

Behaviour Modelling and Safety at Work on a Construction Site

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Abstract:

The concept of the method based on the behavioural approach as the method minimizing hazardous behaviours of employees has been discussed in this article. The main focus has been laid upon one of the largest economic sectors, i.e. is the construction industry. Thereby, risks arising from an improper behaviour of construction workers, and also a factor contributing to it, have been described here. The influence of employee's age and day time have been analysed in terms of accident rates. The attention was also paid to alcohol consumed by workers during and after their work and to the influence that it has on dangerous behaviours. Different ways of approaches to the worker to improve safety and hygiene at work, as well as the manner in which the approach to employee should change depending on the situation, have been presented too.

Keywords: behaviour, behavioural, accidents, method.

1. Introduction

The economic sector, of which the construction industry is a part, is the most rapidly developing branch of global economy. It is due to the fact that this sector employs lots of millions of workers. It is estimated that construction workers in industrialised countries account for 5-10% of the workforce [16]. The analysis of data from the construction industry from 2017 shows that this sector took the 8th position in terms of accidents at work across all economic sectors. The frequency of accidents in this sector amounted to 6.2 persons out of 1000 workers [8]. Most accidents are generated by private companies. The fact that private companies often employ fewer people and inexperienced workers can have an impact on such a situation. Private enterprises are often very small companies, sometimes even one-person companies. Therefore, they do not attach any importance to organizing trainings, mainly due to the lack of proper financial resources to provide proper trainings. Employers running small companies are often unaware of the applicable regulations, as well as the obligations they should comply with in relation to employees [17]. Most frequently reported accidents at work are incidents on the incorrectly installed scaffolding, lack of proper trench safeguards, failure to use individual protective measures, including a head helmet and protection against falls from height [5]. In Europe, about 17.5% of accidents are those in the

construction sector compared to other sectors, which brings about one million unfortunate incidents. Construction workers are exposed to various chemical, physical, biological factors or ones related to the site of job performance and the way of its performance [6].

Scaffolding is used to support work on the construction site, it relates to work at a height or in places of hindered access. The occurrence of dangerous situations concerning scaffolding pertains to their broad application or no common sense of using them [2]. Scaffolding is quite fairly treated as an irrelevant element and then they pose threat itself. The majority of accidents relating to work on the scaffolding ends in a fall from height, and in the aftermath it results in serious detriments to health, and also in threat to life. This problem is prevalent all over the world, most often these occurrences are related to construction defects, poor technical conditions, a humane factor, improper setting, construction overload or lack of securities. Employees often do not use individual protection measures for their own comfort, not utterly realizing hazardous situations [3]. Albert Bandura said: “Fortunately, most human behaviour is learned observationally through modelling from others” [18].

The analysis of I parameter, that is the impact of accidents on the aggrieved person’s age.

