sciendo 10.2478/sjph-2022-0006 Zdr Varst. 2022;61(1):32-39

Antonić R, Janković S, Folić M. Development and validation of questionnaires on professional drivers' knowledge and attitudes about various medications' influence on driving ability. Zdr Varst. 2022;61(1):32-39. doi: 10.2478/sjph-2022-0006.

DEVELOPMENT AND VALIDATION OF QUESTIONNAIRES ON PROFESSIONAL DRIVERS' KNOWLEDGE AND ATTITUDES ABOUT VARIOUS MEDICATIONS' INFLUENCE ON DRIVING ABILITY

PRIPRAVA IN PREVERJANJE VELJAVNOSTI VPRAŠALNIKOV O ZNANJU IN STALIŠČIH POKLICNIH VOZNIKOV O VPLIVU ZDRAVIL NA SPOSOBNOSTI ZA VOŽNJO

Roland ANTONIĆ[1*], Slobodan JANKOVIĆ[2,3], Marko FOLIĆ[2,3]

[1]Academy of Professional Studies Šabac, Pharmacy, Hajduk Veljkova 10, 15000 Šabac, Serbia
[2]Clinical Centre Kragujevac, Clinical Pharmacology Department, Kragujevac, Serbia
[3]University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia

Received: May 17, 2021
Accepted: Nov 19, 2021

Original scientific article

ABSTRACT

Introduction: Professional drivers' knowledge about driving-impairing medications is not satisfactory. The aim of this study was to develop and test the reliability and validity of the questionnaires designed to measure the knowledge and attitude of professional drivers about the influence of various medications on driving ability.

Methods: The questionnaires for assessing professional driver's knowledge (performance-based) and attitudes about influence of various medications on driving abilities were developed by creating the item pool, testing reliability and validity, and factor analysis. The study was conducted as a multicenter, cross-sectional study in Serbia and Bosnia and Herzegovina. The study population consisted of professional drivers, who filled out both questionnaires in three time intervals.

Results: Both questionnaires showed great internal consistency and temporal stability. Cronbach's Alpha for the first questionnaire was 0.984 and for the second it was 0.944. The Kaiser-Meyer-Olkin test for the first questionnaire confirmed sampling adequacy with its value of 0.964 and for the second questionnaire it was 0.933. Exploratory factor analysis of the questionnaire showed that three factors were revealed after rotation for the first questionnaire and they explained 78.0% of variance. Both questionnaires showed high degree of correlation between scores after the first and repeated administration, Spearman's rho coefficient of correlation for was 0.962 and 0.980.

Conclusion: Based on the results of this study, we believe that both questionnaires are useful tools for testing professional drivers' knowledge and attitudes about the influence of medications on driving ability.

Keywords:
Serbia, Bosnia and Herzegovina, questionnaire, validation, professional drivers, driving-impairing medications, knowledge and attitudes, reliability, validity

IZVLEČEK

Uvod: *Znanje poklicnih voznikov o zdravilih, ki zmanjšajo sposobnost za vožnjo, ni zadovoljivo. Cilj te študije je bil pripraviti vprašalnike, namenjene merjenju znanja in stališč poklicnih voznikov o vplivu zdravil na sposobnosti za vožnjo, ter preveriti njihovo zanesljivost in veljavnost.*

Metode: *Vprašalniki za ocenjevanje znanja (na podlagi rezultatov) in stališč poklicnih voznikov o vplivu zdravil na sposobnosti za vožnjo so bili pripravljeni z ustvarjanjem skupine postavk, preverjanjem zanesljivosti in veljavnosti ter z izvedbo faktorske analize. Študija je bila izvedena kot multicentrična presečna študija v Srbiji ter Bosni in Hercegovini. Populacijo študije so sestavljali poklicni vozniki, ki so v treh časovnih presledkih izpolnili oba vprašalnika.*

Rezultati: *Oba vprašalnika sta bila dobro notranje usklajena in časovno stabilna. Cronbachov koeficient alfa pri prvem vprašalniku je bil 0,984, pri drugem pa 0,944. Kaiser-Meyer-Olkinov test za prvi vprašalnik je potrdil ustrezno vzorčenje z vrednostjo 0,964 in za drugi vprašalnik z vrednostjo 0,933. Eksploratorna faktorska analiza vprašalnika je pokazala, da so bili po rotaciji za prvi vprašalnik ugotovljeni trije dejavniki, ki so pojasnili 78,0 % variance. Pri obeh vprašalnikih je bila ugotovljena visoka stopnja korelacije med rezultati po prvi in večkratni uporabi zdravila, saj je bil Spearmanov koeficient korelacije 0,962 in 0,980.*

