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"Pédaler en toute sécurité": The Cycling Behavior Questionnaire (CBQ) in Belgium – A validation study

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A B S T R A C T

Introduction: During the last few years, the use of behavioral questionnaires for assessing risky behaviors of road users different from motor-vehicle drivers has grown considerably in applied research for road safety. In this regard, recent tools such as the Cycling Behavior Questionnaire (CBQ) are gaining ground, being adapted and tested in further languages, thus getting useful to address the case of countries whose language is different to the English and Spanish. Therefore, and in order to extend the use of the CBQ, this study aimed (*i*) to develop the validation of the CBQ to the French and Dutch languages, in order to cover the population of Belgian cyclists and (potentially) other countries speaking these languages, as well as (*ii*) to explore demographic and cycling-related differences in cycling behaviors. **Methods:** For this cross-sectional study, data was collected from a full sample of 1,897 adult cyclists (50.9% males; 48.7% females; 0.4% others) from various regions of Belgium, with a mean age of 41.71 years. **Results:** The results suggest the CBQ, in its French and Dutch versions, has a strong factor composition, fair psychometrical properties and good convergent validity. Further, gender and cycling pattern-related differences were found in regard to the three dimensions measured by the scale. **Conclusion:** The results of this study support the value of the Cycling Behavior Questionnaire to be used for researchers studying road cyclists' behavior from the human factors perspective in French and Dutch-speaking countries.

1. Introduction

Almost all the available literature in transport, health, and sustainability supports the idea that cycling is an excellent non-motorized transport mode: it's not only healthy but also reduces congestion and air and noise pollution in urban areas, and it is cost-effective (Macmillan et al., 2014; Heinen, van Wee et al., 2010; Winters et al., 2010). Indeed, the current and coming changes in terms of transport dynamics, marked by social distancing, have shown that cycling (along with walking) seems to be among the preferred transport choices of road users worldwide; this results in a chance to keep strengthening

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active travel habits in the population (Shang et al., 2021). Other studies have not only placed cycling as an ideal way to avoid crowds during daily movements, but also as an issue with many short and mid-term implications for road safety, transport planning and public health (Doubleday et al., 2021; Anke et al., 2021). With these positive effects and potential, we expect that the usage of bicycles as a mode of transportation would be fairly common, but some challenges remain pending to be overcome.

Firstly, traffic crashes and injuries are still a major active threat for cyclists' safety and welfare (Horan et al., 2021; Shang et al., 2021). Secondly, and although both cyclists and non-cyclists are commonly aware about the several benefits of cycling on a regular basis, they usually perceive certain risks that might contribute to whether people choose not to use their bicycle, e.g., lack of fitness, weather, hilly terrains, feeling of unsafety while cycling, especially in a car-centered society (Useche et al., 2019; Chataway et al., 2014; Greaves et al., 2011; Gatersleben & Appleton, 2007; Spinney, 2007). In fact, it is estimated that about fifty percent of Europeans (EU28) report that they never used their bicycle as a transport mode (European Commission, 2013).

Another important issue potentially discouraging cycling resides in the behavioral sphere. For instance, safe cycling has been traditionally less strengthened through both road safety education and training than motor-vehicle driving, thus enhancing the likelihood of risky riding behaviors that frequently result in conflicts with other road users (Montoro et al., 2021; Ma et al., 2019). Although on-road problematic interactions are (perhaps) as old as road transport itself, recent studies suggest that behavioral improvements among road users could help, e.g., to reduce conflicts between them, to increase both perceived and actual cycling safety, and to promote cycling culture in transportation worldwide (O'Hern et al., 2021; Daniels & Risser, 2014; Johnson et al., 2010).

1.1. The Cycling Behavior Questionnaire

In order to study cycling behavior, Useche et al. (2018b) developed and validated the Cycling Behavior Questionnaire (CBQ). The aim of this questionnaire is to assess cyclists' risky and positive behaviors on the road. The three factors or subscales composing the CBQ are founded on the Behavioral Questionnaire (BQ) paradigm that, based on the *Traffic Violations* (V – Factor 1) / *Errors* (E – Factor 2) taxonomy initially proposed by Reason et al. (1990), has been gaining ground in applied research during the last years. In this regard, the CBQ addresses both risky (deliberate – V, and undeliberate – E) and *Positive Behaviors* on the road (PB; first used with bike riders through the CBQ – Factor 3), comprising a very holistic and generalizable set of riding behaviors affecting cycling safety.

The 29-item versions of the questionnaire, available in Spanish (Useche et al., 2021; Useche et al., 2018b) and English (O'Hern et al., 2021) have shown not only the fairness of its factor structure and adequate internal consistency indexes, but also predictive value for explaining self-reported cycling crashes suffered by bike riders (Useche et al., 2019b). However, and although the CBQ comprises a set of 29 road (risky and protective) behaviors that are theoretically appliable to urban cycling worldwide, it is worth considering factors such as demography, culture and other population-related particularities (including languages spoken in the region) as issues possibly impairing the questionnaire performance. In this regard, researchers overall agree about the fact that empirical evidences on the validity of self-report questionnaires are needed to support their use in specific contexts, especially if the information to be retrieved might be implied in the design and implementation of practical actions or policies (Kristensen, Hannerz, Høgh, & Borg, 2005).

For the present study, we tested the Cycling Behavior Questionnaire (CBQ) for the assessment of cycling behaviors in Belgium, a very politically, historically and culturally diverse country that, although having a long cycling tradition and culture, remains relatively unexplored in terms of studies addressing the behavioral road risks of bicycle riders through large-scale empirical approaches covering its main regions.

Another interesting fact about Belgium is the large set of strong divergences existing between the northern (Flanders) and the southern part of the country (Wallonia and Brussels Capital Region). On average, bicycle use for utilitarian purposes is rather common in the north, while it is relegated to a marginal role (mainly recreational activities) in the south (de Geus et al., 2014; Vandenbulcke et al., 2009). Also, something largely unknown outside the country is that two languages are spoken in Belgium: Dutch (about 60% of population) and French (about 33%; Indexmundi, 2021), so that this study used two different versions (i.e., translations) of the questionnaire, that -as a benefit- would allow applying the CBQ in two new languages, apart from investigating whether differences in use and other factors also potentially influencing cyclists' risky and positive road behaviors, as well as its convergence to different other cycling-related factors.

1.2. Objectives and hypotheses

Given the aforementioned considerations, the aims of the present study were, firstly, to describe in detail the validation in French and Dutch languages of the Cycling Behavior Questionnaire, a self-report questionnaire aimed at assessing both risky and positive bicycle riders' behaviors on the road. Secondly, this study aimed to compare the traffic violations, errors and positive behaviors of Belgian cyclists, according to a set of demographic and riding-related variables.

It was hypothesized that, for the first study aim, the general three-factor structure of the CBQ (Violations, Errors and Positive Behavior) would present adequate goodness-of-fit indices, factor loadings and high convergent validity with other cycling-related constructs, such as experienced and expressed anger while riding, as it has been observed in previous applications in other countries (O'Hern et al., 2021; Zheng et al., 2019; Useche et al., 2018b). In regard to the second purpose, we expected to find significant differences according to demographics (e.g., gender, age) and cycling patterns (e.g., cycling frequency, trip length) of Belgian cyclists for the three sub-scales composing the CBQ.

