

DRIVER HEALTH AND TRAFFIC SAFETY ON THE TOURIST ROUTES

ЗДОРОВЬЕ ВОДИТЕЛЯ И БЕЗОПАСНОСТЬ ДВИЖЕНИЯ НА ТУРИСТИЧЕСКИХ МАРШРУТАХ

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Abstract: Based on the results of studies carried out in the field conditions, there are given some recommendations for drivers of vehicles moving on tourist routes with mountain road conditions, which will reduce likelihood of traffic accidents for them.

The paper also describes the results of studies carried out in accordance with the methodology of health check of drivers of vehicles moving on the tourist routes. As the evaluation parameters, there have been used several indexes as follows: the harmony of driver's body structure and his/her physical development was evaluated by Quetelet-2index; death-birth and power indexes were used for evaluation of the power of the apparatus of external respiration and hand muscle strength, accordingly; the nature of nervous vegetal regulation was determined by means of systolic and diastolic pressure and chest compression frequency of hemodynamics indices; for evaluating the adaptation level by Kerdo index and Robinson index there was used the screening procedure.

Reliability of driver depends not only on his/her qualification and experience, but the state of his/her health and ability to work are of high importance as well.

KEY WORDS: VEHICLE'S DRIVER; TOURIST ROUTE; VEGETAL REGULATION INDEX; HEMODYNAMICS INDICES; SYSTOLIC AND DIASTORIC PRESSURE; CHEST COMPRESSION FREQUENCY; ADAPTIONAL LEVEL

1. Introduction

The driver is an essential link of the "driver-car-road-environment" system, its operator particularly [1]. The driver receives basic information on road conditions through observation. A great deal of information and its nature, which is constantly changing, for example when driving in mountain environments, does not allow for its timely absorbing and processing, and consequently for making the right decision. This process is especially pronounced at psycho-physiological changes in driver's organism.

The system of organizing traffic safety health-care envisages a complex of the actions, which includes both medical prevention of road accidents and provision of medical assistance after these accidents.

One of the most fundamental factors of traffic safety is the health of the driver.

A person's organism has specific requirements when driving in mountain environments. At an altitude of more than three kilometers, a person has trouble breathing because of oxygen deficiency. When driving for long period of time in mountain environments, oxygen deficiency leads us to headaches, reduction in sight and hearing, disorders of digestive system and a number of undesirable effects. All this leads to rapid and severe fatigue of driver.

Travelling in tourist destinations existing in mountains gives a great pleasure to many car enthusiasts (Pic. 1). Of course, overcoming the breathtaking ascents and downhill sections on the twisting mountain roads is much more interesting, as well as enjoying views over the beautiful mountains.

2. Preconditions and means for resolving the problem

Before starting driving on the mountain roads (Pic. 1), the tourist-drivers have to make an in-depth analysis of all those difficulties, which they could face when driving on the mountain roads, as well as it is important to continuously improve skills and moral-psychological qualities of driver.

To that end, the driver has to take into account several recommendations as follows:

To accurately assess your own capacities. For example, if the driver of another vehicle outpaces you, do not step on the gas and do not compete with him! Let him outpace you, and remember that in such case the increased speed is just a direct path to the hospital. Alternately, at best, you may meet this driver on the pass being too tired and nervous, thinking about what to do with this

damaged car, since studies of transport-tourist routes road infrastructure of the Imereti region have shown that service centers are mostly situated only in cities and sometimes in densely populated areas.



Pic. 1. An interesting view of the mountain road section of the Imereti region's transport-tourist route.

Inadequate hazard assessment. The mountain road is full of surprises. For example, studies of the "Kutaisi-Terjola-Tkibuli-Nikotrtsminda-Kutaisi" transport-tourist route have shown that the traffic flow on several tens kilometers of the most dangerous section of the mountain spiral highway is too small, and sometimes there is no oncoming traffic in front. In case of a drivable car, the driver begins to step on the gas. Due to changes in the trajectory of the movement, the possibility of driving onto the oncoming traffic increases that is very dangerous. Because of the insistence on getting fast through this dangerous turn (Pic. 2), the centrifugal forces acting on a car increase lateral skid, and in case of belated braking, the vehicle can suddenly end up at the center line of the closed left sharp turn the tourist bus is following, and, as a result, the probability of tragic traffic accident is too high.