Zaključek: *Na podlagi rezultatov te študije menimo, da sta oba vprašalnika uporabni orodji za preizkušanje znanja in stališč poklicnih voznikov o vplivu zdravil na sposobnosti za vožnjo.*

Ključne besede:
Srbija, Bosna in Hercegovina, vprašalnik, preverjanje veljavnosti, poklicni vozniki, zdravila, ki zmanjšajo sposobnost za vožnjo, znanje in stališča, zanesljivost, veljavnost

***Corresponding author:** Tel. + 381 60 738 4757; E-mail: roland.antonic@gmail.com

1 INTRODUCTION

Driving is an essential skill to facilitate work, social connectedness, and everyday life (1). Driving requires alertness at every moment (2). It is clear that impaired driving is a significant cause of human trauma (3). Traffic crashes are a common cause of death in many countries. Among the numerous risk factors, the effect of medicinal drugs has not received sufficient attention (4). Estimates indicate that at least 10% of people killed or injured in traffic accidents had consumed psychotropic medication that could have been a contributing factor (5). The relation between medications and fitness to drive is complex (6). Medications may affect the visual, cognitive, and/or motor abilities needed for safe driving (1). The consumption of psychoactive medications, both authorized and illicit, is a problem of growing interest in many countries in the world, because these substances are observed increasingly in impaired and injured drivers (7).

Particularly for professional drivers, psychoactive substances including medications can reduce driving performance and increase the risk of accidents with fatal outcomes not only for workers but also for third parties (8). About 21% of them use some sort of medications continuously, regardless of the reason (9). The frequency of psychoactive substance use by truck drivers seems to be high (10). Stimulant use was a common feature in this category of drivers (11). Professional drivers' knowledge about driving-impairing medications is not satisfactory. Just over half of commercial drivers (51%) are not aware that such medications can influence their driving capability (12). There is substantial evidence that the use of psychoactive substances is a major risk factor for accidents by professional drivers (13). Among those who use driving-impairing medications, over half were not cautioned by their healthcare providers about the adverse effect of these medications on driving ability (12). It is accordingly necessary to inform drivers who use driving-impairing medications about the risks of driving under their influence (14, 15). The DRUID project (Driving under the Influence of Drugs, Alcohol and Medications) was launched at 2006 in the European Union in order to curb the prevalence of driving under the influence of alcohol, illicit narcotics, and medications that could adversely affect driving capability (16). The questionnaire used in the DRUID project (17) examined drivers' knowledge about driving-impairing medications in one segment, but it was not validated for the population of professional drivers.

Despite this project's exceptional results (50,000 drivers from 13 countries were interviewed and tested for driving-impairing substances), some data on this topic are missing. There is not enough data about drivers' knowledge and attitudes about the influence of medications on driving ability, but especially there is a lack of information about professional drivers. Also, there are no data about the factors that influence professional drivers' knowledge and attitudes. The Driver Behavior Questionnaire (DBQ) and its modified versions are widely recognized as an effective measure of aberrant driving behaviors that have been associated with an increased risk of experiencing motor vehicle crash (18-20). However, although the DBQ is a validated tool for measuring aberrant driving behavior, there are no validated questionnaires available that could be used to assess the knowledge and attitudes of professional drivers, or of other driver categories, about driving-impairing medications.

The aim of this study was to develop and test reliability and validity of the questionnaire specifically designed to measure the knowledge and attitudes of professional drivers about the influence of medications on driving ability.

2 METHODS

2.1 Development of the questionnaire

The questionnaires validated in this study were developed de novo. The questionnaire for assessing professional drivers' knowledge about influence of medications on driving abilities (QPDK-IMDA) and the questionnaire for assessing professional drivers' attitudes about the influence of medications on driving abilities (QPDA-IMDA) were developed in several steps according to the guidelines (21).

The first step was determining object of measurement, and that was a composite of professional drivers' knowledge and attitudes about the impairing effects of various substances on driving ability, associated with a clear adverse consequence: traffic accidents. The construct of the test is drivers' insufficient knowledge about the impairing effect of medication or substances in general on driving and its relationship to their underestimating attitude towards any medications they may be using during driving sessions. The body of knowledge was divided into five segments about the impairing effects that certain abused substances have on driving (alcohol, opioids, stimulants, hallucinogenic substances, etc.), including prescription drugs used for various conditions and over-the-counter drugs and food supplements, as well as about legal frameworks and expectations from physicians and pharmacists, who should warn and inform patients when prescribing and dispensing the drugs. The first step was carried out by the authors through a series of informal meetings.

