



# Truck Driver Health as a Fleet Asset: Economic Feasibility of Ergonomic Cabin Settings and Short Exercise on the Road

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## ABSTRACT

The purpose of the paper is to identify the key occupational and lifestyle factors that affect the physical and mental health of long-haul truck drivers and to substantiate why the driver's health should be considered an important asset of the fleet. The study applies a structured analytical review of scientific and professional sources on occupational risks in road freight transport and a system-based assessment of workplace conditions. Particular attention is paid to the driver's workplace characteristics, ergonomic configuration of the cab, and the practical inspection of the driver's seat, as well as to prolonged exposure to industrial factors (physical inactivity, extended sitting, vibration, and forced posture). Results indicate that long-term exposure to these factors increases the risk of musculoskeletal disorders, cardiovascular complications, and deterioration of mental well-being, which in turn elevates the probability of occupational pathology and reduces functional performance. It is shown that targeted ergonomic solutions in cab design and workplace arrangement, combined with the driver's conscious self-care (short on-road exercise routines, regulated work–rest schedules, and balanced nutrition), can mitigate cumulative health risks and improve work capacity. Fleet operators and vehicle designers should prioritize preventive measures: ergonomic optimization of the driver's seat and cabin settings, organizational support for regular micro-breaks with brief physical activity, and corporate policies that encourage healthy eating and a sustainable work regime. These steps contribute to improved safety and operational continuity, reducing accident-related risks, delivery disruptions, and financial losses. The paper conceptualizes the driver's health as a measurable component of fleet efficiency and profitability, linking occupational health management with safety performance and economic outcomes in road freight operations.

## KEYWORDS

*working conditions, health status, truck drivers, health disorders, cab ergonomics.*

## Introduction

One of the most common professions in recent years, in which almost every third man of working age is employed, is that of “motor vehicle driver.” Published research results indicate that this category of workers performs their activities under the influence of a complex of harmful occupational factors, among which physical factors are of primary importance. In addition, the work of drivers is associated with psycho-emotional stress and an irrational work schedule.

The prolonged exposure of long-distance truck drivers to occupational factors increases the risk of health problems and contributes to the formation and development of occupational diseases (lumbar-sacral radiculopathy, vibration disease, etc.) and occupationally related pathologies (e.g., arterial hypertension), which determines the need for therapeutic and preventive measures for these diseases. Particular attention should be paid to the preventive prevention of harmful effects on the physical and mental health of drivers.

## Literature Review

The theoretical and methodological basis in the field under study has been formed by scientific research by Guest et al. (2020), Johnson et al. (2021), Lemke et al. (2020), and others. The publications of van Vreden et al. (2022) raise topical issues of transforming approaches and updating methods of supporting the health of long-distance truck drivers in the modern socio-economic space. Particular attention should be paid to research on the theoretical foundations of cabin ergonomics (Pritchard et al., 2022, 2023), the prevention of psychological problems (Lee et al., 2023; Delhomme & Gheorghiu, 2021), components of physical exercise and stress on the road (Aryal et al., 2023; Hamido et al., 2021), and health-preserving approaches to the organization of the driver’s workplace (Tsopa et al., 2022; Crizzle et al., 2020, etc.). Scientists identify the main health threats as the musculoskeletal system, which suffers from physical inactivity, prolonged sitting, vibration, and incorrect posture, as well as the cardiovascular system and threats to mental health.

## Problem Statement

The aim of the article is to identify the key occupational and lifestyle factors affecting the physical and mental health of long-haul truck drivers and to substantiate the concept of driver health as a critical economic asset of a transport fleet, particularly through the implementation of ergonomic cabin settings and short on-road exercise interventions to improve safety, performance, and operational efficiency.

## Methods and Materials

This study was conducted as an analytical narrative review with an applied ergonomic focus on the long haul truck driver’s workplace. The materials comprised peer reviewed research articles and professional sources addressing occupational exposures in freight transport, including prolonged sitting, whole body vibration, constrained postures, irregular work rest patterns, and sustained psycho emotional load, as well as their links to musculoskeletal, cardiovascular, and mental health outcomes. Source selection and synthesis were guided by relevance to cab ergonomics, driver seat adjustment, and prevention strategies that can be implemented during long routes.

