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Item Development to Predict the Driving Risk of Older Drivers using the Delphi Method

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Abstract: *Increasingly, the elderly population is preferring a more-active lifestyle. These seniors can achieve more active social participation through driving. However, elderly drivers are required to undergo safety screening because of the high risk of accidents. Therefore, this study aimed to develop evaluation items for screening the driving risk of elderly drivers using a Delphi survey. The researchers collected the items included in the existing self-reported test of the elderly drivers and the 52 selected pre-items were those contained in at least two of the existing tests. Delphi panels were composed of professors, occupational therapists, social workers, road traffic workers and an elderly driver. In the first and second Delphi surveys, four items were integrated and 48 items were derived. The final 44 items were derived from the results of the third Delphi survey. The final 44 items contained information related to driving by elderly individuals and so can be used to formulate an appropriate test for elderly drivers. In various countries, self-evaluation for elderly drivers is provided as an IT-based service. It is expected that the items developed in this study will be used to develop Korean IT-based services for elderly drivers in Korea.*

Keywords: Driving; Driving Risk; Item; Older; Self-Report

1. Introduction

Impairments of perceptual, motor and cognition with aging impede normal life, such as mobility, in the elderly [1], [2]. The increasing elderly population has a relatively high level of education and health [3]. Therefore, they prefer a more-active lifestyle compared with older people in the past [4]. Increased mobility enables active participation in society, and thus leads to a successful life after retirement [5].

The most frequently used means of transportation are self-driving, walking, cycling, taxis, buses, subways, etc. [6]. Self-driving has been recognized as an essential means of transportation for all adults [7]. However, elderly drivers have a higher risk of accidents than drivers of other ages, with the exception of novice drivers [8]-[10]. Many elderly drivers discontinue driving for this reason; indeed, it is considered a social problem [1], [11].

The assessment of driving functions in elderly drivers demonstrated that the major ways to solve the social problems [12], [13]. An actual driving test comprising on-road and simulation components is the most accurate means of assessment [14], [15]. However, because of the risk of direct evaluation and the relatively high cost and time required, its use is not widespread [16].

Self-regulation can be used to monitor the broader population [17]-[19]. Self-regulation of the elderly can prevent accidents by enhancing sensitive to the changes due to aging [20], [21]. Because of these benefits, self-report assessments can reduce the incidence of accidents by predicting driving risk prior to detailed assessment of the elderly driver [22].

Two such assessment methods, the Driving Decisions Workbook (DDW) and Self-Awareness and Feedback for Responsible Driving (SAFER Driving), are composed of 101 and 89 items, respectively [23], [24]. In contrast, Driving Safely While Aging Gracefully (DSWAG) consists of 23 items, and Driver 65 Plus & Driver 55 Plus, etc. consists of 15 items, it is relatively short, but does not include all driving-related factors [25]-[27]. The recently developed Safe Driving Behavior Measure (SDBM) comprises 68 items regarding only

driving behavior [28]. That is, self-reported evaluation in the elderly is difficult because it must be concise and reflect all factors; i.e., health, driving behavior, cognition and perception, etc. [22], [29]. Therefore, it is necessary to screen for key items that contain all driving-related elements.

Various countries provide IT-based services for elderly drivers to self-assess self-assessment [23], [24], [25]-[27]. If a reasonable evaluation item suitable for the culture in Korea is developed, we can provide Korean-style IT-based services. Therefore, it is necessary to develop new evaluation items through Korean experts and elderly drivers.

The Delphi research method is an objective means of deriving a consensus of expert opinion collected blindly in the social sciences [30]. It was used to obtain a consensus of health care experts in terms of diagnosis, assessment and treatment, and is recognized to be effective [31]-[35]. Therefore, it is necessary to conduct a Delphi survey of elderly driving experts about the items used in existing tests to select key items that predict the risk associated with elderly driving.