The second step, generating an item pool, was conducted through a literature review (made independently by second and third author) about drug use among professional drivers and their awareness of adverse effects on driving ability, the formation of a table of specifications (it crosses a set of items in rows with dimensions of awareness in columns) and two meetings of the authors (organized in

an unstructured way, like brainstorming sessions), one week apart. Questionnaire items about knowledge (n=35) were grouped around the five divisions described in the first step, covering the most important issues (e.g. the drug groups with well-known and major effects on driving ability). The questionnaire about the attitudes was composed of items (n=8) related to knowledge division; each knowledge segment was covered by two items reflecting their relative importance for a driver. The items from both questionnaires are shown in the Table 2.

In the third step (determining format for measurement) each item was constructed in the form of positive statement/questions that should reflect a certain element of knowledge or attitudes towards the influence of medication on driving ability. Five possible answers were offered for each, in the form of a Likert scale.

The fourth step (revision and correction of the initial pool of items) was completed by the three-member expert committee composed of a psychiatrist, a psychologist and a clinical pharmacology specialist, employed by the Clinical Center Kragujevac, Serbia.

Within the fifth step one validation item for investigating respondents' socially desirable behaviors was included in the questionnaire: "I always try to help other people."

In the sixth step the initial pool of items was tested on 4 professional drivers (in Šabac, Serbia) for clarity and comprehension. After the pilot a few minor changes were made, and then final Serbian version of the questionnaire was copied and prepared for use.

The QPDK-IMDA consisted of 35 items about the knowledge of professional drivers about the influence of medications on driving ability. Respondents expressed their agreement with the offered assertions with the Likert scale: "completely disagree" (1), "partially disagree" (2), "neither agree nor disagree" (3), "partially agree" (4), and "completely agree" (5). QPDA-IMDA consisted of 8 questions about professional drivers' attitudes about the influence of medications on driving ability. Participants again gave answers according to Likert scale: "no completely" (1), "no partially" (2), "neither no nor yes" (3), "yes partially" (4) and "yes completely" (5). The scores of the questionnaires were calculated by simple summation – possible range of scores for QPDK-IMDA was 35 – 175, and for QPDA-IMDA 8 – 40. During the study we also collected socio-demographic data as well as data about factors (habits and chronic diseases) that could affect professional drivers' knowledge and attitudes about the influence of medications on driving ability.

2.2 Study settings

The research was conducted as a multicenter, cross-sectional study in 6 cities of Serbia (Šabac, Belgrade, and Vranje) and Bosnia and Herzegovina (Brod, Derventa, and Brčko), at the beginning of 2017. The study was approved by the Ethics Committee of the Faculty of Medical Sciences, University of Kragujevac. All participants gave written consent before completing the questionnaires and were treated according to ethical principles.

The study population consisted of professional drivers of both genders. The study included drivers aged from 20 to 65, where car/truck/van/bus driving was profession (taxi associations, transport organizations, delivery services, auto-traffic companies, etc.) or who spend most of their working time operating machinery (industrial workers, workers who handle cranes, forklifts, agricultural machinery, etc.). Professional drivers who didn't operate motor vehicles or machinery and didn't have a driver's license at the time of the survey, due to health problems or traffic violations, were excluded from the study, as well as those who didn't show the willingness to comply with the study protocol. The study participants were approached through the transport companies where they were employed.

Study participants filled out both questionnaires in three time intervals. The first filling of the questionnaires was by the researchers who interviewed the participants. Seven days later the respondents filled out the questionnaires by themselves for the second time, which were subsequently handed over to the researchers. Seven days after the second survey of the questionnaires, they were completed for the third time by the investigators during interviewing the same study participants.

2.3 Statistical analysis

Before performing statistical analysis, the normality of the data distribution was examined by the Kolmogorov-Smirnoff test. All calculations in this study were performed by SPSS software, version 20. Statistically significant results were those in which the probability of a null hypothesis was less than 5% ($p<0.05$).

Reliability and internal consistency were established for both whole questionnaires, for all three fills, by calculating Cronbach's alpha coefficient for each questionnaire as a whole. After that, questionnaires were randomly divided into two parts and Cronbach's alpha for each part was calculated. Split-half reliability was assessed as the Spearman-Brown coefficient. For each item in both questionnaires, the mean score, standard deviation, and variance were calculated in order to check their suitability for assessing drivers' knowledge and attitude.