The methods included structured analysis and thematic synthesis of the literature to classify risk factors and to map the pathway from working conditions to functional impairment and downstream safety and performance consequences (Clemes et al., 2022). An ergonomic appraisal of cab and seat configuration was carried out using key posture parameters such as recommended joint angles and body segment positioning and essential geometric relationships including steering wheel reach, seat height and depth, backrest inclination, and pedal reach. Evidence from different sources was

compared and integrated into practical recommendations for fleets and drivers that emphasize ergonomically sound settings, micro breaks with short exercise routines, and basic recovery supportive habits.

## Results and Discussion

The layout of the driver's workplace determines the basic geometric dimensions that characterize its position relative to the cab and the location of the controls (Davies et al., 2022). In a truck, the driver sits on a higher seat than in a passenger car, with the legs more bent at the knees and the seat back almost vertical. With this driver position, the length of the cab is minimal, and the height is not critical due to the large height of the vehicle (Johnson et al., 2021).

To determine the position of the driver's seat in terms of length and backrest angle, data from the standards are used. When determining the driver's working position, the recommendations given in Table 1 should be used.

*Table 1. Parameters of the working position of a truck driver*

Parameter name	Size, degrees
Angle of torso deviation from vertical	10
Angle between torso and thigh	90
Angle between thigh and lower leg	95...135
Angle between the lower leg and foot for the right foot in working position	90
Angle between the torso and shoulder	5
Angle between the shoulder and forearm	80...160
Angle between forearm and wrist	170...190
Angle of the thigh to the horizontal, minimum	4

As can be seen from the data in Table 1, the values of the angles can vary widely. It should be noted that the diameter of the steering wheel is most often 350...420 mm. As the diameter increases, the torque that the driver must apply to it with the same force on the rim increases, but then the achievable turning speed decreases.

Trucks use a large steering wheel to increase safety in case of power steering failure. The diameter of the steering wheel rim should be approximately 20 to 30 mm. The angle of the steering wheel determines the amount of force applied by the driver to the wheel rim. As the steering wheel tilt angle increases, the force that the driver can apply to the wheel rim increases. This is because a different group of muscles is working on it (van Vreden et al., 2022; Pritchard et al., 2022; Tsopa et al., 2022). The key parameters of the workplace are given in Table 2.

*Table 2. Parameters of a truck driver's workplace*

Parameter name	Dimension, mm
Distance from the lower edge unregulated steering wheel to the unloaded surface of the cushion seat cushion with the seat in the uppermost position the entire range of longitudinal adjustment, not less than	10...25
Driver's seat width, at least	90...120
Distance from the left inner wall of the cab to the axis of symmetry of the seat, not less than	95...135

The risk factors associated with being a professional truck driver are well known. The sedentary nature of the job, strictly regulated working and rest times, irregular sleep patterns, limited opportunities for physical exercise or access to nutritious food on the road—all contribute to an increased risk of numerous diseases. Back pain, hypertension, obesity, sleep apnea, diabetes, and depression were all common among this group. It has been reported that transportation workers have an increased risk of work-related injuries and that accidents account for only 17% of the burden of injury and illness among truck drivers (Lee et al., 2023).

The car seat is located in the cabin area, which is subject to dynamic influences. This determines the basic requirements for the adjustment of the driver's seat (European Parliament & Council, 2002). A car seat must provide:

1. comfortable position for the driver and passenger;
2. favorable distribution of pressure on different parts of the body;

3. maximum prevention of vibration and other dynamic influences;
4. transfer of necessary dynamic influences for the driver to “feel” the car;
5. fixation of the body in a certain position;
6. ability to change posture (Lemke et al., 2020; Aryal et al., 2023).

The car seat (cushion, backrest, and their fastenings) can withstand a horizontal load directed forward and backward, added to the center of gravity of the seat and equal to 20 times the weight of the seat, and a rearward moment of approximately 530 Nm. The comfort of the driver-passenger is ensured by the dimensions of the seat, the shape and elasticity of the cushion and backrest. The main load from the weight of a seated person falls on the buttocks (van Vreden et al., 2022).

Vehicle seats must be equipped with headrests. The minimum height of the headrest above point H when measured at an angle of 25° must be 700 mm. The width of the headrest must not exceed 170 mm, and it must not shift backward under a static load of 890 N by more than 102 mm.