2. Methods

2.1. Study protocol

The online survey was available during the year 2019 in Dutch and French. The study protocol was approved by the Medical Ethics Committee of the university hospital of the Vrije Universiteit Brussel (B.U.N. 14320183846), certifying its accordance to the Declaration of Helsinki for applied research with human subjects. Only participants that accepted the terms and conditions of this study got access to the questionnaire.

The survey link was distributed through several channels using a snowball sampling technique. At first, we contacted various Belgian cycling advocacy organizations (e.g., 'Gracq', 'Fietsberaad', 'Pro Velo', and 'Fietsersbond') and asked them to spread the survey link through their website and newsletter. The link to the questionnaire was also spread through bike renting companies, the newsletter of the Vrije Universiteit Brussel (VUB), and the Human Physiology and Sports Physiotherapy (MFYS) and Mobility, Logistics and Automotive Technology (MOBI) research groups.

The Cycling Behavior Questionnaire has been previously applied through similar (convenience and web-based) sampling methods, i.e., identifying key scenarios such as rider-related associations/organizations, universities, research groups and social networks to spread the questionnaire (O'Hern et al., 2021; Useche et al., 2021 and 2018b). Other researchers using the CBQ have also referred to professional e-survey websites (Zheng et al., 2019). Overall, these strategies have been found effective, finding that they procedurally ease the task of accessing and recruiting participants from a very specific segment of road users (O'Hern et al., 2021; Useche et al., 2019c). Additionally, and even though there is not an infallible method for it, these strategies contribute to preserve the voluntariness and confidentiality of partakers, that may strengthen the transparency of the information collected (Zheng et al., 2019; Stephens et al., 2019).

2.2. Study context

The empirical analyses conducted in this paper focus on Belgium, a small and highly urbanized country of about 11 million inhabitants in a 30,000 km^2 area. There are marked differences between Flanders (FOD; North) on the one hand, and Wallonia and Brussels (southern and central parts, respectively) on the other hand. Flanders (mainly Dutch speaking) is highly urbanized. Brussels (BCR), the most densely populated Belgian region, is the de facto capital of the European Union, as it hosts a number of principal EU and other international institutions (Vandenbulcke et al., 2011). Wallonia, whose main language is French, is the least densely populated Belgian region (Statistics Belgium, 2019). The latest census travel data collected in 2017 in Belgium revealed large differences in cycle use between the different administrative regions. In Flanders, cycling is used notably more (15.8% non-electric bicycle and 1.6% e-bike) in contrast to BCR (4.0% non-electric bicycle and 0.2% e-bike) and Wallonia (1.5% non-electric bicycle and 0.3% e-bike; FOD Mobiliteit en Vervoer, 2019).

Table 1
Characteristics of the sample of study participants.

Feature	Category	Frequency	Percentage
Gender	Female	923	50.9%
	Male	966	48.7%
	Other	8	0.4%
BMI	Normal weight [a]	1236	65.2%
	Overweight	508	26.8%
	Obese	153	8.1%
Cycling frequency	Less than once a week	399	22.4%
	More than once a week	1379	77.6%
Self-rated health	Poor	11	0.6%
	Fair	140	7.4%
	Good	816	43%
	Very good	722	38.1%
	Excellent	208	11%
Educational level	Primary studies or lower	9	0.5%
	Secondary school	224	11.8%
	Superior (non-university) studies	585	30.8%
	University studies	1079	56.9%

Notes: [a] Underweighted participants (BMI < 18.5 kg/m^2) were classified as normal weight.

2.3. Sample

The sample used for this study was composed of n = 1,897 adult cyclists (18 + years; 50.9% males; 48.7% females; 0.4% others) who used any kind of cycle as a transport mode in the last six months, with a mean age of M = 41.71 (SD = 11.73) years, living in Belgium. Other demographic data on the sample are shown in detail in Table 1.

In the first part of the questionnaire, participants were asked about basic individual and demographic features (i.e., gender, age, educational level). To calculate Body Mass Index participants self-reported their height and weight, being (BMI = $\text{weight}_{(kg)}/\text{height}^2_{(m)}$). As for self-rated health, participants were asked how they would score their current health status on a 5-point scale ranging from bad to excellent. Table 1 appends the information obtained in these regards.

The study sample was considerably similar to the Belgian population in terms of gender and age: as for gender, we counted on a male:female ratio of 0.96, while the populational data of the country estimates it on ± 1.05 (Indexmundi, 2021). No information was available for comparing the category "others", used for grouping non-binary participants (0.4%). In regard to age, the participants of this study had a very close average (41.71 years; 42.39 for males and 40.95 for females) to the population one, that is 41.60 years. As for the Body Mass Index (BMI) of our study participants, we found that only ± 27% of them were overweighted, and ± 8% were obese, while according to the Belgian health examination survey ± 55% of Belgians are overweighted, and obesity reaches ± 21% of the general adult population (Van der Heyden et al., 2018). As specific data for cyclists in this regard do not exist, it could be hypothesized that BMI group-related differences to the general population could be related to (among others) with the fact of counting on a large proportion of *regular* cyclists, given than 77.6% of participants performed at least two bike-trips a week.

2.4. Travel behavior

We also asked the participants to give an indication of their travel behavior (all transport modes) and cycling in particular. Travel-related variables were measured as follows:

Travel behavior: A matrix with different travel modes within the previous 6 months and their frequency of use over the preceding 6 months was proposed. The travel modes were: by foot, car driver and/or passenger, motorcycle driver and/or passenger, bicycle, public transport, e-transporters, combination of motorized transport mode and public transport, combination of bicycle and public transport and combination of foot and public transport. The use frequency scale comprised: never (0), less than one day a month (1), 1–3 days per month (2), 1–2 days per week (3), 3–4 days per week (4) or 5–7 days per week (5). For readability, these variables were recoded into 0, 12, 24, 78, 182, and 312 days per year, respectively, being individuals with an average of $\geq$ 3 trips a week considered as with a regular cycling frequency.

For retrieving information on *cycling habits and patterns*, we used the following questions: *(i)* "what do you use your bicycle for as a means of transport?" (e.g., *commuting trips; trip to/from a specific point of the city; as part of my job*); *(ii)* "I use my bicycle as a means of transport because…" (e.g., *I like its health benefits*); *(iii)* "when I ride a bicycle, I experience": 6 different possible responses (e.g., *anger, fear*).

2.5. Latent variables

Cycling behavior. The Cycling Behavior Questionnaire (CBQ), as developed by Useche et al (2018b), consists of its validated Spanish version of 29 items, a frequency-based Likert scale [0 = never, to 4 = almost always] measuring three dimensions. Two of them are related to "risky" road behaviors performed by cyclists:

(*i*) *Violations* (Factor 1), that presents 8 deliberate illegal behaviors applicable to the context of cycling (example item: "*Circulating against the traffic, or wrong way*"), and whose internal consistency has ranged between [α = 0.79–0.90] for previous applications.

