

Traffic accidents, an ergonomic approach

Sadaoui Meriem *

University Center of Aflou (Algeria), m.sadaoui@cu-aflou.edu.dz

Received: 15/10/2023 Accepted: 12/01/2024 Published: 23/01/2024

Abstract:

There is no doubt that traffic accidents cost countries socially and economically, and there is no doubt that they intimidate members of society as well as decision-makers because of the human and material losses they cause. Therefore, it is necessary to combine the efforts of researchers, each according to his competence, in order to address this phenomenon. Through applied scientific contributions, the ergonomics specialist is among the most important specialists who have contributed to reducing the risk of traffic accidents. Through this article, we aim to clarify the importance of ergonomic applications in reducing traffic accidents.

Keywords: Ergonomics, Traffic accidents, Traffic environment, Pedestrians, Vehicles, Road.

INTRODUCTION

With every state of progress and development in the world due to the great scientific and technical revolution and, before it, the industrial revolution, this case, on the other hand, has features that may seem negative if countries do not improve their exploitation and control. The tremendous progress in the various means of transportation, especially cars, has been accompanied by many accidents as a result of their use, which has become a constant concern for individuals and governments alike. In light of the increase in car accidents and casualties, their percentage ranked second after the victims of wars and fierce battles.¹

That is why traffic accidents have become a source of concern for all members of society, and it is one of the major problems that most countries in the world suffer from, and this phenomenon increases dramatically in developing countries, because it drains the human and material resources of society, in addition to being a cause of psychological and social problems for its members, so facing this problem must be based on scientific foundations based on concerted efforts and specialized agencies.²

The World Health Organization called the phenomenon of traffic accidents a phenomenon of modern disease, so serious work must be done to eradicate it or at least mitigate its symptoms and effects. In the midst of the dangerous repercussions of the dilemma of the era, scientific research institutes specializing in the subject and international organizations worked to advance studies aimed at controlling and curbing the mechanisms of the phenomenon, as they were able to achieve impressive successes at the beginning of the seventies of the last century by pushing industrial companies to raise the level of vehicle security through mechanical improvements. In the same context, road engineering has made significant strides thanks to the modern equipment accompanying the preparation and paving of roads, and the human factor has become a study target, as scientific research has poured all its efforts in order to deepen the understanding of the contents of its components, especially the driver.

Industrialized countries have succeeded in reducing the risk of traffic accidents through huge efforts focused on raising the level of the driver's performance on the road and ways to increase their level of traffic awareness. The occupants of the vehicle during the accident, and the engineering design of the road has been developed and the traffic safety factor has mainly been integrated into it to reduce the effects of the impact and help the driver during the driving journey to avoid the traffic accident.³

Among the most important applied sciences that industrialized countries rely on to reduce the phenomenon of traffic accidents is ergonomics, a science that has become very reliable in achieving the quality of life for individuals.

It is concerned with all the tasks a person needs in the field of security, safety, and security, especially in the field of interior design, to achieve maximum efficiency and quality in the system of technical specifications and model standards, and to study the factors of security and safety.⁴

So, ergonomics as a science is no longer limited to the human-machine system within the individual's workplace, as it was previously, but rather a field of research concerned with all kinds of systems in which the human is connected to the environment and with various tools, equipment, and supplies, as well as the various places of his presence.⁵ This allowed ergonomics to contribute to researching ways to prevent and reduce the risk of traffic accidents.

1. The question we ask here is how ergonomics has contributed to reducing traffic accidents.

1.1 Ergonomic psychology

The term ergonomics was first used by the Polish naturalist Jastrzebouski in 1887 to mean the science of work. Then it was used in the industrial and mechanical fields by the English psychologist Merrill Murell in 1949. As for the United States of America, the most used term is "engineering." One of the most important characteristics of this science is the multiplicity of specializations and basic sciences on which it depends, such as anatomy, physiology, work psychology, and organization.⁶

1.2 The definition of ergonomics:

Bakraoui (2008) believes that ergonomics is a science related to understanding the interaction between humans and other components of their life systems, and that it is a profession that applies scientific theories, principles, data, and appropriate methods in designing what can give people a comfortable and safe life and better performance in the tasks of their personal and work lives. According to Hajaj and Osmani (2015), "ergonomics seeks to achieve the greatest degree of safety and eliminate the possibility of danger or injury for those who use machines, in addition to a feeling of contentment and happiness".⁷

Bosna (1986)⁸ sees ergonomics as a modern, multidisciplinary science whose applied goal is to improve human efficiency and security in all aspects of life.

