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Title:	The relation between reinforcer	ment sensitivity and self-reported, simulated
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1 Abstract

Previous studies on older drivers show that diminishing functional (i.e. visual, motor and
cognitive) abilities influence driving behavior. Research on young novice drivers, has shown that
personality factors such as reinforcement sensitivity play a role in driving behavior. This relation
however, has been understudied in older drivers.

6 The present study investigated the relationship between reinforcement sensitivity and driving 7 in older drivers at risk of diminished driving ability. Driving was assessed by self-report measures 8 (i.e., Driver Behavior Questionnaire), a simulated driving task and an on-road driving assessment. 9 Both general driving as well as specific aspects of driving (i.e. speed, standard deviation of lateral 10 position [SDLP], reactions to unexpected events) were considered. Reinforcement sensitivity was 11 assessed by means of the classical BIS\BAS self-report instrument. Additionally, as this has been 12 shown already for adolescents, it was investigated whether behavioral inhibition can function as a 13 surrogate measure of reinforcement sensitivity, by studying the relation between behavioral inhibition 14 and reinforcement sensitivity in the current sample of older adults.

Reinforcement sensitivity predicted self-report driving but simulated and on-road driving were mainly predicted by age. In specific aspects of simulated driving, reinforcement sensitivity played only a minor role. The fact that reinforcement sensitivity was related to self-reported driving provides support for the hypothesis that personality differences have a direct influence on older drivers' selfassessment and possibly on self-regulation and ceasing to drive decisions. Behavioral inhibition was unrelated to reinforcement sensitivity in older drivers and can therefore not function as a surrogate measure of reinforcement sensitivity.

22

23 Keywords:

24

Reinforcement sensitivity, Personality, Older drivers, Self-reported driving, Simulated driving,

25 On-road driving

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26 Highlights

- Reinforcement sensitivity predicts self-reported driving ability in older drivers
- Reinforcement sensitivity does not predict driving performance in older drivers
- Age predicts simulated and on-road driving in elderly drivers
- Reinforcement sensitivity plays a minor role in various specific aspects of driving abilities
- Differences in reinforcement sensitivity might influence self-assessment tendencies in driving

32 **1. Introduction**

33 One of the largest challenges faced by society today is the extensive ageing of the population 34 (Sander et al., 2015). The proportion of older people with a driver's license has risen worldwide over 35 the past three decades, indicating an actively aging generation (Nuyttens, Vlaminck, Focant, & 36 Casteels, 2012; Sivak & Schoettle, 2012). Maintaining the ability to drive has many positive effects 37 for older people, such as an increased sense of independence and reduced chances of being admitted to 38 residential care facilities (Freeman, Gange, Muñoz, & West, 2006; Marottoli et al., 1997). Meanwhile, 39 sustained driving is not without risk, because age-related decline and pathologies can have a severe 40 negative influence on driving safety (Ball et al., 2006). Most studies focusing on older driver safety 41 have therefore addressed age-related functional changes (e.g. visual, motor or cognitive function 42 decline) as factors that can have a negative impact on driving (Karthaus & Falkenstein, 2016). 43 In young novice and adult drivers however, the influence of reinforcement sensitivity (i.e. 44 sensitivity to reward, sensitivity to punishment) on driving abilities has received extensive attention. 45 Recent studies and meta-analyses have associated sensitivity to reward, impulsivity and low cognitive 46 control with poorer driving performance, decreased compliance with road rules and risky driving 47 behaviors in young drivers (Ross et al., 2015; Scott-Parker & Weston, 2017, Harbeck, 2017 #453). 48 Traits such as sensitivity to reward, sensitivity to punishment and impulsivity are linked to 49 neurobiological systems originating from the frontal lobe in Steinberg's Dual Systems Approach 50 (Steinberg et al., 2008). The dual system approach assumes the existence of the socioemotional system 51 (responsible for -among others- reward sensitivity) and the cognitive control system (responsible for 52 impulse regulation and self-regulation). The late maturation of the cognitive control system relative to 53 the maturation of the socioemotional system is hypothesized to form a partial explanation to the 54 increased impulsive behavior, risky driving behavior and crash risk of young novice drivers(Steinberg, 55 2010). Original research done by Steinberg and colleagues as well as a previous study from our 56 research group found low cognitive control to be related to risky driving in young novice drivers, 57 especially in a rewarding context (Gardner & Steinberg, 2005; Jongen, Brijs, Komlos, Brijs, & Wets, 58 2011).

