Understanding the Growing Role of Driving Anger in the Risk of Traffic Incidents involving Vietnamese Motorcyclists

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# APPENDIX A.

**Table A1.** The original 14-item DAS and 15-item DAX.

|  |  |
| --- | --- |
| Item | Content |
| **Driving Anger Scale** (Deffenbacher et al. 1994) | |
| 1 | Someone is weaving in and out of trafﬁc |
| 2 | A slow vehicle on a mountain road will not pull over and let people by |
| 3 | Someone backs right out in front of you without looking |
| 4 | Someone runs a red light or stop sign |
| 5 | You pass a radar speed trap |
| 6 | Someone speeds up when you try to pass them |
| 7 | Someone is slow in parking and holding up trafﬁc |
| 8 | You are stuck in a trafﬁc jam |
| 9 | Someone makes an obscene gesture toward you about your driving |
| 10 | Someone honks at you about your driving |
| 11 | A bicyclist is riding in the middle of the lane and slowing trafﬁc |
| 12 | A police ofﬁcer pulls you over |
| 13 | A truck kicks up sand or gravel on the motorcycle you are driving |
| 14 | You are behind a large truck and cannot see around it |
| **Driving Anger Expression Inventory** (Stephens and Sullman 2014) | |
| 1 | I drive right up on the other driver's bumper |
| 2 | I make negative comments about the other driver aloud |
| 3 | I try to get out of the car/motorcycle and tell the other driver off |
| 4 | I roll down the window to help communicate my anger |
| 5 | I try to scare the other driver |
| 6 | I do to other drivers what they did to me |
| 7 | I try to think of positive solutions to deal with the situation |
| 8 | I drive a lot faster than I was |
| 9 | I swear at the other driver aloud |
| 10 | I tell myself it is not worth getting all mad about |
| 11 | I tell myself it is not worth getting involved in |
| 12 | I yell at the other driver |
| 13 | I try to get out of the car and have a physical fight with the other driver |
| 14 | I just try to accept that there are frustrating situations while driving |
| 15 | I tell myself to ignore it |

**Table A2.** Different factor structures of the short DAS.

|  |  |  |
| --- | --- | --- |
| **Model** | **Country (Author)** | **Factor structure: items in Table A1** |
| One factor | USA (Deffenbacher et al. 1994);  New Zealand (Sullman and Stephens 2013);  Malaysia (Sullman et al. 2015) | Unidimensional: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14. |
| Three  factors | China (Zhang et al. 2015, 2018, 2019) | Safety blocking: 1, 2, 3, 4  Arrival blocking: 5, 6, 7, 8, 12, 13, 14  Hostile gesture: 9, 10, 11. |
| Spain (Herrero-Fernandez 2011) | Reckless driving: 1, 3, 4, 6, 13  Progress impeded: 2, 5, 7, 8, 11, 12, 14  Direct hostility: 9, 10. |
|  | **Vietnam** (*current study*) | Traffic violations: 1, 3, 4, 16\*  Unpleasant conditions: 2, 6, 7, 8, 12, 14, 15\*  Hostile gestures: 9, 10, 13  *\*: additional item related to the Vietnamese context.* |
| Four  factors | Spain (Egea-Caparrós et al. 2012) | Another driver's offence: 1, 3, 7, 8, 13  Progress impeded by another driver: 2, 10, 11, 12, 14  Direct offence: 5, 9  Possible sanction: 4, 6. |
| Five  factors | Argentina (Escanés and Poó 2018) | Infringement by another driver: 1, 3, 4, 6, 13  Progress impeded: 2, 7, 8, 11, 14  Hostile gesture: 9, 10  Police presence: 5, 12  Poor road infrastructures: *4 additional items related to the Argentinan context.* |

