



The Impact of Self-reported Sensory Impairment on Cognitive Function Using the Korean Longitudinal Study of Aging Survey Data

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INTRODUCTION

- The prevalence of hearing or visual impairment, and dual sensory impairment (DSI) increases with advancing age. Hearing and visual impairments are likely to be overlooked compared to the burden of other health conditions, but they are public health concerns that degrade the quality of life for individuals, and add to the burden of public health.
- Recent studies suggest that sensory impairment is related to cognitive function at older ages. Cognitive impairment has adverse health consequences, including diminished health-related quality of life, frailty, and high mortality. Cognitive impairment is mainly related to physical function as well as mental health-related factors and lifestyle.
- There is a lack of research on the relationship between sensory disorders and cognitive function among Koreans. Thus, the purpose of this study was to investigate the link between the frequency of weekly breakfast consumption and insulin resistance calculated by the TyG index in the Korean population.

MATERIALS AND METHODS

- Data source:** We used data from the first (2006) to the seventh (2018) waves of the Korea Longitudinal Study of Aging (KLoSA). The study was initiated by the Korea labor institute in 2006, and the sample has been followed up at 2-yearly intervals.
- Study population:** In 2006, the original panel sample was composed of 10,254 adults aged 45 years and over (born in 1961 or earlier) who resided in South Korea. We excluded participants who did not completely provide responses to the questions or those whose data included missing values for all the variables. The total number of participants was 8,220 in the final sample at the baseline (2006 to 2008).
- Outcome variables:** The main objective of this study was to analyze the impact of sensory impairment on cognitive function. Cognitive function was measured by Korea version of the Mini-Mental State Examination (K-MMSE) scale. The K-MMSE comprised 19 questions in five cognitive function areas. The subscale scores for these areas were summed up to derive an overall K-MMSE score ranging from 0 to 30, with higher scores indicating better cognitive function. Participants were categorized into two groups of either cognitive impairment (K-MMSE score < 24) or normal cognition (K-MMSE score ≥ 24).
- Interesting variables:** The main exposure of interest was the development of sensory impairment over time. Sensory impairment was assessed according to the self-reported levels of hearing or vision. We applied a lag-time option to detect changes in sensory impairment compared to that of prior year. Change from normal to poor, indicating new onset, was defined as hearing or visual impairment. When hearing and visual impairment occurred at the same time, this was defined as dual sensory impairment. Participants who already reported hearing, visual, or dual impairment were grouped as ‘Others’.
- Covariates:** The covariates were socioeconomic (age, sex, educational level, region, economic activity, equivalized household income, marital status), health-related (the number of chronic disease, ADL, IADL, BMI, smoking status, alcohol consumption, regular exercise, depressive symptom, use of glasses or lens, use of hearing aid, cataract surgery, glaucoma surgery).
- Statistical analysis:** We used χ^2 -tests to examine the general characteristics of the participants. We also used generalized estimating equation (GEE) model to estimate odd ratios (ORs) and 95% confidence intervals (CIs). All statistical analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA). The statistical significance level was defined as a two-tailed p-value of <0.05.

RESULTS

Table 1. General characteristics of the study subjects at baseline (2008)

Variables	Cognitive impairment (MMSE < 24)					P-value
	Total (n=8,220)	Yes (n =2,141)		No (n=6,079)		
	N	N	%	N	%	
Sensory impairment						<.0001
No → No	4,721	785	16.6	3,936	83.4	
No → Hearing	117	41	35.0	76	65.0	
No → Visual	966	298	30.8	668	69.2	
No → Dual	111	74	66.7	37	33.3	
Others ^a	2,305	943	40.9	1,362	59.1	