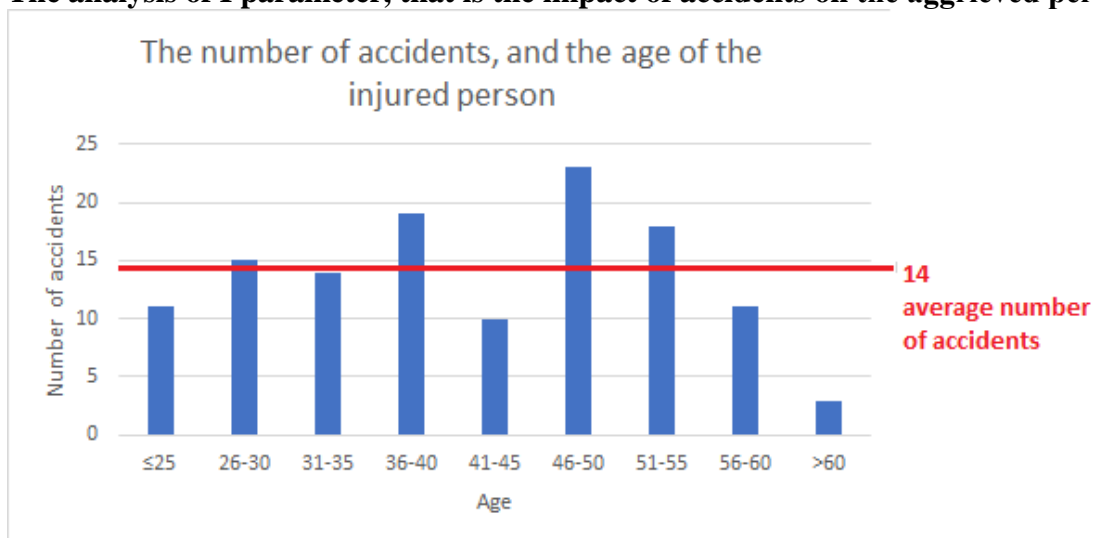


Fig. 1. The number of accidents and the age of the injured person

On the above diagram (Figure 1) it is indicated that most frequent accidents occur in the age bracket of 46-50, 31-35 and 51-55 years old. The average age of the harmed person is 42 years old, whereas average number of victims is 14 people. In the age bracket of 46-50 years old the number of the aggrieved amounted to 23 people, which comprised 18.6% of the overall number of people. Based on the data, a growth in the number of accidents in terms of age cannot be identified.

The analysis of II parameter, that is the impact of the number of accidents on the day time.

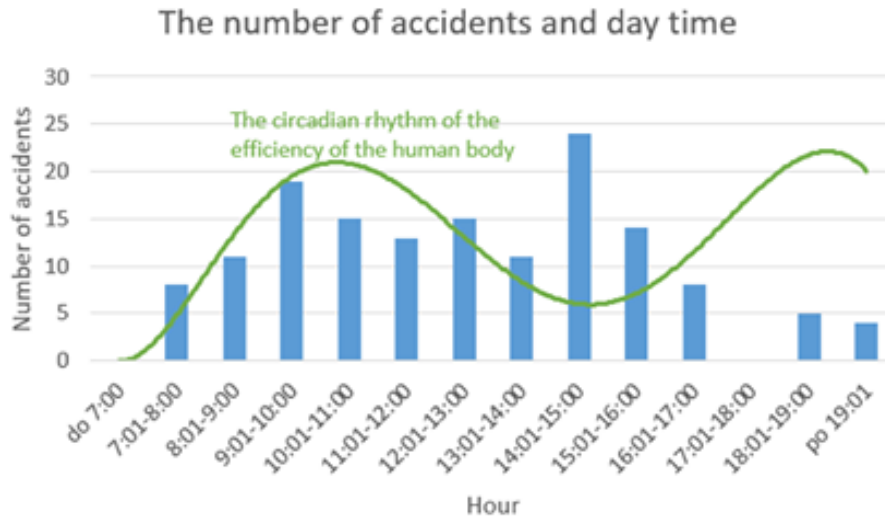


Fig. 2. The number of accidents and day time

By analysing this diagram (Figure 2) it can be noticed that the daily rhythm of the human body is similar to a bar graph. The most frequent accidents occurred between 02:01 p.m. – 03:00 p.m., which is the 7th working hour being repeatedly the last work hour and 09:01 a.m.-10:00 a.m., which is the 3rd working hour before the lunch break.

The analysis of III parameter, that is the impact of the age of the aggrieved person on hour of accident occurrence at work.



Fig. 3. The age of the aggrieved person and time of the accident

Based on this diagram (Figure 3) it can be observed that accidents occur most often between 09:00 a.m. - 12:00 a.m. and 12:00 a.m.- 03:00 p.m. irrespective of the age bracket. Working hours, where accidents are most frequent, overlap with the data of the previous diagram. Nonetheless, workers in the age bracket of 51 – 55 suffer accidents most often. These workers already have richer experience and greater self-confidence at workplace, and this self-assurance and knowledge of many things can reduce reactions and caution.

The analysis of IV parameter, that is the impact of an annual quarter upon accidents at work.



Fig. 4. A yearly quarter and accidents at work

The analysis of this diagram (Figure 4) allows to claim that accidents most often take place in III quarter of the year, which is caused by intensiveness of performed jobs in this quarter and the impact of weather conditions that significantly affect work in the construction industry.

Parameters such as day time, age, season or quarter of the year have a different effect on the number of accidents. A wide variety of factors is heavily correlated with personal predispositions of an employee and working environment, where workstation is situated [11].

