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Safety monitoring analysis in a construction site using eye-tracking method

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Abstract: Construction work is one of the most dangerous business lines. As a result of occupational accidents in construction works, there are consequences that will affect human life such as injury and death, as well as serious financial losses. Especially in developing countries, despite the increase in precautions regarding occupational safety, occupational accidents continue to occur. Human behavior is an important factor in construction work accidents. In the sector where generally low-educated level workers work, analyzing the precautions and occupational safety training results are important to reduce construction work accidents. Eye-tracking technique, a technology that is spreading around the world, finds its place in different sectors. Especially with the use of mobile eye trackers instead of fixed eye trackers, this eye-tracking technology has also become usable in site implementations in the construction industry. In the construction sector, some studies are done especially on occupational safety issues using eye-tracking techniques in recent years. In this study, a site study was done with construction workers using a mobile eye-tracking approach by creating a track with different hazard sources in construction where a fatal occupational accident occurred. In this context, the attention levels of construction workers against different sources of danger and the risk of accidents created by these sources were measured with the mobile eye-tracking technique. The results obtained from the study were shared with the occupational safety experts on the site and the results are interpreted. All workers participating in the experimental study were workers that previously got occupational safety training. Therefore, according to the outcomes of this experiment, the effectiveness of the occupational safety training they received is measured and some suggestions are made.

Keywords: Construction safety, eye-tracking method, occupational accident, hazard detection.

1. Introduction

Despite drastic measures in occupational health and safety regulations to decrease the number of injuries and fatalities in the construction sector, these numbers are still very high. Occupational health and safety are not developed effectively in the construction sector, because there is not enough investment in new methods and technologies in this field (Pinheiro et al., 2016). It is very important to identify potential hazards at construction sites and to take preventive measures for construction workers to decrease or eliminate the risk of death and injuries caused by occupational accidents. For this reason, it is important for construction workers to learn how to detect different kinds of hazards they can face at the construction site and how they can be recognized the hazards in different site conditions (Hinze & Teizer, 2011). The construction site is a primarily dangerous work environment that necessitates all human senses and attention. Many work accidents occur due to the fact that the workers do not perceive and do not notice the dangers at the construction site. To find out the reasons why some hazards were not seen, it is very important to examine what workers' pay attention to and how they perceive objects on the construction site. Therefore, within the scope of this study, the attention levels of a group of construction workers to the sources of danger were measured by using eye-tracking technology, and the results were examined. Creating a statistical data pool over the points where the eye is focused by using eye tracker devices that detect the movements and condition of the eye at a particular moment is called the eye-tracking technique. It is divided into two types according to the use of the eye-tracking technique. The active eye-tracking technique helps to develop activities that can be directed simultaneously with the movements of the eye. The passive eye-tracking technique, on the other hand, is the technique in which the eye movements of the subject do not directly guide the activity, but the data obtained from eye movements (Akgün, 2010).

The goal of the eye-tracking technique is to analyze data about the behavior and approach of people. This technique allows people to determine what they pay attention to, which points they focus on, what they ignore, or what they are uncomfortable with on a computer or through mobile eye-tracking glasses (Russell, 2005). Within the scope of this study, firstly the literature on eye-tracking has been searched and summaries of some important studies have been given. Then, information about eye-tracking and mobile eye-tracking technology and system is given. Eye-tracking applications in civil engineering and occupational safety have been examined and the results were evaluated by working with mobile eye-tracking at the construction site where a fatal work accident occurred.

In the last decade, eye-tracking technology has been used in many fields, and it is a rapidly developing and growing technology that attracts the attention of researchers. Eye-tracking is the process of measuring the point of view (the point the subject is looking at), and this measurement is made with an eye tracker. An eye tracker is a portable hardware instrument that measures eye movement (Li et al., 2020). Within the scope of this study, important studies on eye-tracking technology in recent years are given in Table 1.

Table 1. Literature review.

Author	Year	Performed study
S. Comu et al.	2021	In this study, the manner of different groups of trainees towards advanced safety training with eye-tracking is evaluated. In this context, the eye movement of some trainee groups was monitored during both traditional safety training and an eye-tracking VR-based training method. According to the collected data, the reaction of the experimenters to the training stimulus was identified, and the focus, attention and adaptation levels to the training were measured (Comu, 2021).
J. Li et al.	2020	In this study, wearable eye-tracking technology is used in the identification and classification of mental fatigue of construction operators (Li et al., 2020).
Y. Han et al.	2020	In this study, measurement indexes of cognitive load, construction site condition factors and the impact factors of construction safety hazards were determined using eye-tracking technique (Han et al., 2020).
J. Li et al.	2019	In this study, the effectiveness of wearable eye-tracking technology in measuring the mental fatigue and danger perception ability of operators was evaluated. This study offered some insights based on the paper's findings. Such insights will contribute to effective safety interventions and safety education to reduce construction site accidents (Li et al., 2019).
R. Takahashi et al.	2018	In this study, a system is proposed to collect gaze fixation data for a three-dimensional model of a product using eye-tracking glasses (Takahashi et al., 2018).
S. Hasanzadeh et al.	2018	By using the eye-tracking technique, measures were developed against the risk of falling from a height, and attention measurement analysis was performed in the construction sector (Hasanzadeh et al., 2018).