Today, it is obvious that the profitability of transport companies depends on the health of their drivers, as physical illnesses and mental disorders increase the risk of accidents, prolonged downtime, and staff turnover. An interesting fact is that despite low health indicators, the vast majority of long-distance drivers independently assess their own working capacity as excellent. This is probably because they feel like their good working condition makes up for any potential impact of poor health on their ability to work, thanks to a bunch of factors, like a nice work environment and financial incentives. At the same time, the deterioration of the physical and psychological condition of drivers has significant destructive consequences for the economic viability of companies, which highlights the need to change management approaches to the organization of the driver's workplace, the regulation of work and rest regimes, and the creation of a regeneration system not only at the end of the trip, but also directly during it.

Truck drivers engaged in long-distance, regional, and local transport are exposed to a wide range of health risks, mainly related to their unique working environment. The multi-layered professional context of commercial vehicle driving is deeply rooted in institutional, organizational, political, and physical spheres and depends on effective regulation. The structure and organization of freight transport are determined by a highly competitive sector, excessive pressure on planning and delivery, and mileage-based driver compensation systems, within established and excessive working hours.

In general, it can be said that there are a number of interrelated stress factors in the work of long-distance drivers that exacerbate endemic risks in the transport sector, determine the health of drivers and the level of road safety, and affect the ultimate economic performance of the transport company.

The following are considered to be the key stress factors:

- excessively long working hours, excessive workload, and fatigue;
- high demands for constant mental alertness, despite predominantly monotonous tasks;
- a generally tense, stressful work environment;
- pressure due to tight schedules and timely deliveries;
- irregular shift work, leading to sleep disturbances;
- significant conflicts between work and personal life, chronic social isolation.

Long-distance truck drivers, who work in conditions of increased risk of chronic overload and negative impact on the physical systems of the body, need a system of accessible resources for a healthy lifestyle. In particular, this includes minimal health programs at rest stops, healthy food options, and the development of recommended mini-exercises for major muscle groups that can be performed directly in the cab or in waiting areas (terminals, warehouses, rest stops, etc.).

In the 1990s, a number of global transport companies launched various forms of health programs for their employees and achieved relatively good results in improving individual health indicators, while reducing healthcare costs and increasing productivity; however, these programs did not gain sufficient popularity. Given the fatal accidents involving truck drivers, which are costly in terms of both deaths and financial expenses, as well as speculation about their underlying causes, it is necessary to highlight the importance of the preventive function of wellness programs in reducing the risks associated with commercial driving.

As the results of empirical studies (van Vreden et al., 2022; Lee et al., 2023; Delhomme & Gheorghiu, 2021), it is currently difficult for long-distance truck drivers to access medical services: drivers are far from home, drive bulky and expensive trucks with trailers, and are responsible for cargo and its timely delivery. In such conditions, most truck drivers do not have physical access to medical facilities and are also limited in terms of time. Additional challenges in this situation include restrictions on payment options, lack of insurance coverage, and exclusion of medical insurance for emergency care. This confirms the need for thorough organization of preventive work, a conscious attitude of the employer towards health support, and the creation of a working environment based on the basic principles of ergonomics, which will increase the overall resource efficiency of long-distance drivers and be reflected in the stable operation of companies.

A number of modern developed countries in the European Union, as well as Australia, Israel, and the United Kingdom, have developed measures to establish and regulate the relationship between the health of long-distance drivers and the increased risks of fatigue, downtime, logistics disruptions, and road accidents (Delhomme & Gheorghiu, 2021). Despite significant institutional efforts to regulate, in particular, the establishment of working hours rules (HoS rules) for long-distance drivers, which determine the duration of continuous driving and rest periods, the problem remains relevant: truck drivers continue to have a high prevalence of back problems associated with time spent behind the wheel, as well as high rates of heart disease, which may be related to stress factors in their professional activities.

In addition, even many drivers who have health insurance cannot obtain medical care on the road due to inherent obstacles related to working conditions, such as irregular working hours and constant changes in geographical location. Furthermore, there are minimal resources available for health promotion and prevention, the organization of ergonomic workplaces, and individual therapeutic and psychological support for employees. Transport companies and truck workplaces, including mainly truck stops, freight terminals, and warehouses, provide very limited resources such as fitness centers, wellness programs, or preventive health risk assessments. The lack of these resources is at least partly responsible for the fact that seven out of ten truck drivers do not exercise regularly (Lee et al., 2023).

