

STUDY OF FORMALY UNREGISTERED INJURIES OF TRAVELERS ON CITY BUSES

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Abstract Buses for city transportation are nowadays used by a large number of citizens throughout the world. Safety of passengers is one of the main objectives that must be ensured. In connection with this, the interior design of the bus is one of the main factors that affects passenger safety. In addition, injuries of passengers are one of the main factors that point to the safety of city buses. However, in cases of injuries of travelers on public transport buses, safety indicators are based primarily on injuries recorded in some official facilities, such as hospitals for example. The main assumption in this article is that exist the undocumented injuries of travelers that can indicate the omissions in city bus design or way of transportation. In this article, it is presented a study about the undocumented injuries of travelers on city buses. For the purpose of this study, a new questionnaire was developed, which is intended for the collection of officially undocumented data about injuries of passengers in vehicles for public transportation. Hypotheses directed to the detection of the existence of certain factor that especially contributes to the appearance of injuries were tested.

Keywords: City buses; public transport; safety; injuries; travelers; bus interior design.

1. INTRODUCTION

In the situation of severe injuries in the city bus, it is common to give first aid to passengers at the place of the traffic accident. After that, passengers are moved to medical facilities for additional examination and, if necessary, further medical supervision. In before-mentioned circumstances, injuries are documented and archived. Nonetheless, there are circumstances when passengers suffer certain physical pain and experience minor injuries due to various causes. In such a situation, travelers generally do not use medical care facilities. In general, these injuries are easier and therefore passengers believe that injuries do not seriously affect their health and that they cannot be compensated by insurance companies for these types of injuries [1].

However, with regard to the safety of city buses, these injuries can be important and relevant, because they can indicate a lack of design of the interior of buses for urban transportation of travelers. A review of the references on this topic [2-11] shows that this aspect of the safety of city buses has not been previously adequately addressed. It is hard to find a study that has been directed on this issue.

Given the above, the point of the examination in this paper is to explore the likelihood of the presence of officially unreported injuries in city buses. The central assumption is that exist officially unreported injuries in buses for public transport in the area of Belgrade city.

2. METHOD

Based on the review of the references that deal with the problem of accidents on public buses [2-11], it was not feasible to find a method that addressed systematic information gathering of city buses accidents that are not officially documented. Given this, a tool must be developed to capture this kind of data. Because this information can only be collected from passengers, here a questionnaire has been developed to collect the data needed. This new questionnaire for collection of data about unregistered injuries of passengers in city transport vehicles is given below.

QUESTIONNAIRE FOR GATHERING THE DATA ABOUT NON DOCUMENTED INJURIES IN CITY BUSES

1. Did it ever happen to you that you suffered any kind of injury in the bus for city transport? YES NO

Enter before how many years was the injury suffered? _____

2. Did you report the injury to a health institution? YES NO

3. If you have not reported the injury to a health institution, is the reason for that, your initial assumption that the injury was not of a serious character? YES NO

4. Which body part(s) did you injured at that time (enter on the line)?

5. Did you report the injury to the driver? YES NO

6. Did you report the injury to the transport company? YES NO

7. Did you report the injury to the insurance company? YES NO

8. Did you report the injury to any other institution? YES NO

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9. Describe the type of the injury (e.g. contusion, cuts, fractures, bleeding, loss of consciousness...)

10. Do you occasionally feel the consequences of this injury (pains, reduced mobility...)?

YES NO

11. Whether the injuries occurred as a consequence (more than one answer can be circled)

braking/accelerating embarking/disembarking unsafe interior of the vehicle something else

If it is circled "Something else ", inscribe below how the injury occurred

12. How many situations did you have which led to the injury, and you did not report the injury to the health institution? _____

13. Write on the line below something that you think is still relevant for injuring, without being mentioned before

14. Data about the respondent

Gender _____ Years of age _____

Disability or some physical limitation _____

This questionnaire has been filled by one hundred and forty users of public bus transportation. The criterion for filling out the questionnaire is that everyone has been used public bus services during some period of their lifetime. The study was conducted in the city of Belgrade. The questionnaire was given mainly to interviewees who sat on the bus while driving. Age of participants variegated from 19 to 73 years. The average age of the participants was 41 years ($M = 40.85$, $SD = 15.29$).