A. A. Kogkas et al.	2017	For patient safety, a robot arm was made using the eye-tracking technique and robotic attachments, and its efficiency in the operating room was evaluated (Kogkas et al., 2017).
S. Hasanzadeh et al.	2016	The situational awareness of employees was measured using the eye-tracking technique at a construction site. In this regard, recommendations have been made based on the data on how much attention is paid to warnings in the workplace (Hasanzadeh et al., 2016).
L. Palettaa et al.	2015	By using the eye-tracking technique, the psychophysiological states of the subjects in a stress environment are observed (Patella et al., 2015).
S. Dowiasch et al.	2015	The effect of aging on eye movements was investigated using the eye-tracking technique. The effects of aging on life performance were investigated with subjects from different age groups (Dowiasch et al., 2015).
A. Lanata et al.	2015	Research has been done on the HATCAM system. Data have been obtained from the use of the eye-tracking technique in both dynamic and static situations (Lanata et al., 2015).
M. L. Mele et al.	2012	A general view has been formed about the applications of the eye-tracking technique in psychological fields. A comparison has been made between remote eye-tracking devices and wearable eye-tracking devices (Mele & Federici, 2012).
C. W. Cho et al.	2012	In the study on fixed and mobile use of eye-tracking technique, the ideal situation was investigated for four different situations (Cho et al., 2012).
M. Vidal et al.	2012	The use of eye-tracking techniques in mental health monitoring has been investigated. The results of the experiments performed in the clinical setting and in daily life were evaluated (Vidal et al., 2012).
J. M. Franchak et al.	2011	It is the study of what babies see in their daily interactions with the eye-tracking technique. In this study, the opportunities and the availability of information are investigated on a visual exploration of babies (Franchak et al., 2011).
B. M. t. Hart et al.	2009	A comparison of real-world data with the data obtained in the laboratory environment using the eye-tracking technique has been made (Marius't Hart et al., 2009).
A. Bulling et al.	2009	Using electrooculographic eye trackers, it has been tried to show that these devices are shown a suitable measurement technique to recognize reading activity and eye-based human-computer interaction (Bulling et al., 2009).
F. Schumann et al.	2008	The concept of salience was investigated by using the eye-tracking technique based on human nature. Results regarding the free exploration of visual inputs have been observed in studies conducted indoors and outdoors (Schumann et al., 2008).
N. Reisen et al.	2008	A consumer behavior study has been conducted to decide to purchase a mobile phone using the eye-tracking technique (Reisen et al., 2008).

As seen in Table 1, many studies on the eye-tracking technique have been carried out until today. Compared to other sectors, the work done in construction works is quite new and few. It is observed that especially studies related to work safety in construction works have been made. When the studies on work safety are examined; It is understood that the studies are generally carried out with students and with the static eye-tracking method on the computer with the pictures taken at the site. In this study, construction workers working in an area where there are sources of danger that may cause work accidents were dynamically conducted with mobile eye tracking in the construction site environment which is a university research center building where a fatal occupational accident occurred. Thus, the attention levels of workers working in the real construction site environment and with different experience durations against the sources of danger were measured. By evaluating the results, it was ensured that the worker training and construction site conditions were reshaped according to the results of the work.

2. Eye-tracking technology

Eye-tracking technology is a rapidly growing technology. With the development of this technique, it is possible to develop an approach as if looking through the eyes of people in many disciplines. Therefore, it enables the development of more beneficial solutions for people. Eye-tracking technology is now fast enough to track the movements of the eye every 20 milliseconds. In this way, it is possible to monitor even the very short-term focus of the human being during observation (Byerly, 2007). The emergence of the eye-tracking technique took place in the early 1900s. The study conducted by Dodge and Cline in 1901 by recording eye movements on photographic films only on the horizontal axis is considered to be the first work done with the eye-tracking technique.

In 1905, Judd, McAllister, and Steel conducted a study in which an object placed in the eye was photographed and its movements in both the horizontal and vertical axis were examined. The real major advance in eye-tracking techniques started in the mid-20th century with the discovery of the eye cornea tracking method (Jacob et al., 2003). After the 1930s, research was made on the relationship between reading speed and eye movements. Tinker's study in 1965 investigated the effects of font size, font, and page layout on reading speed. Huey investigated the biological necessities of reading in 1968 and concluded that what is necessary and sufficient for reading is the movements of the eye. In 1967, the first focus analysis with the eye-tracking technique was carried out by Yarbus. On the other hand, in 1987 Javal used the eye-tracking method to perform reading analysis. In this study, it was determined that the reader does not need eye movements in a detailed and specific order throughout the text he read (Dağlı, 2014)