(*ii*) *Errors* (Factor 2), consisting of 15 non-deliberate risky behaviors (example item: "*Failing to notice the presence of pedestrians crossing when turning*"), with a reliability coefficient ranging between [α = 0.82–0.85]. Also, an overall *Risky Behavior (RB)* score can be calculated by summing the scores on Violations (V) + Errors (E). This indicator results useful principally for descriptive purposes, as shown in Fig. 2.

Additionally, this questionnaire comprises a 6-item subscale (Factor 3) for assessing *Positive Behaviors* (example item: "*I usually keep a safe distance from other cyclists or vehicles*"), ranging between [α = 0.70–0.74] (Useche et al., 2019b and 2019b; Zheng et al., 2019). As aforementioned, the CBQ was translated into Dutch and French through a translation/re-translation (back translation) method, performed by a native translator, and revised and endorsed by various experts, including some of the authors of the original CBQ questionnaire – the validated Dutch and French versions of the CBQ can be consulted at the Appendix of this paper.

Is it important to say that, in this study, the CBQ was integrated into a larger questionnaire, also composed of two complementary variables used for assessing its convergent validity, which were:

Cycling anger experience. This convergent factor was measured through the Cycling Anger Scale (CAS) that consists of a five-point Likert scale aimed at assessing to what extent [1 = not at all, to 5 = very much] do cyclists experience anger in presence of difficult and/or demanding cycling-related situations (example item: "*A car forces you off your path*"). It showed an acceptable reliability index [α = 0.71] in previous applications to European cyclists (Oehl, Brandenburg, & Huemer, 2019a and 2019b).

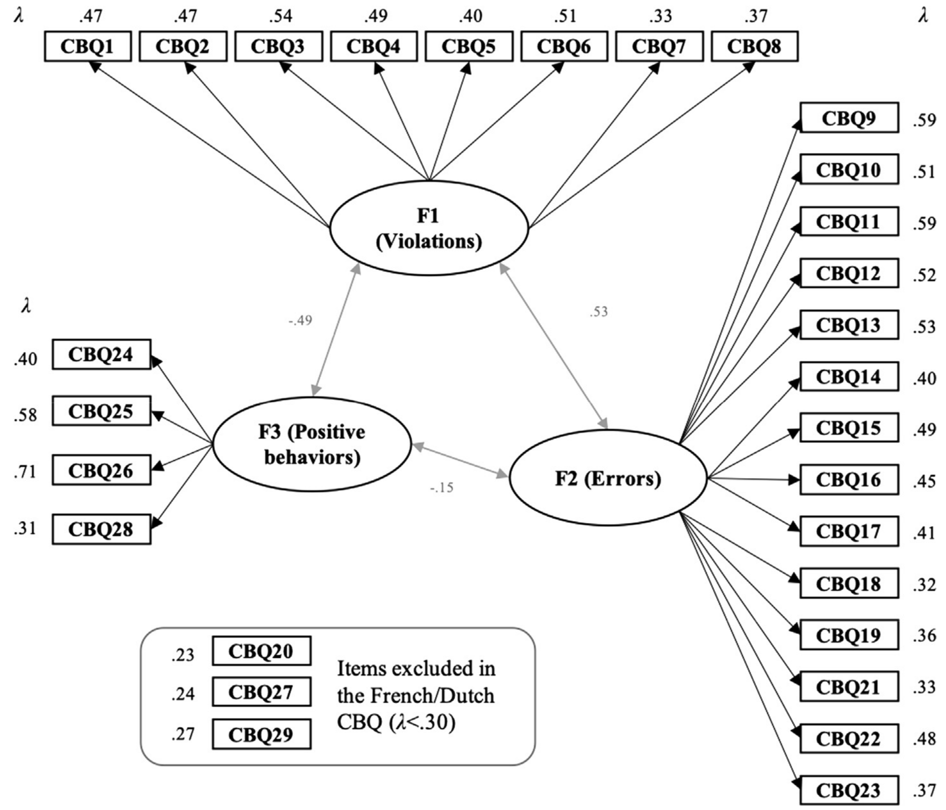

Fig. 1. Standardized parameter estimates and factor correlations. *Notes:* All standardized estimates were $p < .001$; the numbers within squares represent the original numbers of the items in the CBQ (as shown in Table 3).

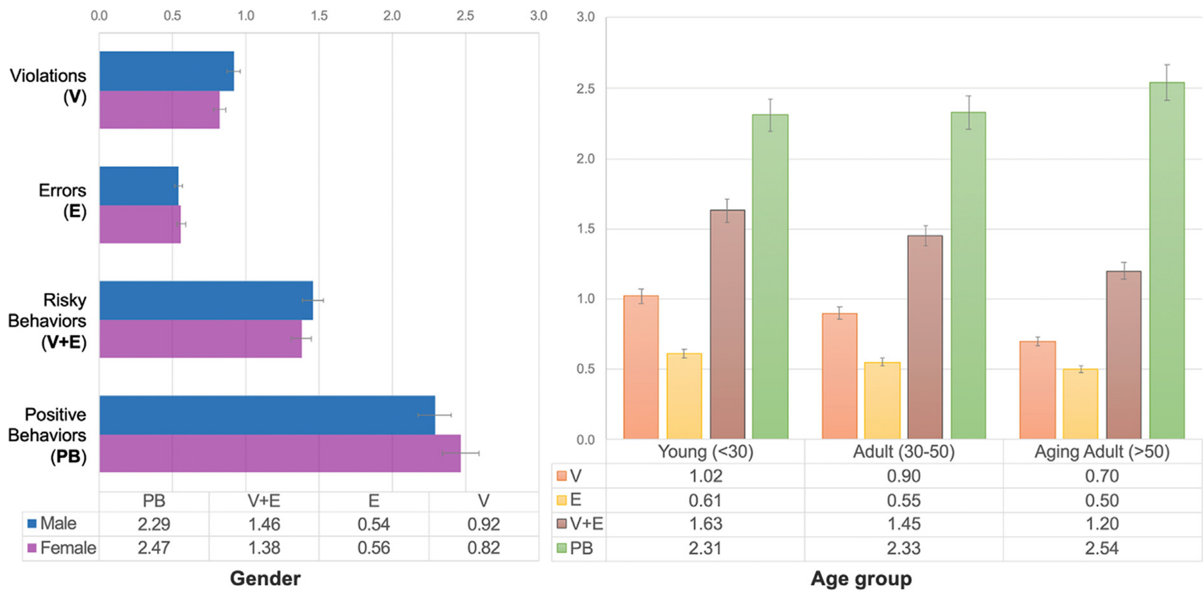

Fig. 2. Gender and age group-based comparative scores for the CBQ Factors.