The purpose of this study was to conduct a Delphi survey of items predictive of the risk of elderly drivers, targeted at specialists in senior driving, and select items that should be used in an evaluation of the risk of elderly drivers.

2. Materials and Methods

2.1 Participants

The experts each had more than 5 years of experience in senior driving-related careers, and experience in research, education and projects. Also, the older drivers who participated in the Delphi survey had more than 10 years of driving experience. The jobs of 28 experts were employed as professors, occupational therapists, social workers, and road traffic regulation. The five older drivers (>65 years) were driving at the time of the study [Table 1].

Table 1. Characteristics of Participants in the Delphi survey

Characteristic			N	%
Expert panel	Gender	Male	15	53.6
		Female	13	46.4
	Age	20s	5	17.9
		30s	19	67.9
		40s	2	7.1
		50s	2	7.1
	Level of education	Bachelor	7	25.0
		Master's course	2	7.1
		Master	7	25.0
		Doctoral course	5	17.9
		Doctoral completion	3	10.7
		Ph.D.	4	14.3
	Period of working	≥ 5 years	17	60.7
		≥10 years	11	39.3
	Job	Professor	8	28.6
		Occupational Therapist	5	17.9
		Social worker	5	17.9
		Worker of Road traffic authority	10	35.7
Older driver	Gender	Male	3	60.0
		Female	2	40.0
	Age	60s	3	60.0
		70s	2	40.0
	Experience of driving	≥10 years	2	40.0
		≥20 years	3	60.0

2.2 Study Design and Process

We performed an online search for prior self-reported assessments of older drivers. Key items among those included in the previous evaluations were selected at a meeting of the five experts. The Delphi survey was carried out three times using the selected items, as shown in Figure 1. And at each stage of Delphi survey, the elderly driver met with the researcher face-to-face, read the items together, and provided direct feedback on whether it was sufficient to check their driving ability. The researcher tried to reflect this review in the evaluation items.

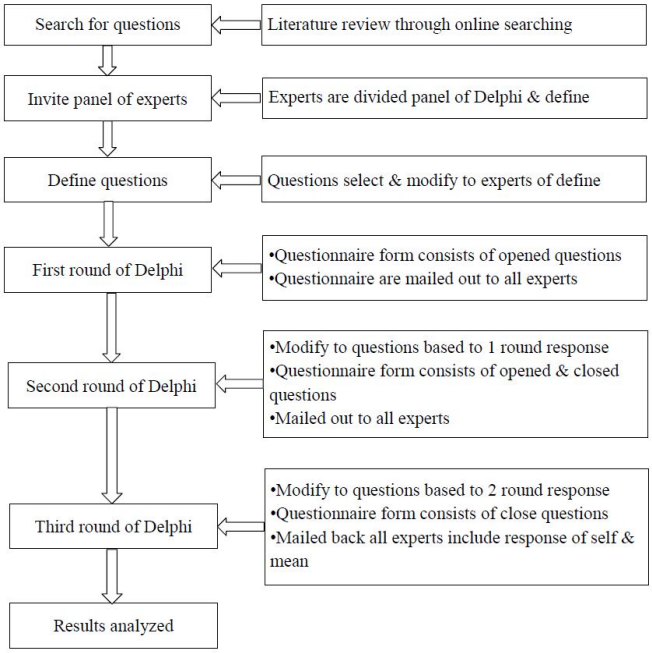

Figure 1. The Study Procedures

2.3 Selection of Delphi Items

We identified the 10 most frequently used prior evaluations through online searching. The 79 items present in two or more tests were selected. Professor 3 and Occupational therapist 2 (>3 years' experience) modified the phrases, and integrated or deleted similar items. The five experts selected the 52 final items from among the 79 items.

