



An Analysis on Drivers' Self-reported Questionnaire Responses, Regarding Aggressive Driving, Attitude Toward Cyclists and Personal Values

Kyriakos Andronis, Nikolaos Mavridis, Alexandros Oikonomou^(✉),
and Socrates Basbas

Department of Transportation and Hydraulic Engineering,
School of Rural and Surveying Engineering,
Aristotle University of Thessaloniki, 54124 Thessaloniki, Greece
aleoikon@gmail.com

Abstract. Driving behavior plays an important role in road safety and it is under investigation by researchers worldwide. In the framework of this paper an attempt is made to gain insight into safe driving behavior with the use of a questionnaire-based survey. One hundred and forty car drivers participated in the questionnaire-based survey that was conducted during 2015 in the city of Thessaloniki. The questionnaire consisted of thirty two questions grouped into four sections. The sections addressed different issues in the scope of Road Safety, Sustainable Mobility and Traffic Psychology such as aggressive driving toward other car drivers, cyclists and pedestrians, attitude toward the use of the bicycle and of the cyclists in general and drivers' personal values that potentially influence their driving behavior. The questionnaire also included a section about drivers' Road Safety awareness and information, driving experience as well as their socioeconomic characteristics. In this paper, the variables derived from the survey are presented with the use of descriptive and inferential statistics.

Keywords: Driving behavior · Aggressive driving · Driver · Cyclist
Road safety · Questionnaire survey · Personal attitudes and values

1 Introduction

Aggressive driving is considered to be associated with road accidents and it is therefore actively studied in the scope of traffic safety [1]. It manifests as a behavior and as such is related to the inner or psychological state of the driver [2]. There are multiple definitions of aggressive driving. Some focus on whether the aggressive behavior is deliberate [3] or on the driver's negative feelings [4] or motives. In most cases, behaviors involved in aggressive driving constitute traffic violations such as speeding and tailgating. The consequence of such behaviors may be endured by any road user including other car drivers, pedestrians and cyclists.

Cycling in particular is a desirable means of urban transport because it promotes sustainable mobility. Still, cycling and cyclists remain largely marginalized [5].

A number of motorists do not seem to accept or tolerate the increasing number of cyclists on the road and tend to hold a negative attitude toward them. Cyclists have an equal right to use the road while at the same time constitute a special group of road users with different characteristics and needs [6]. As previously mentioned, aggressive driving is related to the psychological state of the driver. In this context, certain values drivers hold and their attitude toward other road users become relevant. For example, one could expect that a motorist who values equality in general, would likely consider a cyclist's equal right to use the road.

It must be mentioned at this point that research on the above mentioned topics has been conducted in the School of Civil Engineering and in the School of Rural and Surveying Engineering of the Aristotle University of Thessaloniki during the last years [7–13]. Specifically, the interaction between drivers, cyclists and pedestrians has been investigated in the road environment of Thessaloniki in order to identify and better understand road users' behavior. Within the framework of this paper the focus was set on aggressive driving, driver attitude towards cyclists and driver personal values.

2 Methodology

Car drivers participated in a supervised self-completion questionnaire survey that was conducted in 2015 in Thessaloniki [13]. The average completion time was 6 min and a total of 140 questionnaires were completed. The questionnaire consisted of 32 items grouped into four sections: (a) aggressive driving toward other road users, (b) driver personal values and attitude toward cyclists, (c) questions related to cycling in general and (d) general scope and socioeconomic characteristics. The collected data were screened for incomplete cases, outliers and unengaged responses and were analyzed using IBM SPSS 19 software.

In Table 1, every different type of aggressive driving behavior constitutes a traffic violation according to the Greek Highway Code. This is true even for behaviors that might be considered “not so serious” and the respective rule is hardly ever enforced, such as honking the horn immediately at a green light signal or blocking the pedestrian crossing during a red light signal. A short description of each variable along with their binary values is presented. Following in Table 1, description and values of the variables related to driver attitude toward cyclists and driver personal values are presented. The first two items relating to driver attitude toward cyclists were intentionally formulated as faulty generalizations and express a prejudiced opinion. Obviously, not all cyclists behave this way. Items relating to driver personal values originated from the supplementary questionnaire of European Social Survey, a 21-item measure of human values [14]. Also in Table 1, description and values of the variables related to cycling in general are presented. Variables DMCCycl and AccCar derived from conditional items of the questionnaire and were filled in by car drivers who stated they also cycle or had been cycling.