Exploratory factorial analysis of the questionnaire was made in order to discover the principal factors. Firstly, the suitability of the questionnaires and sample for factorial analysis were tested by the Kaiser–Meyer–Olkin measure of sampling adequacy and Bartlett's Test of Sphericity. Then, the factors were extracted (the method was Generalized Least Squares) at first without rotation, and after that referent axes were rotated, by the Direct Oblimin method, and another extraction of the factors was made, using the same criteria as for the unrotated solution. The extracted factors were then named accordingly.

The stability of the questionnaire's results over time (temporal stability) was examined based on the correlation of the scores of knowledge and attitudes after the first and third surveys. External validation was also done, by performing a Kruskal-Wallis test, with the scores of knowledge and attitudes as test variables and level of education, the number of punishments due to a traffic violations, and recognition of warning symbols on medicinal packaging as grouping variables.

3 RESULTS

The study's response rate was 94.0%. From 235 respondents at the beginning, 221 completed the study. The participants' average age was 42.82 years (ranging from 21 to 65, standard deviation 11.26). There were 216 (97.7%) males among the respondents, and only 5 (2.26%) were females. 168 (76.0%) professional drivers participated from Serbia and 53 (23.9%) from Bosnia and Herzegovina. The score related to the drivers' knowledge (QPDK-IMDA) was 131.58 (range from 49 to 175; standard deviation 32.12) and the score related to the drivers' attitudes (QPDA-IMDA) was 30.45 (range from 8 to 37; standard deviation 7.61). Data about the driver's knowledge and attitudes did not follow the normal distribution, as confirmed by the Kolmogorov–Smirnoff test.

We calculated the mean score, standard deviation, and variance for each item in both questionnaires.

Cronbach's Alpha for the first survey with QPDK-IMDA was 0.984 and with the QPDA-IMDA it was 0.944. Detailed results of reliability and internal consistency testing are given in Table 1.

The Kaiser–Meyer–Olkin test for the QPDK-IMDA confirmed sampling adequacy with its value of 0.964 and for the QPDA-IMDA it was 0.933. Bartlett's Test of Sphericity was significant for both questionnaires.

Exploratory factor analysis revealed three factors, at initial testing and after rotation for QPDK-IMDA, explaining 78.0% of variance. The first factor (loading of 22.951; Cronbach's Alpha=0.985) was composed of 25 items (from 1 to 9, from 17 to 20, and from 24 to 35). The second factor (loading of 2.765; Cronbach's Alpha=0.912) was with only 3 items (from 21 to 23) while the third factor (loading of 1.599; Cronbach's Alpha=0.957) was composed of 7 items (from 10 to 16). After exploratory factor analysis for the QPDA-IMDA only one factor was found with loading of 5.806, which explains 72.6% of variance.

Table 1. Reliability and internal consistency testing.

		Cronbach's Alpha	Intraclass Correlation Coefficient	Cronbach's Alpha Split half	Cronbach's Alpha Split half	Spearman-Brown Coefficient
				Part 1	Part 2	
QDK-IMDA	First survey	0.984	0.636	0.972	0.973	0.939
	Second survey	0.985	0.646	0.973	0.973	0.942
	Third survey	0.975	0.525	0.942	0.974	0.935
QDA-IMDA	First survey	0.944	0.679	0.956	0.811	0.940
	Second survey	0.947	0.692	0.957	0.823	0.946
	Third survey	0.949	0.700	0.960	0.823	0.950

Table 2. The items of both questionnaires.

Questionnaire for assessing professional drivers' knowledge about influence of medications on driving abilities – QPDK-IMDA

