RISK ASSESSMENT AND RISK-TAKING TEST – A TOOL FOR MEASURING THE SUBJECTIVE PERCEPTION OF RISK AND THE FREQUENCY OF RISK-TAKING BY DRIVERS ON THE ROAD

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Summary

Aim: This article presents the process of constructing a tool for measuring subjective risk perception and the frequency of risky behaviours on the road by drivers – the *Risk Assessment and Risk Taking Test*. Subjective risk perception was understood as assessing the amount of risk the driver individually perceives in a given road situation. **Method:** The test items were generated based on literature and police statistics and assessed by competent judges. Psychometric properties were assessed on a sample of 214 people. Exploratory factor analysis was used. **Results:** The tool consists of 22 test items arranged in two factors. Factor one – Risk Assessment scale (α = 0.82), factor two – Risk Frequency scale α = 0.77). **Conclusion:** *The Risk Assessment and Risk-Taking Test* meets the criteria for construct validity and has sufficiently good reliability indicators for both scales.

Key words: risky behaviour on the road, subjective risk perception, risk assessment, drivers, *Risk Assessment and Risk-Taking Test*

Introduction

In 2022, the Police recorded 21,322 road accidents. 1,896 people died on the road and 24,743 were injured (Road Traffic Office of the National Police Headquarters, 2023). Analyses indicate that over 80% of accidents occur due to human-related

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reasons, such as lack of experience, knowledge and skills, and behaviours resulting from risky and aggressive attitudes (Bąk and Bąk-Gajda, 2010). The latest statistics indicate even as much as 87% (Kapica and Obidziński, 2019). In connection with such data, exploring the topic of factors related to risky behaviour on the road to facilitate further research and prevention, it was decided to develop a short tool to measure the subjective perception of risk and the frequency of risky behaviour on the road by drivers – *Risk Assessment and Risk-Taking Test.*

Risk and risky behaviour

Because risk concerns practically every area of human life, there are many definitions of it, which can be grouped into several categories, depending on what aspect they focus on.

The first category consists of definitions related to the possibility of loss. Risk in this approach is a feature of a situation that creates the possibility of experiencing an unfavourable result – including material damage, damage to health or poor well-being (Studenski, 2004). The assessment of risk, in this approach, is influenced by the real or imagined extent of the unfavourable consequences.

Although the same event might be a consequence of different actions, the perceived extent of risk-taking is different. Therefore, researchers began to define risk as the probability of loss, while combining the assessment of its extent with the assessment of probability (Zuckerman, 1994; Slovic, 1967, after Studenski, 2004).

The closest understanding of risk in psychology seems to be relating it to uncertainty. A person functions in a dynamic environment, which is why they are not able to predict all the factors that may occur when they take a specific action (Ratajczak, 2004). However, the lack of such a possibility may result not only from the specifics of the environment but also from the cognitive limitations of the individual. Risk in this understanding is the uncertainty of the result of one's action (Ratajczak, 2004, p. 14).

Knowledge of the above-selected categories of understanding risk allows us to characterize behaviour defined as risky. In simple terms, it is behaviour that carries the possibility of losing personal goods understood as: mental health, physical health or material resources (Wizła, 2019). Undertaking risky activity may pose a threat not only to life but also to successful development (Molesztak, 2020). Undertaking this type of behaviour may expose one to conflicts and make it difficult to: acquire new skills, fulfil social roles or fulfil professional duties (Ostaszewski, 2019, Molesztak, 2020).

When considering the risky behaviours of drivers, the definition developed by M. Znajmiecka-Sikora and M. Sałagacka (2018) was adopted. The authors integrated the knowledge gathered by R. Studenski (2004) describing risky behaviour as *an action, the result of which is unknown, and at the same time generates the risk of negative effects on the physical and mental health of an individual, as well as their social*

environment (Znajmiecka-Sikora and Sałagacka, 2018, p. 732). The driver of the vehicle is interacting with other road users and may carry passengers, therefore the consequences of his or her risky behaviour may affect not only the driver but also his or her social environment. The frequency of undertaking risky behaviours was understood as the frequency of drivers engaging in risky road behaviours understood in the above way. Risky behaviour of drivers on the road is often the cause of road accidents and is therefore of interest to transport psychologists, lawyers and road safety specialists, the police – and finally all road (Baran, Mamcarz, Zieliński, 2024; Baran et al., 2021).