59 The Inhibitory Deficit Hypothesis of Aging claims that frontal lobe degeneration occurs 60 during healthy aging and leads to reduced inhibitory skills and cognitive control (Hasher & Zacks, 61 1988; Kropotov, Ponomarev, Tereshchenko, Müller, & Jäncke, 2016). As reduced cognitive control 62 and an overactive socioemotional system (increased sensitivity to reward) are related to risky driving 63 behavior in younger drivers, it is interesting to study whether cognitive control and sensitivity to 64 reward and punishment also have an influence on older drivers driving behavior. One previous study 65 has found evidence for a relation between sensation seeking and risky driving in older drivers, but 66 only using an artificial simulated driving task (Schwebel et al., 2007). Following suggestions from 67 review studies, we added also other driving evaluations methods (i.e. self-reported driving, on-road 68 driving evaluations) (Nichols, Classen, McPeek, & Breiner, 2012). 69 The concept of reinforcement sensitivity originates from Gray's Reinforcement Sensitivity 70 Theory (RST (Gray, 1972)). The RST model of personality is regarded as a solid basic model of 71 personality because of its strong foundations in neuroscience (Walker, Jackson, & Frost, 2017). The 72 model postulates two distinct neurological systems controlling avoidance (Behavioral Inhibition 73 System; BIS) and approach behaviors (Behavioral Activation System; BAS). Individual differences in 74 the level of activity of these two systems result in the personality traits sensitivity to reward (BAS) and 75 sensitivity to punishment (BIS). For example, high BIS activation leads to sensitivity to punishment 76 and avoidance behaviour when facing punishment (Carver & White, 1994). Individual differences in 77 reinforcement sensitivity are assessed by means of classic self-report measures such as the BIS\BAS 78 questionnaire (Carver & White, 1994). Due to their self-report nature, such measures are prone to 79 (un)deliberate bias. More objective measurements - and neurocognitive correlates - of BIS and BAS 80 activation have been studied using a Go\No-Go task combined with electroencephalography (EEG). 81 Higher BIS activation was associated with a tendency to halt ongoing behaviors, such as is the case in 82 the bottom-up type of inhibition that is required in the Go\No-go task (inhibit an automated behavior if 83 a conflicting or 'no' cue is presented). BAS activation was associated with intended approach and 84 avoidance behavior stemming from prefrontal cortex activation (Amodio, Master, Yee, & Taylor, 85 2008). Another study found no relation between BIS\BAS traits and behavioral inhibition (Lijffijt, 86 Kenemans, Verbaten, & van Engeland, 2005). All previous studies focused on adolescents, while the

relationship between self-reported BIS and BAS personality traits and a standardized measure of
behavioral inhibition has not been studied in older adults before. A secondary aim of this study is
therefore to investigate whether a behavioral task of response inhibition, such as the Stop Signal Task
(SST: (Logan & Cowan, 1984) can function as a surrogate, and more objective measure of BIS\BAS
in older drivers.

92 The limited number of studies investigating the relationship between reinforcement sensitivity 93 and driving in elderly drivers have used a variety of research methods and have led to contradictory 94 results. For example, Owsley and colleagues (2003) made use of self-report measures to assess 95 personality and reinforcement sensitivity (IVE questionnaire: (Eysenck & Eysenck, 1978) as well as 96 driving ability (Driver Behavior Questionnaire: DBQ (Reason, Manstead, Stradling, Baxter, & 97 Campbell, 1990)). Additionally, state crash reports were used as surrogate measure of driving safety. 98 The study found a positive relationship between self-report traffic violations and impulsivity, but no 99 relationship between any of the self-report personality measures and crash reports. Schwebel et al. 100 (2007) also used self-report measurements of sensation seeking and driving (DBQ, self-reported 101 number of tickets), combined with a virtual simulated driving task and state driving reports with older 102 drivers. Various behaviors in the virtual reality task (e.g. stopping before a road block, lateral position) 103 correlated significantly with at-fault road crashes. Self-reported sensation seeking predicted self-104 reported number of traffic tickets, while low temperamental control predicted reckless driving in the 105 virtual driving task. Only one previous study made use of an on-road driving test, rather than self-106 report measures, to assess driving behavior, and failed to find a significant correlation between self-107 report sensation-seeking and driving in older drivers (Adrian, Postal, Moessinger, Rascle, & Charles, 108 2011). A possible explanation for this discrepancy between self-report measures and actual driving 109 might be found in the fact that self-report measures of driving (e.g. DBQ) are suggested to be 110 influenced by personality factors in older drivers (Owsley, McGwin, & McNeal, 2003). A recent study 111 focusing on executive functioning found self-report executive functioning to be correlated to 112 personality, but not to actual, objective measures of executive functioning (Buchanan, 2016). If a 113 similar bias exists for self-report driving measures, DBQ scores might, to a certain degree, reflect 114 personality traits of older drivers (e.g. a person sensitive to punishment might be less likely to disclose

about his or her driving errors), and might not be suitable proxies for actual driving abilities. This idea has been proposed -but not studied- before by Owsley ((Owsley et al., 2003). As the present study is the first to gather self-report, simulated driving and on-road driving data from a larger group of elderly drivers, this provides an opportunity to test whether personality factors are related to self-report driving but not to actual driving performance (which appears to be the case).

120 The present study investigates whether individual differences in reinforcement sensitivity can 121 predict driving performance of older drivers at risk of diminished driving abilities. Other researchers 122 have formulated the hypothesis that not all aspects of driving are influenced by personality factors in 123 the same way (Adrian et al., 2011; Schwebel et al., 2007). We investigate whether this could also be 124 the case for the relationship between reinforcement sensitivity and driving in older adults. We extend 125 on previous studies by assessing driving behavior in three separate ways: by means of self-report 126 measures, a realistic simulated driving task focusing on specific aspects of driving and an on-road 127 driving assessment. This methodology overcomes the proposed limitations of self-report measures in 128 driving, being not only the general self-reporting bias (memory deficits, social acceptability), but also 129 response- and attribution tendencies caused by personality factors, such as reinforcement sensitivity, 130 itself (Owsley et al., 2003).

131

132 **2. Methods**

The present study is part of a larger research project focusing on the driving abilities of older drivers at-risk of diminished driving abilities (Urlings, Cuenen, Brijs, Lutin, & Jongen, 2017). Within the framework of the larger research project, all participants visited the research center three times. All data in the present study were collected during the second study visit at the Transportation Research Institute of Hasselt University. All 136 participants were informed about the study by an informational brochure and gave written informed consent.