1. The driving of a motor vehicle in traffic on the road under the influence of alcohol and/or psychoactive substances is considered a violation according to the Act about road traffic safety
2. Medications may influence psychophysical abilities and the ability to drive motor vehicles or machines
3. Some medications strongly influence psychophysical abilities and the ability to drive motor vehicles or machines
4. Alcohol influences psychophysical abilities and the ability to drive motor vehicles or machines
5. Narcotic drugs strongly influence psychophysical abilities and the ability to drive motor vehicles or machines
6. Medications used in the treatment of insomnia and anxiety can influence psychophysical abilities and the ability to drive motor vehicles or machines
7. Medications used in the treatment of psychiatric diseases (depression, psychosis, etc.) can influence psychophysical abilities and the ability to drive motor vehicles or machines
8. Medications used in the treatment of neurological diseases (epilepsy, Parkinson's disease ...) can influence psychophysical abilities and the ability to drive motor vehicles or machines
9. Medications used in the treatment of severe pain can influence psychophysical abilities and the ability to drive motor vehicles or machines
10. Medications used in the treatment of allergies, flu, and colds can influence psychophysical abilities and the ability to drive motor vehicles or machines
11. Medications used in the treatment of infectious diseases (antibiotics, antimycotics, antivirals) can influence psychophysical abilities and the ability to drive motor vehicles or machines
12. Medications used in the treatment of cardiovascular disease (hypertension, angina pectoris, cardiac insufficiency...) can influence psychophysical abilities and the ability to drive motor vehicles or machines
13. Medications used in the treatment of gastrointestinal diseases can influence psychophysical abilities and the ability to drive motor vehicles or machines
14. Medications that are dispensed without a medical prescription can influence psychophysical abilities and the ability to drive motor vehicles or machines
15. Herbal remedies can influence psychophysical abilities and the ability to drive motor vehicles or machines
16. Dietary supplements can influence psychophysical abilities and the ability to drive motor vehicles or machines
17. Medications that influence eyesight can influence psychophysical abilities and the ability to drive motor vehicles or machines
18. Medications that influence hearing can influence psychophysical abilities and the ability to drive motor vehicles or machines
19. Medications that cause drowsiness, dizziness, and mood swings can influence psychophysical abilities and the ability to drive motor vehicles or machines
20. Medications that reduce the power of observation, the power of reasoning, and the rate of reaction can influence psychophysical abilities and the ability to drive motor vehicles or machines
21. Medications whose packaging is marked with the symbol Δ should not be used before driving motor vehicles and machinery, because they can influence psychophysical abilities and the ability to drive motor vehicles or machines
22. Medications whose packaging is marked with the symbol ▲ should not be used before driving motor vehicles and machinery, because they can strongly influence psychophysical abilities and the ability to drive motor vehicles or machines
23. Medications whose packaging is marked with the symbol § should not be used before driving motor vehicles and machinery, because they can strongly influence psychophysical abilities and the ability to drive motor vehicles or machines
24. Medications that may adversely influence the psychophysical abilities and the ability to drive motor vehicles and machines should be marked with clearer and more understandable symbols on their outer packaging
25. For medications that may adversely influence the psychophysical abilities and the ability to drive motor vehicles and machines, such information must be in the patient's informational leaflet
26. Medications that are dispensed without a medical prescription, herbal remedies, and dietary supplements that may influence the psychophysical abilities and the ability to drive motor vehicles and machines should be adequately labeled, by warning symbols, as medications with a prescription regimen
27. For further information about certain medications' influence on psychophysical abilities and the ability to drive motor vehicles and machines, or in the event of using a large number of drugs, it is necessary to contact a pharmacist and/or physician
28. During dispensing/selling medications, herbal remedies, and dietary supplements that influence psychophysical abilities, it is necessary to give each patient additional information about effects on the ability to drive motor vehicles and machines
29. During dispensing/selling medications, herbal remedies, and dietary supplements that influence psychophysical abilities, it is necessary to give each patient an educational leaflet about effects on the ability to drive motor vehicles and machines
30. It is necessary to periodically conduct educational campaigns in print and electronic media, in cooperation with pharmacies, health institutions, and state institutions, in order to raise awareness and improve drivers' knowledge about the influence of medications, herbal remedies, and dietary supplements on psychophysical abilities and the ability to drive motor vehicles and machines
31. Never operate a motor vehicle or machine under the influence of alcohol, narcotic drugs, or medications that influence the psychophysical abilities and the ability to drive motor vehicles and machines
32. Before using any medicinal product, herbal remedy, and/or dietary supplement, be sure to read the instructions for use, where information about the influence on psychophysical abilities and the ability to drive motor vehicles and machines is located

33. If drowsiness, dizziness, vision, or hearing impairment occur when driving a motor vehicle or machines, immediately stop driving
34. No matter how necessary it may seem, motor vehicles or machines should not be driven if the driver feels tired, has a high temperature, feels severe pain, or is under psychological stress
35. If the driver notices that some of the medications influence their psychophysical abilities and ability to drive motor vehicles and machines, do not try to alleviate these symptoms using energy drinks and/or alcoholic beverages, because such a combination may exacerbate the symptoms

Questionnaire for assessing professional drivers' attitudes about influence of medications on driving abilities - QPDA-IMDA

