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25 1. INTRODUCTION

26 Road Traffic Accidents (RTAs) are attributed to many factors including road, vehicle and human factors.
27 These contributory factors combine in a way that leads to a road user failing to cope in a particular
28 situation (Casbard and Accidents 2003, p. 2). The literature generally agrees that human factors are one
29 of the most dominant factors in understanding the chain of events leading to an accident (e.g. Christ *et*
30 *al.*, 2004; GRSP, 2011) and contributes to as much as 75% of all roadway crashes (Salmon *et al.* 2005,
31 p. 1). More recently, taking ‘man as the measure of all things’ and a starting point, in a balanced
32 combination of the elements ‘road’, ‘vehicle’, and ‘man’ is strongly advocated in programs such as the
33 Sustainable Safety Vision of the Netherlands (Wegman *et al.* 2008, p. 12). It is frequently argued that
34 changes in aberrant behavior of drivers offer the largest opportunities for harm reduction (Evan, 1991).
35 However, in order to improve these behaviors, attitudinal and motivational components attached to them
36 must first be understood (Glendon, 2007; Parker, 2004). Attitudes have long been recognized as having
37 an important influence on driver performance, making this an important road safety issue. The construct
38 continues to be a major focus of theory and research in the social and behavioral sciences (e.g. Ajzen
39 2001; Delaney *et al.* 2004; OECD 1994). There is a consensus that attitudes towards traffic safety affect
40 risky driving behavior (Ulleberg and Rundmo 2003) and efforts can be made to change the attitudes that
41 motivate certain drivers to commit relatively high rate of violations (Parker *et al.* 1995).

42
43 Theory of Planned Behavior (TPB) is one of the most established psychological theories to understand
44 attitude-behavior relations. According to the theory, volitional behavior is based on Intention and
45 intentions are results of cognitive components including Attitudes, Subjective Norms (SN) and
46 Perceived Behavioral Control (PBC). However, many studies challenge the assumption that the
47 predictors in the TPB are sufficient to account for intentions and behavior. This is done by including
48 measures of additional variables in the prediction equation and showing significant improvement in the
49 prediction of intentions or behavior (see Conner and Armitage 1998 for a review). However, Ajzen
50 (1991) states that evidences support the TPB and that adding further variables to the model would not
51 significantly enhance its predictive power (Eby and Molnar 1998, p. 65). In later years, he has further
52 claimed that, even when improvements are found, for the most part the improvements in prediction of
53 intentions or behavior are relatively minor, and their generalizability to other behavioral domains has
54 yet to be demonstrated (Ajzen 2001, p. 46). As the significance and empirical values of the basic
55 constructs of the TPB have already been established in a number of studies (e.g. see Ajzen, 1985; Ajzen,
56 1991; Chorlton, 2007), this research takes primary guidelines from these constructs to look into risky
57 behavior of drivers. The theory is not applied rigidly. However, for the sake of brevity and because of
58 the notable importance of attitudes, the term ‘attitudes’ or ‘attitudes toward road safety’ is used to take
59 into account other internal cognitive components including SN and PBC. This is to illustrate the overall
60 underlying socio-psychological mechanism involved to perform behavior.

61 1.1 Potential of attitudinal segmentation for effective road safety campaigns

62 There has been little research on the effectiveness of road safety campaigns and driver training to bring
63 about a general improvement in driver behavior and accident savings particularly in case of developing
64 countries. However, meta-analysis of the effect of road safety campaigns on accidents by Phillips,
65 Ulleberg and Vaa (2011) suggest positive associations between accident reduction and the use of
66 personal communication or roadside media as part of a campaign delivery strategy. To add, the
67 commonly used statistical methods in socio-psychological investigations like this include Principal
68 Components Analysis (PCA), Factor Analysis (FA), and Regression Analysis (RA). However, it is
69 criticized that although these techniques are a major tool for data analysis, most of multivariate
70 techniques share common limitations. For instance, each technique can only investigate one relationship
71 at one time (Limpanitgul, 2009). Also, these are data reduction techniques and produce groups of highly
72 interrelated variables known as component/factor/dependent variable or composite variable (Hair,
73 Black, *et al.*, 2006). Whilst the review of literature suggests that driving behavior is a function of



74 complex interaction between driver's social-cognitive factors, socio-demographic characteristics and
75 many other external factors.

76 Another limitation of these techniques is linked with failure of intervention studies based on the
77 assumption that attitudes influence behavior to show any consistently significant effects. One of the
78 reasons suggested is that they tend to cover too large and varied groups of drivers (Iversen and Rundmo,
79 2004). It is argued that different groups of people need to be served in different ways to optimize the
80 likelihood of affecting behavior change (Anable, 2005).