139 2.1 Participants

Participants were recruited through the geriatrics day hospital of the Jessa Hospital (Belgium),
as well as through information sessions at local elderly organizations and by means of information
brochures. In all recruitment materials it was specified that elderly drivers with cognitive complaints

and\or suspected of diminished driving abilities by a caregiver were sought. Participants were
excluded if they were under 70 years of age, did not hold a valid driver's license, or were not active
drivers at the time of participation. None of the participants received treatment for cognitive
impairments at the time of their participation, and participation in the study had no consequences for
the possession of a driver's license.

148

149 2.2 Materials

150 2.2.1 BIS/BAS questionnaire.

The BIS/BAS questionnaire is a 24 item self-report questionnaire assessing reinforcement sensitivity (Carver & White, 1994). Four factors are derived from the questionnaire: one related to BIS sensitivity and three related to aspects of BAS sensitivity. All items are responded to on a 4-point scale, with the first answering option reflecting strong disagreement and the fourth answering option reflecting strong agreement. No neutral answering option is provided.

Total possible BIS scores range from 7 to 28 (7 items). The BAS scale consists of three separate subscales. The `Reward responsiveness' subscale (RR, range 5 to 20, 5 items) focusses on positive responses to reward. The `Fun seeking` subscale (FS, range 4 to 16, 4 items) reflects a desire for rewards and the will to approach a possibly rewarding event. Lastly, the 'Drive' subscale (D, range 4 to 16, 4 items) holds items related to persistence in the pursuit of goals.

161 2.2.2 Stop Signal Task.

162 The Stop Signal Task (SST) is a computerized task measuring impulse control (Logan, 1984). 163 The test was administered on a personal computer with attached response box to facilitate responding 164 for participants not familiar with using computer keyboards. The response box (Cedrus RB 844) is a 165 plastic keyboard with eight keys (four large central keys; four small lateral keys). Only the two lower 166 central keys are used in this task. Those two keys were covered with a colored sticker, to make them 167 stand out. Participants were instructed to rest their left and right index fingers on the left and right 168 response button respectively.

Part 1: Participants were instructed to focus on a fixation cross while resting their index
fingers on the response box. During each trial a letter stimulus (X or O; corresponding with the left

171 and right response button) was presented in the middle of the screen, for 1000 milliseconds.

Participants were instructed to respond as fast as possible by pressing the corresponding key. The
initial simple reaction time (reaction – stimulus presentation) was derived from this first part of the
task.

175 Part 2: In the second part of the test an auditory signal followed the visual stimulus in a 176 randomly selected 25% of cases ("invalid trial"). In cases of an auditory signal, the participant was 177 instructed to refrain from pressing the button (i.e. inhibit the response). All four types of trials (valid 178 'x', valid 'o', invalid 'x' and invalid 'o') were presented in a fixed frequency (75% valid; 25% invalid; 179 equal 'o' and 'x') but in randomized order. The auditory signal came with a delay to the visual 180 stimulus (Stop-signal delay; SSD), but participants were instructed to keep responding as fast as 181 possible. Initially the SSD was set at 50 milliseconds below the individuals reaction time (derived 182 from part 1 of the task) and was subsequently adjusted based on performance. If the response was not 183 inhibited, the SSD was shortened, while if the inhibition was successful, the SSD was increased. This 184 procedure ultimately led to a SSD at which the probability of successful inhibition was 50%. The Stop 185 Signal Reaction Time (SSRT) was calculated by subtracting the SSD from the reaction time. The 186 SSRT is indicative of the time needed for the inhibitory process to complete. Higher SSRT's indicate 187 lower inhibitory control.

188 2.2.3. Driving Measures

189 DBQ – Driver Behavior Questionnaire

The DBQ is a paper and pencil based questionnaire to investigate violations and errors made by drivers (Reason et al., 1990). The instrument consists of 28 questions asking how often a driver is confronted with a certain situation in traffic (e.g. How often do you notice that you have selected the wrong gear when you are pulling up? How often do you forget to check your rearview mirror when you are changing lanes?). All items are rated on a Likert scale ranging from 1 (never) to 6 (almost always) and added up to a sum score. The DBQ has been used frequently in driving research, including in studies concerning older drivers (Owsley et al., 2003{Schwebel, 2007 #396). 197 Simulated driving

The study made use of a fixed-base medium fidelity STISIM V3 driving simulator. Mock-up consisted of an adjustable car seat, steering wheel, brake- and throttle pedal, clutch and gearbox, combined with three large LED TV screens, covering 135 degrees of horizontal visual field. Participants selected manual or automatic gearbox based on their personal preference. Speedometer, rearview- and side mirrors were projected in their normal positions on screen. All participants were given the opportunity to become acquainted with the driving simulator during a test drive, after an instruction provided by the researcher.

205 Participants completed four experimental driving scenarios (Table 1): two in an urban 206 environment (one with high traffic, one with low traffic), and two in a rural environment (one with 207 high traffic, one with low traffic). For all analyses measures were averaged over the high and low 208 traffic scenarios. A general observation-based driving assessment form was completed for each 209 participant. This TRIP observational grid (Test Ride for Investigating Practical Fitness to Drive; (De 210 Raedt & Ponjaert-Kristoffersen, 2001)) consists of 13 subscales representing aspects of driving 211 performance that are all scored on a 4-point scale, leading to a total score with a range from 13 to 52. 212 Two subscales assessing following distance from traffic directly in front of the driver were discarded, 213 as no traffic was presented directly in front of the driver in the simulation. In addition to the general 214 assessment, performance on specific aspects of driving was evaluated by means of driving simulator 215 data.

Specific driving measures related to longitudinal as well as lateral control of the vehicle were selected (i.e. average speed, SDLP, speeding behavior) as well as measures related to specific traffic events (i.e., road hazard detection, anticipation behavior at intersections), known to be challenging for older drivers (Horswill et al., 2009; Mayhew, Simpson, & Ferguson, 2006). A detailed description of all driving measures can be found in table 1.