Finally, description and values of general scope variables are presented in Table 2. Items in this section of the questionnaire included driver's road safety awareness and information, driving experience as well as socioeconomic items. Household income was presented as an optional question to the participants.

Table 1. Description and values of variables denoting aggressive driving, attitude towards cyclists, driver personal values and items related to cycling.

Variable	Description	Values
AggrDriv1	Speeding	0: No, 1: Yes
AggrDriv2	Tailgating	
AggrDriv3	Immediately honking the horn at green lights	
AggrPdstr1	Not giving way at pedestrian crossings	
AggrPdstr2	Blocking pedestrian crossings	
AggrCycl1	Parking in cycle lanes	
AggrCycl2	Overtaking cyclists too closely	
AggrCycl3	Honking the horn at cyclists to move over	
Attitude1	Cyclists do not respect traffic rules	
Attitude2	Cyclists drive dangerously	2: Agree,
Attitude3	Cyclists should not be on the road	3: Neutral,
Attitude4	Cycle lanes take up car space	4: Disagree,
		5: Fully Disagree
ValSafety	A person who values safety is:	1: Much like me,
ValEqual	A person who values equality is:	2: Like me,
ValDiffer	A person who values different view is:	3: Somewhat like me,
ValRisk	A person who likes to take risks is:	4: Little like me,
		5: Not like me,
		6: Not like me at all
OwnBic	Own a bike	0: No, 1: Yes
CyclHndcp	Personal reason to refrain from cycling	
ConsdCycl	Do you consider cycling?	1: No thoughts,
		2: Some thought,
		3: Serious thought,
		4: Already cycling
DMCycl	Average days/month cycling (c)	Open type
AccBike	As a driver I had an accident with a cyclist	1: I had an accident,
AccCar	As a cyclist I had an accident with a car (c)	2: Almost had an accident,
		3: No accident

3 Descriptive and Inferential Statistics

3.1 Summary Statistics

For the binary variables of the survey the proportion of the drivers who responded “yes” is presented in Table 3. Despite the fact that 77% of the drivers reported to be aware of the increased road accidents in Greece, percentages for the various types of aggressive driving were considerable. It is worth noting that only 59% were aware of the default urban speed limit (50 km/h); a supposedly well-known piece of traffic rules information.

In regard to driver attitude towards cyclists, considerable percentages that indicate a negative attitude were found and they are presented in Table 4. Especially, in

Table 2. Description and values of the general variables.

Variable	Description	Values
GenderFem	Female gender	0: No, 1: Yes
DrivYears	Years driving a car	Open type
KmYear	Kilometers driven last year	
Age	Age	
Income	Household income (optional question)	
Education	Education level	1: Elementary, 2: High school graduate, 3: University/Technological Educational Institutions student, 4: Technological Educational Institutions graduate, 5: University graduate, 6: Master degree, 7: Doctoral degree
SpeedLimit	Aware of default urban speed limit	0: No, 1: Yes
TrafficTicket	Received a traffic ticket during the last 3 years	
AccidentsGr	Aware of increased road accidents in Greece	
RoadSafetyAd	Watched a road safety campaign	1: A month ago, 2: Six months ago, 3: A year ago, 4: Never

Table 3. Summary statistics of binary variables.

Variable	N	Min	Max	Proportion
AggrDriv1	140	0	1	55.7
AggrDriv2	140	0	1	67.9
AggrDriv3	140	0	1	37.9
AggrPdstr1	140	0	1	27.1
AggrPdstr2	140	0	1	41.4
AggrCycl1	140	0	1	23.6
AggrCycl2	140	0	1	45.7
AggrCycl3	140	0	1	56.4
SpeedLimit	140	0	1	58.6
TrafficTicket	140	0	1	12.9
AccidentsGr	140	0	1	77.1
OwnBic	140	0	1	50.7
CyclHndcp	140	0	1	10.7
GenderFem	140	0	1	47.1

Attitude3: "Cyclists should not be on the road", a combined 66% of the participants responded either "Fully agree" or "Agree". On the contrary, drivers responded mostly in favor of the presence of cycle lanes. Attitude4: "Cycle lanes take up car space", received a combined 73% of either "Disagree" or "Fully Disagree".

Table 4. Percent frequencies of Education.