2.4 Analysis Method

The consensus panel of experts in the first and second Delphi surveys conducted a content analysis. The 5-point Likert-scale scores in the third Delphi survey were analyzed using PASW Statistics version 18.0 and Microsoft Excel 2010. The content validity ratio (CVR), convergence, consensus, stability and Cronbach's α of each item were calculated by analyzing the mean, standard deviation, quartile and median. Minimum cut-off point of CVR was set to 0.33 [36]. The stability is the coefficient of variation calculated by dividing the standard deviation by the average of each item. Coefficients of variation were defined as follows: "no additional survey required, <0.5", "stable, 0.5–0.8" and "further questionnaire required, >0.8". The convergence is the degree of deviation from the quartile, and a higher consensus indicates greater agreement among the opinions of the experts.

3. Results

3.1 Results of Delphi Survey

The primary Delphi survey questionnaire was composed of open-ended questions asking for comments on the addition, modification, integration and deletion of 52 items selected for the Delphi survey. The second

Delphi questionnaire was composed of open-ended questions about the items reconstructed based on the primary response, which were scored on a 5-point Likert scale as follows: "very unsuitable", " unsuitable", "average", "suitable" or "very suitable". Modification or integration of the items was conducted based on the secondary response. The average Likert scale score was calculated and used as a reference in the third Delphi survey. The third Delphi survey provided a self-response and average Likert scale score, based on which the experts reconsidered their opinions. Table 2 presents the response rates of the three Delphi surveys.

Table 2. Personnel Selection and Response Rate to the Delphi Survey

Job	Personnel selection	Response rate		
		First Delphi	Second Delphi	Third Delphi
Professor	8	8 (100)	7 (87.5)	7 (87.5)
Occupational Therapist	5	5 (100)	5 (100)	5 (100)
Social worker	5	5 (100)	5 (100)	5 (100)
Driving employee	10	10 (100)	10 (100)	10 (100)
Older driver	5	5 (100)	5 (100)	3 (60)
Total	33	33 (100)	32 (96.9)	30 (90.9)

3.1.1 First Delphi Survey

According to the opinions of the experts in the first Delphi survey, item No. 19 was incorporated into item No. 18, and item No. 22 into No. 23 (Table 3). In addition, the contents of item Nos.1, 4–6, 12, 15-18, 21, 23, 32, 35–40, 45–47 and 49–51 were modified (Table 5). Thus 50 items were selected in the first Delphi survey.

3.1.2 Second Delphi Survey

According to the experts' opinions on the open-ended questions of second Delphi survey, item Nos. 3 and 8 were integrated with Nos. 2 and 11 (Table 3). And the contents of item Nos. 2, 11, 14, 20, 32, 36 and 51 were modified. As a result, 48 items were finally selected (Table 5).

3.1.3 Third Delphi Survey

In the third Delphi survey, item Nos. 2, 16, 17, 37 had a CVR lower than 0.33, and so were deleted (Table 4). A final total of 44 items were identified as suitable for use in screening for the safety risk of elderly drivers (Table 5).

Table 3. Integrated Items Based on The First and Second Delphi Surveys

No.	Items	Integrated to
3	You have difficulties opening and closing the doors of a car.	No. 2
8	You have difficulty driving within a lane.	No. 11
19	You are under stress due to specific traffic conditions or other drivers.	No. 18
22	You find it difficult to follow fast-moving traffic.	No. 23

Table 4. Items Deleted in The Third Delphi Survey

Items	M	SD	CVR	Convergence	Consensus	Stability	Cronbach's α
2	3.79	0.80	0.290	0.50	0.75	0.211	0.961
18	3.63	0.78	0.161	0.50	0.75	0.217	0.960
20	3.46	0.79	0.097	0.50	0.75	0.230	0.960
41	3.96	0.89	0.226	1.00	0.50	0.226	0.960