81 There is also a criticism on conventional practices of a-priori classification of drivers based on their
82 socio-demographic characteristics (e.g. male driver vs. female driver; higher-income driver vs. lower-
83 income driver). For comparative purposes, attitudinal (or behavioral) results are averaged out for people
84 of each group under investigation. This generalization by attributing a set of characteristics to a group
85 of people can lead to stereotyping and can also result in manipulation of findings by researchers (e.g.
86 see Anable, 2002; Carey, 2011).

87 To address these limitations, this research seeks to move beyond these techniques. It proposes that
88 adoption of segmentation techniques such as Cluster Analysis (CA) can bring more in-depth and
89 realistic understanding to a phenomenon of driving behavior. More recently, the technique has started
90 receiving attention in transport studies research (e.g. Collins, Eynon, *et al.*, 2008; Higgs and Abbas,
91 2015). Fernandes *et al.* (2006, p. 27) specifically support the use of such unconventional techniques in
92 road safety research. They say given the range of factors implicated in the prediction of risky driving, it
93 is necessary to examine such factors together, in order to tease apart the roles of different factors, and
94 identify which factors best predict which *individual* risky driving behavior. Clearly, identifying the
95 causal factors associated with road crashes must remain the optimal goal – however, the investigation
96 of predictive factors worthy of experimental manipulation for specific risky driving behaviors is an
97 important first step to realizing this goal.

98 The technique allows exploring the combined effect of different variables (i.e. attitudes towards road
99 safety) on phenomenon under investigation (i.e. driving behavior). The method does not make prior
100 assumptions about important differences in the population. It reduces the number of entities being dealt
101 with into a manageable number of groups (of drivers) that are mutually exclusive and share well defined
102 characteristics (Anable, 2002). It also provides socio-demographic profiling of extracted groups. This
103 collective information facilitates comprehensive and pragmatic understanding of combination of
104 underlying factors provoking deviant driving practices. Thus, for this research work the technique is
105 adopted in the hope that effective road safety campaigns can be designed following person-based
106 approach for Pakistan. Considering the limitation of resources in the country, it is considered favorable
107 to focus more on person-based cost effective solutions, as these can be incorporated readily into existing
108 decision-making structures. Also it is difficult to entirely rebuild a different transport system to meet the
109 desired standards of road safety. Davies *et al.* (1997) say that the understanding of different demands
110 and decision making process of the segments can be used to design different messages for different
111 groups to be channeled through different media at different times as part of a coordinated and systematic
112 campaign (p. 316). Thus, the aim of this research is to assess the human side of accidents in Pakistan
113 while focusing on attitudes and behavior of drivers in the context of Road Traffic Violations (RTVs).
114 Simply, the principal approach adopted to assess the pre-crash phenomenon is statistical segmentation.
115 It is postulated that the technique provides an underlying explanation of multiple dimensions related to
116 aberrant driving behaviors while classifying sample population into relatively homogenous and distinct
117 groups. Consequently, it also aids in development of targeted road safety intervention by understanding
118 the differences between safe and un-safe drivers.



119 2. METHODOLOGY

120 2.1 Questionnaire

121 In total, 438 drivers agreed to take part in the study who are approached randomly at different locations
122 of Lahore city. They are asked to complete self-reported questionnaires measuring their attitudes
123 towards road safety and aberrant driving behaviors, along with socio-demographic characteristics and
124 driving-related variables. The sample is predominantly composed of the young age group drivers (< 19:
125 12%; 19-34: 64%; 35-55: 17%; 55+: 3%). Male drivers constituted 86% of the sample. Participants also
126 informed about their employment status. Nearly 31% were students and the same percentage was full-
127 time employed (29.2%), closely followed by self-employed drivers (24.1%). Drivers working part-time
128 (3%), unemployed/retired (3.7%), or looking after family (2.8%) were in lesser percentages. The mean
129 near misses and accidents for the study's driver in last six months are 2.72 and 1.98 respectively. On
130 average, participants held a driving license for 8.43 years and have a weekly mileage 363.47km.

