Association Between Public Transportation Use and Loneliness Among Urban Elderly People Who Stop Driving

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Article

Association Between Public Transportation Use and Loneliness Among Urban Elderly People Who Stop Driving

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Abstract

Aim: To examine the association between public transportation use and loneliness in urban elderly who stop driving. **Methods:** In this cross-sectional study, we assessed 31 community-dwelling older adults who had stopped driving. Public transportation use was assessed by using frequency and divided into two groups. The users group was participants who used public transportation more than once a week and the nonusers group was participants who used public transportation less than once a week. Loneliness was measured using the Japanese version of the UCLA Loneliness Scale version 3 (UCLA.LS.ver3), with a higher score indicating greater loneliness. The independent *t* test was used to compare the UCLA.LS.ver3 scores between users and nonusers group. A multiple linear regression model was used with the UCLA.LS.ver3 score as the objective variable and public transportation use as the explanatory variable. **Results:** The UCLA.LS.ver3 score was significantly higher in the nonusers group than in the users group (nonusers group: 12.7 ± 1.9; users group: 10.1 ± 2.9, $p = .017$). After adjustments, public transportation use was significantly associated with lower loneliness ($\beta = -2.55$, $p = .029$). **Conclusion:** Public transportation use might have important role to prevent loneliness in older adults who stop driving.

Introduction

Driving is an accessible mode of transportation and a critical component of autonomy and mobility (Ragland, Satariano, & MacLeod, 2005). With the increase of older adults in Japan, the number of traffic accidents involving older drivers has also increased (National Police Agency, 2005). A previous review reported that these accidents were associated with age-related declines such as visual and cognitive impairments (Anstey, Wood, Lord, & Walker, 2005), which eventually lead to driving cessation by older adults (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008). In addition, older adults may stop driving due to financial problems after retirement (Chihuri et al., 2016). Although various changes that occur with aging may force older adults to stop driving, driving cessation affects various social factors such as decreased

out-of-home activities (Marottoli et al., 2000) and social network (Mezuk & Rebok, 2008) and increased loneliness (Smith, 2012; Weijs-Perree, Van den berg, Arentze, & Kemperman, 2015)

Loneliness is a subjective measure of suffering and quality of life unlike objective measures such as out-of-home activities or social isolation (Perissinotto, Stijacic, & Covinsky, 2012). Loneliness is associated with increased activities of daily living disability and mortality in older adults (Perissinotto et al., 2012). Therefore,

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it is necessary to prevent loneliness in older adults who stop driving.

To maintain their social contacts, other transportation options are necessary for people who are unable or unwilling to drive. A previous cross-sectional study reported that former drivers utilize more alternative transport options than current drivers (Liddle, Reaston, Pachana, Mitchell, & Gustafsson, 2014). Public transportation could be one of the transportation options instead of driving because of publicness. Although older adults who stop driving may feel less loneliness by using public transportation, it is unclear whether the use of public transportation has a positive effect on loneliness.

The purpose of this study was to investigate whether public transportation use is associated with loneliness in elderly people who stop driving.

Materials and Methods

Participants

This cross-sectional observational study recruited community-dwelling elderly aged 65 or older from five community clubs in Kobe city (population 1,540,000 area km[2]). Kobe city is an urban area in Hyogo Prefecture, Japan. The public transportation system in Kobe city is operated by three railways and a bus system. Data collection took place from August to September 2016. Three hundred and six subjects participated in this study. Of these, 32 subjects who stopped driving after reaching 65 years of age were eligible to participate in the study. After excluding those who did not complete all examinations ($n = 1$), 31 subjects were included in the analysis. To ensure that all the samples do not have cognitive impairments that would influence the outcome, the Mini-Mental State Examination (MMSE) was assessed establishing 24 as a minimum score to participate in this study. The Research Ethics Committee of Kobe University Graduate School of Health Sciences approved the study (approval number 181-1). All subjects were informed about the study by researchers and provided written informed consent before participation in accordance with the Declaration of Helsinki.

Driving Status

Driving status was determined from the following questions using a questionnaire: "Do you have a driver's license?" and "Do you drive at present?" Current drivers were defined as those with a valid driver's license who were currently driving. Former drivers were defined as those who previously held a valid driver's license but were not currently driving and never drivers were those who never held a valid driver's license (Ragland et al., 2005). The age of driving cessation was calculated as the number of years after driving cessation subtracted from the participant's age.

Public Transportation Use

Public transportation use was determined by using a questionnaire. Participants were asked the following questions about the frequency of travel using public transportation as "less than once per week," "1–3 days per week," and "4 or more per week" (Tsunoda et al., 2012). The users group was defined as those who used public transportation once or more than once per week. The nonusers group was defined as those who used public transportation less than once per week.