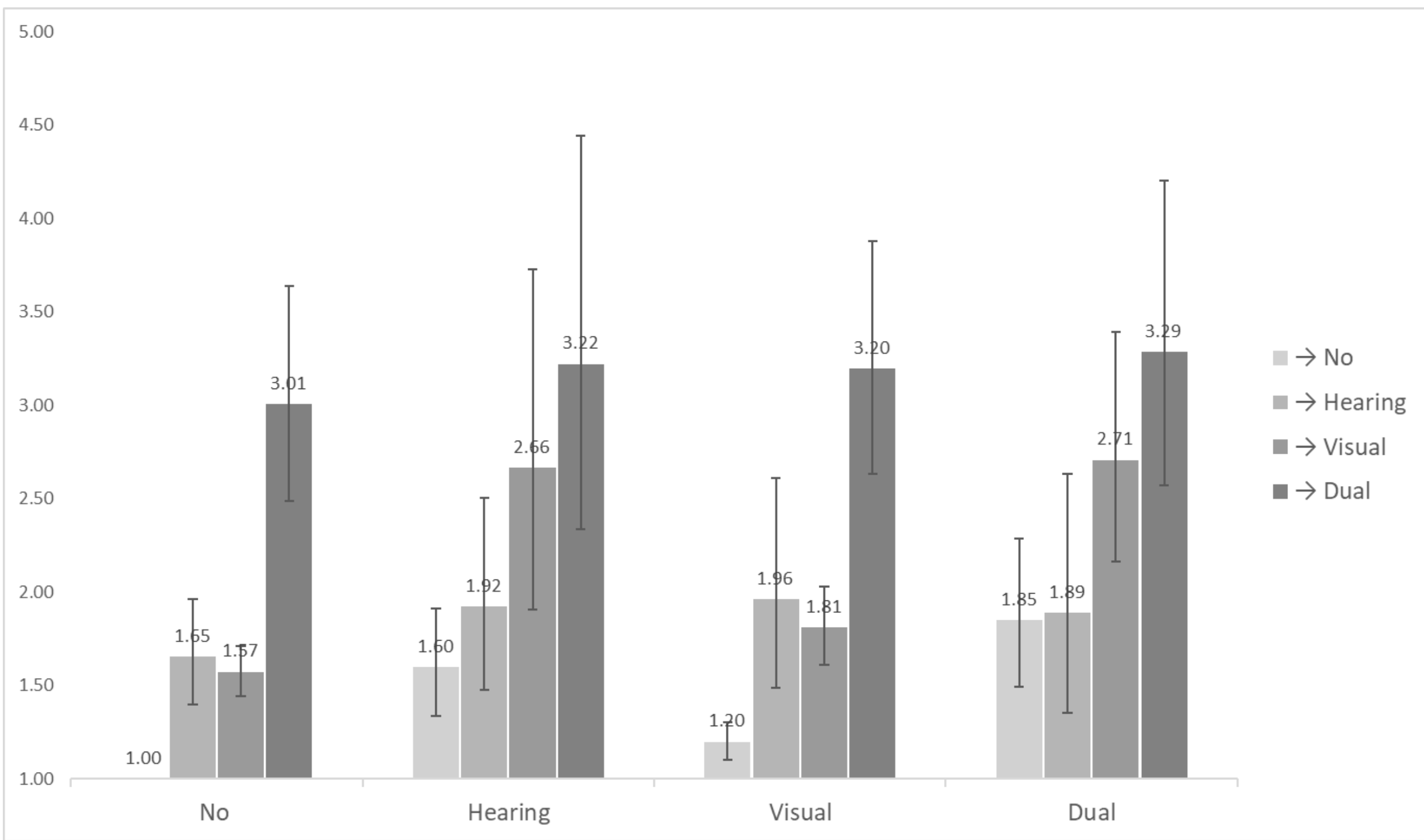
- A total of 8,220 participants were included in the study, of which 26.0% (n=2,141) and 74.0% (n=6,079) were classified with cognitive impairment and normal cognitive function, respectively. Among the 8,220 participants overall, 57.4% (n=4,721) remained normal, while 1.4% (n=117), 11.8% (n=966), and 1.4% (n=111) developed hearing, visual, and dual impairments, respectively.

Table 2. Results of GEE model on cognitive function according to sensory impairment

Variables	Cognitive impairment	
	OR	95% CI
Sensory impairment		
No → No	1.00	
No → Hearing	1.58	(1.33 - 1.88)
No → Visual	1.57	(1.44 - 1.71)
No → Dual	2.80	(2.31 - 3.38)
Others ^a	1.64	(1.53 - 1.74)

- People with a single sensory impairment of hearing or vision had associated cognitive decline (odds ratio (OR)=1.58 [95% confidence interval (CI), 1.33–1.88] for hearing; OR=1.64 [95% CI, 1.53–1.74] for visual). In people with dual sensory impairment, the relationship with cognitive decline was the greatest (OR=2.80 [95% CI, 2.31-3.38]).

RESULTS



- To determine the relationship between changes in different sensory impairment types and cognitive function, all the independent variables were adjusted for in the GEE model We observed that individuals who developed DSI in all the groups were at the highest risk of cognitive decline (OR = 3.01 [95% CI, 2.49–3.64]; 3.22 [95% CI, 2.34–4.44]; 3.20 [95% CI, 2.63–3.88]; and 3.29 [95% CI, 2.57–4.21] for No → Dual; Hearing → Dual; for Visual → Dual; and Dual → Dual, respectively).

