

## Personality traits, risky riding behaviors and crash-related outcomes: findings from 5,778 cyclists in 17 countries

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### 1 INTRODUCTION

The last few years have brought about a series of substantial changes for mobility on two wheels, especially if the impact of the COVID-19 pandemic is considered as a relevant fact for transportation dynamics [1,2]. Social distancing recommendations have promoted the use of individual

transportation systems instead of massive transportations means. Consequently, riding a bike for urban trips has become increasingly prevalent in many countries [3-5].

Besides an opportunity to make urban mobility more active and sustainable, this panorama poses the challenge to prevent that, along with its growing use, bicycle crashes –and their consequences– might continue to increase. In this regard, recent studies have emphasized the role of individual differences and personality-related factors as potential issues influencing both cycling behaviors and traffic crashes suffered while riding [6,7].

## 2 METHODS

The core aim of this study, encompassed within the *Bike-Barometer 2021-2022* macro-project, was to assess the relationships among personality factors (approached from the “Big Five” paradigm), riding behaviors and self-reported safety outcomes of cyclists.

For this purpose, we used the data gathered from an extensive sample of 5,778 cyclists ( $M= 36.63$  years; 59% males) from 17 countries, responding to an electronic questionnaire including: a set of demographics (e.g., age, gender); cycling trip-related factors (e.g., trip frequency and length); the *Cycling Behavior Questionnaire* (CBQ) [8], used to measure risky (violations and errors) and positive riding behaviors; the *Short Big Five Inventory* (BFI-S) [9], used to measure personality traits under the Big Five (OCEAN) approach; and the number of self-reported cycling crashes suffered during the last 5 years.

## 3 RESULTS

The bivariate findings of this study show positive and significant associations among personality traits and road risky behaviors. Namely, traffic violations and errors were negatively correlated to Openness (only for errors), Conscientiousness and Agreeableness, and positively with Extraversion and Neuroticism. Positive behaviors were negatively correlated to Neuroticism and positively with Openness (only for errors), Conscientiousness and Agreeableness. Notwithstanding, only two among the five personality traits addressed in the Big Five model (i.e., Openness and Agreeableness) were significantly correlated to self-reported cycling crashes.

*Table 1: Bivariate correlations among study variables*

Study variable		Mean	SD	1	2	3	4	5	6	7	8	9	10
1	Age	36.63	14.71	--									
2	Weekly cycling intensity	6.16	5.97	.312**	--								
<i>Personality factors (traits)</i>													
3	Openness (O)	5.51	1.51	.130**	.144**	--							
4	Conscientiousness (C)	4.74	1.11	.307**	.197**	.461**	--						
5	Extraversion (E)	4.11	1.31	.159**	.027	.269**	.223**	--					
6	Agreeableness (A)	4.80	1.08	.224**	.104**	.428**	.516**	.178**	--				

7	Neuroticism (N)	3.49	1.18	-.175**	-.149**	-.016	-.159**	-.087**	-.119**	--			
<i>Cycling behavior and safety outcomes</i>													
8	Violations	.68	.58	-.153**	.147**	.012	-.108**	.045**	-.094**	.043**	--		
9	Errors	.50	.53	-.116**	-.072**	-.075**	-.183**	-.001	-.157**	.189**	.515**	--	
10	Positive Behaviors	3.01	.79	.142**	-.030*	.126**	.186**	.008	.193**	-.050**	-.368**	-.306**	--
11	Cycling Crashes	.77	1.31	-.001	.278**	.047**	-.007	-.006	-.053**	-.011	.246**	.239**	-.166**

Notes: \* Correlation is significant at the 0.05 level (2-tailed); \*\* Correlation is significant at the 0.01 level (2-tailed).

Also, hierarchical linear regression models were used to predict self-reported cycling crashes, on the basis of the study variables. Overall, it was found that gender (i.e., being a male) and cycling intensity are factors increasing crash likelihood. Regarding personality traits, it was found that Openness to experience (O) is the only factor increasing crash likelihood, while greater values in Extraversion (E), Agreeableness (A), and Neuroticism (N) were related to lower self-reported crash likelihood rates.

Finally, and as expected, both types of risky behaviors (errors and violations) significantly increased crash likelihood, while positive behaviors kept a negative and significant relationship to the number of riding crashes suffered by cyclists.

Table 2: Hierarchical regression model predicting self-reported cycling crashes based on individual factors, personality traits and riding behaviors.

Variable	Unstandardized Coefficients		Standardized (Beta)	t	Sig.	95% Confidence Interval	
	B	Std. Error				Lower	Upper
<i>Model: <math>\Delta R^2 = .149</math>; <math>F = 83.567</math>; <math>p &lt; .001</math></i>							
Gender <sup>a</sup>	.080	.035	.031	2.287	.022	.011	.149
Age	-.002	.001	-.023	-1.706	.088	-.005	0
Cycling intensity	.041	.003	.179	13.530	<.001	.035	.047
<i>Personality factors (traits)</i>							
Openness (O)	.051	.013	.061	3.939	<.001	.026	.077
Conscientiousness (C)	.009	.019	.008	.508	.612	-.027	.046
Extraversion (E)	-.027	.013	-.028	-2.082	.037	-.053	-.002
Agreeableness (A)	-.070	.018	-.059	-3.827	<.001	-.105	-.034
Neuroticism (N)	-.054	.015	-.050	-3.644	<.001	-.083	-.025
<i>Cycling behaviors</i>							
Violations	.268	.037	.123	7.173	<.001	.195	.342
Errors	.455	.041	.189	11.067	<.001	.374	.535
Positive Behaviors	-.108	.021	-.071	-5.206	<.001	-.148	-.067

Notes: <sup>a</sup> Ref. category= Male; Dependent Variable: Self-reported Cycling Crashes (5 years).

## 4 CONCLUSIONS

The findings of this study show how, apart from gender and cycling intensity, personality factors can act as significant predictors of crash involvement among active urban cyclists. Also, both risky and positive rising behaviors remain significant contributors to cycling crashes suffered by them.

These outcomes might help to understand the relationships among individual, personality and behavioral features of cyclists in relation to their self-reported cycling safety outcomes, as well as their potential link with road risky and positive behaviors preceding traffic crashes involving cyclists.

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