While Wisner (1988) defines it as "a set of scientific knowledge related to man that is necessary for the development of working methods, machines, and various arrangements that can be used in the best manner and effectiveness." Muslim, Muhammad (2007). As for the International Ergonomics Association, it is a scientific study of human factors in their relationship to the work environment and the design of products and equipment.⁹

If we read these definitions with some consideration and examination, we find that they tried to define a general concept of ergonomics that calls for their application in all fields and not only in the field of work and factories, as it turns out that ergonomics can interfere wherever there is discomfort between man and his surroundings, whether this environment is machines used by him in his work or for other purposes, such as vehicles, for example, or the car, where ergonomic design can accurately contribute to making it more comfortable, safer, and less harmful to humans, and it can also intervene and participate in the design of the traffic environment in all its details, and this shows that facing the risk of accidents in all its details, and this shows that facing the risk of accidents in all its details.¹⁰

2. Ergonomic intervention to solve problems:

Ergonomics is based on precise scientific steps that are followed by the ergonomic specialist to solve almost all problems, starting

with identifying the problem and ending with implementing the solution, finding out and tracking its results.

In general, the ergonomics method for solving problems consists of six basic stages:¹¹

1. Is there an issue? What is its size and what is its importance? After that, the causes of the problem are determined using a deep investigation technique.

2. The stage of defining the problem is in which the evaluation criteria are first defined. Second, the current design is evaluated in light of the criteria that have been identified.

3. The stage of searching for possible solutions in which optimal solutions to the problem are proposed, so that the proposed solutions are short-term or long-term. All this is done in light of the obstacles that prevent the full implementation of the proposed solutions, or incentives that encourage their full implementation.

4. The alternatives evaluation stage: in which the possible solutions are evaluated in light of the criteria that have been identified. In general, three solutions are proposed in an initial order, from which one is chosen.

5. The stage of suggesting a solution to the administration: in which a proposal is made to the administration that has requested it or may not have requested it.

6. The stage of implementing the solution and carrying out the follow-up: in which the proposed solution is implemented and the results achieved are considered and followed up for a period until their stability is ensured.¹²

3. Traffic ergonomics:

(Dempsey, et al. 2000) has limited a large number of definitions of ergonomics and concluded that ergonomics is a science and technology, as it is a science that seeks to understand the relationship between man and work. It is also a technology that applies the theories of different sciences (psychology, sociology, physiology, biology, Physics, mechanics) on ergonomic designs to find a solution to its various problems.¹³

If we talk about the endeavors of ergonomics and its role in trying to contribute to alleviating the risk of traffic accidents, it becomes clear to us that this science:

- It seeks to provide the vehicle's safety and security and the traffic environment for the driver and pedestrians through the applied studies it provides and its contribution to the design of vehicles and roads, thus reducing traffic accidents.

- The application also creates a kind of comfort and psychological satisfaction for drivers and pedestrians, due to the availability of the car on safety and security conditions, as well as the suitability of roads for pedestrians and vehicles.

- Thus, ergonomics reaches an effective scientific and practical contribution to avoiding traffic accidents and warding off dangers before they happen.