2.1. Eye-tracking technology and types

Eye trackers track eye movements in different ways. It is possible to classify eye trackers into three main types. The first of these is the type of viewer who is in physical contact with the eye. In this type, hihigh-precision measurements are performed with a contact lens with a special sensor system worn on the eye. A second type is viewers who measure eye movements without physical contact with the eye. In this viewer type, the infrared reflections of light from the eye are measured by a camera or sensor. In these systems, which perform a video recording during the experimental study, the movements of the eye's cornea layer and pupil are examined. The biggest advantage of this method is that it is non-contact so it does not damage other tissues and is more affordable than other systems. Eye monitoring with electrical potential measurement, a third method, is performed by measuring the electrical potential through electrodes connected to the eye contour as a result of the assumption that the eye cornea and retina are in an electrical relationship with each other. The most widely used form of this method is called an Electrooculogram (EOG). The major problem with this method is its inability to measure slow eye movements and fixed focus points (Holmqvist et al., 2011).

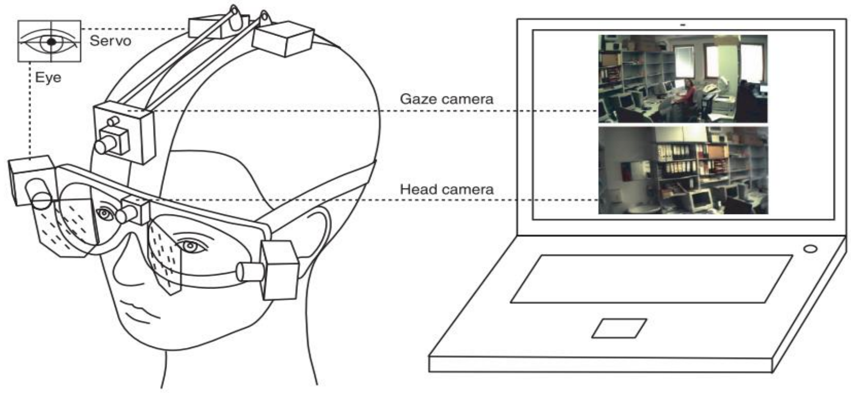

Figure 1. Eye tracking technique (Holmqvist et al., 2011).

2.2. Benefits and limitations of eye tracking

In 1999, Karn et al. Stated the usefulness of eye movement monitoring in line with their study for the "Human-Computer Interaction workshop" they participated in. These benefits are;

- A system that can benefit from other data pools
- Determining the time losses expressed as dead time
- Measuring how long the subject looked at points that managed to attract attention during the experimental study
- Capturing a scan path during the experimental study between different test material
- Determination of general design ideas in line with the experimental study results
- Effect of test material on users
- Objective inferences can be made on the evaluation of the test material.
- Increasing the efficiency and availability of the experimental area
- It enables the detection of subjective differences (Karn et al., 1999).

Although the eye-tracking technique has its benefits, it has some limitations as a developing technology. The most important of these limits is that the experimental equipment is expensive and the experimentation opportunity is stinted due to the limited number of test places. Therefore, it will not be possible to apply experimental studies in all areas. The physical characteristics of the subjects' eyes are also a problem that limits the eye-tracking technique. Optical materials used by the subject chosen for the experimental study may also prevent the experiment. During the experimental study, problems may arise due to experimenting with a living organism. For example, problems such as dry eye or inability to perform tests with equal efficiency every day may be encountered frequently. As a different problem, the calibration between the test device and the eye of the subject can often be disrupted for various reasons during the experimental study. For all these reasons, there may be risks that experiments can be performed with a limited population and that the experiments remain at a low success rate (Schnipke, 2000).

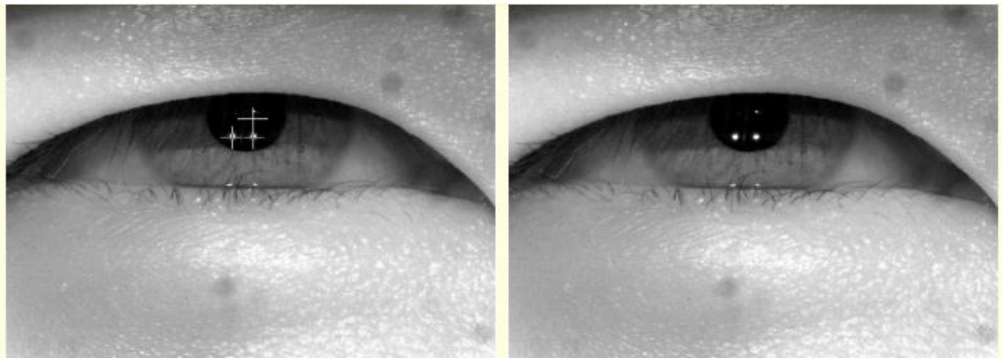

Figure 2. The limiting effect of the physical structure of the eye in eye tracking (Holmqvist et al., 2011).

2.3 Eye tracking applications in civil engineering and occupational safety

The eye-tracking technique, which is a technology that is spreading around the world, finds its place in different business areas. It has also become useful in field applications in the construction sector, especially with the use of mobile eye trackers instead of fixed eye trackers. The construction industry is in a very dangerous risk class in terms of occupational health and safety due to working conditions. For this reason, awareness analysis can be made with mobile eye trackers and solutions can be developed for situations that cause work accidents.