2. The influence of Alcohol

Consumed alcohol has an extremely harmful effect on the human body, it takes 3rd place in terms of health risk factors [12]. One of the effects of the consumed alcohol is altered behaviour caused by the interactions of substances with the brain. Alcohol disrupts brain communication, it affects the conduct and the mood. The common alcohol effect is a disturbed speech and problems with coordination [10].

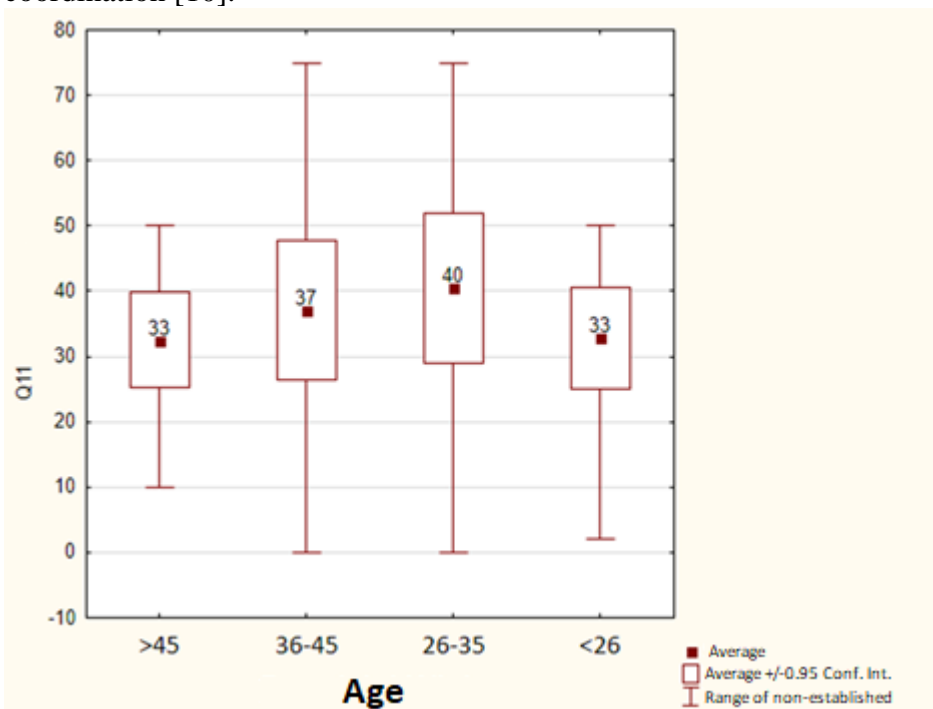


Fig. 5. The amount of consumed alcohol and age [9]

By comparing this diagram (Figure 5) with the previous diagrams of parameters analysis, a certain analogy can be recorded. Most accidents occur within the age bracket of 36-45 years old, for which the average consumption of alcohol amounts to about 37 grams. The smaller consumption of alcohol, the more decreased number of accidents at work can be noted and this analogy can be seen based on the age bracket of 26 years old, where the amount of consumed alcohol and the number of accidents in this bracket are insignificant.

Statistics prove that the issue concerning accidents after alcohol consumption is mainly related to the building industry since about 40% of accident sufferers are representatives of the construction sector. Alcohol translates into the lack of concentration and a failure to abide by basic safety rules at workplace. Employees under the influence of alcohol often show signs of daring and failure to use individual safeguard measures. The acceptance of the building, on the premises of which you could find a bottle of vodka, was a standard, whereas in the contemporary days such situations are rarely observed [7].

3. Why Modification of Conducts is so Important?

According to statistics, accidents at work happen most often as a result of worker's misconduct. For many reasons, these workers act in a way threatening their safety or that of co-employees at work.

The most frequent dangerous behaviours at workplace include:

- Insufficient level of knowledge of safe job performance,
- Inappropriate determination of the occupational risk level,
- Improper work organization,
- Positive effects of dangerous conducts,
- Ignorance of the scope of work safety.