Employees engaged in stressful work tend to compensate for the heavy physical or psychosocial demands placed on them with unhealthy behaviors such as coping strategies involving unhealthy eating, stimulant use, and smoking. This is particularly true for long-distance truck drivers.

Individual details in the organization of the ergonomics of a long-distance driver's workplace and aspects of their life are also important. In particular, we are talking about:

- 1) orthopedic seat cushions, namely models with anatomical relief or zones of varying stiffness, which have a memory effect and improve blood circulation in the legs, provide proper pelvic support, and prevent numbness; it is also advisable to use lumbar cushions that fill the space between the back and the back of the chair, relieving excessive strain on the lumbar spine;
- 2) Regular short exercises on the road, which are critical for a sedentary lifestyle: it is necessary to integrate short warm-ups on the road every hour and a half to two hours, including bending, turning, and other exercises, as well as exercises at stops (lunges, squats, push-ups, etc.).
- 3) healthy sleep for the driver, which requires providing a sleeping place with an orthopedic mattress and establishing a work and rest regime;
- 4) ergonomic organization of space, achieved by using modern modular systems and organizers to maintain order and cleanliness in the cabin.

Although the link between a driver's job and lifestyle remains an important area for future research, it is already clear that the working environment of trucks has a significant impact on drivers' health in the form of pathological conditions, as well as disability due to accidents and injuries. Governments, industry, and healthcare providers face a huge challenge: how to maintain the profitability and competitiveness of the commercial vehicle sector while caring for the health and safety of drivers.

HoS regulations could do more to improve working conditions for truck drivers by addressing irregular working hours, night driving, and social isolation, introducing a system of therapeutic and psychological monitoring as part of the medical insurance provided by the fleet, and monitoring the ergonomics of the driver's workplace. Shifting the focus from simply monitoring time spent behind

the wheel or off the road to managing fatigue could improve control over truck drivers' work and working conditions without compromising road safety, while an alternative system of regeneration at rest stops organized by the employer would preserve the labor force and increase the economic efficiency of the company's operations.

## Conclusion

The increased occupational risk of health problems among long-distance truck drivers necessitates the development and implementation of a system of preventive measures—organizational, technical, sanitary, hygienic, and medical. The most important organizational measures include: exercising production control over compliance with hygiene standards; organizing rational work and rest regimes; psychophysiological selection of drivers; organization of psychophysiological relaxation rooms using various methods to maintain and restore working capacity; informing employees about the presence of occupational health risk factors in the workplace.

During medical measures, priority is given to preliminary and periodic, pre-trip, post-trip medical examinations of drivers, as well as dispensary observation of employees in risk groups with the organization of a complex of medical, diagnostic, and rehabilitation measures (medication, physiotherapy, sanatorium-resort treatment, etc.).

In this regard, special attention should be paid to preventive measures - the proper arrangement of the driver's workplace, taking into account ergonomic requirements, encouraging the driver to perform short sets of physical exercises while on the road, and establishing a healthy diet and work routine. Future research focused on the health of long-distance drivers should aim to measure more complex factors related to work, lifestyle, personal and environmental factors in order to determine the impact of these factors on driver health.