In the study by Hasanzadeh et al. In 2016, real-time attention analysis was done using the mobile eye-tracking technique. This study carried out with 14 subjects with different experiences, possible work accident risks were scored from 1 to 7, and as a result, a score was produced for each subject. As a result, solutions are offered for human-induced occupational accidents (Hasanzadeh et al., 2016).

Figure 3. Eye Tracking in the construction sector (Hasanzadeh et al., 2016).

In the study by Pinheiro et al. in 2016, occupational health and safety studies were carried out in the construction site environment using the eye-tracking technique. In this study, an analysis has been carried out from the detail that attracts the most attention to the least attracted detail in the construction site environment through 3-dimensional and 2-dimensional images of the employees who watch the construction site images together with the eye viewer. As a result of this analysis, it is assumed that 3D images can decrease the risk of occupational accidents (Pinheiro et al., 2016). An awareness analysis was conducted regarding the risk of falling from a height, which is frequently observed in the construction site environment, using the eye-tracking technique (Hasanzadeh et al., 2018). After an eye-tracking study conducted with 14 undergraduate and graduate students at the University of Nebraska-Lincoln campus, a formulation was created, the risks were leveled and the attention of subjects was measured. As a result, attention-enhancing solutions have been suggested against the risk of falling from height in the construction site [8].

3. Methodology

Mobile eye tracking was used in the study. Workers wearing mobile eye-tracking glasses walked into the area where there were different sources of danger created on the construction site. Workers were asked to focus on the sources of danger they saw in their environment. SMI eye-tracking glasses 2.0 are used as mobile eye-tracking glasses. The glasses with a frequency of 60 Hertz transmitted the images to the phone which was connected via a cable and thus recorded. After the site fieldwork, the image records on the phone were analyzed on the computer with mobile eye-tracking software Begaze. As a result of the analysis, the first focal points of the workers, their focus time, the sources of danger they focus on were combined and obtained from the software as a graphical and heat map. The sources of danger, focus analysis and average fixation time graphs were drawn with Excel. The flow chart is given in Figure 4, mobile eye-tracking glasses and the phone used for recording are given in Figure 5.

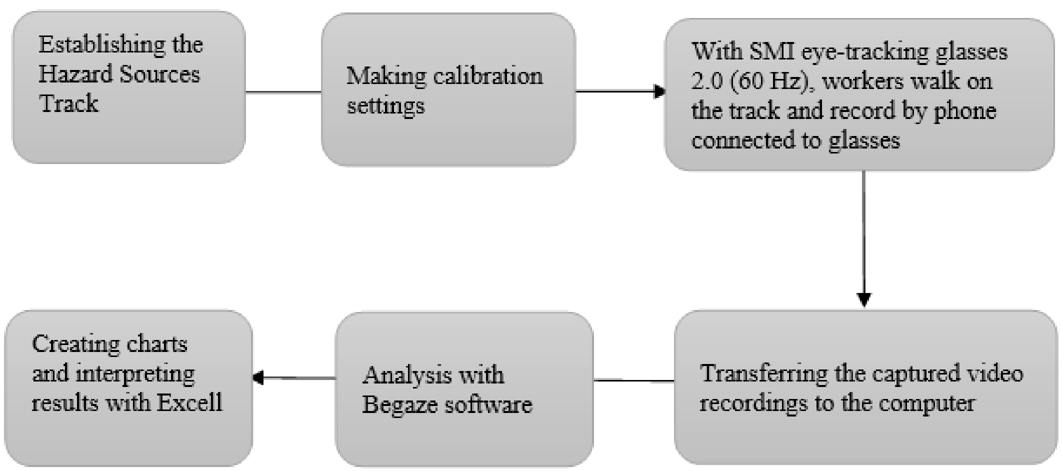

Figure 4. Flow diagram of mobile eye tracking field study.

Figure 5. Mobile eye tracking glasses and phone for recording.

4. Occupational safety analysis with eye-tracking - field study

The area where the study was carried out, is the Istanbul University Research Center (Bioengineering Building), the construction of which started on February 14, 2018, by the Istanbul University Directorate of Construction and Technical Affairs. The construction site has a 4400 m2 floor session. The project, which has approximately 25,000 m2 of construction area, is a composite building type where reinforced concrete and steel systems work together. Between 100-150 workers were constantly working at the construction site, which has 5500 tons of steel. A construction site of this scale contains many risk factors. There was 1 occupational safety specialist and 1 workplace doctor actively on the construction site. Despite the measures taken, a worker lost his life in the work accident that occurred at the construction site (falling from the shaft gap on the mobile ladder).

Figure 6. Three-dimensional model of the building field worked.

For the eye-tracking construction site study, an area within the construction site where the manufacturing continues partially was selected. There are many sources of danger that can cause work accidents in the selected area. These sources of danger contain risk elements that may cause injury and/or fatal work accidents.