221

Road	Specific Measurement	Description
Environment		

Urban (3 km)	Average Speed	Road segments ranging from 200 m. before a road event (e.g., stop
Max. 50 km\h		sign, pedestrian crossing) to 100 m. after the road event were
		excluded from the analyses, to eliminate confounding influences.
	SDLP	Standard Deviation of Lateral Position (SDLP) is a standardized
		index of weaving behavior, and a stable and reliable measure of
		driving performance (Verster & Roth, 2011). Similar to the
		procedure for speed measurements, road segments surrounding a
		road event were excluded.
	Speeding	To quantify the amount of speeding behavior, the surface area
		between the participants' speed curve and the maximum speed line
		was calculated. This method takes into account not only the
		distance over which one speeds, but also the severity of the
		speeding.
	Initial Break Distance	Participants were presented with a person crossing at a pedestrian
	(IBD) – Pedestrian	crossing. The event required active breaking from the participant to
	Crossing	give way to the pedestrian. Distance from the pedestrian crossing
		where the participants first started braking was recorded, with a
		maximum of 100 meters.
	Initial Break Distance	Identical to the pedestrian crossing, an upcoming crossing with a
	(IBD) – Stop Sign	stop sign required participants to brake actively to yield any cross
		traffic. The distance from the crossing where the participants first
		braked was recorded, with a maximum of 100 meters
Rural (3 km)	Road Hazard Detection	An unexpected pedestrian crossed the road and breaking hard to
Max. 90 km\h	Time	avoid a collision was necessary. Time in seconds from hazard onset
		(when a pedestrian started to cross) to first release of the throttle

	(10% release) was recorded as detection time. Time was averaged over the high and low traffic.
Road Hazard Reaction	The road hazard reaction time was defined as the time between
Time	hazard onset and first input of the brake pedal (10% input), in the
	same traffic event as the road hazard detection time.

- Table 1. Description of specific driving simulator measures
- 223 On-road driving task

224 An on-road driving assessment, mimicking the Belgian fitness-to-drive evaluation procedure, 225 was performed in an instructor vehicle with a specialized fitness to drive evaluator from the Belgian 226 fitness-to-drive authority (CARA). A 30-kilometer trajectory was driven the direct surroundings of the 227 Transportation Research Institute. As to complete a full fitness-to-drive evaluation, the trajectory 228 included built-up, city areas (speed limit 30/50 kilometer per hour), rural areas (speed limit 70/90 229 kilometers per hour) and motorway (speed limit 120 kilometers per hour). All on-road evaluations 230 were completed in daylight conditions, between office hours on workdays (i.e. Monday to Friday, 231 between 9 AM and 5 PM). The same assessor completed all on-road driving tests and filled in the 232 TRIP assessment form for all participants, similar to the procedure in the driving simulator. 233 234 2.3 Statistical analysis 235 Statistical analyses were performed with IBM SPSS Statistics 24.0 and significance threshold

Statistical analyses were performed with IBM SPSS Statistics 24.0 and significance threshold was set at p < 0.05. Ten hierarchical regression models were built, exploring the relation between driving performance and reinforcement sensitivity. The DBQ, the (specific aspects of) simulated driving assessment, and the on-road driving assessment served as dependent variables. The four subscales of the BIS\BAS questionnaire and the SSRT score served as predictor variables.

As age tends to influence BIS/BAS questionnaire scores (Carver & White, 1994; Jorm et al., 1998) as well as SST performance (Williams et al., 1999), it was controlled for in all analyses. All regression models were built in two steps; a first step with only age as a predictor, and a second step in which all predictor variables were entered. This second step allowed to investigate the additional percentage of variance explained by our predictor variables, over the variance explained by age alone. 245

3. Results

247 **3.1 Descriptives**

248 Participants (97 males, 31 females) were on average 78.48 years of age (SD 5.40, min. 70, 249 max. 92), and 31.1% of participants drove up to 5.000 km per year. Thirty-six participants suffered 250 from so-called simulator sickness (Kennedy, Lane, Berbaum, & Lilienthal, 1993), preventing them 251 from completing the simulated driving assessment. These driving simulator data were excluded from 252 the analyses. Twelve participants did not complete the on-road driving test, either on their own 253 initiative or because of discontinuation by the evaluator for safety reasons. As no full TRIP evaluation 254 could be filled in in these cases, participants were excluded from the analyses. Descriptive statistics on 255 all variables of interest can be found in Table 2.

256

	Mean	SD	Min	Max
SSRT	236.93	79.84	15.90	405.69
BIS	20.23	3.35	11.00	27.00
BAS D	9.96	2.60	4.00	16.00
BAS FS	10.05	2.04	4.00	16.00
BAS RR	16.60	2.71	7.00	20.00
DBQ	40.31	7.76	28.00	66.00
TRIP -simulator	35.51	6.01	16.00	44.00
TRIP – on-road	46.60	6.53	24.00	52.00
Average Speed	50.15	7.00	35.72	65.85
SDLP	0.24	0.07	0.12	0.47
Speeding	1473.74	1790.28	0.00	7009.44
IBD – Pedestrian	45.27	15.79	15.58	99.71
IBD – Stop Sign	63.96	18.89	23.54	99.99
Hazard Detection Time	1.05	1.53	0.13	12.14