Table 5. The Final Selected Questions Based on The Delphi Survey

No.	Items	M	CVR
1[2]	You forget to wear a seatbelt while driving.	4.46	0.806
2[1,2]	You have difficulties getting in and out of a car (e.g., opening and closing the doors).	3.79	0.290
4[2]	You have difficulty adjusting the driver's seat, considering the distance from the steering wheel and the field of view, etc.	4.17	0.548
5[2]	You have difficulty operating control box (e.g. radio, head light, switch) during vehicle.	4.38	0.871
6[2]	You have difficulty driving in certain conditions (e.g., weather conditions, night driving).	4.75	1.000
7	You have difficulty driving in unfamiliar environments (e.g., with use of a map, navigation, signs).	4.42	0.871
9	You have difficulty in reversing the car (e.g. viewing mirror while reversing, going to the right place).	4.54	1.000
10[2]	You have difficulty rotating the steering wheel (e.g., left, right) while driving.	4.54	0.935
11[2]	You have difficulty fixing the steering (e.g. keeping the lane straight or in a turn) wheel during driving.	4.71	0.935
12	You use the rear-view instead of side mirrors, to check traffic and change lanes.	4.13	0.613
13	You have difficulty proceeding through a congested intersection or rotary.	4.58	0.935
14[2]	You have difficulty noticing moving people, signs, billboards, etc. while driving.	4.75	1.000
15[2]	You have experienced several near-accidents caused by drowsy driving.	4.58	0.806
16[2]	You have received several traffic citations or warnings.	4.17	0.484
17[2]	Because of your negligence while driving, traffic accidents occur frequently.	4.58	0.742
18[1,2]	You are under stress due to specific traffic conditions such as a congested road or other drivers.	3.63	0.161
20[1,2]	You prefer specific driving environments (e.g., urban road, highway, local road).	3.46	0.097
21[2]	Passengers (e.g., children, family members, friends) are concerned about your ability to drive safely.	4.63	0.806
23[2]	You have difficulty on or entering a fast-moving road, such as the highway.	4.63	0.935
24	You have difficulty in quickly responding to dangerous situations while driving.	4.75	1.000
25	You exhibit involuntary violent behavior (e.g. flashing light, blowing horn) while driving.	4.04	0.355
26	Other drivers react negatively to my driving (e.g. flashing light, blowing horn).	4.25	0.742
27	Often surprised by a vehicle that you didn't notice until it was quite close to you.	4.67	0.935
28	You have difficulty maintaining a safe distance from the preceding vehicle (e.g. lane change, rotation, parking).	4.79	1.000
29	You have difficulty focusing because of light (e.g., sunlight, another vehicle light, dashboard light).	4.79	1.000
30	You find it difficult to judge the moving speed of the vehicle (e.g., speed of approach to the vehicle in front, speed without looking at the speedometer).	4.75	1.000
31	You have difficulty quickly operating the brake (e.g., verifying the location of foot, strongly pushing) while driving.	4.92	1.000
32[2]	If you get lost while driving, you have difficulty finding a route using the navigation or map.	4.25	0.613
33	You have difficulty driving and understanding the changing traffic rules.	4.33	0.677
34	You often hesitate at intersections without stop signs or red lights.	4.46	0.806
35[2]	You have difficulty talking with passengers while driving.	4.08	0.548