Variable	N	1	2	3	4	5	6	7	Mean
Attitude1	140	22.1	33.6	8.6	35.0	.7			2.59
Attitude2	140	13.6	33.6	7.9	43.6	1.4			2.86
Attitude3	140	45.0	21.4	1.4	24.3	7.9			2.29
Attitude4	140	12.1	9.3	5.7	47.1	25.7			3.65
ValSafe	140	25.7	25.0	34.3	7.1	5.7	2.1		2.49
ValEqual	140	47.1	32.9	16.4	1.4	.7	1.4		1.80
ValDiffer	140	39.3	37.1	15.7	5.7	1.4	.7		1.95
ValRisk	140	6.4	22.9	30.0	21.4	13.6	5.7		3.30
AccBike	140	.7	5.7	93.6					2.93
AccCar	70	1.4	7.2	91.3					2.90
ConsdCycl	140	21.4	35.7	9.3	33.6				2.55
RoadSafetyAd	140	49.3	23.6	14.3	12.9				1.91
Education	140	10.7	19.3	18.6	16.4	27.9	6.4	.7	2.55

In regard to drivers' personal values (see Table 4), percent frequencies show that drivers mostly identified as persons who value safety, equality and tolerance. However, percent frequencies for those who like to take risks are also sizeable.

Half the drivers (N = 70) reported they also cycle or had been cycling. The majority of the participants hadn't had an accident either as car drivers with a cyclist or as cyclists with a car (see Table 4). About one fifth (21%) of the drivers do not consider cycling as a possibility at all (see Table 4). Also, almost half the drivers (49%) reported they had watched a road safety campaign during the previous month.

Summary statistics for the rest of the variables of the survey that are continuous are presented in Table 5.

Table 5. Summary statistics of continuous variables.

Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
Age	140	19	75	38.55	13.15	.404	-.658
Income	77	1000	75000	16118.70	11304.07	2.429	9.506
DrivYears	140	1	50	16.45	11.63	.536	-.524
KmYear	140	100	150000	12723.21	19972.55	5.406	32.473
DMCycl	70	0	30	7.69	6.93	.788	.679

3.2 Bivariate Associations

Associations between variables from the sections of aggressive driving, driver attitude toward cyclists and driver personal values are presented in Table 6. Only significant associations at the .05 level are presented. Since the variables were measured at different levels, phi coefficient was utilized for associations between two binary variables, rank biserial coefficient between a binary and an ordinal variable and Spearman's rho correlation coefficient between two ordinal variables.

Table 6. Statistically significant bivariate associations between variables denoting aggressive driving, driver attitude towards cyclists and driver personal values.

Variable 1	Variable 2	Association/correlation coefficient	Approx. Sig.	Coefficient used
AggrDriv1	AggrPdstr1	.253**	.003	Phi
AggrDriv2	AggrPdstr1	.248**	.003	Phi
AggrDriv2	Attitude4	-.175*	.038	Rank-Biserial
AggrDriv2	ValDiffer	.330**	.000	Rank-Biserial
AggrDriv2	ValRisk	-.267**	.001	Rank-Biserial
AggrDriv3	AggrCycl3	.359**	.000	Phi
AggrDriv3	Attitude4	-.280**	.001	Rank-Biserial
AggrDriv3	ValDiffer	-.170*	.045	Rank-Biserial
AggrPdstr1	ValRisk	-.241**	.004	Rank-Biserial
AggrPdstr2	AggrCycl3	.359**	.000	Phi
AggrPdstr2	Attitude1	-.218*	.010	Rank-Biserial
AggrPdstr2	Attitude4	-.199*	.018	Rank-Biserial
AggrCycl1	AggrCycl2	.200*	.018	Phi
AggrCycl1	AggrCycl3	.250**	.003	Phi
AggrCycl1	Attitude4	-.228*	.007	Rank-Biserial
AggrCycl1	ValDiffer	.178*	.036	Rank-Biserial
AggrCycl3	Attitude4	-.205*	.015	Rank-Biserial
Attitude1	Attitude2	.582**	.000	Spearman's rho
Attitude1	Attitude4	.195*	.021	Spearman's rho
Attitude3	Attitude4	.244**	.004	Spearman's rho
Attitude3	ValSafe	.187*	.027	Spearman's rho
Attitude4	ValDiffer	-.166*	.050	Spearman's rho
ValSafe	ValEqual	.398**	.000	Spearman's rho
ValSafe	ValDiffer	.350**	.000	Spearman's rho
ValEqual	ValDiffer	.650**	.000	Spearman's rho

Note. * $p < .05$, ** $p < .01$.