3. RESULTS AND ANALYSIS OF RESULTS

The basic results regarding this research are given in [1]. Parts of the body of the injured travelers and the number of such injuries that occur on buses for passenger transportation in Belgrade in a sample of 140 respondents is shown in Figure 1.

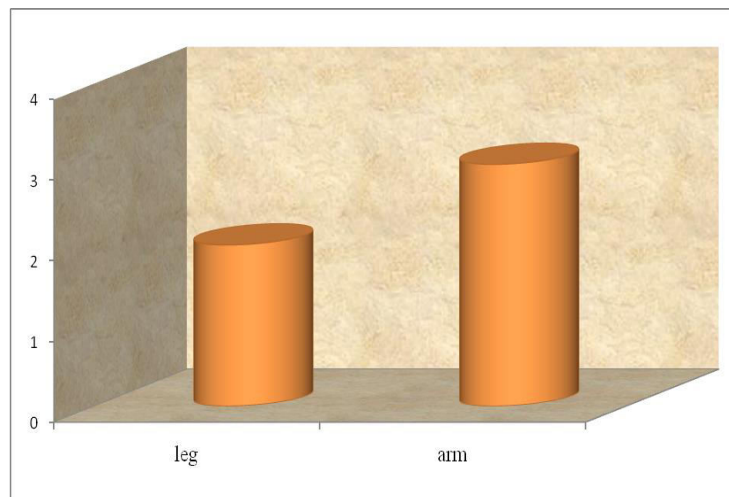


Figure 1. Injury frequency of individual body parts.

The types of personal injuries and the number of injuries suffered by passengers on public buses in Belgrade in a sample of 140 respondents are shown in Figure 2.

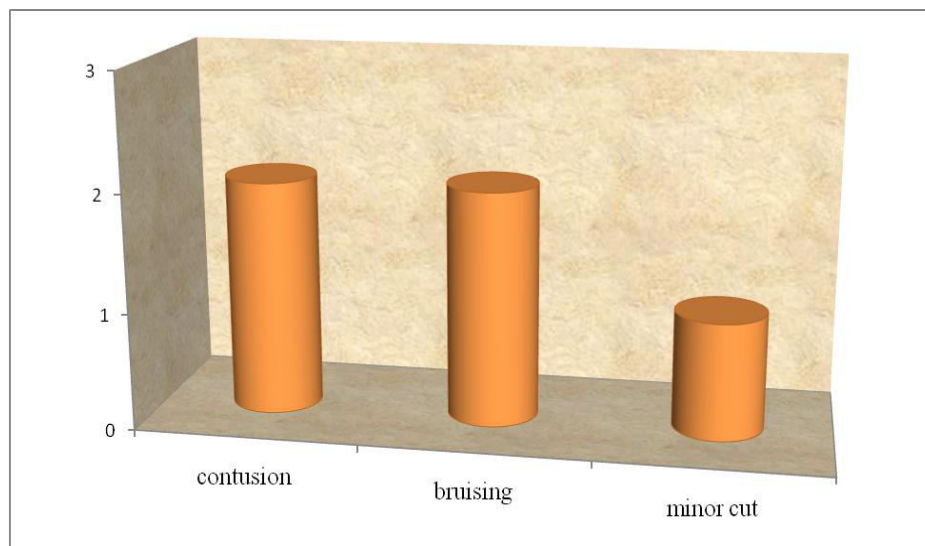


Figure 2. The injury types and their frequency occurrence.

The origins of personal injuries on public transport buses in Belgrade and the frequency of their occurrence in the sample of 140 respondents are shown in Figure 3.