Cycling anger expressions. This variable was measured by means of the Cycling Anger Expression (CAX) questionnaire that consists of a frequency-based 14-item Likert scale [1 = never, to 5 = always] aimed at assessing the anger-related expressions of cyclists (example item: "*I try to scare the other road user*"). Its mean score reflects an unifactorial solution with an internal reliability coefficient of [α = 0.89] found in previous applications (Møller & Haustein, 2017).

2.6. Data processing

2.6.1. Factor analyses/structural models

After carefully carrying out the data curation, performing descriptive-analytic procedures on the sample features and confirmed the invariance of the questionnaire between both forms (Dutch and French languages), the factorial structure of the Cycling Behavior Questionnaire (CBQ) was tested through Confirmatory Factor Analyses (CFA) with successive fit steps (forward), that entails several advantages for managing (e.g.) missing data, categorical or non-normally distributed variables (Finney & DiStefano, 2013).

The use of a CFA approach was supported by previous CBQ-based studies performed in different countries (*see* O'Hern et al., 2021; Useche et al., 2019b and 2019c; Zheng et al., 2019; Useche et al., 2018b) confirming its hypothesized factor structure. Precisely, this 3-factor dimensional model comprised the baseline model to be tested, comparing it with other possible structural solutions through a "competitive" structural analysis. This method allows researchers to test of several models under different theoretical assumptions and hypothesized structures, indicating what solution has a more adequate and parsimonious fit. In this case, IBM SPSS-AMOS software was used for specifying and estimating these models. The cut-off criteria for considering an item's factor loading as adequate was established as $\lambda > 0.30$.

2.6.2. Goodness-of-fit

The goodness-of-fit of the structural models used was appraised through several complementary indexes from different types and natures (Marsh, Hau, & Wen, 2004). More specifically, we used: Chi-square (χ^2), minimum discrepancy ratio (CMIN/df); Root Mean Square Error of Approximation (RMSEA), Tucker-Lewis Index (TLI), Normed Fit Index (NFI), and Confirmatory Fit Index (CFI). The cut-off standards of the model were: TLI / NFI / CFI coefficients >0.90, added to an RMSEA not higher than 0.08, and a disparity ratio (CMIN/df) lower than 5.0 suggest a satisfactory model fit (Marsh et al., 2004). Furthermore, the plausibility and theoretical sense of the model were also assessed in consideration of the coherence and strength of the estimates, added to the absence of large modification indices (MIs). Additionally, and considering that the questionnaire form had been applied in two languages, the adjustment indexes of the data retrieved through both CBQ (French and Dutch) forms were independently tested in the final validated model, assessing the goodness-of-fit of each one in comparison with the fit reported for the general country-based model.

2.6.3. Convergent validity and reliability

The convergent validity of the CBQ was tested by means of three Criterion Variables (CVs) supported by the literature to be related to cycling behaviors: age (CV^1); cycling anger experiences (CV^2; Oehl et al., 2019a); and cycling anger expressions (CV^3; Stephens et al., 2019; Møller & Haustein, 2017). Please see *2.3 Description of the Questionnaire* for further information on the criterion variables measured.

To estimate the internal consistency and reliability of the questionnaire and its subscales, we calculated (*i*) Alpha coefficients (Cronbach's α), and (*ii*) the Composite Reliability Index (CRI), that is an additional consistency index that ranges between 0 (no consistency) and 1 (total consistency), statistically computed from the factor loadings and residuals observed in the confirmatory results. The use of this second index also helps overcome some of the traditional gaps of Cronbach's alpha as a single way of assessing scale reliability (Raykov & Marcoulides, 2011; Raykov, 2001).

2.6.4. Comparative analyses

Finally, One-way ANOVA analyses for mean comparisons were used to compare the CBQ scores according to demographic and cycling-related factors, in order to test whether there are significant differences according to three user's features: (*i*) gender (males and females), for which other values (n = 8) were omitted due to the lack of statistical power for performing comparisons; (*ii*) Age groups (weighted due to sub-sample disproportionality): young adults (<30), adults (30–50), and aging adults (>50); and (*iii*) Cycling frequency: low frequency (<182 days a year, or $\leq$ 2 days per week on average over the preceding 6 months) and high frequency ($\geq$182 days a year, $\geq$3 days per week on average over the preceding 6 months). Comparative tests were performed with cut-off criteria of $p < .05$, $p < .01$, and $p < .001$.

3. Results

3.1. Structural equation modeling

With the aim of understanding the factorial structure of the French and Dutch versions of the Cycling Behavior Questionnaire (CBQ), and after testing the raw fit of the model through EFA, two competitive theory-based CFAs were performed. First, we tested the original structure composed of three factors and, second, a unifactorial structure, in order to perform fit comparisons and thus determine the best possible theoretical structure for the scale.

The model fit for the unifactorial solution was considerably inadequate, while the baseline three-factor model showed better fit indexes (see Table 2). A close inspection of this unconstrained three-factor model allowed us to identify a reduced set of large modification indexes (covariances) between items that were controlled, and three items with notorious psychometric shortcomings ($\lambda < 0.300$). The new simplified three-factor constrained model fitted the data reasonably well, presenting the key indices reported in the Table 2.

It is relevant to remark that when this model fit is compared to a unifactorial solution with the same set of items, the final three-factor adjusted structure presents a much better fit without the need of deleting an extensive number of items; only three questions with considerably low factor loadings / $\lambda < 0.30$ and poor psychometric adjustment impairing the model fit had to be deleted, i.e., CBQ20 (errors), CBQ27 and CBQ29 (positive behaviors). Considering both their theoretical parsimony, adequate factor loadings, and the adequate reliability scores obtained in the subsequent analysis of reliability (see *3.2 Internal consistencies*), 26 out of the 29 items composing the questionnaire were kept for the final model.

Further, and considering that the questionnaire form had been applied in two languages (French and Dutch), the goodness-of-fit for each form was assessed in regard to the final country-based model, in order to discard substantial variations of the structure across regions of the country speaking different languages. In both cases, the data fitted well, and all the metric criteria were successfully achieved, endorsing the similarity of the data and their adjustment to the final model.

Table 3 shows the content, descriptive data (average scores and standard deviations), standardized factor loadings, and significance levels of each item composing the CBQ. It is noticeable that all factor loadings are over the cut-off point, remain positive, and statistically significant within their respective factors, as it is also shown in Fig. 1.

3.2. Reliability and internal consistency of the CBQ

Cronbach's Alpha estimates were all above the $\alpha = 0.60$ criteria, as usually established in psychometric literature, which indicates adequate internal reliability: $\alpha = 0.645$ for Traffic Violations (F1; 8 items); $\alpha = 0.782$ for Riding Errors (F2; 14 items); and $\alpha = 0.603$ for Positive Behavior (F3; 4 items).

Furthermore, several specialized sources suggest the use of a second coefficient (i.e., the Composite Reliability Index) for supporting the internal reliability of factors, as an alternative reliability measurement to the Cronbach's Alpha, which may be biased especially in the case of short scales (Raykov, 2001; 1998; McDonald, 1970). In this regard, the composite reliability indices (CRIs) had very satisfying reliability values for all the three latent constructs measured through the questionnaire. All the CRIs ranged between 0.867 (F3) and 0.978 (F2) in a [0–1] interval.