Subjective risk perception and related factors

Just as the perceived image of the world allows a person to adapt to the environment, the perception of risk is necessary for a person to be able to cope with it (Dean, 1994, after Studenski, 2004). The needs of a person and their perception of risk determine how they will behave in a risky situation – whether they will choose safe or risky behaviour (Figure 1) (Studenski, 2004).
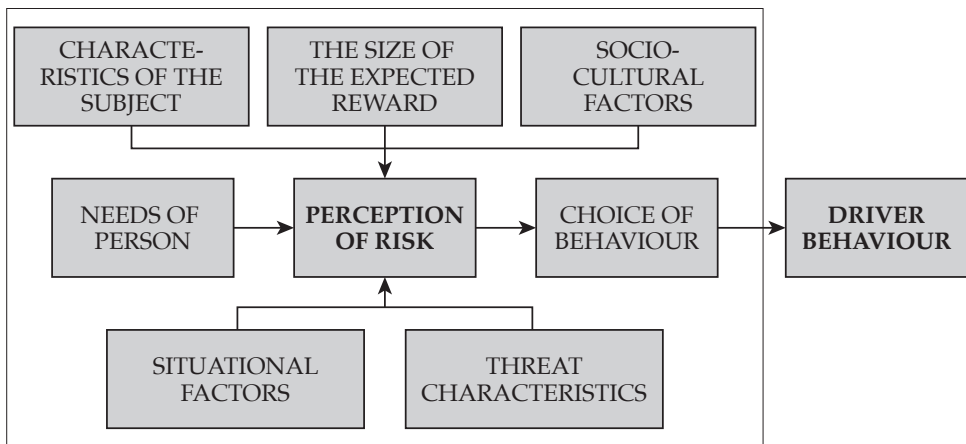

Figure 1. Behaviour in risk situations and the variables that determine it

Risk perception is a cognitive process in which a person, based on receiving and processing stimuli, assesses the amount of risk of a given action (Studenski, 2004). This is an individual process, which means that everyone can perceive a different amount of risk in a given situation. To emphasize the diversity of risk assessments, as well as to highlight the fact that the perceived amount of risk often differs from the objective assessment of the extent of threat, the term subjective risk perception is used. The subjective risk perception in the tool is understood as the amount of risk that the driver individually perceives in a given situation.

In the model of R. Studenski (2004) (figure 1), risk perception is influenced by both situational factors and characteristics of the subject. Such an understanding is consistent with the interactive approach, which assumes that behaviour is the result of the interaction of the characteristics of the subject and the characteristics of the situation. The validity of considering both risk perception and risky behaviour in the interactive approach is emphasized by M. Goszczyńska (1997).

The characteristics of the subject that participate in the perception of risk include, among others, personality traits (Bowen, Budden, Smith, 2020; Studenski, 2004), temperament, sense of control location, sense of agency, self-esteem (Goszczyńska, 1997), gender or age (Studenski, 2004). K. Pirecki (2004) considers the most important characteristics related to risk perception to be: neuroticism, level of extraversion and aggression, and the need for dominance and achievement.

Due to the high level of risk to the health and life of road users in Poland, it was decided to create a new short tool that would enable quick diagnosis of risk assessment and risk-taking tendencies in drivers. Among the tools used by psychologists in driver studies, it is difficult to find such a tool.

Table 1. Items generated in the first stage of tool creation

Item
1. Driving after drinking two beers.
2. Conducting a telephone conversation using a hands-free set.
3. Exceeding the speed limit by 40 km/h or more.
4. Accelerating when we see another vehicle overtaking us.
5. Accelerating at the sight of a yellow light to make it before it turns red.
6. Driving without proper external vehicle lighting, e.g. with a burnt-out bulb
7. Overtaking on a bend.
8. Overtaking at a pedestrian crossing.
9. Driving without wearing a seat belt.
10. Continued driving without stopping despite fatigue.
11. Exceeding the speed limit by 15 km/h.
12. Using the phone while driving (e.g. checking messages, recording videos, switching music).
13. Driving after smoking marijuana.
14. Not reducing speed despite the beginning of rain.