4. Ergonomics and road design:

Ergonomics has been widely applied in the military and industrial fields, and its success in these two areas by improving performance and production, and promoting occupational health and safety, prompted the encouragement of its application in the field of agriculture and services, and among the service sub-fields that witnessed a wide application of ergonomics, are medicine and hospitalization, transportation, and communications.¹⁴ Road design and traffic regulation are two essential factors in traffic safety and are critical factors in traffic accidents. They constitute one of the main pillars of what is known as the three factors related to the road environment, on the one hand, to vehicles, and on the third hand, the behavior of road users, which interaction between its elements leads either to road safety and the prevention of accidents, or to the occurrence of traffic accidents with the exacerbation of results, and includes approaches to the street environment in particular and the design of the various elements concerned with it such as the width of the road and its sides, sidewalks, the field of vision, safety delays. This is to ensure the roads that are constructed or rehabilitated with their various categories and functions, as much as possible of safety for their various users (pedestrians, cyclists or motorized bikers, drivers and passengers of vehicles designated for transporting passengers or goods, people with special needs, the elderly)¹⁵

5. Ergonomics and traffic environment design:

is known to everyone, the elements that share responsibility in the occurrence of traffic accidents are the driver, the road and the

vehicle, and if the extent of the impact of each of the three elements varies, the role of roads in the occurrence of accidents has not been studied in depth in Algeria as a result of the poor registration of traffic statistics on the one hand and the lack of technical expertise on the other hand, specialized studies and international experience always emphasize the role of the road in the occurrence of accidents, so that the most famous guide in road design, which is the AASHTO Manual (2001) AASHTO confirms the concept of “forgiving highways” in order to consolidate the role of road engineers to make the road environment tolerant of driver errors, so that traffic safety specifications are included in all engineering elements of the road from fixed objects such as service poles, which reduces the risk of collision and thus the risk of the accident, and the columns of signs, services and advertisements that are fractious and close to the road reduce the damage resulting from its impact if the driver loses control of his vehicle, In addition, the sufficient field of vision at an intersection that is not governed by a traffic light or stop signs gives the driver sufficient time to avoid collision with vehicles crossing his path, and the presence of delays, potholes, slopes, and others increases the possibility of accidents.¹⁶

In most cases, we find that the spatial distribution of accidents cannot be organized on the roads, so we find places where accidents occur more than other places, especially intersections in the main streets and places crowded with pedestrians, and some studies have found that accidents that are repeated in specific locations can be treated or somewhat reduced. After making structural or design modifications to the streets, such as improving lighting, placing directional signs, and others. The engineering side plays a major role in sound traffic safety, maintenance and continuous evaluation, and increasing interaction and participation between traffic engineers in the various engineering sectors. And relying on the technical side in the traffic process, like the developed countries that were able to reduce traffic accidents through the use of modern technologies, and engineering fields related to traffic safety are engineering planning, organization, and design, and include participation in planning and organizing cities and focusing on traffic safety, engineering organization and design of intersections and roads and studying

Traffic volumes, participation in infrastructure planning, participation in setting technical specifications, organizing mass public transport and focusing on its use. The engineering aspect also includes engineering construction, maintenance, implementation, and management, such as placing safety means and warning signs.¹⁷

6. Driving and ergonomics:

Various statistics indicate that the driver bears a large proportion of the responsibility for falling into traffic accidents, by his behavior that often contradicts the rules of traffic safety, whether intentionally or unintentionally.¹⁸ where driving activity is among the behaviors related to safety and security that require the interaction of a set of behaviors carried out by the driver, such as maintaining the car, respecting traffic signals, speed and safety, buckling the seat belt, and sound driving during bad weather conditions. The driver's behavior is also related to controlling his psychological state such as anger and recklessness, not to mention maintaining a stable physical position, attention, and efficiency in cognitive processes, which would maintain safe driving that prevents exposure or endangerment of others, given that driving is an act that requires a high level of focus and attention.¹⁹

7. Pedestrians and Traffic Environment Design:

Attention has always prevailed when designing roads, in general, to the needs of the traffic of cars and motorized vehicles, while neglecting the needs of pedestrians.²⁰ and in a study by Bourqaba (2014) on the role of the human factor in traffic accidents, it was found that the category of road users most at risk as they are unsafe or victims of an accident, given the selfishness and lack of awareness of drivers, or a reason for them to be inattentive and careless, such as pedestrians violating traffic and the pedestrian lane, As well as getting out of the car in the wrong way, or without monitoring the road, walking and standing on the road, as it is noted from the behavior of pedestrians as follows: not complying with the places for pedestrians to cross or not using them, and their failure to appreciate the risks of violating traffic rules such as traffic lights, and walking on the road despite the presence of sidewalks, The absence of family guidance and the failure to educate the child to abide by traffic rules, the failure to respond to traffic awareness campaigns.²¹