**Table A3**. EFA results of the Vietnamese DAS.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Item | Situation | M | S.D. | Factor loading | | |
| TV | UC | HG |
| 1 | Someone is weaving in and out of trafﬁc | 3.37 | 1.19 | .78 |  |  |
| 4 | Someone runs a red light or stop sign | 2.81 | 1.17 | .70 |  |  |
| 3 | Someone backs right out in front of you without looking | 3.39 | 1.11 | .63 |  |  |
| 16 | There are drivers who deliberately violate the traffic laws on the same road (e.g., drunk-driving, using the phone while driving, not wearing helmets,...) | 3.31 | 1.27 | .59 |  |  |
| 15 | Driving in adverse conditions (severe weather, polluted, dusty road…) | 2.26 | 1.20 |  | .73 |  |
| 14 | You are behind a large truck and cannot see around it | 2.56 | 1.14 |  | .60 |  |
| 6 | Someone speeds up when you try to pass them | 2.53 | 1.16 |  | .56 |  |
| 2 | A slow vehicle on a mountain road will not pull over and let people by | 2.28 | 1.10 |  | .52 |  |
| 12 | A police ofﬁcer pulls you over | 2.05 | 1.18 |  | .52 |  |
| 7 | Someone is slow in parking and holding up trafﬁc | 2.63 | 1.10 |  | .52 |  |
| 8 | You are stuck in a trafﬁc jam | 2.64 | 1.22 |  | .50 |  |
| 9 | Someone makes an obscene gesture toward you about your riding | 3.29 | 1.30 |  |  | .83 |
| 13 | A truck kicks up sand or gravel on the motorcycle you are riding | 3.56 | 1.22 |  |  | .80 |
| 10 | Someone honks at you about your riding | 2.96 | 1.23 |  |  | .65 |
|  | **Cronbach's alpha** |  |  | .74 | .80 | .78 |
| *5* | *You pass a radar speed trap* | *1.46* | *.88* |  |  |  |
| *11* | *A bicyclist is riding in the middle of the lane and slowing trafﬁc* | *2.68* | *1.06* |  |  |  |

*TV: Traffic violations; UC: Unpleasant conditions; HG: Hostile gestures.*

**Table A4**. EFA results of the Vietnamese DAX.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Expression | M | S.D. | Factor loading | |
| AggExp | AdapExp |
| 12 | I yell at the other driver | 1.37 | .69 | .75 |  |
| 3 | I try to get out of the car/motorcycle and tell the other driver off | 1.40 | .60 | .73 |  |
| 5 | I try to scare the other driver | 1.19 | .53 | .73 |  |
| 6 | I do to other drivers what they did to me | 1.24 | .59 | .67 |  |
| 4 | I roll down the window to help communicate my anger | 1.54 | .72 | .62 |  |
| 2 | I make negative comments about the other driver aloud | 1.56 | .67 | .61 |  |
| 13 | I try to get out of the car and have a physical fight with the other driver | 1.19 | .57 | .61 |  |
| 9 | I swear at the other driver aloud | 1.35 | .65 | .61 |  |
| 1 | I drive right up on the other driver's bumper | 1.42 | .59 | .52 |  |
| 11 | I tell myself it is not worth getting involved in | 2.66 | .98 |  | .84 |
| 10 | I tell myself it is not worth getting all mad about | 2.52 | .98 |  | .82 |
| 15 | I tell myself to ignore it | 2.73 | .93 |  | .69 |
| 14 | I just try to accept that there are frustrating situations while driving | 2.31 | 1.00 |  | .65 |
| 7 | I try to think of positive solutions to deal with the situation | 2.44 | .93 |  | .44 |
|  | **Cronbach's alpha** |  |  | .83 | .74 |
| *8* | *I drive a lot faster than I was* | *1.59* | *.75* |  |  |

*AggExp: Aggressive expression; AdapExp: Adaptative expression*

**Table A5.** Description of variables.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Description** | **M** | **S.D** |
| Age | Motorcyclist's age | 25.18 | 8.37 |
| Driving years (DY) | Total years of riding motorcycles | 7.27 | 6.81 |
| Weekly mileage (WM) | Average weekly mileage (km) | 99.34 | 93.9 |
| Minor crash | Number of minor crashes\* last 12 months | .96 | 1.95 |
| Major crash | Number of major crashes\*\* last 12 months | .06 | .28 |
| Offences | Number of penalized traffic violations last 12 months | .33 | 1.12 |
| HG | "Hostile gestures" factor | 3.27 | 1.02 |
| UC | "Unpleasant conditions" factor | 2.42 | .76 |
| TV | "Traffic violations" factor | 3.22 | .88 |
| AggExp | "Aggressive expressions" factor | 1.36 | .40 |
| AdapExp | "Adaptive expressions" factor | 2.53 | .68 |

*\*Minor crash: "only material damages or minor injuries but received no medical treatment";*

*\*\*Major crash: "received medical treatment for injuries sustained."*

**Table A6.** Goodness-of-fit summary statistics with previous DAS factor structures.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Model | χ2 | df | χ2/df | CFI | GFI | TLI | SRMR | RMSEA [C.I. 90%] |
| One factor | 648.91 | 77 | 8.43 | .82 | .89 | .79 | .07 | .095 [.088; .102] |
| Three factors (China) | 470.57 | 74 | 6.36 | .88 | .92 | .85 | .06 | .081 [.074; .088] |
| Three factors (Spain) | 531.24 | 74 | 7.18 | .86 | .91 | .86 | .06 | .087 [.080; .094] |
| Four factors | 607.42 | 71 | 8.56 | .83 | .90 | .79 | .06 | .096 [.089; .103] |
| Five factors | 446.17 | 70 | 6.37 | .88 | .92 | .85 | .05 | .081 [.074; .088] |