Figure 7. Construction site work area.

It has been ensured that most of the risk sources generally found in constructions are present in the created track. In the study field, there are sources of danger such as shaft gap without a guardrail, shaft gap with safety band instead of guardrail, ladder bucket with missing safety sign, exterior without a guardrail, scaffold with a worker in hand, cable suspended from steel beam, formwork boards on the ground, nails. In Figure 8, the track created in the construction is given.

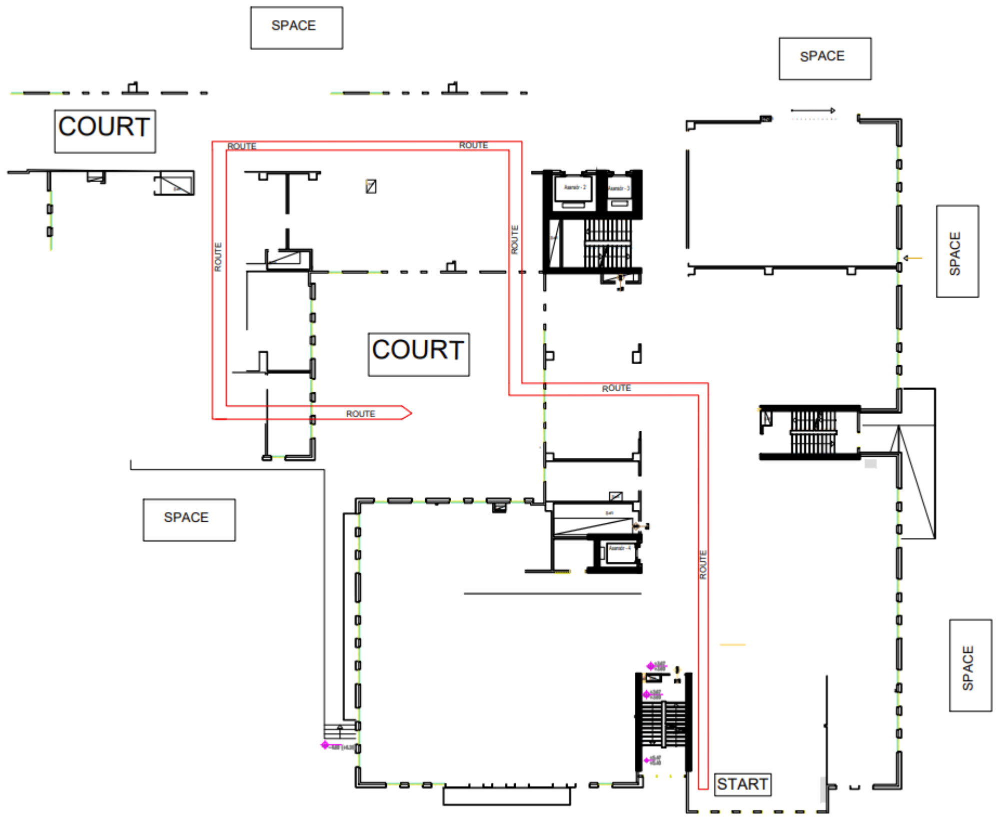

Figure 8. Fieldwork track drawing.

The eye-tracking construction site study was applied to a total of 12 workers in 3 groups according to the duration of experience and working in various positions on the construction site. The sources of danger and the risks in the track are determined and given in Table 2. In the study performed with mobile eye-tracking glasses, the records were taken via mobile phone loaded with the application. Calibration settings were made before the device was used, and analyzes were made with deglazing software, which is the mobile eye-tracking software itself. It is accepted that each worker becomes aware of the sources of danger that he focuses on for at least 0.1 seconds. At the end of the study, fixation focal points and fixation times were measured.

Table 2. Sources of danger.

Number	Track information	Source of danger	Risk
1	Shaft gap	There is no railing on one side	Falling out of shaft gap
2	Shaft gap	Safety tape that does not prevent falling instead of railing	Falling out of shaft gap
3	Ladder Bucket	Railings are missing. There is a safety warning sign	Falling out of ladder bucket
4	Stack of wood and nails in the floor	Formwork board, pieces of iron and nails on the floor	Tripping and falling out or piercing nails
5	Worker working on the scaffolding	Worker working at height with a tool	hitting the scaffolding, the work tool falling on the worker
6	Electric cable hanging in the beam	Electric cable suspended down from steel beam	Electric shock

7	Exterior	Safety tape that does not prevent falling	Falling from high
8	Safety warning signs	Disregarding the warnings on warning signs	Paying attention to warning signs reduces the risk of accidents.

5. Results

In the work carried out in an area where there are sources of danger that may cause work accidents in the construction site environment; The workers, who are classified as less experienced, experienced, and very experienced workers, were requested to wear mobile eye-tracking glasses and walk on the track. In the study field, the workers were asked to identify the sources of danger with the risk of work accidents. The time they spent walking the track was recorded via mobile phones. The video recordings acquired were analyzed with eye-tracking software deglaze. With these analyzes, the points they looked at for more than 0.1 seconds were considered as focal points and accepted as fixation points. The graphics created by combining these points are given as an example below. Fixation focus times were also measured. Heat charts are combined in this direction and given below. The first focus of workers was often on shaft gaps.