131 Although, the theory is not applied rigidly, a 58-item questionnaire is developed inspired by attitudes,
132 SN and PBC constructs of the TPB. Preliminary guideline to develop an Attitudinal Questionnaire (AQ)
133 has been borrowed from the Driver Attitude Questionnaire (DAQ: Parker, Stradling *et al.*, 1996). The
134 questionnaire tapped drivers' opinion towards issues such as speeding (e.g. if you are safe driver, it is
135 acceptable to exceed the speed limit), use of seatbelt/helmet (e.g. for me to wear seatbelt/helmet each
136 day while driving on road is unpleasant), unsafe lane change (e.g. I know exactly when I can change
137 lane safely across a continuous while line), red light running (e.g. even running a red light when there
138 is no traffic makes you less safe as a driver), drink and drugs driving (e.g. I would never ride with
139 someone I knew has been taking drugs), one-way driving (e.g. I think it is okay to drive the wrong way
140 on a one-way road), close-following (e.g. close following is not really a serious problem) and overtaking
141 (e.g. it is quite acceptable to take slight risk when overtaking). The questionnaire also attempted to cover
142 road safety issues in local context with inclusion of items related to attitudes towards enforcement (e.g.
143 stricter enforcement of overtaking regulations on urban roads would be effective in reducing the
144 occurrence of road accidents), compliance of rules and regulations (e.g. my friends and family would
145 think I am not a good driver if I try to follow traffic rules and regulation,) in-vehicle driving distraction
146 (e.g. it is quite acceptable to have television in vehicles), and different socio-culture factors (e.g. it is
147 easy for you to get rid of fines, penalties by using your status profile or personal connections).
148 Collectively, these statements are termed as '*attitudes toward road safety*'. A five-point Likert scale is
149 used to record responses with end points 1 (strongly disagree) to 5 (strongly agree) such that higher
150 score on any item indicates safe attitude.

151 To study drivers' behavior, a 12-item modified version of the Driver Behavior Questionnaire (DBQ)
152 which is focused on Highway Code Violations and Aggressive Violations is taken from Lawton, Parker,
153 *et al.*, (1997). The questionnaire is further adapted to cover all the inappropriate behaviors targeted in
154 the AQ so as to make the findings of both the data sets relevant and comparable in the later stages. Thus,
155 a 29-item extended version of the DBQ is developed. The questionnaire mainly tapped behaviors related
156 to speeding (e.g. How often do you disregard the speed limit on a residential road?), close-following
157 (e.g. How often do you become angered by another driver and give chase with the intention of giving
158 him/her a piece of your mind?), drink and drug driving (e.g. How often do you drive when you suspect
159 you might be over the legal blood alcohol limit?), overtaking (e.g. How often do you overtake a slow
160 driver on the inside?), driving distraction (e.g. How often do you use a hand held mobile phone when
161 you are driving?), use of seatbelt/helmet (e.g. How often do you wear a seatbelt/helmet in built-up
162 areas?), and vehicle fitness (e.g. How often do you drive a vehicle with improper lights at nights?).
163 Participants are asked to indicate how frequently they get engage in performing these behaviors by rating
164 on a six point scale with endpoints 0 (never) and 6 (nearly all the time). High score on any item indicates



165 high aberrant behavior. Finally, personal information of participants along with their involvement in
166 RTAs and near misses in last six months is also recorded.

167 2.2 Analysis

168 Three distinct stages of segmentation are sequentially adopted on the attitudinal data. To begin, 58
169 attitudinal items and 29 behavioral items are factor analyzed to reduce the variables into smaller number
170 of factors. Then, the extracted attitudinal factors are treated as grouping variables to perform CA. The
171 analysis produced four stable and distinguishable sub-groups of drivers. Finally, the segments are
172 interpreted and profiled in terms of their reported driving behaviors and socio-demographic
173 characteristics. Analysis of variance (ANOVA) along with post-hoc multiple comparisons tests are also
174 run to identify significant differences among the segments.

175 3 RESULTS

176 Results of statistical segmentation are pooled across the segments in Tables 1, 2 and 3. Results of Factor
177 analysis in Table 1 suggests that the urban population of Pakistan has six discrete attitudinal dimensions
178 including attitudes towards rule-breaking (e.g. waiting time at signals is often too long so it is quite
179 acceptable to drive through red lights if there is no other traffic), taking care in driving (e.g. it is quite
180 acceptable to drive with worn-out tires), enforcement (e.g. I would welcome stringent checks and
181 monitoring of a vehicle safety standards), ability to override peer pressure (e.g. it is hard to follow the
182 rules if everyone else is disobeying them), regard for personal safety (e.g. for me to wear seatbelt/helmet
183 each day while driving on roads is unpleasant), and regard for other road users (e.g. for me to speed,
184 blow horn or overtake to get ahead of female drivers is satisfying). Likewise, four behavioral constructs
185 produced by the DBQ items related to Pakistani drivers are labeled as 'intimidating' behavior of the
186 drivers (e.g. how often do you race away from lights with the intention of beating the driver next to
187 you?), being above the rules (e.g. how often do you park your vehicle in a no parking zone?), risk-prone
188 infringements (e.g. how often do you carry goods/articles in your vehicle more than its capacity?), and
189 assertion-this is my space (e.g. how often do you pull out of a junction so far that the driver with right
190 of way has to stop and let you out?). For all the extracted factor, magnitude of centroid element >0.40
191 is taken as a high factor score (for further details see Batool and Carsten: 2016).