Construction and verification
of the Risk Assessment and Risk-Taking Test

Description of the tool construction

The tool was developed based on the Road Test Samples by Ryszard Cibor and Wojciech Korchut (2008, after Cibor, n.d.; Cibor and Korchut, 2008). The first stage of tool construction consisted of generating 14 test items (Table 1). These items were assessed by 30 competent judges, who were traffic police officers and driving instructors from the Kuyavian-Pomeranian, Warmian-Masurian, Lower Silesian and Silesian voivodeships. Initially, the tool was to consist of 28 questions – 14 for each part. Both parts were to include the same examples of risky behaviours. Due to doubts about the content, one item was removed from the pool of 14 – 2. *Conducting a telephone conversation using a hands-free set*. Finally, a preliminary version of the tool was obtained consisting of 26 test items – 13 for each part. The response format was created on a five-point Likert-type scale. For the first part – Risk Assessment scale: 0 – *no risk*, 1 – *low risk*, 2 – *medium risk*, 3 – *high risk*, 4 – *very high risk*. In the second part – Risk Frequency scale: 0 – *never,* 1 – *very rarely*, 2 – *sometimes*, 3 – *often*, 4 – *very often*.

Test sample and procedure

The study was conducted online. *The Risk Assessment and Risk-Taking Test* and *IPIP-BFM-50* (Strus, Cieciuch, Rowiński, 2014) were used. Data were collected from April 2023 to January 2024. Respondents were recruited by placing a link to the study on groups of drivers and motoring enthusiasts operating on the social networking site Facebook. The next respondents were recruited using the snowball method. Participants were informed about the anonymous nature of the study and the possibility of resigning from participation at any stage. Submitting the form was tantamount to expressing consent to participate in the study.

The study sample consisted of 222 people (111 women and 111 men). All of them had a Category B driving license. Eight people declared that they had not driven for a long time. Therefore, their answers were excluded from further analyses. It was considered that people who had not used a vehicle for a long time could distort the results, among others, regarding the frequency of risky behaviours on the road. Ultimately, the study group consisted of 214 people (110 women and 104 men). The age of the study participants ranged from 19 to 62 years ($M = 26$, $SD = 7.2$). The number of years that the study participants had held a driving license ranged from 1 to 40 years ($M = 7$). In the study sample, 38 drivers were fined in the last 12 months. 35 people had penalty points, and their number ranged from 1 to 11 points.

Table 2. Rotated factor loadings

Question	Risk Assessment	Risk Frequency
2. Exceeding the speed limit by 40 km/h or more.	.57	−.17
3. Overtaking at a pedestrian crossing.	.46	−.16
4. Accelerating when we see another vehicle overtaking us.	.52	−.17
5. Accelerating at the sight of a yellow light to make it before it turns red.	.72	.00
7. Driving without wearing a seat belt.	.54	−.06
8. Continued driving without stopping despite fatigue.	.58	.03
9. Exceeding the speed limit by 15 km/h.	.70	−.02
10. Using the phone while driving (e.g. checking messages, recording videos, switching music).	.59	−.11
11. Driving without proper external vehicle lighting, e.g. with a burnt-out bulb	.61	−.11
12. Driving after smoking marijuana.	.42	−.29
13. Not reducing speed despite the beginning of rain.	.69	.03
1. How often do you drive after drinking two beers?	.02	.76
2. How often do you exceed the speed limit by 40 km/h or more?	−.27	.50
3. How often do you overtake at a pedestrian crossing?	−.02	.71
4. How often do you accelerate when you see another vehicle overtaking you?	−.11	.53
6. How often do you find yourself overtaking on a bend?	−.05	.66
7. How often do you drive without wearing a seat belt?	−.04	.44
8. How often do you continue driving despite being tired?	−.23	.35
10. How often do you use your phone while driving (e.g. checking messages, recording videos, switching music)?	−.29	.38
11. How often does it happen to you that you drive without proper external vehicle lighting, e.g. with a burnt-out bulb?	−.08	.45
12. How often do you drive after smoking marijuana?	−.04	.66
13. How often does it happen to you that you do not reduce your speed, despite the beginning of rain?	−.35	.25