The application of the behavioural approach influences improvement to safety at work, it involves the identification and analysis of dangerous actions of employees and managers. The next step is the recognition of reasons and modification. The modification results from the exclusion of dangerous reasons of behaviours and motivation of workers to maintain safety. Ludwig von Mises in his book writes: "Behaviourism proposes to study human behaviour according to the methods developed by animal and infant psychology. It seeks to investigate reflexes and instincts, automatism and unconscious reactions. But it has told us nothing about the reflexes that have built cathedrals, railroads, and fortresses, the instincts that have produced philosophies, poems, and legal systems, the automatism that have resulted in the growth and decline of empires, the unconscious reactions that are splitting atoms." [14].

The most popular method of specification of reasons for misconduct is observation and analysis. In some enterprises safe conducts are also covered by observation.

Employee's behaviour is affected (both positively and negatively) by various factors. Not only the identification and elimination are important in this method but also identification and reinforcement of safe workers' actions.

Exemplary negative behaviours include:

- Time pressure,
- Risky co-workers' conducts,
- Poor organization of workstation,
- Superior's aggressive conduct,
- Home issues,
- Stress on the way to workplace.

Exemplary reasons for positive behaviours include:

- Safety & Hygiene instructions,
- Training courses and meetings,
- Safety & Hygiene posters,
- Warning and alarm systems,

- Safe co-workers' conducts,
- Safety signs and boards.

Factors of behaviours are:

- Persons – an example is a co-worker who establishes individual protective measures when getting down to work,
- Objects – an example is the disorder left by the preceding employee from the previous shift,
- Site – an example is the location of workstation with respect to the safe passage next to the machine,
- Event – an example is a conversation, which can induce safe conducts at the given workstation.

As for the behavioural method, the conduct has a decisive meaning. It is possible to observe it thanks to the fact that it is visible. The observation and analysis of employee's conduct is much easier compared to an attempt of observation of these behaviours or motives. Jacque Fresco once said: "Human behaviour is subject to the same laws as any other natural phenomenon. Our customs, behaviours, and values are byproducts of our culture. No one is born with greed, prejudice, bigotry, patriotism and hatred; these are all learned behaviour patterns. If the environment is unaltered, similar behaviour will reoccur" [4].

Consequences of conducts are important, their positive reception, that is commendations for safe way of action and negative ones, that is bringing attention to the dangerous conduct. A lot of people behave in such way to avoid negative consequences. B.F. Skinner wrote: "A person who has been punished is not thereby simply less inclined to behave in a given way; at best, he learns how to avoid punishment. Some ways of doing so are maladaptive or neurotic, as in the so-called 'Freudian dynamisms.' Other ways include avoiding situations in 'which punished behaviour is likely to occur and doing things which are incompatible with punished behaviour. Other people may take similar steps to reduce the likelihood that a person will be punished, but the literatures of freedom and dignity object to this as leading only to automatic goodness. Under punitive contingencies a person appears to be free to behave well and to deserve credit when he does so. Non-punitive contingencies generate the same behaviour, but a person cannot then be said to be free, and the contingencies deserve the credit when he behaves well." [13].

Consequences are also positive, the most effective is application of rewarding for positive conducts in this whole process of change to behaviours.

Based on the research findings of CIOP-PIB, in workplaces where rewards for safe conducts are applied, workers:

- More readily submit own suggestions concerning an improvement to safety at work,
- Pay attention to their co-employees if they perform a job in a dangerous or improper way,
- Report subcontractors' hazardous behaviours to Safety & Hygiene services.

To successfully improve safety at workplace through the change of workers' conducts, sometimes more attention should be dedicated to reasons, not consequences.

More attention ought to be devoted to reasons for conducts when employees:

- Do not know what to do,
- Do not know how to do it,
- Must overcome obstacles to perform a certain job.

More attention should be devoted to consequences of behaviours when employees:

- Know well what to do,
- Choose a dangerous conduct by making selection,
- To perform a job safely they only need a motivating factor.

Before getting down to the modification of behaviours, conduct which is the problem should be defined, and safe conducts, which is expected from the employee. The next step is reflecting what cause has an effect on the fact that the worker behaves in such a way, preparation of the list of consequences of behaviours essential for the employee, including the ones which are:

- positive and negative,
- immediate and delayed,

- direct and indirect,
- certain and uncertain [1].