1. Do you consider that alcohol can influence the ability to drive motor vehicles and machines?
2. Do you consider that some medications can influence the ability to drive motor vehicles and machines?
3. Do you consider that the combination of alcohol with medications can have a negative influence on the ability to drive motor vehicles and machines?
4. Do you consider drivers should be provided with information about the influence of medications, alcohol and narcotic drugs on the ability to drive motor vehicles and machines?
5. Do you consider that health professionals should provide more information to drivers about the influence of medications, alcohol and narcotic drugs on the ability to drive motor vehicles and machines?
6. Do you consider that drivers need to provide more information through the media about the influence of medications, alcohol and narcotic drugs on the ability to drive motor vehicle and machines?
7. Do you consider that the warning symbols on the outer package of medications are understandable (Δ, ▲, §)?
8. Do you consider that the warning symbols on the outer package of medications (Δ, ▲, §) should be replaced with different symbols which understandably and more clearly indicate that the medications influence the ability to drive motor vehicles and machines?

The stability of the results of both questionnaires over time (temporal stability) was examined with the nonparametric correlation of the scores of knowledge and attitudes after the first and the third surveys. Both questionnaires showed a high degree of correlation; Spearman's rho coefficient of correlation for QPDK-IMDA was 0.962 ($p<0.001$) and for the QPDA-IMDA it was 0.980 ($p<0.001$).

Since the level of education, number of punishments due to traffic violations, and recognition of warning symbols on drugs box have been identified as factors that influence professional drivers' knowledge and attitudes about driving-impairing medications, we used them for external validation of the questionnaires, as grouping variable in Kruskal-Wallis test. This test showed statistically significant differences in scores of QPDK-IMDA ($x2=103.541$; $df=4$; $p<0.001$) and QPDA-IMDA ($x2=103.234$; $df=4$; $p<0.001$), depending on the educational level (drivers with higher education receiving higher scores). Very similar results were obtained for the number of punishments due to a traffic violations QPDK-IMDA ($x2=84.034$; $df=4$; $p<0.001$) and for the QPDA-IMDA ($x2=83.558$; $df=4$; $p<0.001$) and with the recognition of warning symbols as the influential factors, for the QPDK-IMDA ($x2=55.266$; $df=1$; $p<0.001$) and for the QPDA-IMDA ($x2=70.204$; $df=1$; $p<0.001$).

4 DISCUSSION

According to our knowledge there are no validated measurement instruments to examine professional drivers' knowledge and attitudes about driving-impairing medications. The current study addressed the development and validation of a new measurement instruments about this very important social issue. The results of our study showed that the QPDK-IMDA and QPDA-IMDA have a high level of reliability, good structure and homogeneity.

The majority of respondents in our study were males, which is typical for professional drivers. Other of the respondents' demographic characteristics are similar to the results of extant studies on drivers (12, 17, 22, 23).

The QPDK-IMDA and QPDA-IMDA showed excellent reliability and internal consistency, with a high value of Cronbach's Alpha for the entirety of the questionnaires and after splitting (21), which is slightly better than in a similar study on professional drivers (24). The great internal consistency of the questionnaires used in the second and in third surveys was also demonstrated with a high value of Cronbach's Alpha (21).

Factor analysis was done in order to identify a small set of factors that show internal bonds in the group of linked variables. Factorial analysis revealed three factors in the QPDK-IMDA. The first of them, "General knowledge about driving-impairing medications", includes 25 items about professional drivers' general knowledge about driving-impairing medications and their potential adverse effects, the influence of alcohol, narcotics, and psychoactive medications (medications used in treating psychiatric and neurological diseases, as well as medications for severe pain treatment) on driving ability, which is partly expected and known (4). The second factor "Warning symbols" is dedicated to recognition of warning symbols on medicinal packaging, namely an empty triangle in the text color (Δ), a full red triangle (▲), and the sign of paragraph for narcotic drugs (§), and contains 3 items. Evidence suggests that patients ignore or do not read prescription labels that warn

about driving impairment (25). The level of recognizing the warning symbol on medicinal packaging is low in our study (32.6%), wherefore it is necessary to change the labeling system and implement more understandable symbols that clearly indicate that the drugs have a negative impact on driving (26, 27). The third factor, "Driving-impairing medications", consists of 7 items about the influence of a specific group of medications (antimicrobial drugs, medications used in treating allergies, flu and colds, cardiovascular and gastrointestinal diseases), as well as OTC drugs, herbal remedies, and dietary supplements, on driving ability. This factor can be especially significant because drivers use medications from these groups in therapy (5) and it is poorly known that driving-impairing medications can be found among them, although the full extent of impaired driving has yet to be elucidated with prescription agents that are not traditionally thought of as impairing (28). All 8 questions from the QPDA-IMDA represent one factor about attitudes of professional drivers about driving-impairing medications.