Data Analysis Method and Results

To check the factor structure of the questionnaire, an exploratory factor analysis was conducted using the principal components method with Varimax rotation without normalization. The results of the analysis indicated a 5-factor solution that would explain 53.6% of the variance. However, due to the theoretical assumption regarding two scales adopted in the construction of the tool, analyses were conducted for a 2-factor solution. The total explained variance for such a solution was 34.5%. The matrix of rotated components is presented in Table 2. The minimum value of factor loadings was assumed to be .40 (Tabachnick and Fiedell, 2012). Both factors met the Keiser criterion (eigenvalue above 1). The first of them explained 12.56% of the variance, while the second one explained 11.96%. Due to cross-loadings or negative loadings of variables, questions 1 and 6 were removed from the analysis – from the first part, and questions 5 and 9 from the second part, which loaded the opposite factor.

Reliability

The conducted analysis indicated high reliability of both parts of the tool (Risk Assessment Cronbach's α = .82; Risk Frequency Cronbach's α = .77). It was decided to leave the items with loadings lower than .40 (three questions of the second scale) because their removal did not increase the reliability of the scale, and all of these items have discriminatory powers above .30 (Hornowska, 2009). Descriptive statistics and discriminatory power coefficients are presented in Tables 3 and 4.

Table 3. Descriptive Statistics and Discriminant Power Coefficients – Risk Assessment

Item number Risk Assessment	Average	Variance	Standard deviation	Discriminatory power	Alpha when removed
2	29.43	26.96	5.19	.48	.81
3	28.86	28.63	5.35	.42	.81
4	29.36	26.83	5.18	.46	.81
5	30.41	25.93	5.09	.59	.80
7	29.22	26.78	5.17	.45	.81
8	29.07	28.40	5.33	.47	.81
9	30.85	25.41	5.04	.56	.80
10	29.22	27.02	5.20	.50	.81
11	30.02	26.17	5.12	.53	.80
12	29.00	28.53	5.34	.37	.82
13	29.70	26.11	5.11	.55	.80

Table 4. Descriptive Statistics and Discriminant Power Coefficients – Risk Frequency

Item number Risk Frequency	Average	Variance	Standard deviation	Discrimina-tory power	Alpha when removed
1	6.32	17.52	4.19	.47	.71
2	5.27	14.10	3.76	.49	.68
3	6.16	16.84	4.10	.47	.70
4	6.06	16.73	4.09	.37	.70
6	6.11	16.76	4.09	.43	.70
7	6.11	16.53	4.07	.35	.71
8	5.39	15.43	3.93	.36	.71
10	4.98	14.32	3.78	.42	.70
11	5.84	16.65	4.08	.35	.71
12	6.26	17.07	4.13	.37	.71
13	5.21	15.22	3.90	.30	.72

Calculating results

The results on both scales are calculated by summing up the individual items. There are no reverse-scoring items in the tool. The higher the score on the Risk Assessment scale, the higher the person subjectively perceives the risk in the risky road behaviours presented. The higher the score on the Risk Frequency scale, the more often they engage in risky road behaviours included in the tool. No overall score is calculated.

