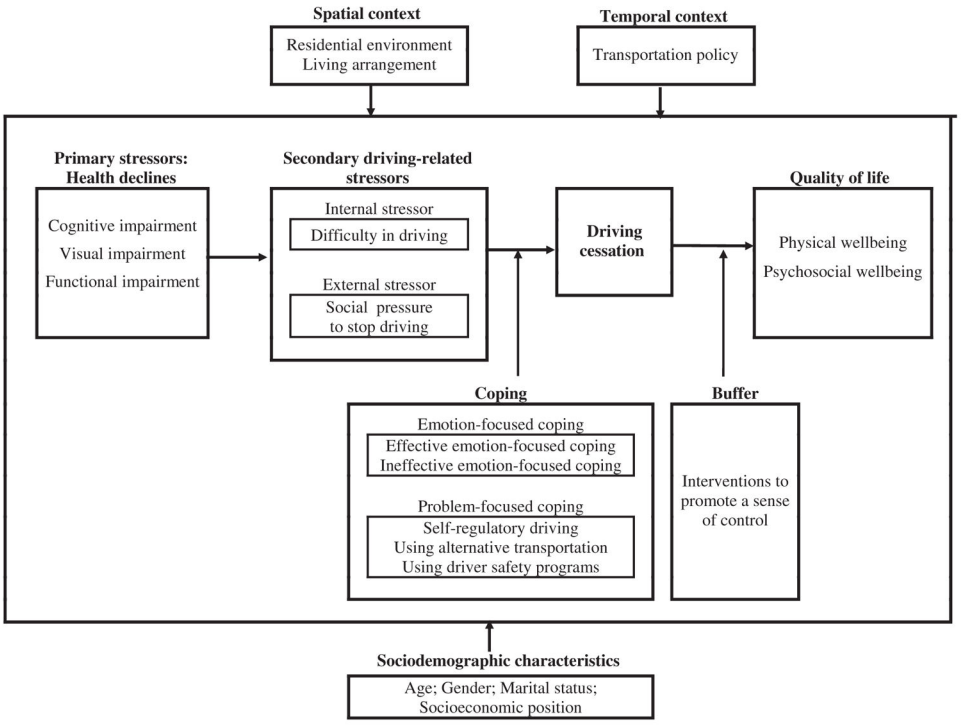

Figure 1.
A conceptual model of the driving cessation process.