Loneliness

Loneliness was assessed using the six-item short form of the Japanese version of the UCLA Loneliness Scale version 3 (UCLA.LS.ver3; Toyoshima & Sato, 2013). This Japanese scale is well validated (CMIN/DF = 2.23, goodness of fit index [GFI] = .89, adjusted goodness of fit index [AGFI] = .87, root mean square error approximation [RMSEA] = .062) and has good reliability (Cronbach's α = .91) (Toyoshima & Sato, 2013). An example of an item used would be "how often do you feel lonely?" with the response options "always," "some of the time," "hardly ever," and "never." The scores on the scale were summed to provide a loneliness score ranging from 4 to 24, with a higher score indicating greater loneliness.

Other Variables

Demographic data were recorded, including age, gender, years of education, living status, housemate's driving status, annual household income, and self-rated health (1 = "excellent" to 5 = "poor"). Body mass index (BMI) was calculated as weight (kg) divided by height (m[2]). Mobility was assessed by gate speed. Social network was assessed using the Lubben Social Network Scale (LSNS; Kurimoto et al., 2009). Cognitive function was assessed using MMSE (Folstein, Folstein, & McHugh, 1975). Depression symptoms were assessed using the Geriatric Depression Scale-15 (GDS-15; Jerome, Yesavage, Javaid, & Sheikh, 1986). GDS-15 scores range from 0 to 15, with higher scores indicating depression. Access to public transportation was assessed using the question "Your home is within a 10–15 minute walk to a transit stop (such as bus, train, trolley, and tram). Would you say that you . . .?" Answers were set out as follows: "strongly disagree," "somewhat disagree," "somewhat agree," and "strongly agree." We coded this question into binary variables: "strongly disagree" and "somewhat disagree" were coded as poor, whereas "somewhat agree" and "strongly agree" were coded as good (Tsunoda et al., 2012). The question is used from the Japanese version of the International Physical Activity Questionnaire Environment Module (IPAQ-E). The Spanish version of IPAQ-E has shown good reliability (Alexander, Bergman, Hagströmer, & Sjöström, 2006) and the Japanese version of IPAQ-E was checked

Table 1. Participant Characteristic According to Public Transportation Use.

	Nonusers group (n = 10)	Users group (n = 21)	p value
Age (years)[a]	76.1 ± 6.2	78.1 ± 4.4	.309
Gender (women)	4 [40.0]	7 [33.3]	1
BMI (kg/m²)[a]	22.7 ± 2.6	24.0 ± 2.9	.237
Years of education[b]	12 (9.8-12.0)	12 (12.0-14.0)	.083
Annual household income (n = 30)			.037*
<¥200,000	5 [50.0]	2 [10.0]	
¥200,000-¥400,000	5 [50.0]	14 [70.0]	
>¥400,000	0 [0.0]	4 [20.0]	
Living status: living with other	7 [70.0]	16 [76.2]	1
Self-rated health[b]	3.4 (3.4-4.2)	3.4 (3.4-4.4)	.626
Gait speed: <1 m/s	1 [10.0]	2 [9.5]	1
LSNS, score[a]	17.0 ± 3.3	20.2 ± 6.2	.135
MMSE, score[b]	28 (26-29)	29 (26-29)	.651
GDS-15, score[b]	2 (1.3-3.0)	2 (0.0-3.0)	.763
Housemate's driving status: yes (n = 23)	3 [42.9]	5 [31.2]	.657
Access to public transportation: good	10 [100]	21 [100]	
UCLA.LS.ver.3, score[a]	12.7 ± 1.9	10.1 ± 2.9	.017*

Note. Date are presented as *M* ± *SD*, or as numbers [percentages]. BMI = body mass index; LSNS = Lubben Social Network Scale; MMSE = Mini-Mental State Examination; GDS-15 = Geriatric Depression Scale-15; UCLA.LS.ver.3 = the Japanese version of UCLA Loneliness Scale version 3.
[a]the independent *t* test.
[b]the Mann–Whitney *U* test.
*Significant at *p* < .05.

up by the IPAQ Reliability and Validity Committee and accepted (Inoue et al., 2009).