3.3. Factor inter-correlations and convergent validity of the CBQ

Overall, Pearson's (bivariate) correlations between the CBQ factors were statistically significant and their directionality theoretically coherent, as it was hypothesized on the basis of previous applications of the instrument (Useche et al., 2019b and 2019c; Zheng et al., 2019).

Inter-factor association measures were established as follows: Factor 1 (traffic violations) and Factor 2 (riding errors), were positively and significantly correlated between them ($r = 0.449$; $p < .001$). On the other hand, both Factor 1 (traffic violations; $r = -0.346$; $p < .001$) and Factor 2 (riding errors; $r = -0.120$; $p < .001$) had a negative association to Factor 3 (positive behaviors), as shown in Table 4, in which Pearson coefficients (r_s) are presented along significance levels achieved.

Furthermore, the convergent validity between the three CBQ factors and other related variables was evaluated by means of the correlation coefficients among them and three chosen Criterion Variables (CVs): *1)* cyclist' age, *2)* cycling anger, and *3)* cycling anger expressions. In this regard, Pearson' association coefficients have shown significant and coherent correlations between CV^1 (age) and Factors 1 and 2 (negative), and 3 (positive). CV^2 (cycling anger) / CV^3 (cycling anger expressions) and: Factors 1 and 2 (positive), and Factor 3 (negative).

Table 2
Competitive analysis-based fit indices of the structural models and goodness-of-fit of the two applied versions of the CBQ for the final model.

Model	X^2	df[1]	*p*	CMIN/df[2]	RMSEA[3]	90% CI for RMSEA		CFI[4]	NFI[5]	TLI[6]
						Lower	Upper			
Unifactorial solution	4410.480	754	<0.001	5.849	0.051	0.049	0.052	0.585	0.542	0.553
Three-factor baseline model	3350.010	748	<0.001	4.479	0.043	0.041	0.044	0.705	0.652	0.680
Three-factor adjusted model (26-items final model)	657.770	248	<0.001	2.652	0.030	0.027	0.032	0.945	0.916	0.928
French language version of the CBQ	402.364	248	<0.001	1.622	0.035	0.029	0.041	0.913	0.910	0.908
Dutch language version of the CBQ	634.47	248	<0.001	2.558	0.033	0.030	0.037	0.936	0.901	0.916

Notes: [1]df = Degrees of freedom; [2]CMIN/df = Minimum discrepancy ratio between X^2/df; [3]RMSEA = Root Mean Square Error of Approximation; [4]CFI = Confirmatory Fit Index; [5]NFI = Normed Fit Index; [6]TLI = Tucker-Lewis Index.

Table 3
Item content, factor that the item belongs to, mean (M), standard deviation (SD), standardized factor loading (λ), standard error (S.E.), Critical Ratio (C.R.), and p-values in the retained model.

Item[1]	Item content	Factor	M	SD	λ	S.E.	C.R.	p
CBQ1	Cycling under the influence of alcohol and / or other drugs or hallucinogens.	F1: Traffic violations(8 items)	0.667	0.732	0.466	0.184	6.320	<0.001
CBQ2	Circulating against the traffic (wrong way).		1.017	0.858	0.474	0.096	12.378	<0.001
CBQ3	Zigzagging between vehicles when using a mixed lane.		1.516	1.049	0.543	0.126	13.209	<0.001
CBQ4	Handling potentially obstructive objects while riding a bicycle (food, packs, cigarettes ...).		0.703	0.770	0.486	0.086	12.693	<0.001
CBQ5	Feeling that sometimes I'm going at a higher speed than I should be going at.		1.091	0.809	0.398	0.139	6.762	<0.001
CBQ6	Crossing what appears to be a clear crossing, even if the traffic light is red.		1.146	0.995	0.507	0.115	12.805	<0.001
CBQ7	Carrying a passenger on my bicycle without it being adapted for such a purpose.		0.223	0.528	0.334	0.052	10.016	<0.001
CBQ8	Having a dispute in speed or "race" with another cyclist or driver.		0.607	0.801	0.367	0.136	6.320	<0.001
CBQ9	Unintentionally crossing the street without looking properly, thus making another vehicle brake to avoid a crash.	F2: Riding errors(14 items)	0.366	0.517	0.595	0.124	12.860	<0.001
CBQ10	Colliding (or being close to it) with a pedestrian or another cyclist while cycling distractedly.		0.433	0.538	0.509	0.049	18.185	<0.001
CBQ11	Braking suddenly and being close to causing an accident.		0.418	0.536	0.586	0.057	17.771	<0.001
CBQ12	Failing to notice the presence of pedestrians crossing when turning.		0.576	0.580	0.524	0.058	16.795	<0.001
CBQ13	Not braking on a "Stop" or "Yield" sign and being close to colliding with another vehicle or pedestrian.		0.345	0.542	0.527	0.052	17.780	<0.001
CBQ14	Braking very abruptly on a slippery surface.		0.366	0.537	0.402	0.050	13.945	<0.001
CBQ15	While I am distracted, I do not realize that a pedestrian intends to cross a crosswalk, and therefore I do not stop to let him or her do so.		0.996	0.699	0.492	0.071	15.813	<0.001
CBQ16	Not realizing that a parked vehicle intends to leave and consequently having to brake abruptly to avoid a collision.		1.094	0.713	0.455	0.073	14.503	<0.001
CBQ17	When driving on the right side, not realizing that a passenger is getting out of a vehicle or bus, and thus being close to hitting him or her.		0.924	0.749	0.415	0.074	13.616	<0.001
CBQ18	Trying to overtake a vehicle that had previously used its indicators to signal that it was going to turn, consequently having to brake.		0.349	0.630	0.323	0.056	11.744	<0.001
CBQ19	Misjudging a turn and hitting something on the road, or being close to losing balance (or falling).		0.255	0.457	0.361	0.042	12.875	<0.001
CBQ21	Failing to be aware of the road conditions and falling over a bump or hole.		0.805	0.720	0.330	0.067	11.578	<0.001
CBQ22	Confusing one traffic signal with another, and maneuvering according to the latter.		0.460	0.567	0.480	0.058	15.281	<0.001
CBQ23	Trying to brake but not being able to use the brakes properly due to poor hand positioning.		0.328	0.529	0.367	0.049	12.860	<0.001
CBQ24	I stop and look at both sides before crossing a corner or intersection.	F3: Positive behaviors(4 items)	2.596	1.093	0.396	0.190	7.268	<0.001
CBQ25	I try to move at a prudent speed to avoid sudden mishaps or braking.		2.496	0.995	0.582	0.163	8.236	<0.001
CBQ26	I usually keep a safe distance from other cyclists or vehicles.		3.007	0.766	0.710	0.158	7.989	<0.001
CBQ28	I avoid circulating under adverse weather conditions.		1.414	1.058	0.313	0.100	7.268	<0.001

Notes: [1]Original item number (see Useche et al., 2018b; 2021).

Table 4
Bivariate correlations found between CBQ factors and criterion variables.