In an interview with United Nations Radio, Dr. Hala Saqr, Head of the Injury and Violence Control Program at the WHO Regional Office for the Eastern Mediterranean, said:

“Road safety is not a product of the individual behavior of pedestrians only. Individual behavior is one of the factors that enhance or increase the risk of being exposed to a road collision or injury resulting from it, but they are other factors. There are many factors, so how can a person walking on the road or cross the road safely if the road is not planned so that there are designated places for pedestrians to cross. Man deals, moves, and walks in a context and a surrounding environment, and this environment, whether it is physical, cultural, economic, or social, either enhances his ability to make the right choice or the healthiest choice, or it is an environment that hinders him from making such a choice, and sometimes he is forced to make choices that may expose him. For some risks, not because he is not aware or sufficiently informed, but because we have not strengthened his ability to make the right choice and he has not been adequately empowered”.²²

Accordingly, we can conclude from this statement that pedestrians, although they constitute an important number in traffic accidents, their position is ignored in the philosophy of traffic security, and both Qasemi and Shaker (2016) attribute this to:

The interference of pedestrian traffic with the movement of vehicles: The reality in which many Algerian cities live reveals many defects due to the different areas allocated to them between each traffic station and the other, as well as the lack of connection with each other, as well as the presence of many beams that permeate these sidewalks, such as designated basins to plant trees for decoration and deception, and the irregularity of their positioning in a unified arrangement. In addition to the exploitation of these spaces by shop owners and sidewalk sellers and their transformation into private holdings that are used in their commercial activities, many pedestrians, especially when this is combined with heavy traffic in them, are forced to abandon them and go to the edge of the road to walk, to avoid a large number of intersections, congestion, and slow movement.²³

The absence of iron barriers on sidewalks: The need for pedestrians to move from one place to another and from one side of a road to another, is one of the issues raised in abundance in Algerian cities, a phenomenon that has gradually turned into a factor impeding the movement of vehicles in its various forms and sizes, through a large number of pedestrian interference. In the spaces and lanes left for cars at all times and at every point, without respecting either the traffic lights or the places designated for crossing, which often causes fatal accidents, especially on the main roads of cities, as a result of the speed that normalizes the movement of vehicles and the right of priority given to them by traffic lights. The city is impossible for pedestrians to cross, with maneuvering spaces left for them at specific points according to the traffic flow on the designated roads.

Overpasses and Underground Pedestrian Tunnels: The other feature that characterizes the performance of pedestrian traffic in cities, especially on the highways that cross it, revolves around the recorded lack of structures designated for safe passage from one side of a road to another, such as crossings or overpasses and underground tunnels, which raises a serious problem of how pedestrians would navigate in such a situation instead of risking of a road hazard. In addition, the models available in some cities, although few, are characterized by two main things: the distance between them, as well as the lack of scientific design process, as they are characterized by a high altitude that burdens the young before the old... which makes the idea of exploiting them very unpalatable for many pedestrians except for those who have to.

Indeed, some studies have indicated that pedestrians are more at risk of traffic accidents, as Odeiro (1997) found that 41% to 75% of road user deaths are pedestrians in urban areas, as most pedestrians and cyclists tend to choose the shortest path and the easiest, even if it was less secure. Jahan Mohamed Ibrahim and others (2011) indicated that traffic accident injuries in Egypt represent 45% of fatal injuries, 75% of which are related to pedestrian injuries. The same researchers also surveyed the perception of road danger and pedestrian injuries among the students of Ain Shams University in Egypt. Where the study included 1,324 students, it was found that 21.9% of them had suffered a pedestrian injury during the past six months, and 28.9% of

those had been admitted to a hospital or medical clinic as a result of the injury.²⁴

For this reason, those in charge of the order must follow the technical standards, engineering specifications, and safety and security rules with international standards to protect pedestrians and give them the right to walk in safe places.