192
193 As discussed earlier, the extracted attitudinal factors broadly grouped the population into four clusters
194 namely, the *autonomous*, *opportunists*, *regulators*, and *risk-averse*. The group scoring high (>0.40) on
195 any/all of the extracted factors is considered as indicative of strong association of the group on that
196 particular construct. Likewise, positive orientation indicates favorable and negative orientation indicates
197 unfavorable attitude/behavior towards that particular construct as can be seen in Table 1. For example,
198 *autonomous* indicates favorable (or positive) attitudes towards rule compliance (.58) in contrast to
199 *opportunists* who have strong but negative loading on the factor (-.93). The table shows that driving
200 behaviors of the extracted groups are attributable to their attitudes particularly those related to
201 enforcement and careless driving such that the segments indicating safer attitudes, also found reporting
202 low aberrant behaviors and vice versa. Similarly, significant relationships has been noted between
203 aberrant behaviors of drivers and their involvement in RTAs with the segments scoring high on aberrant
204 behaviors are also found to have high involvement in near misses and accidents and vice versa.
205 Intimidating behaviors of Pakistani drivers and their propensity of taking themselves above the rules are
206 identified as the most risky behavioral dimensions of the sample population.

207
208 Table 2 provides socio-demographic composition of the groups in percentage. The results indicate that
209 the *autonomous* group is dominantly composed of young drivers from lower-income background. Half
210 of them drive motorcyclists and nearly two-third of them have only attained basic education (up to
211 intermediate). They are mostly employed in government sector. In contrast, the *opportunists* group is
212 mainly composed of high-income group drivers who drive cars. Nearly one-third of drivers in the group
213 are female, which is the largest proportion of all. Furthermore, half of the group population is single,



214 with also a considerable percentage of separated/divorced individuals in comparison to other groups. As
 215 the group is affluent, it therefore should not be surprising that it has students and degree holders in higher
 216 percentages than the sample as a whole. The *regulators* mainly belong to lower and middle-income
 217 backgrounds. The group has young drivers in the least and mature and married drivers in the highest
 218 percentages in comparison to the sample who mainly work in private sector. The group has highest
 219 percentage of professional drivers. Lastly, the personal profile of *risk-averse* indicates them to be mainly
 220 single and affluent driver who drive car. The group also has second highest percentage of degree-holders
 221 and females in the sample after the *opportunists*.

222
 223 Based on the overall attitudinal and behavioral profiles of the segments, it can be concluded that the
 224 *regulators* and *autonomous* constitute a relatively safer category of the drivers in comparison to the
 225 *opportunists* and *risk-averse*. The *risk-averse* are noted to be similar to the *opportunists* in terms of their
 226 driving behavior and socio-demographic characteristics. Table 3 provides complete description of the
 227 segments.

228
 229 *Table 1: Mean factor scores and significant differences of clusters on attitudinal and behavioral*
 230 *variables*

Factors (number of items)	Autonomous	Opportunists	Regulators	Risk-averse
<i>Attitudinal Factors</i>				
Attitudes towards rule-compliance (13)	.58 ²³	-.93 ¹³⁴	-.29 ¹²⁴	.46 ²³
Taking care in driving (6)	.56 ³⁴	.96 ³⁴	-.05 ¹²⁴	-.43 ¹²³
Value of enforcement (9)	-.24 ²³⁴	-.95 ¹³	.61 ¹²⁴	-.78 ¹³
Ability to override peer pressure (3)	.98 ³⁴	.33 ⁴	-.02 ¹⁴	-.50 ¹²³
Regard for personal safety (3)	-.89 ³⁴	-.28	.06 ¹	.25 ¹
Regard for other road users (3)	-.79 ²³⁴	1.52 ¹³⁴	-.01 ¹²	.03 ¹²
Total AQ score	136.28	129.89 ³	137.70 ²⁴	133.35 ³
<i>Behavioral Factors</i>				
Intimidating other road users (8)	-.08	.41	-.23 ⁴	.33 ³
Being above the rules (7)	.22	.45 ³	-.24 ²⁴	.31 ³
Risk prone infringements (4)	.05	.29	-.27 ⁴	.28 ³
Assertion; this is my space (5)	.00	.49 ³	-.28 ²⁴	.35 ³
Total DBQ score	57.43	65.22 ³	47.43 ²⁴	63.44 ³
<i>Safety related measures</i>				
Near misses (number)	1.77	2.61	2.66	2.38
Accidents (number)	1.11	1	1.64	1.27

231 Note: magnitude of centroid element >0.40 is considered as a high factor score and represents a strong association
 232 of the group on that particular construct with positive orientation indicates favorable and negative orientation
 233 indicates unfavorable.