Study Factor / Criterion Variable		F2	F3	CV[1]	CV[2]	CV[3]
F1	Traffic violations	0.449**	−0.346**	−0.280**	0.147**	0.370**
F2	Riding errors	–	−0.120**	−0.117**	0.145**	0.265**
F3	Positive behaviors		–	0.162**	−0.007	−0.148**
CV[1]	Cyclist's age			–	0.015	−0.066**
CV[2]	Cycling anger experience (CAS)				–	0.212**
CV[3]	Cycling anger expression (CAX)					–

Notes: ** Correlation is significant at the 0.001 level (2-tailed).

3.4. Demographic and cycling-related differences in CBQ factors

Finally, One-way ANOVA mean comparisons were performed in order to determine the existence of significant differences in regard to the CBQ factors (i.e., traffic violations, riding errors, and positive behaviors) according to demographic (gender and age) and cycling-related (cycling frequency) features of the study participants. Summarizing the results shown in Table 5, it was found that:

Table 5
Gender, age-based, and cycling frequency differences in CBQ factors.

Study variable	Factor	Group	N	Mean	SD	95% CI for Mean[1]		Mean differences (ANOVA)		
						Lower	Upper	*F*	df[2]	p
F1: Traffic Violations	Gender	Male	966	0.92	0.45	0.89	0.95	23.377	(1,1887)	<0.001
		Female	923	0.82	0.41	0.80	0.85			
	Age[3]	Young adults	325	1.02	0.51	0.96	1.07	61.341	(2,1886)	<0.001
		Adults	1116	0.90	0.40	0.87	0.92			
		Aging adults	448	0.70	0.38	0.66	0.73			
	Cycling Frequency	Low	735	0.85	0.45	0.81	0.88	3.668	(1,1776)	0.056
		High	1043	0.89	0.44	0.86	0.92			
F2: Riding Errors	Gender	Male	966	0.54	0.30	0.53	0.56	0.543	(1,1887)	0.461
		Female	923	0.56	0.31	0.54	0.58			
	Age[3]	Young adults	325	0.61	0.33	0.58	0.65	13.259	(2,1886)	<0.001
		Adults	1116	0.55	0.31	0.53	0.57			
		Aging adults	448	0.50	0.28	0.47	0.52			
	Cycling Frequency	Low	735	0.53	0.31	0.50	0.55	7.085	(1,1776)	<0.01
		High	1043	0.57	0.32	0.55	0.59			
F3: Positive Behaviors	Gender	Male	966	2.29	0.63	2.25	2.33	38.308	(1,1887)	<0.001
		Female	923	2.47	0.60	2.43	2.51			
	Age[3]	Young adults	325	2.31	0.62	2.24	2.37	22.084	(2,1886)	<0.001
		Adults	1116	2.33	0.60	2.30	2.37			
		Aging adults	448	2.54	0.63	2.49	2.60			
	Cycling Frequency	Low	735	0.31	0.63	0.27	0.36	12.900	(1,1776)	<0.001
		High	1043	0.42	0.64	0.38	0.46			

Notes: [1]CI = 95% Confidence Interval for the Mean; [2]df = Degrees of freedom; [3]Disproportional groups were weighted for the comparative analyses.

(*i*) *Gender:* Males report significantly higher rates of traffic violations than female cyclists, while females report higher rates of positive behaviors. Non-significant differences were found for the case of riding errors, as it can be seen in Fig. 2.

(*ii*) *Age groups*: Younger cyclists (<30) have the greater rate of risky behaviors (both errors and violations) and the lesser for positive behaviors, while aging adults (>50) report the lesser risky behaviors and the greater rates of protective ones. Also, aging cyclists report significantly lesser risky behaviors than both adults and young adults. Similarly, adults (30–50 years) have lower risky behavior rates than the reported by the younger (<30) cyclists. However, there are no differences in the rate of positive behaviors between young and adult cyclists. Finally, the positive behavior rate of aging adults was significantly higher than the reported by both young and adult cyclists, as it is presented in Fig. 2.

(*iii*) *Cycling frequency*: Finally, high-frequency cyclists (using the bike $\geq$ 3 times per week on average over the preceding 6 months) report greater rates of riding errors (undeliberate risky behaviors) than low-frequency ones. On the other hand, they also report higher rates of positive (protective) behaviors than cyclists riding with a lower frequency. No significant differences were found for traffic violation rates.

4. Discussion

4.1. Psychometric properties and validity of the Cycling Behavior Questionnaire

The first aim of this study was to validate in French and Dutch languages a widely used tool for the assessment of bicyclists' risky and positive road behaviors, that is the Cycling Behavior Questionnaire (CBQ). Overall, the CBQ Dutch and French versions have shown good psychometric qualities, keeping its original 3-factor structure, plus an adequate set of goodness-of-fit coefficients.

Psychometrically speaking, Root Mean Square Errors of Approximation (RMSEAs) ranged between [0.33–0.35], the discrepancy ratios were found into the interval [1.62–2.56], and the Comparative, Normed and Tucker-Lewi's fit indexes oscillated between [0.91–0.94], working very similarly for both forms (Dutch and French) as recommended by expert literature (Ropovik, 2015; Bentler, 1990). Also, lambda coefficients (λ, or factor loadings) were overall > 0.30, presenting in most cases values comparable to the original version of the questionnaire (Useche et al., 2018b; tested in >25 countries in the last three years), and having to exclude a considerably small number of items (only three that presented obvious psychometric problems), for a final composition of 26 items.

Further, the convergent validity analyses satisfactorily confirmed the initial assumptions in regard to the positive correlations between cycling anger-related variables and road risky behaviors reported by urban riders in third countries, keeping the significance and right directionality in the case of both cycling anger experiences and expressions (Stephens et al., 2019; Oehl et al., 2019a and 2019b).

4.2. Age, gender and cycling frequency in regard to cycling behavior

Our second aim was to compare the CBQ scores on errors, violations, and positive behaviors as a function of individual and cycling-related factors. In this regard, the results allow to depict key age and gender-based differences, in terms of both risky (deliberate and undeliberate) and protective cycling behaviors. Specifically, traffic violations reported by Belgian cyclists were significantly higher for the case of men while women report more frequent positive behaviors, coherently with previous similar studies on cycling behavior carried out in other countries of Europe and Latin America (Useche et al., 2018a; Cordellieri et al., 2016; Bernhoft & Carstensen, 2008). However, no gender-based differences were found for the case of undeliberate behaviors, suggesting that riding errors -more linked to cycling skills than risk perception/assumption itself- might homogeneously work in terms of gender. On the other hand, the gender differences found in self-reported traffic violations could be explained, rather, by psychosocial variables such as differences in terms of risk perception, cycling anger, and personality traits between male and female riders (Useche et al., 2018a; Møller & Haustein, 2017; Oehl et al., 2019a). This also echoes the long-documented proneness of men for anger in general as compared with women (Kopper & Epperson, 1996).