Thus, it is essential that the tourist bus drivers have experience with driving on these mountain roads, or/and they must be retrained by appropriate methodology. Practical and theoretical trainings should enable drivers to drive on the mountain roads safely and with a low likelihood of traffic accident.



Pic. 2. The dangerous turn of the Imereti region's transport-tourist route

When driving on the mountain roads, the most important factor is the strict observance of traffic rules by drivers of vehicles, as well as their health check system.

During intensive traffic flow in complicated mountain environments, high demands are placed to the state of health of a driver. In order to define driver's health end-points, he is needed to have a medical check-up. Proper medical check-ups before setting out on the journeys represent an essential link in the prevention of road traffic accidents.

Any person, who is not accustomed to mountain environments, may even have the mild or severe forms of mountain sickness. So, those people, who are physically unprepared and are in poor health, especially the drivers, must comply with safety regulations. Some people are adapting rapidly to oxygen deficiency, but some of them need a long period of adjustment.

Health end-points, which may represent the basis for refusing the vehicle's driver journey, are as follows:

- The presence of severe symptoms or complications of chronic diseases;
- Increasing or reducing heart rate and variation of the upper and lower rates of blood pressure that is typical of all tested drivers;
- The driver is under the influence of alcohol or other preparations (narcotic drugs and psychotropic preparations), which disturb their functional status.

For a comparative analysis of morphofunctional parameters, the observations were carried out on the tourist routes on the vehicles's drivers of different age and physical abilities for the period of three three years. During the period of carrying out anthropometric screening, by meeting certain requirements, the

following have been measured: driver's height, cm; weight, kg; chest circumference S, cm; lung capacity, V; right hand size, A, cm; left hand size, B, cm; systolic pressure P₁, mm, Mmhg; diastolic pressure P₂, mm, Mmhg, heart ratio, f, beats per minute.

As the evaluation parameter there has been used the body-weight index, or Quetelet-2 index, which is calculated by the formula:

$$I_m = \frac{M}{h^2}$$

The body-weight index allows for assessing the level of compliance of the body-weight with its height, in other words the harmony of its physical development. The body-weight index evaluates indirectly if the mass of a person is sufficient, normal or excessive. According to foreign medical scientists, variation of the body-weight index within 25-27 kg/m² for men is ideal. As the evaluation parameter there also are used: the birth-death ratio $I_s = V/M$, which characterizes the power of the apparatus of external respiration, but the power index $I_p = A/M$, determines the hand muscle strength.

Of high importance for the drivers of tourist buses in mountain environments is calculation of Kerdo index [2], or the index of nature of nervous vegetal regulation by the formula:

$$I_k = 1 - \frac{P_2}{f}$$

For quantitative evaluation of energy potential of human organism, there is used the Robinson index [4], which is calculated by the formula:

$$I_r = \frac{f \cdot P_1}{100}$$

The Robinson index characterizes the heart systolic work. The larger is this index for physical load, the higher is functional capacity of heart muscle.

For evaluating the adaptation level, there was used the screening procedure, which is calculated by the formula:

$$K = 0,011xf + 0,014xP_1 + 0,008xP_2 + 0,014xW + 0,009xM + 0,004xC - 0,009xh - 0,273,$$

where, W- age (years); C- gender (male -, female - 2).

The adaptation level of human organism to the environment "health level" is classified as follows: health first level – the state is optimal, satisfactory adaptation; health second level –the adaptation mechanisms are tense; health third level –unsatisfactory adaptation level, during which there are inconsistencies with the organism functioning mechanism; health fourth level –interruption of adaptation – status of patient before or during disease [3].

Hemodynamic indices represent the criterion of cardiovascular system, which is influenced by the environmental factors. Thus, the drivers of buses moving on the tourist-transport routes in mountain environments have been subjected to a medical examination on the parameters, which affect the hemodynamic indices (Table 1).