Both questionnaires showed a high degree of correlation in terms of the scores of knowledge and attitudes after the first and the third surveys, and therefore a high level of temporal stability. This indicates a high level of reliability of QPDK-IMDA and QPDA-IMDA, which means that if the changes do not occur over time, it will not affect the process of measurement with these questionnaires (29). Similar results of temporal stability were found in the study with older drivers (30). The external validation of both questionnaires by factors that affirmatively affect respondents' knowledge and attitudes (level of education, number of punishment due to traffic violations, and recognition of warning symbols) also demonstrate their good reliability.

The limitation of our study was lack of validated instrument ("gold standard") for measuring professional drivers' knowledge and attitudes about the influence of medications on driving ability, so it is impossible to make an adequate comparison. The results of our study showed high reliability of the QPDK-IMDA and QPDA-IMDA, which should be additionally tested in future studies with different populations of drivers.

5 CONCLUSION

Based on the results of this study, the QDPK-IMDA and the QPDA-IMDA are useful tools for testing professional drivers' knowledge and attitudes about the impact of medications on driving ability. By identifying professional drivers with poor knowledge and negative attitudes about driving-impairing medications, health service providers have the opportunity to inform them about this important issue, as well as develop an adequate system of education for this population. Also it is necessary to launch targeted educational campaigns in order to raise drivers' knowledge, attitudes, and awareness to the expected level. All of that is to prevent driving under the influence of medications, alcohol, or psychoactive drugs, with the purpose of raising traffic safety to a higher level.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

ETHICAL APPROVAL

The research was conducted after obtaining the approval of the Ethics Committee of the Faculty of Medical Sciences, University of Kragujevac.

REFERENCES

1. Hetland A, Carr DB. Medications and impaired driving. Ann Pharmacother. 2014;48(4):494-506. doi: 10.1177/1060028014520882.
2. Duquet N. Drugs and driving. J Pharm Belg. 2013;(2):4-11.
3. Kelly E, Darke S, Ross J. A review of drug use and driving: epidemiology, impairment, risk factors and risk perceptions. Drug Alcohol Rev. 2004;23:319-44. doi: 10.1080/09595230412331289482.
4. Orriols L, Salmi LR, Philip P, Moore N, Delorme B, Castot A, Lagarde E. The impact of medicinal drugs on traffic safety: a systematic review of epidemiological studies. Pharmacoepidemiol Drug Saf. 2009;18(8):647-58. doi: 10.1002/pds.1763.
5. Del Río MC, Alvarez FJ. Medication and fitness to drive. Pharmacoepidemiol Drug Saf. 2003;12(5):389-94. doi: 10.1002/pds.806.
6. Alvarez FJ, Del Río MC. Medicinal drugs and driving: from research to clinical practice. Trends Pharmacol Sci. 2002;23:441-3. doi: 10.1016/s0165-6147(02)02083-7.
7. Walsh JM, Verstraete AG, Huestis MA, Mørland J. Guidelines for research on drugged driving. Addiction. 2008;103(8):1258-68. doi: 10.1111/j.1360-0443.2008.02277.x.
8. Rosso GL, Feola M, Rubinetto MP, Petti N, Rubinetto L. Professional drivers and psychoactive substances consumption: results from medical surveillance at the workplace in Piedmont region. G Ital Med Lav Ergon. 2011;33(Suppl 3):203-6. doi: 10.5772/38234.
9. Girotto E, Guidoni CM, González AD, Mesas AE, Andrade SM. Continued use of drugs and working conditions among truck drivers. Cien Saude Colet. 2016;21(12):3769-76. doi: 10.1590/1413-812320152112.24212015.
10. Girotto E, Mesas AE, de Andrade SM, Birolim MM. Psychoactive substance use by truck drivers: a systematic review. Occup Environ Med. 2014;71(1):71-6. doi: 10.1136/oemed-2013-101452.
11. Williamson A. Predictors of psychostimulant use by long-distance truck drivers. Am J Epidemiol. 2007;166(11):1320-6. doi: 10.1093/aje/kwm205.