Regarding age-based differences, the results of this study show interesting figures among the three age segments of cyclists. Young adult Belgian cyclists were the group showing greater involvement in overall risky behaviors (including traffic violations and riding errors), suggesting similar trends to the observed in other countries, whether measured through the CBQ (Useche et al., 2019b and 2019c) and other relevant behavioral questionnaires, such as the BRBQ (Hezaveh et al., 2018) and the ACBQ (Feenstra et al., 2011). Concretely, Belgian cyclists aged over 50 (i.e., aging adults) seem to be the age segment reporting significantly lower rates of risky behaviors, and significantly greater rates of positive behaviors), as also observed in previous studies carried out with pedestrians (Useche et al., 2020) and motor-vehicle drivers (Lucidi et al., 2019). In this regard, previous evidence also provides good highlights on the greater level of constructive responses to cycling anger and psychosocial demands while riding observed in older cyclists (Vanparijs et al., 2020; Stephens et al., 2019; Useche et al., 2019b and 2018), as well as the importance they give to, e.g., choose safer cycling paths and avoiding high traffic-density spots for riding than can be also considered as protective behaviors (Van Cauwenberg et al., 2019).

Finally, cycling frequency has shown to be a *double-edged sword* for road risks among Belgian cyclists, if the reported outcomes in terms of risky and positive behaviors are weighed: in regard to the first, higher-frequency cyclists (riding $\geq$ 3 times a week – usually for commuting) have shown to report greater rates of positive behaviors than those using the bike with less frequency. This is consistent with previous empirical evidence dealing with cross-cultural samples of urban bike riders, in which the correlation between weekly cycling intensity and protective cycling habits tends to be positive and significant (O'Hern et al., 2021; Useche et al., 2018c).

Nevertheless, the results of this study also place higher-frequency cyclists as those self-reporting the greater rates of traffic violations while riding, and similar outcomes in this regard have been recently documented in other regions, such as Latin America and Oceania. Although it is clear that the contexts from where these studies become (and their road safety figures) may substantially differ, some patterns can be found. On the one hand, cycling-cultural issues and riding reasons of Latin American riders may contrast with the reported by riders from countries such as Belgium and Australia, starting by the fact that leisure cycling is more common in high-income countries, that anyway keep several other differences between them, such as their geography, adequacy of built environment for cycling and the most common motives for riding a bike (Useche et al., 2019b; Owen et al., 2010).

On the other hand, statistical figures seem to remain consistent. For instance, O'Hern et al. (2021) found a positive correlation between weekly cycling hours and traffic violations among Australian cyclists, and Useche et al. (2021) found a full statistical mediation of traffic violations between risk perception and self-reported cycling crashes of Latin American cycling commuters (that also tend to be younger and male, and to ride more hours a week), implying road risk perception as a key issue to be emphasized for road training among regular cyclists. Precisely, road risk perception in cycling constitutes one of the key topics targeted by recent studies for improving cycling safety in Belgium, giving its relationship with cyclists' behavior (Ghekiere et al., 2014). This is, actually, another avenue that might be convenient to empirically address on the basis of the incoming changes in nonmotorized mobility. Although a move to *greener* (and more active) transportation was already forecasted many years ago in highly cycling-cultured countries such as Belgium, it is undoubtable that the current global health situation is accelerating it (Anke et al., 2021), and sooner rather than later may represent an opportunity to promote a healthier and safer transportation for cyclists.

4.2.1. Limitations of the study and further research

Even though our study sample was very extensive and covered the main regions of Belgium, there are some limitations that we should acknowledge. Firstly, this study focused only on cyclists of 18 + years, who were regular riders. This will have excluded younger cyclists (i.e., child and teenager cyclists), whose case may also be worthy of investigation, also limiting the generalizability of the results to the addressed age groups. Secondly, the online form used for collecting the data could have limited the participation of certain potential partakers not commonly using connected devices and mobile apps. However, higher age segments were well-represented in the study. Finally, the results of this research are based on self-reported survey information, that should be carefully interpreted, given that the self-presentation biases especially for "sensitive" topics, such as one's own behavior in social environments, as traffic safety and risky behaviors. In order to counteract this, all partakers of the study were clearly assured that participation was totally anonymous, and the data provided were exclusively aimed at scientific purposes.

Also, and since the results of this study are geographically limited, the CBQ could be now applied in other French and Dutch-speaking countries, allowing researchers to develop further insights on riding behavior in other locations. In this regard, researchers should also consider assessing the impact of the nowadays changing transportation dynamics (*e.g.*, *less commuting trips due to telework?, more/less fear of crime?, sharing bike lanes with e-scooters?*) on cyclists' risky and positive road behaviors, and their safety-related outcomes.

5. Conclusion

This study firstly addressed the risky and positive cycling behaviors of almost two thousand active cyclists in Belgium, by using the 29-item version of the CBQ (Cycling Behavior Questionnaire; Useche et al., 2018b). The structural analyses performed endorsed the consistency and validity of the questionnaire, finding interesting associations and differences based on demographic (age and gender) differences and cycling-related factors (cycling frequency).

Results showed how male Belgian cyclists report a considerably greater frequency of deliberate risky behaviors (*violations*) and less positive safety-related habits (positive behaviors) than their female counterparts. On the other hand, no gender-based differences were found for unintended risky behaviors (*errors*). As for age differences, young adult cyclists are the ones reporting more risky behaviors (both errors and violations), while aging adults have the lower rates in this regard, plus a significantly higher rate of self-reported positive cycling behaviors. Hence, both gender and age-based differences show relevance for being addressed in road safety-related (RSE) interventions, especially for male and younger cyclists.

Another strength of this validation that should be mentioned is the fact that it allows the CBQ to be applied to Dutch and French-speaking countries that, in the case of Europe, have a long cycling tradition (e.g., the cases of France and the Netherlands), in contrast to a relative lack of validated questionnaire-based tools potentially enhancing the study of behavioral factors on cycling safety, with the aim of improving cycling safety in the light of empirical evidence.

CRediT authorship contribution statement

Sergio A. Useche: Conceptualization, Methodology, Investigation, Writing - original draft, Writing - review & editing. **Pierre Philippot:** Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Toon Ampe:** Visualization, Writing - original draft. **Javier Llamazares:** Data curation, Writing - original draft, Writing - review & editing. **Bas Geus:** Visualization, Conceptualization, Investigation, Software, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. Translated versions of the Cycling Behavior Questionnaire (CBQ)

Dutch version of the CBQ
Beantwoord deze vraag alleen als aan de volgende voorwaarden is voldaan:
0 = Nooit; 1 = Zelden; 2 = Soms; 3 = Vaak; 4 = Altijd