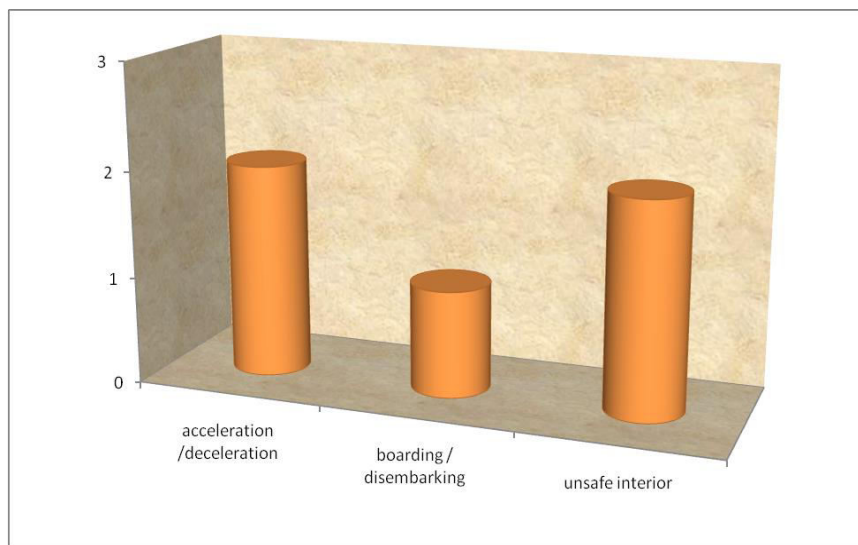


Figure 3. The circumstances that ended in passenger injuries and frequencies of their appearances.

It is important to consider the possibility of the existence of a statistically significant difference between the incidence of injuries of the body parts that were the subject of the injuries. The existence of a statistically significant difference between parts of the body that were injured could indicate the existence of a systemic factor related to the conditions of injuring (for example, the design of some interior element of a bus). In this connection, a null hypothesis will be tested that there is no statistically significant difference in percentages of arm and leg injuries (parts of the body for which the injuries were identified in this research). One-sample t-test between percents (Statistics calculator software) will be used to check the null hypothesis. The calculated value of test statistics is t-statistic = 0.456 ($p = 0.6718$). The t-statistic was not significant at the 0.05 critical alpha level. Therefore, we fail to reject the null hypothesis and conclude that the difference was not significant.

It is also important to determine the possibility of the existence of a statistically significant difference between the frequency of occurrence of particular types of injuries. The existence of a statistically significant difference between the types of injuries could potentially indicate the existence of a factor that favors the occurrence of injuries of a particular type. However, given the existence of an identical number of injuries that are qualified as contusion and bruising (for identical sample size), we conclude that there is no statistically significant difference between these types of injuries. Therefore, we will test the null hypothesis that there is no statistically significant difference in the percentages of occurrence of contusions and minor cuts. The one-sample t-test between percents will be used to check the null hypothesis. The calculated value of test statistics is t-statistic = 0.598 ($p = 0.5823$). The t-statistic was not significant at the 0.05 critical alpha level. Therefore, we fail to reject the null hypothesis and conclude that the difference was not significant. Similarly, we arrive at the conclusion that there is no statistically significant difference in the percentage of the occurrence of bruises and minor cuts.

Finally, we will investigate the possibility of the existence of a statistically significant difference in the presence of certain causes of injuries in the incidence of injuring. If the percentage related to the manifestation of a specific cause of injury is greater than the percentage of occurrence of other causes of injuries, then it could also indicate that special attention needs to be dedicated to a certain factor causing a higher rate of injuries. Considering the existence of an identical number of injuries resulting from acceleration/deceleration and unsafe interior, we conclude that there is no statistically significant difference between these causes of injuries. Therefore, we will test the null hypothesis that there is no statistically significant difference in the incidence rates of injuries due to acceleration/deceleration and boarding/disembarking. The one-sample t-test between percents will be used to check the null hypothesis. The calculated value of test statistics is $t\text{-statistic} = 0.598$ ($p = 0.5823$). The t-statistic was not significant at the 0.05 critical alpha level. Therefore, we fail to reject the null hypothesis and conclude that the difference was not significant. Similarly, we arrive at the conclusion that there is no statistically significant difference in the percentage of the occurrence of the boarding/disembarking and unsafe interior.