234 *Table 2: Selected socio-demographic information of the segments*

		Autonomous (%)	Opportunists (%)	Regulators (%)	Risk-averse (%)
Age (%)	≤19	14	17	8	18
	19-34	60	61	67	64
	≥35	20	22	23	14
Income group (%)	Lower-income	49	28	46	22
	Middle-income	17	17	25	21
	Higher-income	17	39	13	31
Gender (%)	Male	86	72	92	75
	Female	14	28	8	25
Marital status (%)	Single	51	50	49	66
	Married	40	39	49	29
	Separated/divorced	3	6	0.7	3
Education (%)	Up to intermediate	57	41	66	51
	Graduates	23	28	18	26
	Postgraduates	14	17	11	11
Type of vehicle (%)	Motorcyclist	49	33	42	40
	Car	34	56	35	50
	Professional driver	17	11	23	10
Employment type (%)	Government	37	22	25	15
	Private	17	22	50	30

235



236 Table 2: Description of the segments based on their attitudes, behaviors and socio-demographic composition

CLUSTER DESCRIPTION
<p>Autonomous (n= 35; 12.73%)</p> <p>This group driver is autonomous in nature. By having relatively favorable attitudes towards road safety, the group overall can be treated as second safest group of the study. The group appreciates rules-compliance, careful driving and has ability to override peer pressure. The self-reported low commission of aberrant behaviors makes it the second most compliant among all. The only noticeable behavioral dimension of the group is its propensity to consider itself above the rules. For example, the group has reported to use its personal connection to get rid of fines, penalties. This can be linked to their working status. As the group of drivers is mostly government employees, it is quite possible for them to get away with fines and penalties by taking advantage of their status (the issue of using bribes, personal connections in Pakistan is also highlighted earlier in Batool <i>et al.</i> 2012). The other socio-demographic indicators inform that this group drivers have lower-income levels and more than one-third of them are degree holders.</p>
<p>Opportunists (n=18, 6.54%)</p> <p>This group of drivers are opportunistic in nature. The smallest in size, the group has the most unfavorable attitudes towards road safety particularly those related to rule-compliance and enforcement. It is the only group which consistently reported committing all types of aberrant behaviors. Specifically, this group driver is highly likely to intimidate other road users and to compete with them for road space. The group's drivers considered themselves highly above the rules which make them appear a supermacist in nature. This can be linked to being affluent and/or young. The other notable socio-demographic characteristic of the group is its good education level with the highest percentage of degree holders in the sample. It also has the females, singles as well as separated/divorced individuals in high percentages who mainly drive cars.</p>
<p>Regulators (n=142, 51.64%)</p> <p>This group driver is regulatory in nature. The group is the largest in size and also emerged as the safest by having the most favorable attitudes towards road safety. The group strongly value enforcement of rules and regulations. With reference to its driving behaviors, this group drivers reported to refrain from all types of aberrant behaviors, have the lowest DBQ scores and are significantly different from the <i>opportunists</i> and <i>risk-averse</i>. The possible explanations of their safe attitudes and behaviors can partially be linked with their income levels, age distribution, employment as well as marital status. Although, in accord with the sample overall composition, the group is predominantly composed of lower-income group drivers. The group also has highest percentage of professional drivers It also has the highest percentage of drivers from middle-income household as compared to the other groups. They are mostly married, have the lowest percentage of separated/divorced individuals.</p>
<p>Risk-averse (n=80; 29.09%)</p> <p>This group of drivers is risk-averse in nature. It is the second largest in the sample and also has the second most unfavorable attitudes towards road safety. It does not appreciate careful driving, does not value enforcement, and reported to be affected by peer pressure. Interestingly, the group mirrors the <i>opportunists</i> in terms of its behavioral characteristics and socio-demographic composition. For instance, although not significantly, the group driver tends to intimidate other road users, compete with them for road space, commit risk-prone infringements and consider themselves above the rules. The group has the highest percentage of young and single drivers. It also has the highest percentages of females, degree-holders who mainly drive cars and come from affluent backgrounds after the <i>opportunists</i>.</p>