Statistical Analysis

The normality was verified using the Shapiro–Wilk test for continuous variables. Comparisons between the users and nonusers groups were conducted using the independent *t* test for parametric variables (age, BMI, LSNS, and UCLA.LS.ver3), the Mann–Whitney *U* test for nonparametric variables (years of education, self-rated health, MMSE, and GDS-15), and Fisher's exact test for categorical variables (living status, annual household income, gait speed, and housemate's driving status) as appropriate. A multiple linear regression model was applied, with UCLA.LS.ver3 as the response variable and the absence or presence of public transportation use as the explanatory variables. Based on a literature review (Mezuk & Rebok, 2008), the following variables were included as confounding factors: age, gender, years of education, cognitive function, living status, and self-rated health. Normality of residuals was assessed by means of QQ-plots. A value of *p* < .05 was considered statistically significant. All statistical analyses were performed using EZR Ver 1.33 (Kanda, 2013).

Results

Women comprised 35.5% (*n* = 11) of the participants and the mean age was 77.5 ± 5.1 years. Public transportation

users comprised 67.7% (*n* = 21) and nonusers comprised 32.3% (*n* = 10).

Table 1 shows the results of the comparison between the users and nonusers groups. The UCLA.LS.ver3 score was significantly higher in the nonusers group than in the users group. Demographic data, MMSE scores, and GDS-15 scores were not significantly different between the users and nonusers groups.

Table 2 shows the results of multiple linear regression analysis. After adjustments for age, gender, years of education, cognitive function, living status, and self-rated health, lack of public transportation use was significantly associated with loneliness.

Discussion

Our study investigated the relationship between public transportation use and loneliness in elderly people who stopped driving. The public transportation users comprised 67.7% of the participants, whereas the nonusers comprised 32.3%. Members of the nonusers group experienced more loneliness than those in the users group.

Our results suggest that public transportation use is significantly associated with less loneliness in elderly people who stop driving. One cross-sectional study found that the perception of transportation-related barriers is significantly associated with loneliness in community-dwelling people aged 50 and older (Ferreira-Alves, Magalhães, Viola, & Simoes, 2014). A previous qualitative study also demonstrated that lack of transportation

Table 2. The Relationship Between Public Transportation Use and Loneliness: Multiple Regression Analysis.

	β [95% CI]	*p* value
Public transportation use	−2.55 [−4.82, −0.28]	.029*
Age	−0.07 [−0.32, 0.18]	.558
Women (reference: men)	−2.55 [−5.54, 0.45]	.092
Years of education	−0.06 [−0.69, 0.56]	.832
Living status	0.36 [−2.55, 3.27]	.799
Self-rate health	−0.83 [−2.64, 0.98]	.351
MMSE	−0.46 [−1.11, 0.19]	.159

Note. Multiple regression model was adjusted for age, gender, year of education, living status, self-rate health, and MMSE. Adjusted R^2 = .196. CI = confidence interval; MMSE = Mini-Mental State Examination.
*Significant at *p* < .05.

contributes to loneliness in community-dwelling older adults (Smith, 2012). The subject of present study is elderly people who stop driving and is vulnerable to loneliness. Therefore, our findings support and expand these previous results and suggest that public transportation use may mitigate feelings of loneliness after driving cessation.

Many studies have reported the negative effects of driving cessation. However, few have investigated how to prevent adverse outcomes following driving cessation. One cross-sectional study found that perceived transportation barriers are significantly associated with higher depressive symptoms in elderly people who stop driving (Choi & DiNitto, 2015). The present study assessed the frequency of public transportation use in daily life, not perceived barriers, and provides new insights into the association between public transportation use and negative effects of driving cessation.

One possible explanation for our findings is that public transportation users maintain enough social relationship to prevent loneliness. The previous study showed that public transportation use was important for social leisure participation (Galenkamp et al., 2016), and it is important because lack of social relationship is predictor of feeling loneliness (Ferreira-Alves et al., 2014). A previous longitudinal study using free bus pass showed that eligibility for the free bus pass was associated with an increase in the public transportation use. In addition, the study showed that public transportation use increases social relationship and reduces feeling of loneliness (Reinhard, Courtin, van Lenthe, & Avendano, 2018). Also after drive cessation, public transportation use may help older adults maintain enough social relationship and feel less lonely.

There are several limitations to the present study. First, the study had a cross-sectional design. Thus, we could not establish the cause–effect relationship of public transportation use and loneliness. Second, the sample of this study was small. Thus, the further study is needed to increase the number of study sample so the result could be more reliable. Third, the question to assess the

frequency of public transportation use does not have validation. However, we assessed transportation use by the frequency base on the previous study (Tsunoda et al., 2012), because there is no valid questionnaire to assess public transportation use. Finally, this study did not assess regional differences. As accessibility to public transportation varies by region, the relationship should be investigated in various regions.

In conclusion, lack of public transportation use is associated with loneliness in elderly people who stop driving. Therefore, public transportation use helps older adults to feel less lonely after driving cessation.

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