5.1 Attention to shaft gap and scaffolding

As a result of the experimental field study conducted with mobile eye-tracking, the attention of the workers against the sources of danger that have a potential work accident risk was measured. In Figure 9a, the points where each worker focuses on the sources of danger can be seen. In Figure 9b, a common result was obtained by combining the focus points of each subject as a heat map. The change of color from green to yellow and red indicates that the focus time is increased.

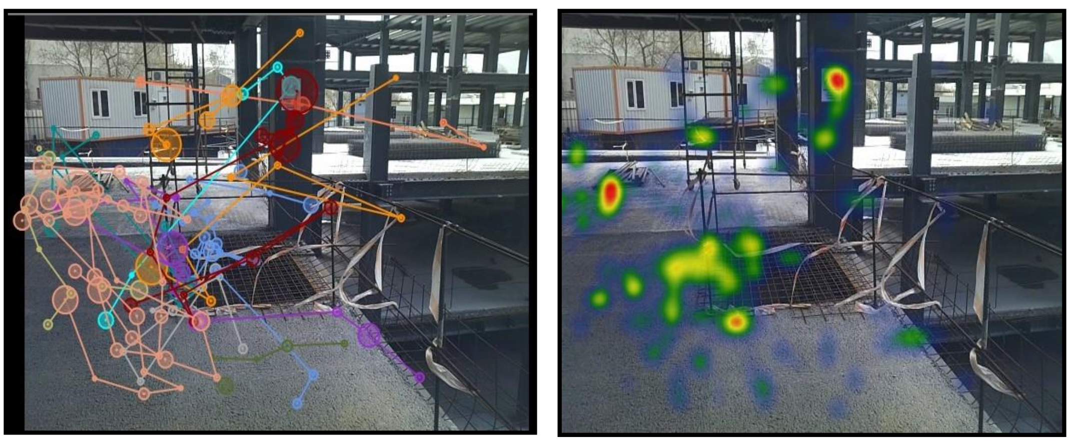

Figure 9. (a) Shaft gap attention measurement, (b) Shaft gap heat map.

5.2. Warning signs attention analysis

The attention measurement of the workers against the warning signs in the construction site is given in Figure 10. As a result of the fieldwork with mobile eye tracking, it was observed that some of the workers working on the construction site did not pay attention to the warning signs. The other part focused on the figure on the sign but not on the written text. From here, it was evaluated that it would be beneficial to teach the workers what the symbols on the warning signs mean and to remind them of these symbols in periodic training.

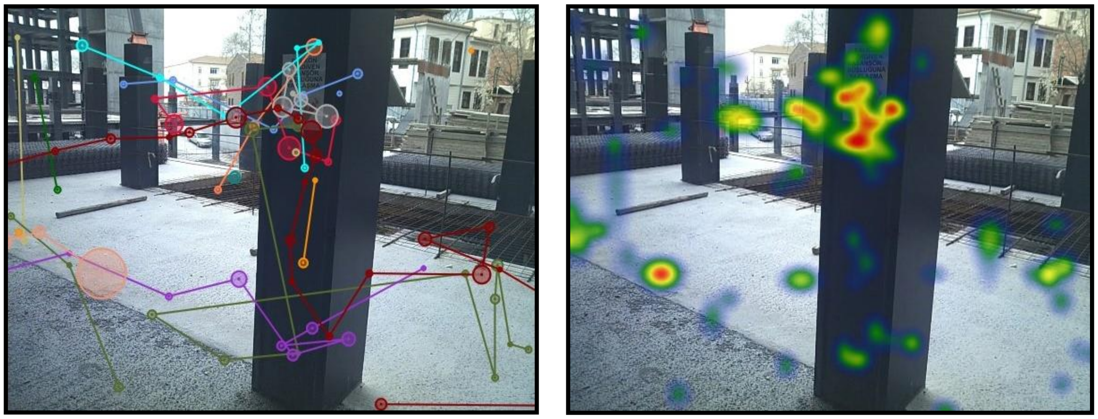

Figure 10. (a) Signboard attention measurement, (b) Signboard heat map.

5.3. Attention analysis of danger sources in the location and the environment

A construction site can contain materials to be used in manufacturing and materials that are removed after manufacturing. Some of these materials can be a source of danger for the work safety of employees. During the experimental fieldwork, the sensitivity of the workers towards the mentioned sources of danger is shown in Figure 11.