237



238

239 **4 RESEARCH IMPLICATIONS**

240 **4.1 Targeting multifarious cognitive antecedents of the segments**

241 The commercial marketing literature indicates that targeting is essential for any realistic marketing
 242 campaign (Anable 2002; Roberts 1996). The unique characteristics of each of the segments have
 243 provided their propensity to act safely or unsafely on the roads. This diagnostic insight is valuable so as
 244 to refrain from *average* mass marketing, and to develop *targeted* campaigns with an emphasis on the
 245 *individuality* of each segment which can attract and influence diverse audiences. It is considered much
 246 more productive to first concentrate efforts on the segments which emerged as safer. The reason is that
 247 stimulating safe driving practices will be achieved much more easily in the groups already holding
 248 favorable attitudes and behaving less aberrantly. By applying this principle, the *regulators* and
 249 *autonomous* should be the focus. Collectively, these groups contain nearly two-thirds of the sample
 250 population. Moreover, contrary to the common belief that cognitive flexibility and readiness to change
 251 one’s attitudes decline with age, the results of several studies have demonstrated that susceptibility to
 252 attitude change declines from early to middle adulthood and then increases again in late adulthood
 253 (Ajzen 2001, p. 37). Thus the idea of keeping a prime focus on the *regulators* and *autonomous* is further
 254 reinforced as both the groups contain relatively mature population. The discussion carried out is such
 255 that it first identifies favorable attitudes which need to be reinforced and likewise highlights unfavorable
 256 attitudes which should be changed. As the attitudes can be changed through persuasion, therefore in
 257 order to help drivers learning favorable attitudes, recommendations are generally made by following the
 258 basic psychological tactics including observational learning and operant conditioning. Table 4
 259 consolidates the discussion held in this section and defines each segment most positive aspect to promote
 260 safety culture.

261 *Table 3: Guidance on potential persuasive interventions to influence and promote safe driving behaviors*
 262 *in each of the segment*

	Road safety positives to capitalize	Road safety negatives to uproot	Potential policy options
The regulators	Appreciate stringent enforcement	Weak potential to break rules	Persuasive Content: should educate about basic traffic line and lane rules; should promote professional and disciplined attitudes; should make drivers realize about their potential to regulate traffic flow; should promote economic benefits of safe driving Immediate target: professional drivers
The autonomous	Appreciate traffic rules, careful driving,	Mildly disapprove enforcement	Persuasive Content: should educate drivers about their moral and social obligations; should give them training to behave consistently safe; should conceptualize on social-inequity issue Immediate target: government employee drivers
The opportunists	Highly regard other road users	Strongly disapprove enforcement, rule-compliance	Persuasive Content: should impress the link between enforcement, rule-compliance and accidents; should promote association between road safety and civic sense; should promote health and social benefits of safe driving Immediate target: affluent students
The risk-averse	Appreciate rule-compliance	Strongly disapprove enforcement	Persuasive Content: should reinforce rule-compliance attitudes; should promote health benefits of safe driving; should train drivers to achieve equilibrium in driving Immediate target: affluent students

263



264 4.1.1 The regulators

265 The *regulators* group has the strongest potential to act as a *safeguard* against aberrant practices because
266 it contains (i) more than half of the sample's population, (ii) holds the most positive attitudes, and (iii)
267 is most likely to exercise safe behavior. These traits make the group the most attractive to target first.
268 This group of drivers strongly supports stringent enforcement. Therefore, it is recommended that
269 campaigns should capitalize on this aspect and should assign to the group a social role of literally acting
270 as '*regulators*' on the roads. However, at the same time it is important to note that this group of drivers
271 have a motivation to break traffic rules, although weak, in case they are not enforced properly. As these
272 behaviors are found to be weak in terms of empirical strengths and considered to be the result of
273 unawareness of traffic rules and/or adverse consequences of committing violations. It can be expected
274 that uprooting of these behaviors is relatively easy by educating the group about basic traffic rules and
275 regulations and consequences of engaging in intentional violations with an overriding aim to improve
276 their self-awareness (e.g. through training courses, media campaigns or by simply distributing
277 pamphlets). Delhomme *et al.*, (2009) say that education can be used to communicate information and
278 raise awareness of a specific issue. It helps people develop knowledge, skills, and changes in attitude
279 (e.g., through educational programmes, driver's training, etc.) and promotes the development of internal
280 and informal social controls. They further discuss about raising awareness related to adverse
281 consequences of intentional violations among drivers by educating them that "this could happen to them"
282 through the use of emotional, realistic portrayals of road crashes and their consequences.

283 The segmentation has identified that professional drivers constitute nearly one-fourth of the *regulators*.
284 The finding suggests that these drivers have great amenability to improve behavior as they have highly
285 favorable orientation towards road safety. The revelation is interesting and can be exploited by the
286 policy-makers; especially considering the fact that these drivers are easily identifiable, accessible, and
287 can be hand-picked for training purposes in order to induce the phenomena in mainstream traffic. The
288 only need is to drill down and address the issues which prohibit them from translating their favorable
289 attitudes comfortably into safe behavior on the roads. An earlier investigation conducted in Pakistan has
290 also provided a possible explanation of their inappropriate discourse and linked it to competition; poor-
291 working facilities, low-wages and unawareness of rules and regulations etc. (for details, see Batool *et*
292 *al.*, 2012). The corrective measures which government can immediately take are enforcement of basic
293 working regulations for the drivers, and requiring the operators to adhere to them with heavy penalties
294 and fines.