## References

- Aryal, A., Janssen, B., Casteel, C., et al. (2023). Applying the worker well-being framework to identify factors that impact turnover among long-haul truck drivers. *Workplace Health & Safety*, 71(9), 419–428. <https://doi.org/10.1177/21650799231178636>
- Bovenzi, M. (2010). A longitudinal study of low back pain and daily vibration exposure in professional drivers. *Industrial Health*, 48(5), 584–595. <https://doi.org/10.2486/indhealth.mswbvi-02>
- Clemes, S. A., Varela-Mato, V., Bodicoat, D. H., Brookes, C. L., Chen, Y.-L., Edwardson, C. L., Gray, L. J., Guest, A. J., Johnson, V., Munir, F., Paine, N. J., Richardson, G., Ruettinger, K., Sayyah, M., Sherry, A., Suazo Di Paola, A., Troughton, J., Yates, T., & King, J. A. (2022). The effectiveness of the Structured Health Intervention for Truckers (SHIFT): A cluster randomised controlled trial (RCT). *BMC Medicine*, 20(1), 195. <https://doi.org/10.1186/s12916-022-02372-7>
- Crizzle, A. M., McLean, M., & Malkin, J. (2020). Risk Factors for Depressive Symptoms in Long-Haul Truck Drivers. *International Journal of Environmental Research and Public Health*, 17(11), 3764. <https://doi.org/10.3390/ijerph17113764>
- Davies, H. W., Wang, F., Du, B. B., Viventi, R., & Johnson, P. W. (2022). Exposure to whole-body vibration in commercial heavy-truck driving in on- and off-road conditions: Effect of seat choice. *Annals of Work Exposures and Health*, 66(1), 69–78. <https://doi.org/10.1093/annweh/wxab078>
- Delhomme, P., & Gheorghiu, A. (2021). Perceived stress, mental health, organizational factors, and self-reported risky driving behaviors among truck drivers circulating in France. *Journal of Safety Research*, (79), 341–351. <https://doi.org/10.1016/j.jsr.2021.10.001>
- European Parliament & Council. (2002). Directive 2002/44/EC of 25 June 2002 on the minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (vibration). *Official Journal of the European Communities*. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02002L0044-20190726>
- Guest, A. J., Chen, Y., Pearson, N., King, J. A., Paine, N. J., & Clemes, S. A. (2020). Cardiometabolic risk factors and mental health status among truck drivers: A systematic review. *BMJ Open*, 10(10), e038993. <https://doi.org/10.1136/bmjopen-2020-038993>

- Hamido, S., Hamamoto, R., Gu, X., & Itoh, K. (2021). Factors influencing occupational truck driver safety in ageing society. *Accident Analysis & Prevention*, (150), 105922. <https://doi.org/10.1016/j.aap.2020.105922>
- Johnson, J. K., Vingilis, E., & Terry, A. L. (2021). Qualitative study of long-haul truck drivers' health and healthcare experiences. *Journal of Occupational and Environmental Medicine*, 63(3), 230–237. <https://doi.org/10.1097/JOM.0000000000002107>
- Lee, P., Xia, T., Zomer, E., van Vreden, C., Pritchard, E., Newnam, S., Collie, A., Iles, R., & Ademi, Z. (2023). Exploring the health and economic burden among truck drivers in Australia: A health economic modelling study. *Journal of Occupational Rehabilitation*, (33), 389–398. <https://doi.org/10.1007/s10926-022-10081-4>
- Lemke, M. K., Apostolopoulos, Y., & Sönmez, S. (2020). A novel COVID-19 based truck driver syndemic? Implications for public health, safety, and vital supply chains. *American Journal of Industrial Medicine*, 63(8), 659–662. <https://doi.org/10.1002/ajim.23138>
- Pritchard, E. K., Kim, H. C., Nguyen, N., van Vreden, C., Xia, T., & Iles, R. (2022). The effect of weight loss interventions in truck drivers: Systematic review. *PLoS One*, 17(2), e0262893. <https://doi.org/10.1371/journal.pone.0262893>
- Pritchard, E., van Vreden, C., Xia, T., Newnam, S., Collie, A., Lubman, D. I., de Almeida Neto, A., & Iles, R. (2023). Impact of work and coping factors on mental health: Australian truck drivers' perspective. *BMC Public Health*, 23(1), 1–13. <https://doi.org/10.1186/s12889-023-15877-4>
- Tsopa, V., Cheberiachko, S., Yavorska, O., Deryugin, O., & Bas, I. (2022). Increasing the safety of the transport process by minimizing the professional risk of a dump truck driver. *Mining of Mineral Deposits*, 16(3), 101–108. <https://doi.org/10.33271/mining16.03.101>
- van Vreden, C., Xia, T., Collie, A., Pritchard, E., Newnam, S., Lubman, D. I., de Almeida Neto, A., & Iles, R. (2022). The physical and mental health of Australian truck drivers: A national cross-sectional study. *BMC Public Health*, 22(1), 1–13. <https://doi.org/10.1186/s12889-022-12850-5>