36[2]	You often forget the location of documents related to driving (vehicle registration, insurance policy), driver's license and keys.	4.17	0.742
37[2]	You have difficulty understand traffic guidance on the road.	4.58	0.742
38[2]	You often forget something pre-defined (go to the mart or gas station).	4.21	0.548
39[2]	You have difficulty finding your car in a parking lot	4.50	0.806
40[2]	You have difficulty finding a house by driving in familiar places (grocery stores, etc.).	4.63	0.871
41[1]	You regularly verify the latest information related to health and well-being due to anxiety.	3.96	0.226
42	You often get tired while driving.	4.54	0.935
43	You regularly verify your vision due to worry about its effect on the driving.	4.33	0.613
44[2]	You screw up your eyes to see distant objects and signs.	4.25	0.677
45[2]	You have difficulty reading the small print in the navigation or map.	4.54	0.806
46[2]	You have difficulty find a specific sign among many signs (e.g., finding a restaurant on the street)	4.42	0.677
47[2]	You have difficulty hearing a car horn, navigation voice guidance, etc.	4.70	0.867
48	You experience pain or stiffness or weakness (in the hips, knees, ankles, and feet) during or after the driving.	4.63	0.935
49[2]	You feel decreased mobility (e.g., 2 m walk and climbing two floors without help) and flexibility (e.g., head turning while driving).	4.21	0.742
50[2]	You usually take medications (e.g., for sleep, blood pressure, depression, anxiety).	4.29	0.484
51[2]	You have consulted a doctor or pharmacist due to worry about the effect on driving of a medical condition.	4.58	0.806
52	In the past 2 years, you have experienced dizziness, seizure or loss of consciousness.	4.75	0.806

[1]Deleted items, [2]Modified items

4. Discussion

Driving is an essential occupation to adapt to social change in the elderly [37]. However, many elderly drivers have potential risk factors for accidents due to the natural course of aging [38]. Thus the purpose of this study was to develop items for screening of driving risk of the elderly.

The four items were combined with other items in the first and second Delphi surveys. The integrated item Nos. 2 and 3 were contained in four and three prior evaluations. The contents of these two items were similar, so item No. 2 was integrated into “open and close door.” Item Nos. 8 and 11 were contained in two and five evaluations. Thus the meaning of these two items was duplicated. Therefore, they were integrated into the broader item No. 11. Item Nos. 18 and 19 were used in six and two prior evaluations. These were thus integrated into item No. 18 “Certain driving situations such as congested roads.” Items No. 22 and 23 were used in four prior evaluations, and were integrated into the broader item No. 23. The local independence estimates the difference in response between the items, and is necessary for item development [39]. Overlapping items were integrated based on the opinion of the Delphi panel in an attempt to ensure local independence.

Due to the lack of an absolute standard for content validity, the CVR in the existing theory is defined as “0.40–0.60, validity” and “0.60–0.80, high validity” [36]. Accordingly, item Nos. 4, 25, 35, 38 and 50 can be interpreted as having validity. The remaining items with the exception of the deleted item Nos. 4, 18, 20 and 41 can be interpreted as having high validity. Item Nos. 25 and 35 were to related traffic violations and reckless driving. These items were judged by some experts to be observed in general immature and impulsive driving. Item Nos. 4, 38 and 50 comprised information about driver’s seat control, amnesia, and use of sleeping pills. It

was estimated by opinion of some experts that cannot affect driving in the process of natural aging. According to this opinion, these five items had a CVR lower than 0.33 and were thus removed.

Driving is a complex task that requires cognition, perception and motor functions [1], [2], [12]. These were related to “Nos. 1 and 4–17, on the road”, “Nos. 21 and 23–31, coping or getting around”, “Nos. 32–40, thinking”, “Nos. 43–46, seeing” and “Nos. 42 and 47–52, health”. These reflect essential elements of driving behavior—coping with driving, thinking, seeing and health [22]—that are included in the existing self-reported test of older drivers. Driving behavior included the ability to operate the door, steering wheel, control box and driver’s seat; driving abilities in specific traffic and weather conditions; and the ability to identify road signs and traffic rules. Coping was included the ability to adapt to changes in the environment, traffic conditions, and emergency situations. Thinking included pathfinding, understanding traffic rules, attention, and memory. Seeing was the ability to distinguish maps or navigation systems, signboards or traffic signs. And health was related to general health, physical function, drug use, loss of consciousness and seizures.

A self-reported driving test should involve elderly individuals assessing their driving status by self-regulation. The test should be concise and involve all information relevant to driving [22], [29]. The 44 items finally selected in this study involved all elements of driving. Previous self-reported tests comprised around 100 items relevant to driving, or ≤20 items relevant only to driving behavior [23]-[26]. This why the items in this study differ from those used in previous evaluations.