Hazard Reaction Time	1.11	0.71	0.27	5.46

257 Table 2. Descriptive statistics

	Age	SSRT	BIS	BAS D	BAS FS	BAS	DBQ	TRIP -	TRIP –
						RR		simulator	On-
									road
Age	-								
SSRT	0.020	-							
BIS	-0.097	0.094	-						
BAS D	0.097	0.057	0.008	-					
BAS FS	0.006	0.140	0.141	0.431**	-				
BAS RR	0.166	0.201*	0.417**	0.354**	0.397**	-			
DBQ	-0.241**	-0.163	0.124	-0.051	0.159	-0.156	-		
TRIP - Simulator	-0.477**	0.042	0.107	-0.063	0.180	0.139	0.303**	-	
TRIP – On-road	-0.335**	0.038	-0.092	-0.133	0.031	-0.001	0.079	0.542**	-

258

Table 3. Bivariate correlations of BIS/BAS questionnaire and SSRT measures. p<0.05, ** p<0.01

Age was significantly related to self-report, simulated and on-road driving. None of the factors related to reinforcement sensitivity correlated significantly with any of the driving measures.

261 Behavioral inhibition (SSRT) correlated significantly with BAS reward responsiveness, but not with

any of the other BAS scales, nor with the BIS scale. BIS scores were significantly related to BAS

263 Reward Responsivity, but not to other BAS subscales. All BAS subscales were significantly related to

each other. All bivariate correlation coefficients can be found in Table 3.

265

266 **3.2 Hierarchical regression models**

267 Before running the regression analyses, all factors were checked for outliers. The variables

268 Road Hazard Detection Time (one case), Road Hazard Reaction Time (two cases) and Initial Brake

269 Point of the pedestrian crossing (one case) showed outliers with z-scores <-3.29 or >3.29. Those cases

- 270 were removed from their respective regression models.
- 271 Self-report driving (DBQ) was significantly predicted by BAS FS and BAS RR and

272 marginally significantly by BIS. The model including all predictor variables (F (6, 103) = 3.810,

p=0.002) predicted 13.4% of the variance in DBQ score and was a significantly better model than the

274 one with age as a predictor. General driving performance in the simulated driving task (TRIP) was

275	predicted by age (F (1, 78) =23.033, $p < 0.001$), but none of the measures related to reinforcement
276	sensitivity were significant predictors. Age predicted 21.8% of the variance in simulated driving
277	performance and with each increasing year of age, TRIP total score was predicted to decrease with
278	0.540 point. General driving performance during on-road driving (TRIP) was predicted by age as well
279	as BIS (F (6, 100) = 3.480, <i>p</i> =0.004).

280 For the specific aspects of driving, average speed driven as well as speeding behavior were 281 predicted by BIS score. SDLP was predicted by both BAS Drive and BAS Reward Responsiveness. 282 Detection and reaction time when confronted with a sudden road hazard were not predicted by any of 283 the reinforcement sensitivity measures. Initial brake distance was predicted by BAS Reward 284 Responsiveness, but only in case of approaching a pedestrian crossing (not a stop signaled crossing). 285 For all specific aspects of driving, it should be noted that none of the models including the 286 reinforcement sensitivity factors lead to significantly increased percentages of variance explained, 287 compared to the model consisting of only age as a predictor, with the exception of the model for 288 SDLP. Only in this case, 10.1% of the variance in SDLP was explained by the models consisting of 289 age and reinforcement sensitivity factors. Increased sensitivity to reward and increased drive are 290 related to higher SDLP and thus increased weaving behavior in the driving simulator.

All regression models can be found in table 4.

Driving measure		Adj. R ²	sig. ΔR^2
DBQ	Model 1	0.049	0.011*
	Model 2	0.134	0.012*
	Predictor	β	Р
	Constant		0.000
	Age	169	0.070
	BIS	0.196	0.055
	BAS RR	-0.272	0.018*
	BAS Drive	-0.053	0.606
	BAS FS	0.285	0.007*
	SSRT	-0.159	0.084
TRIP - simulator	Model 1	0.218	0.000**
	Model 2	0.252	0.145
	Predictor	β	Р
	Constant		0.000
	Age	-0.493	0.000**
	BIS	-0.020	0.853
	BAS RR	0.213	0.096
	BAS Drive	-0.203	0.081