12. Kagashe G, Seleman K. Knowledge, attitude and practice of commercial drivers in Dar es Salaam with regard to medicines that impair driving. Trop J Pharm Res. 2009;8(4):297-302. doi: 10.4314/tjpr.v8i4.45220.
13. Bernhoft IM, Steentoft A, Johansen SS, Klitgaard NA, Larsen LB, Hansen LB. Drugs in injured drivers in Denmark. Forensic Sci Int. 2005;150(2-3):181-9. doi: 10.1016/j.forsciint.2004.12.039.
14. Janssen NB, Oort FJ, Fockens P, Willems DL, de Haes HC, Smets EM. Under what conditions do patients want to be informed about their risk of a complication? A vignette study. J Med Ethics. 2009;35(5):276-82. doi: 10.1136/jme.2008.025031.
15. International Pharmaceutical Federation. FIP statement of professional standards: the supply of medicines affecting driving performance. J Pain Palliat Care Pharmacother. 2005;19(2):55-7.
16. European Monitoring Centre for Drugs and Drug Addiction. Driving under the influence of drugs, alcohol and medicines in Europe — findings from the DRUID project. Luxembourg: Publications Office of the European Union, 2012.
17. Monteiro SP, van Dijk L, Verstraete AG, Alvarez FJ, Heissing M, de Gier JJ. Predictor for patient knowledge and reported behaviors regarding driving under the influence of medicines: a multi-country survey. BMC Public Health. 2012;12:59. doi: 10.1186/1471-2458-12-59
18. Af Wåhlberg AE, Barraclough P, Freeman J. The Driver Behaviour Questionnaire as accident predictor; a methodological re-meta-analysis. J Safety Res. 2015;55:185-212. doi: 10.1016/j.jsr.2015.08.003.
19. Stephens AN, Fitzharris M. Validation of the Driver Behaviour Questionnaire in a representative sample of drivers in Australia. Accid Anal Prev. 2016;86:186-98. doi: 10.1016/j.aap.2015.10.030.
20. Cordazzo ST, Scialfa CT, Ross RJ. Modernization of the Driver Behaviour Questionnaire. Accid Anal Prev. 2016;87:83-91. doi: 10.1016/j.aap.2015.11.016.
21. DeVellis RF. Scale development: theory and applications (applied social research methods). 3rd edition. London: SAGE, 2011.
22. Kazuko O, Goro F, Makoto K, Ritsu K. Patterns of use, knowledge, and perceived effects of sedating medication on driving: a questionnaire survey of Japanese drivers who use sedating medication. Transport Res Part F Traffic Psychology Behav. 2018;54:276-89. doi.org/10.1016/j.trf.2018.02.009
23. Antonić R, Alimpić D, Pešić M, Vezmar Kovačević S, Miljković B. Drugs and safe driving – how much do our drivers know? Accessed August 2018. at: http://www.fip.org/abstracts?page=abstracts&action=item&item=7786.
24. Łuczak A, Tarnowski A. Validation of selected temperament and personality questionnaires for diagnosing drivers' aptitude for safe driving: a Polish study. Accid Anal Prev. 2014;70:293-300. doi: 10.1016/j.aap.2014.04.001.
25. Veldhuijzen DS, van Wijck AJ, Verster JC, Kalkman CJ, Kenemans JL, Olivier B, et al. The impact of chronic pain patients' psychotropic drug knowledge and warning labels on the decision whether to drive a car or not. Traffic Inj Prev. 2006;7(4):360-4. doi: 10.1080/15389580600943005.
26. Fierro I, Gómez-Talegón T, Alvarez FJ. The Spanish pictogram on medicines and driving: the population's comprehension of and attitudes towards its use on medication packaging. Accid Anal Prev. 2013;50:1056-61. doi: 10.1016/j.aap.2012.08.009.
27. Monteiro S, Huiskes R, van Dijk L, van Weert J, de Gier J. How effective are pictograms in communicating risk about driving-impairing medicines? Traffic Inj Prev. 2013;14(3):299-308. doi: 10.1080/15389588.2012.710766.
28. Sigona N, Williams KG. Driving under the influence, public policy, and pharmacy practice. J Pharm Pract. 2015;28(1):119-23. doi: 10.1177/0897190014549839.
29. Janković SM. Translation, adjustment and evaluation of reliability and validity of the questionnaires. In: Research Design. 1st ed. Kragujevac: Medrat, 2016:108-14.
30. Koppel S, Stephens AN, Charlton JL, Di Stefano M, Darzins P, Odell M, et al. The Driver Behaviour Questionnaire for older drivers: do errors, violations and lapses change over time? Accid Anal Prev. 2018;113:171-8. doi: 10.1016/j.aap.2018.01.036.