Gender differences

Using the nonparametric Mann-Whitney U test, differences between genders were checked in the risk frequency on the road. The results of the analysis indicated a significant difference in the frequency of undertaking risky behaviours between women and men ($Z = -2.29$; $p = .021$). Men are characterized by a higher risk frequency ($M = 7.19$; $SD = 5.03$) than women ($M = 5.59$; $SD = 3.48$). This result is consistent with the results of studies conducted by M. Castro-Nuño and L. Lopez-Valpuesta (2023) and E. Odachowska and D. Ścigała (2014). It was also checked whether gender differentiates people in terms of subjective risk perception using the Student's t-test. The results were significant and indicated that women subjectively perceived a higher risk ($M = 34.07$; $SD = 4.48$) than men ($M = 30.87$; $SD = 6.04$), which is consistent with the results of the study by Megías-Robles et al. (2022).

Connections with personality traits

It has been shown that the level of intensity of personality traits such as extraversion (*rho* = .16; *p* < .05), conscientiousness (*rho* = .36; *p* < .01) and emotional stability (*rho* = .85; *p* < .001) is related to the frequency of risky behaviour on the road. Drivers characterized by a higher level of these traits declared more frequent risky behaviour on the road. In the case of extraversion, this result is consistent with the results of the research by M. Znajmiecka-Sikora and M. Sałagacka (2018), which showed that extravorted people are more likely to engage in risky behaviour. The same result was obtained by R. Studenski (2004).

In previous studies, both newer and older (cf. Baran et al., 2021; Luo et al. 2023, Tokarczyk, 2012), it was indicated that high conscientiousness in the context of undertaking risky behaviours on the road is rather a protective factor. However, in our study, the opposite relationship was noted. Perhaps the accuracy and dutifulness associated with high conscientiousness is a factor that encourages people to risk-taking to fulfil their obligations, e.g., getting to work on time (cf. Bąk and Bąk-Gajda, 2010). A similar assumption was made by Parr et al. (2016), who noted a positive relationship between conscientiousness and the frequency of using the phone while driving among American teenagers.

Drivers characterized by a higher intensity of emotional stability declared more frequent risky behaviour on the road. What is more, the observed relationship between these variables was high. This result may seem surprising in relation to the results of research by, among others, K. Horoszkiewicz (2019), who found that people with high neuroticism admit to more frequent risk-taking on the road. However, in our research, it was also observed that with the increase in the intensity of emotional stability, the subjective perception of risk decreases (*rho* = −.34; *p* < .001). This means that people with a higher intensity of emotional stability perceive lower risk in the risky road behaviours included in the study. Therefore, they may engage in them more often. The validity of integrating these two results is indicated by the significant relationship between the subjective perception of risk and the frequency of engaging in risky behaviours noted in the study (*rho* = −.41; *p* < .001). It has been proven that drivers who perceive a higher risk in the risky behaviours presented are less likely to engage in them.

The obtained results did not confirm the significance of the relationship between the intensity of the traits of intellect and agreeableness and the frequency of undertaking risky behaviours.

Summary

Analyses indicate that over 80% of accidents occur due to human-related causes. In addition to lack of experience, knowledge and skills, risky behaviours are mentioned. Identifying factors related to undertaking risky behaviours on the road

seems to be crucial in the context of designing and implementing preventive measures. Understanding risk factors allows us to indicate groups to which preventive measures can be directed first. Identifying protective factors allows us to direct attention to areas that should be strengthened. Therefore, to facilitate further research, a short tool was developed to examine the subjective perception of risk and the frequency of undertaking risky behaviours on the road by drivers – the *Risk Assessment and Risk-Taking Test*. The tool consists of two scales: the *Risk Assessment* scale and the *Risk Frequency* scale. Each scale consists of 11 items and does not contain items with reverse scoring. The results are calculated by adding up the points for each scale. The higher the score on the *Risk Assessment* scale, the higher the person subjectively perceives the risk in the presented risky road behaviours. The higher the score obtained by a person on the *Risk Frequency* scale, the more often they undertake risky behaviours on the road included in the tool. No overall score is calculated. The tool meets the criteria for theoretical validity. It also has sufficiently good reliability indicators for both scales (*Risk Assessment* Cronbach's α = .82; *Risk Frequency* Cronbach's α = .77). This tool can therefore be useful in psychological tests of candidates for drivers, in periodic tests or tests of drivers – perpetrators and victims of road accidents.