The self-reported assessments have been used in various countries, it includes DDW, Driver 65 Plus, SDBM et al. [23], [27]-[28], [40]. The meaningful discovery of this study is that new evaluation items were developed by considering Korean culture and reflecting the latest information. Various countries provide IT-based self-examination services so that elderly drivers can check their problems on their own [41]. It is expected that IT-based self-examination services will be provided in Korea using the developed items of this study.

This study suggested the content validity and reliability of key items related to elderly driving. Future research should determine the reliability and validity of assessments of older drivers. Then, the items identified in this study will be useful for evaluation of elderly drivers.

5. Conclusions

The study comprised a Delphi survey of items predictive of the risk of elderly drivers. The results of three Delphi surveys were used to derive 44 key questions among the items used in the existing elderly driver self-reported evaluation. The results indicated the content validity and reliability of the key items, it was concisely involved all information to relevant the driving. The items will be used in a test for elderly drivers that will be useful in both the research and clinical fields.

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Conflicts of Interest: The authors declare that there is no conflict of interest associated with this manuscript.

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References

[1] C. Owsley, "Driving mobility, older adults, and quality of life. Gerontechnology," vol. 1, no. 4, pp. 220-230, Oct. 2002, doi: https://doi.org/10.4017/gt.2002.01.04.002.00.

[2] K. J. Anstey, T. D. Windsor, M. A. Luszcz, and G. R. Andrews, "Predicting driving cessation over 5 years in older adults: psychological well-being and cognitive competence are stronger predictors than physical health," J. Am. Geriatr. Soc., vol. 54, no. 1, pp. 121-126, Sep. 2005, doi: https://doi.org/10.1111/j.1532-5415.2005.00471.x.

[3] J. A. Vincent, C. R. Phillipson, and M. Downs, The Futures of Old Age, Sage Publishers, London, 2006.

[4] C. O'Fallon and C. Sullivan, "Trends in trip chaining and tours: Analysing changes in New Zealanders' travel patterns using the ongoing New Zealand Household Travel Survey," in New Zealand Transport Agency Research Report, Nov. 2009, [Online] Available: https://trid.trb.org/view/904627.

[5] D. Banister and A. Bowling, "Quality of life for the elderly: the transport dimension," Transp. Policy., vol. 11, no. 2, pp. 105-115, Apr. 2004, doi: https://doi.org/10.1016/S0967-070X(03)00052-0.

[6] American "Occupational Therapy Association, Occupational therapy practice framework: Domain and process (second ed.)," Am. J. Occup. Ther., vol. 62, no. 6, pp. 625-683, Nov. 2008, doi: https://doi.org/10.5014/ajot.62.6.625.

[7] American "Occupation Therapy Association, Occupational therapy practice framework: Domain and process (3rd ed.)," Am. J. Occup. Ther., vol. 68, pp. s1-s48, Mar. 2014, doi: https://doi.org/10.5014/ajot.2014.682006.

[8] M. R. J. Baldock, J. L. Mathias, A. J. McLean, and A. Berndt, "Self regulation of driving and its relationship to driving ability among older adults," Accid. Anal. Prev., vol. 38, no. 5, pp. 1038-1045, Sep. 2006, doi: https://doi.org/10.1016/j.aap.2006.04.016.

[9] S. Lyman, S. A. Ferguson, E. R. Braver, and A. F. Williams, "Older driver involvements in police reported crashes and fatal crashes: trends and projections," Inj. Prev., vol. 8 no. 2, pp. 116-120, Jun. 2002, doi: http://dx.doi.org/10.1136/ip.8.2.116.

[10] D. McKenzie and R. Peck, "Revised teen and senior facts report confirms previous trends (Research notes, Spring 1998)," CA: Department of Motor Vehicles Publishers, Sacramento, 1998.