4 Conclusions

A considerable proportion of the drivers that participated in the questionnaire-based survey stated that they drive aggressively. The most common behaviors were speeding (56%) and tailgating (68%). In comparison to the literature, a report on aggressive driving in Canada [15] found that roughly 60% of the drivers were driving in excess of the posted speed limit.

The participants of the study claimed that cyclists are dangerous drivers (56%) with no respect for the traffic rules (47%) and should not be allowed to use the road space (66%). These results are in accordance with a previous study that argues cycling remains marginalized [5]. Most drivers (73%) didn't regard cycle lanes as facilities that take up car space. Concerning personal values, drivers tended to value safety (85%), equality (96%) and tolerance (92%). However, a sizeable proportion (41%) was in favor of taking risks.

The bivariate correlations that are presented in this paper simply provide a useful indication for further investigation into the true nature of the relations between such data. Many interrelationships between items from the questionnaire's sections of aggressive driving, driver attitude toward cyclists and driver personal values were found statistically significant. The largest effect sizes were found to be those between ValEqual and ValDiffer, $rs(138) = .65$, $p < .00$, Attitude1 and Attitude2, $rs(138) = .58$, $p < .00$, and ValSafe and ValEqual, $rs(138) = .40$, $p < .00$. Furthermore, the statistically significant correlations between the different types of aggressive driving are in accordance with previous research [16], in which it is shown that drivers who engage in one type of aggressive driving behavior are also likely to engage in other types of aggressive driving behavior.

References

1. AAA Foundation for Traffic Safety: Aggressive Driving: Research Update. AAA Foundation for Traffic Safety, Washington, DC (2009)
2. Barjonet, P.E.: Traffic Psychology Today. Kluwer Academic Publishers, Boston (2001)
3. Tasca, L.: A Review of the Literature on Aggressive Driving. Ontario Advisory Group on Safe Driving Secretariat, Toronto, Ontario (2000)
4. Dula, C.S., Geller, E.S.: Risky, aggressive, or emotional driving: addressing the need for consistent communication in research. *J. Saf. Res.* **34**(5), 559–566 (2003)
5. Aldred, R.: A matter of utility? Rationalising cycling, cycling rationalities. *Mobilities* **10**(5), 686–705 (2015)
6. Schimek, P.: The Dilemmas of Bicycle Planning. Volpe Center, Cambridge (1999)
7. Paschalidis, E., Basbas, S., Politis, I., Prodromou, M.: "Put the blame on...others!": the battle of cyclists against pedestrians and car drivers at the urban environment. A cyclists' perception study. *Transp. Res. Part F Traffic Psychol. Behav.* **41**, 243–260 (2016)
8. Paschalidis, E., Politis, I., Basbas, S., Lambrianidou, P.: Pedestrian compliance and cross walking speed adaptation due to countdown timer installations; a self report study. *Transp. Res. Part F Traffic Psychol. Behav.* **42**, 456–467 (2016)

9. Oikonomou A., Tafidis P., Kyriakidis P., Basbas S., Politis I.: Risk compensation in a changing road environment. In: Proceedings of the AIIT International Conference on Transport Infrastructure and Systems, Rome (2017)
10. Lambrianidou, P., Basbas, S., Politis, I.: Can pedestrians' crossing countdown signal timers promote green and safe mobility? *Sustain. Cities Soc.* **6**, 33–39 (2013)
11. Papaioannou, P., Politis, I.: Preliminary impact analysis of countdown signal timer installations at two intersections in greece. *Procedia Eng.* **84**, 634–647 (2014)
12. Pascahalidis, E., Prodromou, M., Basbas, S., Politis, I.: Investigation of cyclists' attitudes and perceptions towards other road users: evidence from a case study in Thessaloniki, Greece. *Int. J. Transp.* **5**, 33–46 (2017)
13. Andronis K., Mavridis N.: Investigation of passenger car drivers' behavior characteristics in the city of Thessaloniki. Diploma thesis, School of Rural and Surveying Engineering, Aristotle University of Thessaloniki, Supervisor: Basbas S. (2015)
14. ESS Homepage. <http://www.europeansocialsurvey.org>. Accessed 25 Jan 2018
15. Ministry of Transportation of Ontario: Photo radar safety evaluation preliminary 4 month speed results. Ministry of Transportation, Toronto, Ontario (1995)
16. Beirness, D.J., Simpson, H.M.: Study of the profile of high-risk drivers. Transport Canada, Road Safety and Motor Vehicle Regulation, Ottawa, Ontario (1997)