4. BBS – Behaviour - Based Safety

Method for the behavioural approach has been applied for several decades, however its efficiency in the last years contributed to an increase in its popularity in Polish companies too. Based on the study results, which were conducted in 2001 by an American psychologist, Edward Scott Geller, it can be concluded that exerting impact on workers' behaviour is more effective than changing the attitude towards work safety. The change to behaviour results in a change to thinking and attitude. The behavioural method concerns the way of modification of conducts to ultimately deprive of the humane factor as a reason for accidents at work. If you assume that lack of focus, risky behaviours, carelessness or flaws in thinking are psychological variables, their disposal may follow through application of the method of behavioural approach. In order to achieve it, the behavioural audit, which will be comprised of the following steps, needs to be implemented:

Step 1, that is the phase of design, starts with development of instructions to implementation of this method, its realization and monitoring. A large team, particularly of lower-rank employees is engaged in this phase, where a few people, who will be observing conducts of remaining employees will be chosen. Especially vital is here development of the records of dangerous misconducts, potentially hazardous and accidents.

Step 2, that is the executive phase, allows for such rules as cyclicity of observations, universality of observations, objectivity of evaluation, complexity of observations, compatibility of observations and conveyance of return information to an employee is the most essential rule in the entire process. In this phase, particular guidelines regarding the observation plan are laid down, including training materials for self-education, procedures, instructions, observation cards.

Step 3, that is evaluation and monitoring, the observer should hold a conversation with an employee about the feedback in this phase. The interlocutor informs in this talk of the observed behaviours, which are supposed to identify whether the performed job was carried out safely and whether its difficulties were caused by time pressure, rush, ergonomics at workstation or work pace. The general rules of imparting information is giving it immediately after observation, discussion of improper behaviours consequential to health, evaluation of behaviour and not specific people, application of assertive messages is also important.

Step 4, that is parameterization, in spite of the fact that this method originates from social theories, it should account for criteria of dependability, unreliability of carrying out of observations and relevance. Designation of the coefficient will allow to prevent faults in observations.

To sum up, about 60 % of companies all over the world have successfully implemented the method based on behavioural attitude. In preparation of this method, some special attention should be paid to the fact that the effects of its implementation are visible not earlier than after the elapse of long time. It is to a large extent affected by psychics of adults, at which it is very difficult to influence the stance and way of thinking. The economic profits, which through an implementation of the method based on behavioural attitude are brought to the company, are first and foremost related to the payment of compensation on the grounds of the accident, and also minimization of costs of payments for sick leaves. The overriding advantages of this method include:

- improvement to workers' safety and minimization of the humane factor as the reason for accidents at work,
- improvement to work culture,
- setting new goals of safety improvement,
- employees' self-reflection with regard to dangerous conducts,
- possibility of learning through modelling positive behaviours,
- defining new fields of risk [15].

The behavioural approach is aimed to improve the level of safety in the enterprise. The reasons for employees' behaviours are often strongly complex and difficult to resolve. This method

poses the question why people do it. To ensure that this method works properly it is necessary to check what people do, when, where and in what manner they perform their job.

- Workers should engage voluntarily. It does not mean that from the beginning they need to show a correct posture as it is not quick to change, they must be ready and become engaged in the process of behavioural transformation. Observation of behaviour and information about it are passed on to the worker so that they could obtain a full picture of benefits of participation in the behavioural method,
- Such process takes place in stages. The first phase begins with planning, organizing, consulting and studying,
- Specifying the character of required observations,
- Employees are asked for observing each other and recording particular behaviours to eliminate them.

Very few workers are going to behave in a way that brings a counterproductive effect, which results in a higher likelihood of accident [8].

5. Conclusions

There is an equal correlation between employee's age and the day time or amount of consumed alcohol, and the accident rate. To minimize it, it is necessary to scrutinize hazardous employees' conducts, and also the factors, which lead to it and try to eliminate them. In addition, it can be observed that the average age, at which there comes to the most accidents is about 50 years old. People at this age quite often fall into routine, midlife crisis. It can explain carelessness or indifference to safety and hygiene rules. To reduce the effect of human factors on the accident rate, a behavioural approach largely consisting in observation of conducts and conversation with the worker is perfectly suitable.

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