4. CONCLUSION

This research has verified the initial assumption that exists a particular percentage of undocumented injuries, which experienced passengers during transportation in city buses. This amount is relatively low and in this research, it equals 1.42% of the total number of answers. Undocumented injuries compose 40% of the total number of injuries registered in this research. However, this research was conducted on a specimen of 140 answerers, representing a relatively small percentage of Belgrade's population. Given the population in Belgrade and the level of injuries produced, it can be estimated that exist a larger number of people who were sometimes injured while driving through the city. As the analysis shows, basically, these injuries are not serious. However, they indicate that additional care should be directed to the several aspects connected with the interior design and the way of driving, to further reduce passenger injury rates on city buses.

The structure and the content of the questionnaire that was developed in the frame of this research allow its use for the collecting of the data about unregistered injuries for any type of the city vehicle, which is in the use for transportation of passengers. Testing of hypotheses which has been performed in this study has not separated any dominant factor that especially contributes to the injuring of travelers. In fact, all identified factors, in the statistical sense, have almost equal significance. However, these factors have had a prevalence in relation to other possible factors of injuring, which were not registered in this research.

References

- [1] Zunjic A., Sremcevic V., and Čičević S., 2018, Research of undocumented injuries of passengers in buses for city transport, *Proceedings of the 7th International Symposium on Industrial Engineering*, pp. 99-101, University of Belgrade - Faculty of Mechanical Engineering, Belgrade.

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<http://ietl.net/TES/>

2019, Volume 3, Issue 1, 25-31, DOI: 10.6722/TES.201907_3(1).0003

- [2] Albertsson P., and Falkmer T., 2005, Is there a pattern in European bus and coach incidents? A literature analysis with special focus on injury causation and injury mechanisms, *Accident Analysis and Prevention* 37, pp. 225–233.
- [3] Bjornstig U., Albertsson P., Bjornstig J., Bylund P-O., Falkmer T., and Petzall J., 2005, Injury events among bus and coach occupants - non-crash injuries as important as crash injuries, *IATSS Research* 29, pp. 79-87.
- [4] Grant R., Kirk A., and Bird R., 2002, Why do passengers get hurt when buses don't crash?, *Contemporary ergonomics* 2002, pp. 465-470, Taylor & Francis, London.
- [5] Halpern P., Siebzeher M.I., Aladgem D., Sorkine P., and Bechar R., 2005, Non-collision injuries in public buses: a national survey of a neglected problem, *Emerg Med J* 22, pp. 108-110.
- [6] Kirk A., Grant R., and Bird R., 2003, Passenger casualties in noncollision incidents on buses and coaches in Great Britain, *Proceedings of the 18th International Technical Conference on the Enhanced Safety of Vehicles*, National Highway Traffic Safety Administration, New Jersey.
- [7] Nagata H., and Lee S., 2004, Survey on accidental falls of elderly workers while commuting to and from work, *Contemporary ergonomics* 2004, pp. 78-82, CRC Press, Boca Raton.
- [8] Palacio A., Tamburro G., O'Neill D., and Simms C.K., 2009, Noncollision injuries in urban buses - strategies for prevention, *Accident analysis and prevention* 41, pp. 1–9.
- [9] Wahlberg A.E., 2002, Characteristics of low speed accidents with buses in public transport, *Accident analysis and prevention* 34, pp. 637–647.
- [10] Wahlberg A.E., 2004, Characteristics of low speed accidents with buses in public transport: part II, *Accident analysis and prevention* 36, pp. 63–71.
- [11] Zunjic A., Sremcevic V., Sijacki V.Z., and Sijacki A., 2012, Research of injuries of passengers in city buses as a consequence of non-collision effects, *Work* 41(S1), pp. 4943-4950.