	BAS FS	0.184	0.121
	SSRT	-0.007	0.947
TRIP On-Road	Model 1	0.104	0.000**
	Model 2	0.123	0.210
	Predictor	β	Р
	Constant		0.000
	Age	-0.369	0.000**
	BIS	-0.217	0.038*
	BAS RR	0.185	0.114
	BAS Drive	-0.193	0.069
	BAS FS	0.069	0.519
	SSRT	0.033	0.726
Average Speed	Model 1	-0.012	0.704
	Model 2	0.015	0.240
	Predictor	β	Р
	Constant		0.041
	Age	0.075	0.537
	BIS	0.295	0.027*
	BAS RR	-0.128	0.406
	BAS Drive	0.117	0.404
	BAS FS	0.103	0.468
	SSRT	0.020	0.874
SDLP	Model 1	0.015	0.152
	Model 2	0.101	0.050*
	Predictor	ß	Р
	1 / Cuicioi	P	
	Constant	P	0.792
	Constant	0.200	0.792
	Constant Age BIS	0.200	0.792 0.084 0.225
	Constant Age BIS BAS PP	0.200 0.152 0.203	0.792 0.084 0.225 0.015*
	Constant Age BIS BAS RR	0.200 0.152 0.203 0.203	0.792 0.084 0.225 0.015*
	Constant Age BIS BAS RR BAS Drive	0.200 0.152 0.203 0.330	0.792 0.084 0.225 0.015* 0.015*
	Constant Age BIS BAS RR BAS Drive BAS FS	0.200 0.152 0.203 0.330 -0.084	0.792 0.084 0.225 0.015* 0.533
	Constant Age BIS BAS RR BAS Drive BAS FS SSRT	0.200 0.152 0.203 0.330 -0.084 -0.363	0.792 0.084 0.225 0.015* 0.015* 0.533 0.088
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1	0.200 0.152 0.203 0.330 -0.084 -0.363 0.000	0.792 0.084 0.225 0.015* 0.533 0.088 0.316
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2	0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041	0.792 0.084 0.225 0.015* 0.533 0.533 0.088 0.316 0.172
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 P
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 P 0.127
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS BAS FS SSRT Model 1 Model 2 <i>Predictor</i> Constant Age	$ \begin{array}{c c} \rho \\ \hline 0.200 \\ 0.152 \\ 0.203 \\ 0.330 \\ \hline -0.084 \\ \hline -0.363 \\ 0.000 \\ 0.041 \\ \hline \beta \\ \hline 0.135 \\ \hline 0.$	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 <i>P</i> 0.127 0.258
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 0.273	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.037*
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 <i>Predictor</i> Constant Age BIS BAS RR BAS RR	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 -0.084 0.221	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS SC	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.792 0.084 0.225 0.015* 0.533 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.090
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS PS SSRT	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 -0.084 0.234 -0.007 0.027	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.090 0.959
Speeding	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS FS SSRT	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 -0.084 0.234 -0.007 -0.036 0.012	0.792 0.084 0.225 0.015* 0.533 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.090 0.959 0.764
Speeding Detection Time	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS FS SSRT Model 1	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.792 0.084 0.225 0.015* 0.015* 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.090 0.959 0.764 0.576
Speeding Detection Time	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS FS SSRT Model 1 Model 2	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 -0.084 0.234 -0.007 -0.036 -0.012 0.078 ρ	0.792 0.084 0.225 0.015* 0.533 0.088 0.316 0.172 <i>P</i> 0.127 0.258 0.037* 0.579 0.090 0.959 0.764 0.576 0.081 <i>P</i>
Speeding Detection Time	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor	ρ 0.200 0.152 0.203 0.330 -0.084 -0.363 0.000 0.041 β 0.135 0.273 -0.084 0.234 -0.007 -0.036 -0.012 0.078 β	0.792 0.084 0.225 0.015* 0.533 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.090 0.959 0.764 0.576 0.081 P
Speeding Detection Time	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS Comparison Constant Constant Comparison Constant Const	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.792 0.084 0.225 0.015* 0.015* 0.533 0.088 0.316 0.172 P 0.127 0.258 0.037* 0.579 0.959 0.764 0.576 0.081 P 0.473 0.481
Speeding Detection Time	Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BIS BAS RR BAS Drive BAS FS SSRT Model 1 Model 2 Predictor Constant Age BAS PS SSRT Addet 1 Model 2 Predictor Constant Age BAS PS SSRT Addet 1 Model 1 Model 2 Predictor Constant Age BIS BAS PS SSRT Addet 1 Model 1 Model 2 Predictor Constant Age BIS BIS BAS PS SSRT Addet 1 BAS PS SSRT Addet 1 BAS PS SSRT Addet 1 BAS PS SSRT Addet 2 Constant Age BIS BAS PS SSRT Addet 2 Predictor Constant Age BIS	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c} & 0.792 \\ & 0.084 \\ & 0.225 \\ & 0.015^* \\ & 0.533 \\ & 0.533 \\ & 0.088 \\ & 0.316 \\ & 0.172 \\ \hline P \\ & 0.127 \\ & 0.258 \\ & 0.037^* \\ & 0.579 \\ & 0.037^* \\ & 0.579 \\ & 0.090 \\ & 0.959 \\ & 0.764 \\ & 0.576 \\ & 0.081 \\ \hline P \\ \hline 0.473 \\ & 0.481 \\ & 0.901 \\ \hline \end{array}$