We also find in many Algerian cities a lack of crossings and protected lanes for pedestrians their poor distribution, and the lack of warning signs before the crossing. The pedestrian crossing is considered among the intersections of great importance for the safety of pedestrian movement, and the design of the crossing differs according to several considerations, the most important of which is the speed specified on the road. The surface crossing is not safe for speeds of 70 km/h and above. In the circumstances of these speeds, the engineer must resort to upper or lower crossings, taking into account the justifications and the need for the crossing to be feasible, a matter that requires monitoring the volume of pedestrian movement and the nature and uses of the lands served by the crossing. In any case, when choosing the location of the crossing between intersections, the engineer must take into account that it is in an attractive location and the road to it is short and safe so that the crossing attracts pedestrians to use it instead of random crossing.

8. Ergonomics and vehicle design:

Mental or cognitive ergonomics is concerned with studying the mental and cognitive abilities and limits of the user, as well as studies on aspects of human mental performance (engineering psychology and human decision-making). Since the interactions between the user and the product are continuous throughout use, the product designer, in general, must be aware and sufficiently familiar with how these interactions occur, and specify the correct specifications that are ergonomically appropriate to the requirements of the work environment and the different uses of the systems and the surrounding environment.²⁵

Engineering psychology focuses on psychological theoretical applications in the design of systems and products, and aspects of engineering psychology tend to the studies of the psychological aspect of the user, or the emotional aspect of the behavior of the user

in the design, and the emotional aspect of behavior includes trends, motives, emotions, personality characteristics, and others, where the human action is issued on emotional influences that he is affected by and bears their features, within the context of the impact of the emotional side on the behavior of the user and then in determining the extent of his relationship with the product.

Designers must think about the necessity of complete harmony between the interior and exterior appearance of the car, and to achieve this purpose, we need to study the interior space available for passengers and luggage, how to design the seats, the instrument panel in front of the driver, the air conditioner, the distribution and components of the stereo system and the operating switches, and from here it becomes clear the necessity of designing and experimenting every small and large inside the car to ensure harmony.

Perhaps among the most important interior parts, we find the dashboard in the car, where the dashboard is one of the most important components of the car, as it informs the driver about the criteria he needs to drive his car correctly, and is often found directly in front of the driver, from the information provided by the speed, the engine system, The engine oil level, the fuel level, helps adjust the car's movement through the steering, brakes and various lights.

The dashboard is an important tool for driving the car and directing it towards its correct path in that it provides the driver with awareness of every situation, and this awareness turns into a movement that is taken to ensure good control.²⁶

As for the latest development that has been introduced to the design of vehicles for pedestrian protection, it is Autonomous Emergency Braking. The vehicle equipped with these brakes has sensors, usually installed behind the front grille and/or at the top of the vehicle behind the windshield, and it can scan the road and its sides in front of the car. In case it senses any danger of collision with any of the pedestrians (or vehicles) in front of the vehicle, the driver will be alerted, and/or the brakes will be applied automatically. Currently, these automatic brakes have a modest market penetration. However, their use is likely to increase rapidly with the European New Car Assessment Program (NCAP) and other similar programs

for this type of brake. As is the case with all modern technology, it takes several years before vehicles equipped with this system have a noticeable impact on the total number of collisions that occur.