[11] H. I. Ahmed, E. E. Mohamd, and S. M. Aly, "Effect of mobility on the quality of life among older adults in geriatric home at Makkah Al-Mukarramah," Advances in Life Science and Technology, vol. 17, pp. 39-50, Feb. 2014, [Online] Available: https://iiste.org/Journals/index.php/ALST/article/view/10825.

[12] L. Staplin, K. H. Lococo, J. Stewart, and L. E. Decina, "Safe mobility for older people notebook (Report no. DOT HS-808-853)," Department of Transportation, Washington Publishers, USA, 1999.

[13] Transportation Research Board, "Transportation in an aging society: Improving mobility and safety for older, persons," National Academy Press Publishers, Washington, vol. 1, 1988.

[14] T. Galski, H. Ehle, M. A. McDonald, and J. Mackevich, "Evaluating fitness to drive after cerebral injury: basic issues and recommendations for medical and legal communities," J. Head Trauma Rehabil., vol. 15, no. 3, pp. 895-908, Jun. 2000, doi: http://dx.doi.org/10.1097/00001199-200006000-00004.

[15] J. E. Meyers, M. volbrecht, and B. J. Kaster, "Driving is more than pedal pushing," Appl. Neuropsychol., vol. 6, no. 3, pp. 154-159, 1999, doi: http://dx.doi.org/10.1207/s15324826an0603_3.

[16] J. C. Stutts and J. W. Wilkins, "On-road driving evaluations: a potential tool for helping older adults drive safely longer," J Safety Res., vol. 34, no. 4, pp. 431-439, 2003, doi: http://dx.doi.org/ 10.1016/j.jsr.2003.09.014.

[17] P. Husband, "A literature review of older driver training interventions: implications for the delivery programmes by Devon County Council and Devon Road Casualty Reduction Partnership," Devon County Council., Mar. 2010.

[18] L. J. Molnar, D. W. Eby, P. S. Kartje, and R. M. St. Louis, "Increasing self-awareness among older drivers: The role of self-screening," J. Safety Res., vol. 41, no. 4, pp. 367-373, Aug. 2010, doi: http://dx.doi.org/ 10.1016/j.jsr.2010.06.003.

[19] N. Baster, "It's my choice: Safer mobility for an ageing population, Parliamentary Advisory Council for Transport Safety (PACTS) Publishers," London, 2012.

[20] J. L. Charlton and L. Molnar, "Self-regulation, self-screening instruments and safe driving practices," Washington DC, 2011.

[21] A. Siren and A. Meng, "Cognitive testing of older drivers does not produce safety benefits," Accid. Anal. Prev., vol. 45, no. 2, pp. 634-638, Mar. 2012, doi: http://dx.doi.org/10.1016/j.aap.2011.09.032.

[22] B. Lang, A. Parkes, and K. Fernandez-Medina, "Driving choices for the older motorist: the role of self-assessment tools," RAC Foundation, London, Feb. 2013.

[23] D. W. Eby, J. M. Molnar, and P. Kartje, "SAFER Driving: The Enhanced Driving Decisions Workbook," The University of Michigan Transportation Research Institute, Ann Arbor, 2006.

[24] D. W. Eby, L. J. Molnar, and J. T. Shope, "Driving decisions workbook. Report No. UMTRI-2000-14," MI: University of Michigan Transportation Research Institute, Ann Arbor, 2000.

[25] National Highway Traffic Safety Administration, "Driving Safely While Aging Gracefully," USAA Educational Foundation, Washington, D.C., 1999.

[26] J. L. Malfetti and D. J. Winter, "Drivers 55 plus: Test your own performance. A Self-Rating Form of Questions, Facts and Suggestions for Safe Driving," AAA Foundation for Traffic Safety Publishers, Washington, DC, 1986.

[27] AAA (Australian Automobile Association), "Drivers 65 Plus: Check Your Performance," AAA Foundation for Traffic Safety Publishers, Washington, DC, 2010.