	BAS RR	-0.048	0.767
	BAS Drive	0.297	0.057
	BAS FS	-0.271	0.089
	SSRT	0.233	0.077
Reaction Time	Model 1	-0.014	0.995
	Model 2	-0.051	0.777
	Predictor	β	Р
	Constant		0.422
	Age	0.032	0.797
	BIS	0.082	0.549
	BAS RR	-0.219	0.172
	BAS Drive	0.000	0.999
	BAS FS	0.009	0.950
	SSRT	0.093	0.463
IBD Pedestrian	Model 1	-0.012	0.651
	Model 2	0.015	0.250
	Predictor	β	Р
	Constant		0.282
	Constant Age	0.112	0.282 0.365
	Constant Age BIS	0.112 0.120	0.282 0.365 0.374
	Constant Age BIS BAS RR	0.112 0.120 -0.329	0.282 0.365 0.374 0.040*
	Constant Age BIS BAS RR BAS Drive	0.112 0.120 -0.329 -0.102	0.282 0.365 0.374 0.040* 0.472
	Constant Age BIS BAS RR BAS Drive BAS FS	0.112 0.120 -0.329 -0.102 0.079	0.282 0.365 0.374 0.040* 0.472 0.586
	ConstantAgeBISBAS RRBAS DriveBAS FSSSRT	0.112 0.120 -0.329 -0.102 0.079 0.162	0.282 0.365 0.374 0.040* 0.472 0.586 0.202
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1	0.112 0.120 -0.329 -0.102 0.079 0.162 -0.017	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2	0.112 0.120 -0.329 -0.102 0.079 0.162 -0.017 0.036	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2Predictor	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.162 \\ & & & 0.017 \\ & & 0.036 \\ & & & \\ & & \beta \end{array}$	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstant	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.162 \\ & & -0.017 \\ & & 0.036 \\ \hline & & \beta \end{array}$	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstantAge	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.162 \\ & & & 0.162 \\ & & & -0.017 \\ & & 0.036 \\ \hline & & & \\ $	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882 0.658
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstantAgeBIS	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.079 \\ & & 0.162 \\ & & -0.017 \\ & & 0.036 \\ \hline & & \beta \\ \hline & & \\ & & 0.060 \\ & & 0.234 \\ \end{array}$	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882 0.658 0.117
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstantAgeBISBAS RR	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.162 \\ & & -0.017 \\ & & 0.036 \\ \hline & & \\ & $	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882 0.658 0.117 0.891
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstantAgeBISBAS RRBAS RRBAS Drive	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ \hline & & 0.162 \\ & & -0.017 \\ \hline & & 0.036 \\ \hline & & \\ & & $	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882 0.658 0.117 0.891 0.990
IBD Crossing	ConstantAgeBISBAS RRBAS DriveBAS FSSSRTModel 1Model 2PredictorConstantAgeBISBAS RRBAS DriveBAS FS	$\begin{array}{c c} & & & \\ & & 0.112 \\ & & 0.120 \\ & & -0.329 \\ & & -0.102 \\ & & 0.079 \\ & & 0.162 \\ & & -0.017 \\ & & 0.036 \\ \hline \beta \\ \hline \\ & & 0.036 \\ \hline \beta \\ \hline \\ & & 0.060 \\ & & 0.234 \\ & & 0.024 \\ \hline \\ & & 0.002 \\ \hline \\ & & 0.228 \\ \hline \end{array}$	0.282 0.365 0.374 0.040* 0.472 0.586 0.202 0.769 0.179 P 0.882 0.658 0.117 0.891 0.990 0.158



Table 4. * p<0.05, ** p<0.01 All reported Beta values are standardized coefficients

293

4. Discussion

The current study investigated the relationship between reinforcement sensitivity and driving in elderly drivers at risk of diminished driving abilities. Driving abilities were assessed by means of the self-report DBQ, a realistic simulated driving task and an on-road driving assessment, thereby extending on methodologies used in previous studies. During the simulated driving assessment, both general driving performance as well as more specific aspects of driving abilities were investigated, which is novel in this target group. Simulated driving performance was highly correlated with on-road driving performance, indicating that simulated driving gives a valid indication of driving abilities in
 elderly drivers presenting with or suspected of diminished functional and driving abilities.

303 Self-reported driving was predicted by a combination of reinforcement sensitivity factors (13.4 304 % explained variance). This result is in line with previous studies using the DBQ measure to assess 305 driving in older adults, such as the study by Lucidi (2014) that reported a direct effect of sensation 306 seeking on traffic violations, measured by the DBQ, or the study by Owsley (2003) that found a 307 relationship between impulsivity and self-report violations in older drivers. The present study 308 confirmed that the relationship between self-report driving measures and personality factors also 309 extends to older drivers suspected of or presenting with diminishing functional abilities.

310 Contrary to what might have been expected, simulated and on-road driving were mainly 311 predicted by age. BIS score was related to on-road driving, but BIS score did not lead to a significantly 312 better model than the model consisting of age alone. A previous study with a much smaller sample 313 focusing on the relationship between personality traits (including sensation seeking), executive 314 functions and on-road driving in older drivers also found a strong effect of age, and not of executive 315 functions nor personality factors (Adrian et al., 2011). This result might be sensible, especially in the 316 present sample, as no functional abilities were considered as predictors. The effect of declining 317 functional abilities might therefore be reflected in the variable 'Age'. Also in previous studies, older 318 age is associated with increased risk of functional decline, which in turn leads to impaired driving 319 (Ball et al., 2006 {Anstey, 2011 #153).

320 Only one previous study to our knowledge investigated the relationship between driving and 321 personality factors in older drivers by also making use of a driving simulator (Schwebel et al., 2007). 322 In line with the present study, Schwebel and colleagues found self-reported driving measures 323 (violations, errors, tickets) to be related to reinforcement sensitivity factors such as sensitivity to 324 reward and impulsivity. However, contrary to the present results, this study did find a composite 325 measure of reckless driving from the driving simulator assessment to be predicted by temperamental 326 control. A possible explanation for these deviant findings could be that Schwebel and colleagues 327 (2007) specifically tailored their simulated driving assessment towards risky driving behaviors, similar 328 to other studies focusing on younger drivers(Scott-Parker & Weston, 2017). To evaluate the influence

of personality on driving abilities of older drivers suspected of diminished abilities as fair as possible,
the simulated driving assessment was developed to mimick the real-life driving task as close as
possible. The fact that the DBQ questionnaire does specifically include violations and risk-behaviors
such as drinking and driving, red light running and tailgating might be an alternative explanation for
the finding that reinforcement sensitivity factors are related to DBQ scores, but not to (specific aspects
of) simulated driving behavior.

335 Regarding the specific aspects of driving, SDLP was positively predicted by two of the BAS 336 scales, indicating that higher sensitivity to reward and higher approach drive predict increased 337 weaving (10.1% variance explained). BIS scores predicted longitudinal control variables (average 338 speed, speeding), while BAS Reward Responsiveness was negatively related to anticipation towards 339 pedestrian crossings. These combined results provide support for the hypotheses by both Adrian and 340 colleagues (2011) and Schwebel and colleagues (2007), that not all aspect of driving are related to 341 reinforcement sensitivity in the same way, and that personality related factors seem to play a minor 342 role in specific aspects of driving. This second claim is supported by the fact that the percentage of 343 variance explained in the specific aspects of driving by reinforcement sensitivity remained low, 344 indicating that factors other than age and reinforcement sensitivity play a major role in driving.