295 Another issue to address is the unawareness of basic rules and regulations. To rectify this, concerned
296 government departments can design intensive road safety courses for the drivers with a compulsion to
297 attend. It is important to recall that not only mass- but para-transit services are extensively operational
298 in the urban cities of Pakistan including Lahore. These services such as rickshaw, qinqi are pervasive.
299 Therefore, this research strongly recommends making this group a focal point of training and awareness.
300 At this micro level just by stopping this group from committing its three most frequent violations -
301 wrong overtaking, inappropriate use of lane and speeding - can have a substantial impact in regulating
302 overall traffic of cities. It is also recommended that not only educating the group is important but making
303 it aware of its 'true' potential and role in bringing positive and lasting change on the roads. Nevertheless,
304 as this group of drivers have low incomes, making them aware of the economic benefits of disciplined
305 regulatory driving e.g. driving smoothly or less haphazardly is more fuel efficient, can prove very
306 attractive. Once the message of safe driving practices has convinced up to half of this driving population,
307 it can be hoped to have a trickledown effect and that other drivers will imitate their good behavior.

308 4.1.2 The autonomous

309 Tapping attitudinal and behavioral characteristics of the second safest group in the population can also
310 bring important changes. Taking into account the profiling of the segment, it is conceivable that the
311 *autonomous* have the potential to be the accomplices of the *regulators*. The group has the second most



312 favorable set of attitudes towards road safety (significantly favorable orientations towards rule-
313 compliance, careful driving, and unconcerned from peer pressure). However, its driving behavior is
314 found not to be *statistically* different from the *regulators*. For instance, unlike the *regulators*, the
315 *autonomous* considered themselves above the rules (see Table 1). These behavioral tendencies of the
316 group are attributed to its independent, self-regulatory nature with a temptation for undisrupted, free
317 movement. This group of drivers has reported unfavorable attitudes towards enforcement, although
318 weak, and disregard for other road users. Therefore, in order to improve its performance, policy makers
319 should address these cognitive issues first.

320 It is recommended that the content of any road safety campaign developed for the group should
321 continually impress the connection between enforcement and accidents. Further success may be gained
322 by altering the group's propensity to consider itself above the rules. This group of drivers is mostly
323 motorcyclists, working in the government sector. Therefore, they appear relatively comfortable in
324 breaking the rules by taking advantage of their physical and social positions. Support for this rationale
325 can be found at various discussion levels (e.g. see Aslam, 2015; Batool *et al.*, 2012) which highlight the
326 rampant issue of influence peddling in Pakistan. It is recommended that the safety profile of the group
327 can be improved by instilling in it the values of respecting the law and their fellow road drivers. This
328 can be achieved by linking it up with the moral and social responsibility of the group's drivers as citizens
329 towards the society as a public servant. It is recommended that, similar to the targeting of professional
330 drivers in the *regulators*, road safety agencies should liaise with all the government departments to run
331 safety courses as an immediate plan of action. The content of such programs should not only provide
332 road safety education but should be designed with the aim to encourage the above mentioned values. To
333 further combat the behavior, the adverse impacts of abusing the power should be conceptualized to the
334 group by making it aware of the greater issue of social inequity and feelings of deprivation they are
335 likely to create in other road users. Furthermore, the group of drivers should be trained and taught not
336 to be affected by changes in driving environment and to maintain safety while driving in ill-enforced
337 areas.

338 4.1.3 The opportunists

339 Keeping in mind the evidences from Table 1, it will not be wrong to assume that the *opportunists* have
340 a strong propensity to act as 'spoilers' in interactions with others, closely followed by the *risk-averse*.
341 Endogenous cognitive mechanisms affect the *opportunists* more strongly than is the case with the other
342 segments, and are much more active in shaping the group's behavior. It is indicative that socio-
343 psychological person-based interventions can be effective to influence the group's behavior. However,
344 the attitude-change literature tells that the stronger the attitudes, the harder it is to effect change.
345 Therefore, a stronger emphasis on reinforcing and facilitating positive attitudes already held by the
346 group may prove much more beneficial and realistic in promotional campaigns, than making attempts
347 to uproot negative attitudes which are robust and more likely to be difficult to change.

