

## DRIVERS' AND CO-DRIVERS' HEART RATE DURING LONG-DISTANCE NIGHT DRIVING

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### ABSTRACT

This paper describes the results of an investigation concerning pulse oscillations of motor-coach drivers and co-drivers. The investigation was conducted during a thirteen-hour night drive, with 4 crews of motor-coaches. The heart rate was registered by an automatic memoport system. By their variations, pulse oscillations, as an indirect indicator of cortical activation, pointed to the need for studying the work of drivers and co-drivers of motor-coaches at two levels: basic activity, state of "wakefulness" while working, during active driving (driver) is higher in all observed pairs than during "passive driving" (co-driver), while in excess situations, the reactions of the co-driver's pulse oscillations are more distinct than those of the driver, and may be interpreted as a sudden leap of activation, intensified by the co-driver's feeling of helplessness.

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The organization of work in road transport is directed in practice both towards increasing safety, and towards the humanization of the drivers' work. This is tried to achieve by means of legal regulations and dictated by deep-rooted tradition. In the case of long-distance driving, one of the measures which should help prevent fatigue in the driver and ensure indispensable rest, is the regulation which demands a continual presence of, and alternate driving by, two drivers, the underlying idea being that one driver should be resting while the other one is driving. Work organized in this manner offers several variations (the co-driver rests sitting in the seat beside the driver or he lies in the cab of the vehicle during the drive, etc.).

The aim of this study was to observe certain parameters of the degree of the co-driver's psychophysical activation during the drive, and to establish if the rest foreseen for him was justified.

### METHODOLOGY

The study was conducted in driving conditions with 4 crews (driver and co-driver) of motor-coaches of ASTUP "Lasta", during a thirteen-hour drive on the relation Trieste-Belgrade or Belgrade-Trieste. The drivers were clinically healthy persons, 31–48 years of age, with creditable service from 10–25 years,

and had been driving on this relation for some time. They were told of the experiment and motivated for the research.

Heart rate frequency was checked throughout the trip by means of an automatic memoport system of the type "Hellige". During the drive, all actions of both drivers were registered, and the respective records entered in the graphic survey of the pulse oscillations.

### RESULTS AND DISCUSSION

In studying the recorded material, we noticed that certain phenomena occurred in all four crews. The basic oscillations of the pulse rate in all observed drivers gave a more or less repeated picture (Table 1). The obtained results speak in favour of a general activation tonus, connected with the period of physical work, i.e. operating the vehicle.

TABLE 1  
Most frequent oscillations of the pulse rate observed in drivers and co-drivers.

Driver	Driving	Not driving	Driving	Not driving	Driving	Not driving
1	86-95	82-88				
2		64-74	84-88			
3	78-86	70-74	76-82	58-62		
4		63-66	70-78	60-64	70-78	
5	82-86	66-72	76-82	67-74	76-84	
6		72-78	82-88	62-68	78-82	70-76
7	86-94	68-74	74-82	64-70		
8		74-80	78-86	60-64	82-90	

Some interesting observations were made regarding the reactions of the driver and co-driver of the same coach during drive. In the same driving conditions and in the same working space and environment, the co-driver reacted to individual situations by pulse oscillations which were less uniform than those of the driver. From this it is obvious that while resting the co-driver retains a relatively high level of activation. This phenomenon becomes more manifest in exceptional and critical situations so characteristic of road driving. Reactions to similar traffic situations (overtaking, sudden braking, avoiding an accident) were observed in three crews: the co-driver always reacted with greater pulse oscillation than did the driver.

Similar traffic situations create similar stress generating situations and provoke similar physiological reactions in both numbers of the crew. The driver, being able to control the situation, intensifies his general activation tonus less than the co-driver. Although the average activation levels of the co-driver are lower, he reacts more promptly and more strongly. This may be due to the fact that the co-driver, as an active participant in traffic feels a certain helplessness. These sudden and frequent loads on functional states suggest that the co-driver does not rest enough while not driving.

#### CONCLUSIONS

The work of driving personnel should be observed at two levels: at the level of the average, continuous activation tonus, and in emergency situations, which in their unpredictability are characteristic of this kind of work.

Pulse oscillations are indirect indicators of cortical activity (wakefulness, readiness for work), i.e. they are indicators only for its approximate evaluation. Pulse oscillations show that in the same, exceptional traffic situations, the co-driver reacts with much greater psychophysical activation. This fact suggests that the co-driver is not completely at rest during his period of "passive" driving. The authors stress the need for further research regarding the work of co-drivers on the basis of polygraphic methods.

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