[28] S. Classen, P. S. Wen, C. A. Velozo, M. Bédard, S. M. Winter, B. Brumback, and D. N. Lanford, "Psychometrics of the self-report Safe Driving Behavior Measure for older adults," Am. J. Occup. Ther., vol. 66, no. 2, pp. 233-241, Mar. 2012, doi: http://dx.doi.org/10.5014/ajot.2012.001834.

[29] K. J. Anstey, J. Wood, S. Lord, and J. G. Walker, "Cognitive, sensory and physical factors enabling driving safety in older adults," Clin. Psychol. Rev., vol. 25, no. 1, pp. 45-65, Jan. 2005, doi: http://dx.doi.org/ 10.1016/j.cpr.2004.07.008.

[30] A. Fink, J. Kosecoff, M. Chassin, and R. H. Brook, "Consensus methods: characteristics and guidelines for use," Am. J. Public Health, vo. 74, no. 9, pp. 979-983, Sep. 1984, doi: https://doi.org/10.2105/AJPH.74.9.979.

[31] N. C. Dalkey and O. Helmer, "An experimental application of the Delphi method to the use of experts," Manage. Sci., vol. 9, no. 3, pp. 458-467, Apr. 1963, doi: https://doi.org/10.1287/mnsc.9.3.458.

[32] F. J. Romm and B. S. Hulka, "Developing criteria for quality of assessment: effect of the Delphi technique," Health Serv. Res., vol. 14, no. 4. pp. 309-312, 1979.
[33] J. Zinn and A. Zalokowski, "The use of the Delphi panel for consensus development on indicators of laboratory performance," Clin, Leadersh Manag. Rev., vol. 13, no. 6, pp. 386-408, Nov. 1998.
[34] B. J. Hillman, S. J. Hessel, R. G. Swensson, and P. G. Herman, "Improving diagnostic accuracy: a comparison of interactive and Delphi consultations," Invest. Radiol., vol. 12, no. 2, pp. 112-115, Mar. 1977, doi: https://doi.org/10.1097/00004424-197703000-00002.
[35] A. V. Milholland, S. G. Wheeler, and J. J. Heieck, "Medical assessment by a Delphi group opinion technic," N. Engl. J. Med., vol. 288, no. 24, pp. 1272-1275, Jun. 1973, doi: https://doi.org/10.1056/NEJM197306142882405.
[36] C. H. Lawshe, "A quantitative approach to content validity," Pers. Psychology, vol. 28, no. 4, pp. 563-575, 1975.
[37] C. Gagliardi, F. Marcellini, R. Papa, C. Giuli, and H. Mollenkopf, "Associations of personal and mobility resources with subjective well-being among older adults in Italy and Germany," Arch. Gerontol. Geriatr., vol. 50, no. 1, pp. 42-47, Jan. 2010, doi: https://doi.org/10.1016/j.archger.2009.01.007.
[38] B. N. Fildes, "Future directions for older driver research," Traffic Inj. Prev., vol. 9, no. 4, pp. 387-393, Aug. 2008, doi: https://doi.org/10.1080/15389580802272435.
[39] R. K. Hambleton, "Fundamentals of item response theory," Sage publications Publishers, USA, vol. 2, 1991.
[40] S. Shen, K. L. Ratnapradipa, G. C. Pervall, M. Sweeney, and M. Zhu, "Driver License Renewal Laws and Older Adults' Daily Driving, United States, 2003–2017," J Gerontol B, vol. 75, no. 10, pp. 2268-2277, Jun. 2020, doi: https://doi.org/10.1093/geronb/gbaa070.
[41] M. O. Park, "Development of a web-based Mini-Driving Scene Screening Test (MDSST) for clinical practice in driving rehabilitation," Int. J. Environ. Res. Public Health , vol. 19, no. 6, p. 3582, Mar. 2022, doi: https://doi.org/10.3390/ijerph19063582.