348 Based on this principal, it seems much more appealing to capitalize on the group's regard for other road
349 users. The results inform that they uphold the highest regard for other road users amongst the segments
350 and also disapprove careless driving. This research recommends that attitudes and behavior of the group
351 may be improved by impressing a link between road users regard and civic sense while considering the
352 fact that the group's cognitive mechanism strongly recognize/understand road courtesy. At the same
353 time, it is also important to note that the group has reported strong behavioural tendencies of intimidating
354 other road users and asserting their own space. This contradiction can be highlighted in road safety
355 campaigns and this group of drivers should be educated about it. Batool *et al.* (2012) has indicated that
356 people in Pakistan are concerned about a lack of civic sense. Given that this group of drivers is highly
357 educated and affluent, inducing the concept in the group may prove convenient and practical. The other
358 attitudinal orientations of the group which should be changed are its strong intentions to break the rules
359 and dislike for stepping-up the level of enforcement. There is sufficient evidence that both of the
360 dimensions are key determinants of behavior of drivers. Therefore, the group should be encouraged to



361 change this orientation by conceptualizing the strong association between enforcement, rule-compliance
362 and road traffic accidents. However, as the group holds strong beliefs, associating additional benefits
363 with rule-compliance or enforcement can gain a much more productive outcome. For instance,
364 promoting health benefits along with social benefits of practicing civic sense can be an effective option
365 in this regard. It is so because the group of drivers comes from affluent backgrounds and also contains
366 one-quarter female drivers in it. Literature in psychology informs that historically affluent people and
367 females are the health conscious people (e.g. see BBC 1999; Khor 2008).

368 4.1.4 The risk-averse

369 While the *regulators* and the *autonomous* can act as law enforcement conduits, road safety can also
370 substantially benefit by improving the behavior of the *risk-averse*. The group is the second largest in the
371 sample and contains one-quarter of its population. Therefore, even a small improvement in its behaviors
372 is likely to make a significant contribution to improving overall standards of road safety on urban roads,
373 and may also help to sustain a positive change induced in traffic culture through other drivers. This
374 group of drivers strongly disapproves of stringent enforcement, similar to the *opportunists*. Moreover,
375 the group also mirrors the *opportunists* in terms of its behavioral characteristics and socio-demographic
376 composition. Therefore, policy guidelines developed for the *opportunists* may also be applicable for the
377 *risk-averse* and vice versa. For instance, the promotion of health benefits associated with safe driving
378 should be promoted in the group. It should be targeted with messages that continually establish the
379 connection between enforcement and accidents. As this group driver is risk-averse in nature, it is
380 expected that such messages will appeal them more. For example, when speed goes down, the number
381 of accidents or injured road users also goes down in 95% of the cases (Elvik *et al.* 2004).

382 The only favorable attitudinal orientation of the group is its law-abiding nature. It is recommended to
383 emphasize the importance of reinforcing and practicing law-abiding behaviors more than condemning
384 the disadvantages of disapproving enforcement. Davies *et al.* (1997) point out that the prevalent view in
385 health promotion campaigns is to avoid 'condemning' behavior, but to focus on the benefits of
386 behavioral adaptation. For instance, a more acceptable and effective message than 'do not eat chips',
387 would be 'keep chips to once a week'. Thus messages focusing on the positive aspects of safe driving
388 or rule-compliance are expected to encourage the group to change its behavior. At the same time, it is
389 also important to consider that promoting intrinsic benefits may not always be effective in promoting
390 enduring changes. For instance, investigators of pro-environmental behaviors have concluded that
391 intrinsic rewards are not sufficient to influence behavior and that people must be provided with extrinsic
392 rewards of tangible value (Anable 2002; Roberts 1996). Considering the fact that the group's law-
393 abiding nature is its only positive dimension, and it mainly has single status, e.g. student drivers from
394 affluent backgrounds; policy-makers should focus on providing some innovative and interesting rewards
395 and penalties for the group for complying with the law rather than just imposing heavy fines.

396 5 CONCLUSIONS

397 As accidents are rare events, the main objective of this research is to reach to a common understanding
398 of the dimensions of risky driving behavior in Pakistan while taking them as criteria of traffic safety and
399 underpinning of socio-psychological mechanisms influencing these behaviors. Therefore, the ultimate
400 contributions of this research are considered to be the identification of useful targets for developing road
401 safety interventions for the country in the light of the evidence collected. The research has demonstrated
402 the explanatory utility of the market segmentation approach to systematically relate the interaction
403 between attitudes, behaviors and socio-demographic characteristics. Identification of groups
404 representing specific attitudes associated with specific risk behavior more than others can help develop
405 more adjusted and effective traffic safety interventions with the potential of changing behavioral
406 practices.



407 To help teaching the segments favorable attitudes towards road safety, it is recommended that their
408 observational learning can be enhanced by introducing well-educated, trained drivers on roads who
409 exercise safe behaviors consistently. It is considered that professional drivers, government employees,
410 students in privileged institutes may form useful targets for applying these ideas immediately. It is also
411 recommended that road safety messages should highlight the direct connection between enforcement
412 and law compliance and accident prevention. It is suggested that negative beliefs, particularly those held
413 by the risky drivers, can be weakened by linking road safety with civic sense, moral obligation,
414 economic and health benefits. These motivations and reasons to behave safely can be inculcated through
415 emotive advertisements (classical conditioning), and can be further strengthened through operant
416 conditioning (e.g. heavy fines, community services).

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