Accordingly, a large part of the attention and effort during the design of the vehicle serves traffic safety, so that the accident can be avoided or mitigated, and the design for safety does not focus on the interior of the vehicle from elements such as the seat belt, air bag and other elements only, but includes the vehicle body and the engine, as the Scientific research and development has led to the improvement of many of these elements, so there are night vision tools to improve driving during the dark period and the development of the seat belt, as it has become more sensitive and recognizable for accidents, and other types of bags have been added, such as side air bags in the event of a side collision and roof air bags in the event of a vehicle rollover, head cushions have been developed in vehicles with sensors to detect the area around the vehicle, especially in dead corners, and modern systems have been developed to control vehicle speeds so instead of being satisfied with the old automated model, which limits speed in a mechanical way, satellites and road sensors will be used to control the speed of the next generation vehicles in order to match their speed with the maximum permissible speeds and environmental conditions, as is experimentally applied in some Scandinavian countries using the European system of Galileo satellites. The vehicle's steering was modified to respond to the collision and collapsed instead of rushing to the driver's chest, and the front design of the vehicle was modified to reduce the damage caused to pedestrians in the event of a vehicle colliding with the other development tools. Al-Janahi (2006) these elements were developed based on strict methodologies in scientific research in which scientists and experts from various fields such as engineers, psychologists, doctors, and others participated. From (Mohammadi and Foghali, 2019, p. 541).

9. CONCLUSION

Through the foregoing about the importance of confronting traffic accidents, with the contribution of ergonomics, it has been found that it is necessary to combine the efforts of all sciences that can provide practical scientific solutions that will mitigate the effects of these accidents on the individual and society alike.

It was also shown to us that eliminating traffic accidents must take a holistic view of their causes, so you cannot study their causes separately, for random interventions, or rather that do not take all the elements of the traffic environment into consideration, we think that they will not be effective solutions, but if they have results, they will be either little or instant results. Therefore, contributing to the eradication of the disease of the age requires the concerted efforts of all specialists, as well as the awareness of the individual and society as a whole of the importance and seriousness of this disease.

References:

1. Al-Bahith Journal for Academic Studies, Volume 06, Issue 03, Al-Bahith Journal for Academic Studies, 2019.
2. Boghazi. T and Amamra, S. Occupational pressure and its relationship to healthy driving behavior among party drivers, Journal of Human and Social Sciences, Issue 17, December 2014.
3. Bourguiba, M. The Role of the Human Factor in Traffic Accidents, Al-Hikma Journal for Social Studies, Volume 2, Issue 3, January 2014.
4. Boussena, M. Ergonomics and Development in the Developing World, Presentations of the First National Days of Work Psychology and Education Sciences, May 8th and 9th, 1986.
5. Bouzarifa, H. Al-Ahsan, H. Reasons for not using the sidewalk by pedestrians, activities of the International Forum on Ergonomics and its Role in Prevention and Development, Prevention and Ergonomics Laboratory, University of Algiers 2, 2012.
6. Bouzid Serragni, Khawla Bounab, The Social and Economic Repercussions of Traffic Accidents in Algeria
7. Essawy, A. Psychology and Production, University House for Printing and Distribution, Alexandria, 1998.
8. Hafry, Z. The importance of designing school spaces in the educational process, a field study of the reality of some Algerian

primary schools, Journal of Architecture and Child Environment, Child Lab, City and Environment, second issue, first year, Batna University 1, Algeria, 2016.

9. Hajjaj Rachida, Othmani Iman, The role of ergonomics in reducing traffic accidents - an ergonomic evaluation study of national, state and municipal roads in the wilaya of Oum El Bouagui - Activities of the third international forum on: Applications of ergonomics in developing countries: reality and prospects, October 26-27, 2015.

10. Hawalif, R. The Economic and Social Costs of Traffic Accidents in Algeria, Al-Bahet Journal, No. 11, 2012.

11. Hussein, J. and Al-Rifi, H. Cognitive ergonomics as an introduction to designing counseling and guidance systems in hospitals and treatment places, activities of the International Forum on Ergonomics and its Role in Prevention and Development in Developing Countries, Prevention and Ergonomics Laboratory, 2012.

12. Khawi, R. The design ergonomics approach to work accidents (a field study at the Akram Foundation for the manufacture of tiles in Barhoum -M'sila-) Master's thesis, Faculty of Humanities and Social Sciences, Mohamed Boudiaf University, Algeria, 2017.

13. Mekdad, M. Ergonomics in industrially developing countries: the need for it and obstacles to its application, the events of the international forum on ergonomics and its role in prevention and development, Prevention and Ergonomics Laboratory, University of Algiers 2, 29-30 April 2012.