Table 4. Subgroup analysis of cognitive function with sensory impairment

Variables	Cognitive impairment (MMSE < 24)							
	No → No		No → Hearing		No → Visual		No → Dual	
	OR	OR	95% CI	OR	95% CI	OR	95% CI	Others
Age								
45-54	1.00	0.58	-	1.80	-	2.37	-	1.17
55-64	1.00	2.02	(1.25 - 3.27)	1.85	(1.51 - 2.25)	4.03	(2.30 - 7.08)	1.90
65-74	1.00	1.82	(1.34 - 2.48)	1.43	(1.25 - 1.63)	3.22	(2.33 - 4.45)	1.55
≥ 75	1.00	1.54	(1.22 - 1.96)	1.70	(1.46 - 1.98)	2.56	(1.98 - 3.30)	1.73
Sex								
Male	1.00	1.52	(1.19 - 1.94)	1.61	(1.39 - 1.88)	3.14	(2.34 - 4.21)	1.60
Female	1.00	1.64	(1.29 - 2.09)	1.54	(1.39 - 1.71)	2.42	(1.91 - 3.07)	1.65
Chronic disease								
0	1.00	1.08	(0.74 - 1.58)	1.46	(1.21 - 1.77)	2.64	(1.70 - 4.09)	1.44
1	1.00	1.99	(1.43 - 2.76)	1.81	(1.53 - 2.13)	2.80	(1.87 - 4.19)	1.54
≥ 2	1.00	1.70	(1.34 - 2.15)	1.58	(1.39 - 1.78)	3.48	(2.70 - 4.48)	1.89
BMI (kg/m ²)								
Normal or underweight (< 23)	1.00	1.64	(1.31 - 2.06)	1.80	(1.59 - 2.04)	3.01	(2.31 - 3.92)	1.75
Overweight (< 25)	1.00	1.89	(1.34 - 2.66)	1.47	(1.24 - 1.75)	2.64	(1.84 - 3.77)	1.75
Obese (≥ 25)	1.00	1.29	(0.87 - 1.91)	1.36	(1.15 - 1.61)	3.40	(2.09 - 5.53)	1.46
Smoking status								
Current smoker	1.00	1.84	(1.14 - 2.96)	1.58	(1.20 - 2.08)	2.59	(1.41 - 4.77)	1.59
Ex-smoker	1.00	1.69	(1.11 - 2.57)	2.00	(1.58 - 2.53)	4.67	(3.05 - 7.17)	1.95
Never	1.00	1.54	(1.25 - 1.89)	1.51	(1.37 - 1.66)	2.52	(2.02 - 3.13)	1.61
Alcohol consumption								
Current drinker	1.00	1.60	(1.09 - 2.34)	1.88	(1.58 - 2.23)	3.85	(2.60 - 5.70)	1.67
Ex-drinker	1.00	1.73	(1.22 - 2.45)	1.54	(1.23 - 1.93)	3.10	(2.12 - 4.55)	1.85
Never	1.00	1.57	(1.25 - 1.97)	1.49	(1.34 - 1.66)	2.28	(1.78 - 2.93)	1.58
Regular exercise								
Yes	1.00	1.69	(1.21 - 2.36)	1.72	(1.46 - 2.02)	2.80	(1.87 - 4.18)	1.77
No	1.00	1.64	(1.34 - 2.01)	1.56	(1.41 - 1.72)	3.04	(2.43 - 3.79)	1.63

- The subgroup analysis of this study showed that two or more chronic diseases, obesity, past smokers, current drinkers, and not exercising regularly were high risk factors for cognitive decline among participants who had dual sensory impairment.

DISCUSSION

- In this study, we examined the impact of changes in sensory impairment on cognitive function in Koreans aged 45 years or older using the KLoSA data. We found that those who reported the development of sensory impairment perceived greater cognitive decline than older adults without these impairments. Moreover, older adults with dual sensory impairment perceived even more cognitive impairment than those with either hearing or visual impairment alone.
- The subgroup analysis of this study showed that people with two or more chronic diseases, obesity, past smokers, current drinkers, and those who do not exercise regularly were more likely to have cognitive impairment.
- Our results on changes in sensory impairment types showed that those with dual sensory impairment had higher risk of cognitive decline, which is in line with several previous studies. Specifically, the findings of our study provide further evidence implying a relationship between dual sensory impairment and cognitive function. Considering Korea’s rapidly aging population, this is a salient topic with important public health implications.
- The limitations of this study should be considered when interpreting our results. Firstly, the KLoSA data used in this study were self-reported, so there may have been potential response or recall biases in the respondents’ responses. Second, despite using standardized instruments to measure cognitive function and controlling for year as a covariate, the results may have been exaggerated because the passage of time during the investigation may have been accompanied by cognitive decline. Third, we could not measure the cause of sensory impairment in the participants due to data limitations. Finally, although we adjusted for numerous potential confounders, some residual confounding may still persist.

CONCLUSION

- This study highlighted that developing sensory impairment was related with cognitive function in middle-aged and older adults in South Korea. Considering Korea’s rapidly aging population, this is a salient topic with important public health implications.
- Timely assessment of sensory function in older persons may be useful in identifying individuals at risk of cognitive impairment. Our research findings could provide health policy makers and professionals with valuable information about the development of intervention strategies to alleviate cognitive dysfunction by preventing sensory loss.