345 The finding that self-reported driving, but not actual driving performance, was predicted by 346 personality factors makes it seem likely that personality factors influence the way older drivers assess 347 and report on their own driving behavior. The absence of a relation between self-report measures and 348 actual performance has previously been found for executive functioning, and it has been suggested 349 that personality factors could prove an explanation for this finding {Buchanan, 2016 #499}. For 350 example, people scoring high on conscientiousness might be more aware of their mistakes, resulting in 351 more negative self-report assessments. Or, people scoring high on neuroticism, might be more likely 352 to report more problems in general and therefore evaluate themselves as more negative (Buchanan, 353 2016). In the same way, reinforcement sensitivity might influence how likely older drivers are to 354 disclose accurate information about their driving behaviors and habits; e.g. people sensitive to rewards 355 might be less likely to report failures or errors. This hypothesis was previously made by Owsley

356 (2003) and our present results, combining self-reported, simulated driving and on-road driving data357 provide support for this claim.

358 This self-assessment bias might influence self-regulation in driving and even driving cessation 359 likelihood. A recent study found a relation between personality factors and driving status in older 360 drivers, indicating that specific personality characteristics increase the risk of premature driving 361 cessation and associated loss of independent mobility (Gadbois & Dugan, 2015). Furthermore, 362 previous studies found evidence for a relation between personality factors and self-report strategic (i.e. 363 avoiding driving conditions such as driving at night) and tactical (i.e. adapting one's driving style to 364 personal skill level) compensation while driving (De Raedt & Ponjaert-Kristoffersen, 2000; Sawula et 365 al., 2017). Combined with the results of the present study (i.e. only self-report driving behaviors are 366 predicted by personality factors) it might be hypothesized that part of the older driver population 367 restricts their driving too early or too strictly while others compensate too late. Given the negative 368 effects associated with driving cessation (Marottoli et al., 1997), as well as the obvious safety issues as 369 drivers don't adapt their driving to their personal skill level, it is important that older drivers and their 370 caregivers are supported in making informed, rational decisions with respect to (partial) driving 371 cessation. As personality factors are related to self-report driving and self-regulation, driver education 372 programs focusing on self-regulation and compensation might be more effective if they are tailored to 373 the personality and cognitive level of the participant. Additionally, as personality traits seem to 374 influence self-reported driving, personality traits should be considered by medical professionals in 375 providing advice to older adults with respect to driving cessation (Classen, Nichols, McPeek, &

376 <u>Breiner, 2011</u>).

Regarding our secondary aim - to investigate whether response inhibition (SSRT) can function as a more objective measure for reinforcement sensitivity - we found a negative result. SSRT scores correlated significantly only with BAS Reward Responsiveness and not with any of the other reinforcement sensitivity scales. A correlation coefficient of 0.201 should also be classified as 'small' (Field, 2009). SSRT was also unrelated to self-report, simulated or on-road driving. This result is in line with a previous study by Adrian and colleagues (2011), that focused on older drivers. Previous studies on young novice drivers have found a relationship between response inhibition skills and 384 specific aspects of driving (Jongen et al., 2012). These contradictory results might indicate different 385 underlying mechanisms of driving in young and older drivers. Our previously proposed idea that 386 decreased inhibitory control, caused by frontal aging results in a dominant socioemotional system and 387 additionally in risky driving does not hold for older drivers.

388 This has important implications for possible training options for older drivers to improve 389 driving abilities. Inhibitory control training, a paradigm that has been found successful in other 390 research fields (Berkman, Kahn, & Merchant, 2014; Houben & Jansen, 2011) is not likely to transfer 391 to driving abilities in older drivers at risk of diminished driving abilities due to the minimal influence 392 of inhibitory control on (aspects of) driving.

393

394 4.1 Limitations

395 Driving simulator sickness is a common adverse health effect associated with virtual 396 environments that leads to considerable percentages of participants dropping-out of simulated driving 397 assessments. Also, in the present study, a significant number of participants (36 out of 128) suffered 398 from symptoms of simulator sickness and were therefore unable to complete the simulated driving 399 task. Although this dropout led to a considerable reduction in the sample size for the analyses 400 concerning the data acquired in the driving simulator, the experience of simulator sickness in older 401 drivers has been found not to be related to driving abilities (Mullen, Weaver, Riendeau, Morrison, & 402 Bédard, 2010),

The present study focused solely on reinforcement sensitivity as an aspect of personality, because of its well-established relationship with driving in young novice drivers. Other studies have found evidence that other aspects of personality, such as extraversion, are related to on-road driving performance in older drivers(Classen et al., 2011). Further study is needed to investigate whether other personality aspects are related to driving abilities in a group of older drivers that are at risk of diminished driving abilities. If this is the case, personality should -next to functional abilities- be considered in driving evaluations of elderly drivers.

410

411 **4.2 Conclusion**

- 412 The present study investigated the influence of reinforcement sensitivity on driving abilities in
- 413 older drivers at risk of diminished driving abilities. Reinforcement sensitivity predicted self-report
- 414 driving, but not simulated or on-road driving. Age was the most important predictor of driving ability,
- 415 in the absence of other functional abilities. When reviewing specific aspects of driving abilities,
- 416 reinforcement sensitivity appeared to play a minor role. Personality factors should be taken into
- 417 account when interpreting self-report information from older drivers, as reinforcement sensitivity
- 418 appears to play an important role in self-disclosure tendencies with respect to driving behaviors.
- 419

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