*CFI: Comparative Fit Index; GFI: Goodness-of-Fit Index; TLI: Tucker-Lewis Index;*

*SRMR: Standardized Root Mean Square Residual; RMSEA: Root Mean Square Error of Approximation.*

**Table A7**. Correlation coefficients between variables.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Factor/Variable | Age | DY | WM | TV | UC | HG | AggExp |
| Driving years (DY) | .94\*\* | 1 |  |  |  |  |  |
| Weekly mileage (WM) | .23\*\* | .25\*\* | 1 |  |  |  |  |
| Traffic violations (TV) | -.16\*\* | -.13\*\* | -.08\* | 1 |  |  |  |
| Unpleasant conditions (UC) | -.13\*\* | -.13\*\* | -.04 | .50\*\* | 1 |  |  |
| Hostile gestures (HG) | -.18\*\* | -.17\*\* | -.06 | .45\*\* | .59\*\* | 1 |  |
| Aggressive expressions (AggExp) | -.01 | -.00 | .03 | .00 | .20\*\* | .06 | 1 |
| Adaptive expressions (AdapExp) | .02 | -.01 | .00 | .06 | -.03 | .02 | -.10\*\* |

*\*\*: p<.01*

**Table A8.** Summary of independent-samples t-tests.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Subgroups by categorical variable (G1, G2) | Variable | G1 | | G2 | | Dif. | t(958) |
| M | SD | M | SD |
| Gender (G1= Female, G2= Male) | TV | 3.30 | .86 | 3.08 | .90 | .22 | 3.71\*\* |
| UC | 2.46 | .74 | 2.35 | .79 | .11 | 2.11\* |
| HG | 3.35 | 1.01 | 3.13 | 1.05 | .22 | 3.15\*\* |
| AggExp | 1.33 | .40 | 1.42 | .40 | -.09 | -3.17\*\* |
| Had driver's license (G1= No, G2= Yes) | HG | 3.45 | 1.02 | 3.24 | 1.02 | .21 | 2.14\* |
| Had university degree (G1= No, G2= Yes) | TV | 3.26 | .87 | 3.15 | .90 | .11 | 1.94\* |
| HG | 3.34 | 1.01 | 3.14 | 1.04 | .20 | 2.96\*\* |
| Had motorcycle (G1= No, G2= Yes) | HG | 3.47 | .94 | 3.24 | 1.03 | .24 | 2.45\* |

*\*\*: p<.01; \*: p<.05; Dif.: Mean difference; TV: Traffic violations; UC: Unpleasant conditions; HG: Hostile gestures; AggExp: Aggressive expressions.*

# APPENDIX B. Statistical Analysis

The Principal Component Analysis (PCA) and Confirmatory Factor Analysis (CFA) were applied to explore and validate the factor structures of Vietnamese DAS and DAX. The original dataset of 960 observations was randomly divided into two equal sub-groups for the PCA and the CFA.

The data was examined using Bartlett's test of sphericity (p<.5) and Kaiser–Meyer–Olkin (KMO>.8) statistics to confirm the sampling adequacy before performing the PCA (Andy Field 2018). The Scree plot and Parallel analysis were used to determine the number of factors. As there might be inter-correlations between factors, the Promax rotation method was applied. Only items with high factor loading (>.4) and without significant multiple loading would be retained. The factor was considered for retention if it had at least three eligible items and Cronbach's alpha higher than .6. Each factor's score was calculated using the mean of all items within that factor.

CFA with Maximum likelihood estimates was performed to assess the fits of the Vietnamese DAS and DAX. Appropriate fitted models should have Chi-squared/degree of freedom (χ2/df) <5, GFI (Goodness of Fit Index) >.9 , CFI (Comparative Fit Index)>.9, SRMR (Standardized Root Mean Square Residual) <.08, and RMSEA (Root Mean Square Error of Approximation) <.08 (Joseph F. Hair et al. 2019). The convergent and discriminant validity of the scales were tested by using Composite Reliability (CR) and Average Variance Extracted (AVE). Configural invariance tests were performed to examine whether our factor structures achieve acceptable fit across genders and age groups (first, 16-37 years old, and second, 38-61 years old).

Correlation analysis was applied to evaluate the relationships between the DAS and DAX factors with continuous variables (age, weekly mileage, driving years). Moreover, categorical variables (gender, university graduation, motorcycle ownership, driver's license possession) were used to divide the data into motorcyclists' subgroups, and the independent-samples t-tests were applied to explore the differences in driving anger factors' scores between those subgroups.

Finally, the negative binomial regression was applied to predict crash involvement and traffic offences based on DAS and DAX factors and individual differences.

# APPENDIX C. References

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