Inhoud (Item)	Frequentie				
1. Fietsen onder invloed van alcohol en/of drugs	0	1	2	3	4
2. Fietsen tegen het verkeer in waar het niet mag	0	1	2	3	4
3. Zig-zaggen tussen auto's wanneer ik me op een gemengde rijbaan bevind	0	1	2	3	4
4. Mogelijk belemmerende zaken, zoals gsm, eten, bagage, een sigaret die ik rook, … in de hand houden tijdens het fietsen	0	1	2	3	4
5. Het gevoel hebben dat ik soms te snel rij	0	1	2	3	4
6. Oversteken wanneer er geen verkeer is, zelfs al staat het licht op rood	0	1	2	3	4
7. Een passagier op de fiets vervoeren zonder daar voorzieningen voor te hebben	0	1	2	3	4
8. Conflict hebben over snelheid of 'racen' tegen een andere fietser of automobilist	0	1	2	3	4
9. Onopzettelijk de straat oversteken zonder te kijken, waardoor een voertuig bruusk moet remmen om een aanrijding te vermijden	0	1	2	3	4
10. (Bijna) een voetganger of fietser aanrijden omdat ik te weinig aandacht besteed aan het verkeer rondom me	0	1	2	3	4
11. Bruusk remmen waardoor ik bijna een ongeval veroorzaak	0	1	2	3	4
12. Overstekende voetgangers niet opmerken wanneer ik afsla	0	1	2	3	4
13. Niet remmen voor een stop- of voorrangsbord, waardoor ik bijna een voertuig of voetganger aanrijd	0	1	2	3	4
14. Heel bruusk remmen op een glad oppervlak	0	1	2	3	4
15. Uit verstrooidheid merk ik niet op dat een voetganger wilt oversteken op het zebrapad, waardoor ik hem of haar niet de kans geef om over te steken	0	1	2	3	4
16. Niet opmerken dat een geparkeerd voertuig wil vertrekken waardoor ik bruusk moet remmen om een aanrijding te vermijden	0	1	2	3	4
17. Wanneer ik rechts rij, merk ik niet op dat een passagier uit een voertuig of bus wil stappen waardoor ik bijna tegen hem of haar aan rij	0	1	2	3	4
18. Een voertuig proberen in te halen dat al aangegeven heeft dat het zal afslaan, waardoor het voertuig moet remmen	0	1	2	3	4
19. Een bocht verkeerd inschatten waardoor ik tegen iets aanrij op de weg of waardoor ik mijn evenwicht verlies	0	1	2	3	4
20. *Onopzettelijk tegen een geparkeerd voertuig aanrijden	0	1	2	3	4
21. Het niet bewust zijn van de toestand van de wegen en vallen over een hobbel of put	0	1	2	3	4
22. Verschillende verkeerstekens verwarren en niet op de gepaste situatie reageren	0	1	2	3	4
23. Proberen te remmen, maar de remmen niet goed kunnen gebruiken omdat mijn handen niet goed gepositioneerd zijn	0	1	2	3	4
24. Stoppen en links en rechts kijken voor ik een hoek afsla of een kruispunt oversteek	0	1	2	3	4
25. Proberen niet te snel te fietsen om te vermijden dat ik verrast word door abrupte obstakels of dat ik bruusk moet remmen	0	1	2	3	4
26. Zorgen voor een veilige afstand tussen mezelf en andere fietsers of voertuigen	0	1	2	3	4
27. *Wanneer ik op het fietspad rij, fiets ik altijd in de richting van het verkeer	0	1	2	3	4
28. Vermijden te fietsen wanneer het slecht weer is	0	1	2	3	4
29. *Vermijden te fietsen wanneer ik me zeer moe of ziek voel	0	1	2	3	4

French version of the CBQ

Donnez une estimation de la fréquence à laquelle vous effectuez les opérations suivantes lorsque vous faites du vélo:

0 = Jamais; 1 = Rarement; 2 = Parfois; 3 = Souvent; 4 = Toujours

Contenu de la question	Fréquence				
1. Faire du vélo sous influence d'alcool et/ou de drogues	0	1	2	3	4
2. Rouler à contre sens de la circulation, là où ce n'est pas permis	0	1	2	3	4
3. Zigzaguer entre les véhicules lors de l'utilisation d'une voie mixte	0	1	2	3	4
4. Manipuler des objets potentiellement encombrants (gsm, nourriture, bagage, cigarettes, etc.) en faisant du vélo	0	1	2	3	4
5. Ressentir que parfois je roule à une vitesse supérieure à ce que je devrais	0	1	2	3	4
6. Traverser ce qui semble être un passage libre, alors que le feu est rouge	0	1	2	3	4
7. Transporter un passager sur mon vélo sans que cela soit adapté à un tel usage	0	1	2	3	4
8. Avoir un conflit de vitesse ou de "course" avec un autre cycliste ou conducteur	0	1	2	3	4
9. Traverser involontairement la rue sans regarder correctement, faisant ainsi freiner un véhicule pour éviter un accident	0	1	2	3	4
10. Collision (ou presque) avec un piéton ou un autre cycliste en étant distrait sur son vélo	0	1	2	3	4
11. Freiner brusquement et être sur le point de provoquer un accident	0	1	2	3	4
12. Ne pas remarquer la présence de piétons traversant la route en prenant un virage	0	1	2	3	4
13. Ne pas freiner pour un panneau « stop » ou « céder le passage » et être sur le point de heurter un autre véhicule ou un piéton	0	1	2	3	4
14. Freiner très brusquement sur une surface glissante	0	1	2	3	4
15. En étant distrait(-e), je ne me rends pas compte du fait qu'un piéton a l'intention de traverser un passage pour piétons et je ne m'arrête donc pas pour le laisser traverser	0	1	2	3	4
16. Ne pas réaliser qu'un véhicule garé a l'intention de partir et, par conséquent, devoir freiner brusquement pour éviter une collision	0	1	2	3	4
17. Lorsque vous roulez du côté droit, ne pas réaliser qu'un passager est en train de sortir d'un véhicule ou d'un bus et être donc sur le point de le heurter	0	1	2	3	4
18. Essayer de doubler un véhicule qui utilisait ses clignotants pour signaler qu'il allait tourner, l'obligeant par conséquent à freiner	0	1	2	3	4
19. Mal juger un virage et cogner quelque chose sur la route, ou être sur le point de perdre l'équilibre	0	1	2	3	4
20. *Involontairement cogner un véhicule garé	0	1	2	3	4
21. Ne pas être au courant des conditions de la route et tomber à cause d'une bosse ou un trou	0	1	2	3	4
22. Confondre un feu de signalisation avec un autre et manœuvrer selon ce dernier	0	1	2	3	4
23. Essayer de freiner mais ne pas pouvoir utiliser les freins correctement en raison d'un mauvais positionnement de la main	0	1	2	3	4
24. M'arrêter et regarder des deux côtés avant de tourner à un coin ou de traverser un carrefour	0	1	2	3	4
25. Essayer de me déplacer à une vitesse prudente pour éviter les accidents et les freinages soudains	0	1	2	3	4
26. Garder une distance de sécurité avec les autres cyclistes ou véhicules	0	1	2	3	4
27. *Quand je roule sur la piste cyclable, je roule toujours dans le sens de la circulation	0	1	2	3	4
28. Eviter de circuler à vélo dans des conditions météorologiques défavorables	0	1	2	3	4
29. *Eviter de circuler à vélo si je me sens très fatigué(-e) ou malade	0	1	2	3	4

Notes: *Item excluded for the validated version.

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