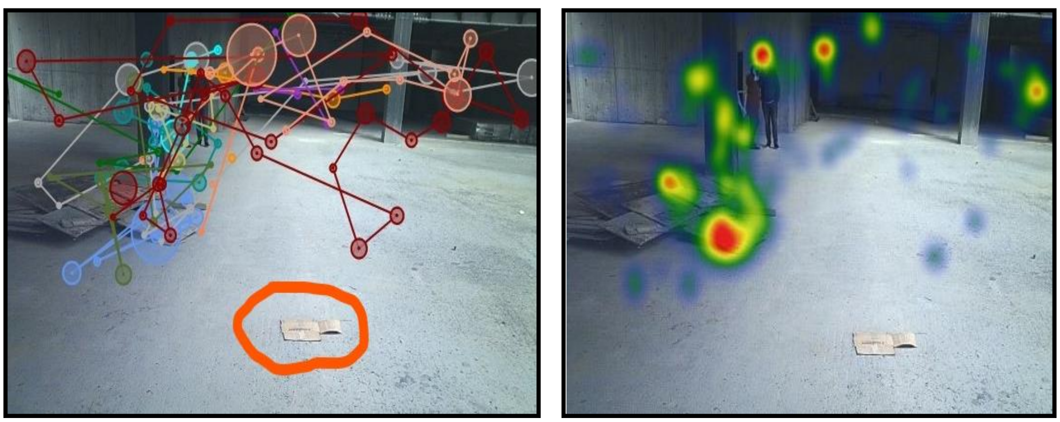

Figure 11. (a) Risk on the ground attention measurement, (b) risks on the ground heat map.

When the figures are examined, it is seen that some of the workers focus on wooden pieces scattered on the ground. None of the workers involved in the study paid attention to the piece of cardboard found on the ground. It should not be ignored that there may be piercing and cutting tools or parts under the cardboard that may cause work accidents.

5.4. Hazard sources focus analysis

We have previously described the points that the workers focus on for at least 0.1 seconds as fixation points. The number of sources of danger that the workers focused on - their fixation points were calculated as a percentage and given in Figure 12. When the figure is examined, it is seen that the most focused source of danger is the railings on the edges of the shaft gaps. The least focused source of danger was the electrical cable hanging down from the steel beam.

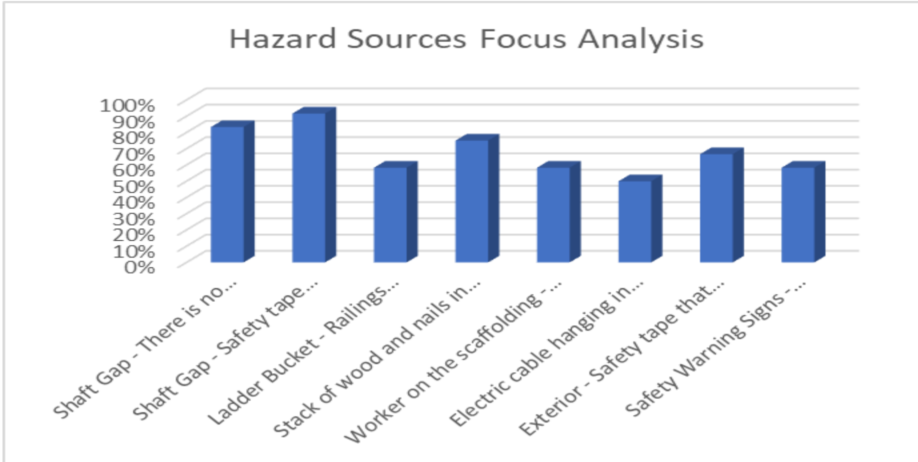

Figure 12. Hazard sources focus analysis.

5.5. Average fixation time analysis

Total times that workers focus on sources of danger are fixation times. Average fixation times were calculated by dividing the total fixation times by the number of workers and the results are given in Figure 13. When the figure is examined, according to the average fixation times, the most focused source of danger was the shaft gap without a guardrail on one side.

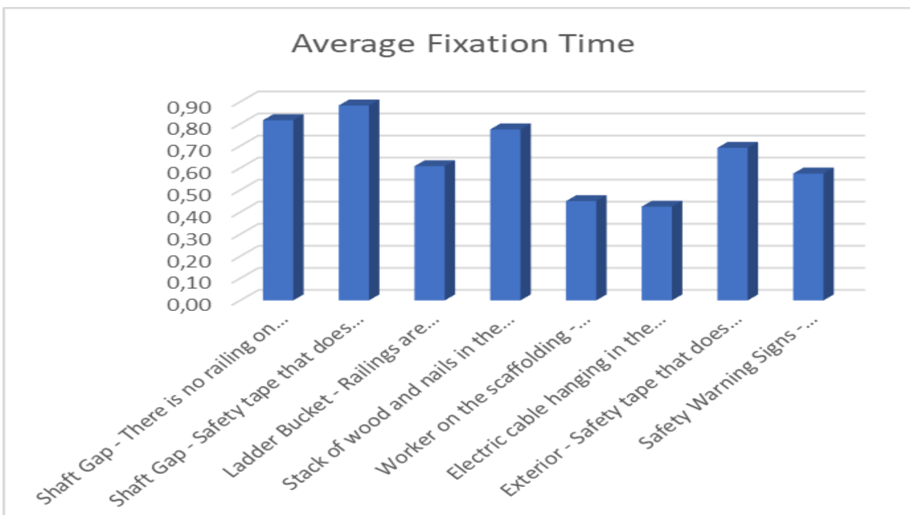

Figure 13. Average fixation time analysis.