Table 1

Comparative Analysis of Driver's Hemodynamic Indices			
	2014	2015	2016
Heart Ratio(f)			
1.	72,1±2,50	71,4±2,70	71,1±2,60
2.	80,3±1,90	82,2±1,30	83,8±2,10
3.	68,4±3,45	69,2±2,10	68,4±2,57
4.	76,9±4,46	82,1±2,32	80,8±1,24
5.	78,4±4,22	81,5±3,20	82,5±4,29
Systolic Blood Pressure (P ₁)			
1.	118,1±4,48	119,5±2,27	121,3±2,49

2.	136,8±2,80	137,0±2,89	133,2±2,44
3.	118,7±2,46	117,7±4,53	122,3±3,30
4.	135,6±2,11	136,2±3,92	140,4±4,26
5.	135,8±1,42	133,6±2,09	136,2±5,56
Diastolic Blood PressureP ₂ (P ₁)			
1.	70,2±4,44	74,4±3,77	75,3±2,87
2.	78,3±3,88	78,6±3,26	79,3±2,71
3.	75,2±2,55	78,1±3,30	79,1±3,16
4.	78,1±3,40	81,4±4,18	80,7±4,88
5.	82,1±5,32	84,4±4,91	83,4±5,10

It has been established that during the entire period of research, heart ratio has a narrow range of frequencies, which indicates stability and tolerance of organism.

Systolic and diastolic pressures tend to increase in line with the rise in age, especially among older drivers.

Table 2

The values of the drivers' physical development (morphofunctional parameters) and their assessment

Driver	1	2	3	4	5
Quetelet-2 index	22,9	25,9	25,4	28,6	26,1
Assessment	1	2	2	3	2
Kerdo index	0,04	0,04	-0,13	0,01	-0,02
Assessment	2	2	3	2	2
Robinson index	85,3	111,3	82,1	109,8	109
Assessment	2	3	2	3	3
Adaptation level	2,35	2,94	2,21	3,19	3,09
Health level	1	2	1	3	2

Note: 1- below the norm; 2- normal value; 3- above the norm.

By Quetelet-2 index, it has been established that the drivers have a harmonic ratio of the body height and weight (Table 2), the only exception is one tested patient ($I_m = 28,6$). According to this parameter, he has excess weight, and another one has insufficient mass ($I_m = 22,9$). So, as it is believed by psychologists, the body dysmorphic disorder may have a negative effect on human psychological health: impairment in self-assessment ability, causing depression.

The level of nervous vegetal system effect on blood vessels was assessed by Kerdo index (Table 2). The values of this index are within normal physiological parameters from 0,1 to -0,1. In addition to the driver, who had initial vegetation tonus with exuberant sympathetic effect (-0,13), one more driver has been identified with vegetonometry tendency (-0,02).

For describing the quality of the exchange-energy processes occurring in the organism and myocardial oxygen consumption, there has been used the Robinson index. The upper (111,3) and lower (82,1) values of Robinson index confirm exuberance of sympathetic or para-sympathetic vegetation nervous system, but two of them disclosed the signs of cardio-vascular system regulation disturbance (109 and 109,8), and one of them had the cardio-vascular system regulation disturbance directly.

By the ratio of health level, the has been determined the adaptation level. The lower is the value of the adaptation level parameters, the higher is health level. In general, the drivers disclosed the positive result of health assessment and adaptation capacities (Table 2): satisfactory adaptation (first health level) was disclosed by 2 drivers, in other words, their organisms have high functional capacities; 2 drivers belonged to the functional stress group (second health level; and 1 driver disclosed unsatisfactory level of adaptation.

3. Conclusion

Good characteristics of nervous vegetal regulation indicate the optimal level of functional reserve of regulation and self-regulation mechanisms, which ensures adaptation to the ambient environmental factors.

The rivers of buses moving on the tourist-transport routes are needed to have medical check-ups on the parameters, which affect hemodynamic indices.

Thus and so, Reliability of driver depends not only on his/her qualification and experience, but the state of his/her health and ability to work are of high importance as well.

4. References

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