Will Mobility Constrained People Embrace Automated Vehicles?

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1. INTRODUCTION --

- 35% of the people in Germany can be considered constrained in mobility (young children, physically or mentally disabled individuals and elderly persons)

- Automated driving promises mobility improvements such as increased independence, flexibility and better access to essential daily activities and opportunities

However, little is known about:

- if and how mobility constrained people expect to benefit from specific automated vehicle concepts (AVs)

- how they expect their mobility behavior to change

- barriers that prevent AVs from reaching their full potential

2. METHODOLOGY --

- A sample of 447 Germans 70 years old and older representative of technically affine elderly persons

- Sample of physically disabled 183 Germans

  – 80% of both groups reported that they already heard about autonomous driving and even 25% knows the topic very well

  – 76% of elderly and 67% physically disabled participants drive their own cars at least once a week

- Online survey with an illustrated scenario depicting the service the studied AVs would provide: one orders the vehicle, rides autonomously to a destination and gets out of the car

Studied AV concepts

(a) Concept presented to elderly persons

(b) Concept presented to physically disabled

3. RESULTS --

Which benefits did participants foresee when forecasting the availability of on-demand AVs?

Specific benefits for daily mobility	Elderly persons	Physically disabled
Having more time for running errands and exercising leisure activities	20 %	30 %
Meeting friends and relatives more frequently	14 %	26 %
Spending leisure time more actively	21 %	30 %
Being able to (longer) practice a meaningful occupation, e.g. honorary position	15 %	19 %
Better managing daily errands, e.g. shopping groceries or visiting the doctors	26 %	35 %
Performing activities in greater distance	22 %	33 %
Heading for places outside the town more often	23 %	31 %
Better access to shops	27 %	32 %
Specific benefits on a trip		
Better protection from nuisance and crime	17 %	16 %
Reduced risk of injuries on travels	26 %	27 %
More comfortable journey	40 %	44 %
Perceiving less stress on travels	32 %	40 %
Foregoing active travel support	not asked	31 %
Other benefits		
More flexibility	34 %	40 %
Gaining higher quality of life	32 %	43 %
Gaining back daily mobility if faced a bodily handicap	44 %	55 %
Gaining better access to public transport	34 %	36 %
Agreeing with at least one of these benefits	69 %	79 %

How do they expect their mobility behavior to change?

Agreeing with…	Elderly persons		Physically disabled	
…using AV in daily life	38 %		51%	
…mobility won't improve only due to AV	not asked		49 %	
…travelling longer distances	19 %		34 %	
…making more trips	15 %		31 %	
…travelling short distances (< 1 km) with AV	13 %		26 %	
…walking less	11 %		21 %	
Daily number of trips	Mean	Median	Mean	Median
National Household Survey MiD 2008	3.01$_a$ (SD=2.30)	3	3.03$_b$ (SD=2.49)	2
National Household Survey MiD 2017	2.78$_a$ (SD=2.20)	2	2.47$_a$ (SD=2.28)	2
Self reported expected number of trips forecasting the availability of on-demand AVs	2.74$_a$ (SD=3.19)	2	3.27$_b$ (SD=2.86)	3
Daily kilometres	Mean	Median	Mean	Median
National Household Survey MiD 2008	13.82$_a$ (SD=19.32)	6.3	17.27$_b$ (SD=23.01)	8.1
National Household Survey MiD 2017	15.19$_b$ (SD=20.51)	7.4	16.07$_a$ (SD=23.20)	5.8
Self reported expected daily kilometres forecasting the availability of on-demand AVs	17.17$_c$ (SD=16.27)	12	24.45$_c$ (SD=25.29)	20
Use of public transport	1 = never … 5 = daily			
Current usage vs. usage forecasting the availability of on-demand AVs	$Z = 1.82$ n.s.		$Z = 2.09$ *	

$_{a, b, c}$ different indices indicate significantly different ($p < .05$) t-Tests/ Wilcoxon signed-rank tests
* indicates $p < .05$ in Wilcoxon signed-rank tests

A structural equation model indicates that primarily expected specific benefits on a trip (b = 0.82, $p < .001$) and only to a lesser extent expected benefits for daily mobility (b = 0.18, $p < .05$) predict mobility constrained people's intention to use an on-demand AV ($p (\chi^2) < .001$, RMSEA [95% CI] = 0.045 [0.035,0.054], SRMR = 0.047, CFI = 0.996, TLI = 0.995).

Which are the main barriers for elderly persons and physically disabled to utilize the full potential of AVs?

- Already feel flexible due to customized private automobiles

- High importance of being able to drive themselves

- Accessibility required: includes accessibility at destination or for public transport

- Dependence on technology and safety issues

4. CONCLUSIONS ---

- Elderly persons and physically disabled expect benefits for their daily lives and stated intention to use AVs to access daily activities

- Yet, daily mobility of elderly persons without physical disability is not expected to benefit as much as daily mobility of physically disabled

- Only minor changes in future traffic demand , but an increase in kilometers travelled are expected

- Deploying on-demand AVs may promote usage of accessible public transport

- The results suggest the importance of decision-makers in promoting on-demand AVs as an inclusive means of transport

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