14. Melody, S. and Bousseta, J. The Role of the National Center for Prevention and Road Security in Reducing Traffic Accidents, Volume 06, Issue 03, Al-Bahith Journal for Academic Studies, 2019.

15. Mohammadi, S and Foghali, B. Strategic Planning for the Prevention of Traffic Accidents, Al-Baath Journal for Academic Studies, Volume 06, Issue 03, Special Issue for the National Forum's Work on: Road Accidents Reality, Tragedies and Suffering - A Reading in the Reality of the Phenomenon, Repercussions and Solutions. 2019.

16. Moqaddam, W. Strategic management of the institution through the dashboard, University Education House, Alexandria, 2020.

17. Muhammad, Confronting Occupational Accidents between the Approaches to Ergonomics and Industrial Security, Journal of the Researcher in Humanities and Social Sciences, Volume 3, Issue 03, 2013.

18. Nuhair, S. and Mahdi Z. Ergonomics: between the necessities of identification and the fields of application, Proceedings of the International Conference: Educational Ergonomics/ Tripoli-Lebanon 30-31/03/2018.

19. Rahal, A. The Role of Training Development in Driving Schools in Ensuring Traffic Safety, Al-Bahet Journal in Humanities and Social Sciences, Volume 06, Issue 01, 2017.

20. Saad A. Attitudes of people with special needs towards the applications of ergonomics assigned to them and its impact on their psychological security, Al-Hikma Journal for Educational and Psychological Studies, Volume 03, Issue 06, 2015.

21. Saadi, L. The importance of corrective ergonomics in reducing work accidents: a field study to correct the control center (guardianship) at the Sonatrach Foundation, Master's thesis, Psychology of Work and Organization, University of Algiers 2, Algeria, 2012.

22. Saudi, A. and Belkhairi Wafaa, The Role of Psychological Factors in Drivers' Failure to Respect the Traffic Law, Cultural Dialogue, Volume 04, Issue 02, 2015.

23. Sharad, Y. Delays and their Relationship to Traffic Accidents in Legal and Sharia Perspectives, Journal of Legal and Political Research and Studies, Volume 6, Issue 2, June, pp. 521, 535, 2017.

24. Taibi, N. Implementing ergonomics in the educational process, the effectiveness of the second international forum on: The application of ergonomics in countries on the path of growth: ergonomics in the service of development, Part Two, May 28-29 2014, Algeria.

25. UN News, WHO highlights factors that put pedestrians at risk of death in Road Safety Week, May 9, 2013.

26. World Health Organization, Pedestrian Safety, Road Safety Training Manual for Decision Makers and Practitioners, Middle East Regional Office, 2013.

Margins:

- ¹ Bouzid Serragni, Khawla Bounab, The Social and Economic Repercussions of Traffic Accidents in Algeria
- ² Melody, S. and Bousseta, J. The Role of the National Center for Prevention and Road Security in Reducing Traffic Accidents, Volume 06, Issue 03, Al-Bahith Journal for Academic Studies, 2019.
- ³ Mohammadi, S and Foghali, B. Strategic Planning for the Prevention of Traffic Accidents, Al-Baath Journal for Academic Studies, Volume 06, Issue 03, Special Issue for the National Forum's Work on: Road Accidents Reality, Tragedies and Suffering - A Reading in the Reality of the Phenomenon, Repercussions and Solutions. 2019.
- ⁴ Sharad, Y. Delays and their Relationship to Traffic Accidents in Legal and Sharia Perspectives, Journal of Legal and Political Research and Studies, Volume 6, Issue 2, June, pp. 521, 535, 2017.
- ⁵ Hafry, Z. The importance of designing school spaces in the educational process, a field study of the reality of some Algerian primary schools, Journal of Architecture and Child Environment, Child Lab, City and Environment, second issue, first year, Batna University 1, Algeria, 2016.
- ⁶ Saadi, L. The importance of corrective ergonomics in reducing work accidents: a field study to correct the control center (guardianship) at the Sonatrach Foundation, Master's thesis, Psychology of Work and Organization, University of Algiers 2, Algeria, 2012.
- ⁷ Essawy, A. Psychology and Production, University House for Printing and Distribution, Alexandria, 1998.
- ⁸ Boussena, M. Ergonomics and Development in the Developing World, Presentations of the First National Days of Work Psychology and Education Sciences, May 8th and 9th, 1986.
- ⁹ Khawi, R. The design ergonomics approach to work accidents (a field study at the Akram Foundation for the manufacture of tiles in Barhoum -M'sila-) Master's thesis, Faculty of Humanities and Social Sciences, Mohamed Boudiaf University, Algeria, 2017.
- ¹⁰ Taibi, N. Implementing ergonomics in the educational process, the effectiveness of the second international forum on: The application of ergonomics in countries on the path of growth: ergonomics in the service of development, Part Two, May 28-29 2014, Algeria.
- ¹¹ Nuhair, S. and Mahdi Z. Ergonomics: between the necessities of identification and the fields of application, Proceedings of the International Conference: Educational Ergonomics/ Tripoli-Lebanon 30-31/03/2018.
- ¹² Muhammad, Confronting Occupational Accidents between the Approaches to Ergonomics and Industrial Security, Journal of the Researcher in Humanities and Social Sciences, Volume 3, Issue 03, 2013.
- ¹³ Mekdad, M. Ergonomics in industrially developing countries: the need for it and obstacles to its application, the events of the international forum on ergonomics and its role in prevention and development, Prevention and Ergonomics Laboratory, University of Algiers 2, 29-30 April 2012.
- ¹⁴ Al-Bahith Journal for Academic Studies, Volume 06, Issue 03, Al-Bahith Journal for Academic Studies, 2019.
- ¹⁵ Rahal, A. The Role of Training Development in Driving Schools in Ensuring Traffic Safety, Al-Bahet Journal in Humanities and Social Sciences, Volume 06, Issue 01, 2017.
- ¹⁶ Saad A. Attitudes of people with special needs towards the applications of ergonomics assigned to them and its impact on their psychological security, Al-Hikma Journal for Educational and Psychological Studies, Volume 03, Issue 06, 2015.
- ¹⁷ Hajjaj Rachida, Othmani Iman, The role of ergonomics in reducing traffic accidents - an ergonomic evaluation study of national, state and municipal roads in the wilaya of Oum El Bouagui - Activities of the third international forum on: Applications of ergonomics in developing countries: reality and prospects, October 26-27, 2015.
- ¹⁸ Saudi, A. and Belkhairi Wafaa, The Role of Psychological Factors in Drivers' Failure to Respect the Traffic Law, Cultural Dialogue, Volume 04, Issue 02, 2015.
- ¹⁹ Boghazi. T and Amamra, S. Occupational pressure and its relationship to healthy driving behavior among party drivers, Journal of Human and Social Sciences, Issue 17, December 2014.
- ²⁰ World Health Organization, Pedestrian Safety, Road Safety Training Manual for Decision Makers and Practitioners, Middle East Regional Office, 2013.
- ²¹ Bourguiba, M. The Role of the Human Factor in Traffic Accidents, Al-Hikma Journal for Social Studies, Volume 2, Issue 3, January 2014.

²² UN News, WHO highlights factors that put pedestrians at risk of death in Road Safety Week, May 9, 2013.

²³ Hawalif, R. The Economic and Social Costs of Traffic Accidents in Algeria, Al-Bahet Journal, No. 11, 2012.

²⁴ Bouzarifa, H. Al-Ahsan, H. Reasons for not using the sidewalk by pedestrians, activities of the International Forum on Ergonomics and its Role in Prevention and Development, Prevention and Ergonomics Laboratory, University of Algiers 2, 2012.

²⁵ Hussein, J. and Al-Rifi, H. Cognitive ergonomics as an introduction to designing counseling and guidance systems in hospitals and treatment places, activities of the International Forum on Ergonomics and its Role in Prevention and Development in Developing Countries, Prevention and Ergonomics Laboratory, 2012.

²⁶ Moqaddam, W. Strategic management of the institution through the dashboard, University Education House, Alexandria, 2020.