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Risk Assessment and Risk-Taking Test

Karolina Spychała and Hanna Liberska

I. Situations on the road

Below there are 11 examples of road situations. Please rate how risky you think each of them is:

0 – no risk
1 – low risk
2 – medium risk
3 – high risk
4 – very high risk

1. Exceeding the speed limit by 40 km/h or more.	0 1 2 3 4
2. Overtaking at a pedestrian crossing.	0 1 2 3 4
3. Accelerating when we see another vehicle overtaking us.	0 1 2 3 4
4. Accelerating at the sight of a yellow light to make it before it turns red.	0 1 2 3 4
5. Driving without wearing a seat belt.	0 1 2 3 4
6. Continued driving without stopping despite fatigue.	0 1 2 3 4
7. Exceeding the speed limit by 15 km/h.	0 1 2 3 4
8. Using the phone while driving (e.g. checking messages, recording videos, switching music).	0 1 2 3 4

9. Driving without proper external vehicle lighting, e.g. with a burnt-out bulb.	0 1 2 3 4
10. Driving after smoking marijuana.	0 1 2 3 4
11. Not reducing speed despite the beginning of rain.	0 1 2 3 4

II. Situations on the road – frequency

Please indicate how often the following situations occur to you.
This is about determining how often you behave in this way, not how often such a phenomenon occurs.
0 – never
1 – very rarely
2 – sometimes
3 – often
4 – very often

1. How often do you drive after drinking two beers?	0 1 2 3 4
2. How often do you exceed the speed limit by 40 km/h or more?	0 1 2 3 4
3. How often do you overtake at a pedestrian crossing?	0 1 2 3 4
4. How often do you accelerate when you see another vehicle overtaking you?	0 1 2 3 4
5. How often do you find yourself overtaking on a bend?	0 1 2 3 4
6. How often do you drive without wearing a seat belt?	0 1 2 3 4
7. How often do you continue driving despite being tired?	0 1 2 3 4
8. How often do you use your phone while driving (e.g. checking messages, recording videos, switching music)?	0 1 2 3 4
9. How often does it happen to you that you drive without proper external vehicle lighting, e.g. with a burnt-out bulb?	0 1 2 3 4
10. How often do you drive after smoking marijuana?	0 1 2 3 4
11. How often does it happen to you that you do not reduce your speed, despite the beginning of rain?	0 1 2 3 4

TEST OCENY RYZYKA I RYZYKOWANIA – NARZĘDZIE DO POMIARU SUBIEKTYWNEJ PERCEPCJI RYZYKA I CZĘSTOTLIWOŚCI RYZYKOWANIA KIEROWCÓW NA DRODZE

Abstrakt

Cel: Niniejszy artykuł prezentuje proces konstrukcji narzędzia do pomiaru subiektywnej percepcji ryzyka oraz częstotliwości podejmowania zachowań ryzykownych na drodze przez kierowców – *Test Oceny Ryzyka i Ryzykowania*. Przez subiektywną percepcję ryzyka rozumiano ocenę wielkości ryzyka, jakie indywidualnie dostrzega kierowca w przedstawionej sytuacji drogowej. **Metoda:** Pozycje testowe wygenerowano w oparciu o literaturę oraz statystyki policyjne a następnie poddano ocenie sędziów kompetentnych. Właściwości psychometryczne oceniono na próbie 214 osób. Zastosowano eksploracyjną analizę czynnikową. **Wyniki:** Narzędzie składa się z 22 pozycji testowych układających się w dwa czynniki. Czynnik pierwszy – skala Oceny Ryzyka ($\alpha = 0{,}82$), czynnik drugi – skala Częstotliwości Ryzykowania $\alpha = 0{,}77$). **Wnioski:** *Test Oceny Ryzyka i Ryzykowania* spełnia kryteria trafności teoretycznej i ma wystarczająco dobre wskaźniki rzetelności dla obu skal.

Słowa kluczowe: zachowania ryzykowne na drodze, subiektywna percepcja ryzyka, ocena ryzyka, kierowcy, *Test Oceny Ryzyka i Ryzykowania*