5.6. Attention analysis according to experience of workers

When the workers participating in the mobile eye-tracking experimental field study are separated as less experienced, experienced, and very experienced according to their experience time and analyze the results of the study, the level of attention they show against the dangers in the construction site is given in Figure 14. The data in the aforementioned graph was obtained as a result of scoring the fixation points of the workers. When the graph is examined, it is seen that experienced workers are the most sensitive to sources of danger within the scope of this study. It has been found that less experienced workers have lower awareness of sources of danger.

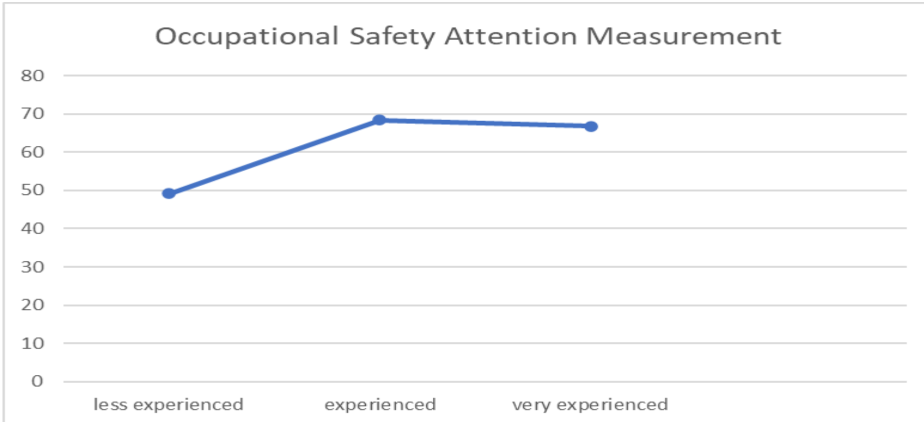

Figure 14. Measuring Attention According to Experience Level of Workers.

6. Conclusions

In this study, a track with various sources of danger that may cause an occupational accident was created at a construction site where a fatal occupational accident occurred. The workers' attention levels were measured against danger sources and points they focused were identified by using a mobile eye tracking device on the track with twelve, less experienced, experienced, and highly experienced workers according to their working hours. The images recorded with the mobile phone were analyzed with the own software of the mobile eye-tracking device. Fixation points, fixation times, and combined heat maps were obtained with this analysis. The number of sources of danger that the workers focused on and the duration of their focus was analyzed and graphed separately. Also, the danger sources' awareness was scored according to their experience levels and the effect of the experience on the study was revealed.

The data obtained from the study are listed below.

- Often the primary source of danger for workers was shaft gaps. It has been evaluated that the death of a worker falling from the shaft gap may have an impact on this.
- It has been observed that the most important source of danger is the railings at the edges of the shaft gaps. The least focused source of danger was the electrical cable hanging down from the steel beam.
- When the graph is examined, according to the average fixation times, the most focused source of danger was the shaft gap without a guardrail on one side. The least focused source of danger was the worker working at the pier and the electric cable hanging from the beam.
- It has been determined that the warning signs are not paid much attention. It was understood that the workers who looked at the signs did not pay attention to the inscriptions that they only focused on the shape. Accordingly, the importance of knowing the meanings of pictures and symbols on warning signs by all workers has emerged. It was concluded that the meanings of these pictures and symbols should be taught to the workers and repeated in periodic training.
- While the large piles of material in the construction site attracted attention, smaller sources of danger were not.
- As the level of experience increases, it has been determined that more attention is paid to sources of danger; however, it has been observed that the attention of highly experienced worker’s decreases compared to experienced workers. It has been evaluated that this may be due to excessive self-confidence.

The sensitivity of the workers to the sources of danger was determined by the fieldwork carried out in the construction site environment. As it is known, there are various sources of danger in construction sites and these sources may change according to the progress of the production. After the fieldwork, training was organized for all workers and the results of the study were shared. The things to be done and the precautions to be taken in the face of dangerous sources and danger sources were given in the form of training. It has been shared with the employees that attention should be paid not only to sources of danger such as shaft gaps and building edges that may cause falling from heights but also attention should be paid to all sources of danger in the construction site that may cause work accidents. It was also stated that by showing the sources of danger one by one, the risks that may cause work accidents should be eliminated if possible, if not possible, minimized, and occupational safety experts should be warned about this issue. After the construction site field study was carried out, the mentioned construction site was observed for a while. Until the construction site fieldwork was carried out, three work accidents, one fatal and two minor, and many near-miss incidents took place on the site. In the last 6 months following the fieldwork, there were no occupational accidents at the construction site, but only two near-miss incidents ocured. In this direction, occupational safety experts were asked to carry out these studies at certain intervals.

These studies should be carried out at certain periods at the construction sites and the results should be reflected in the occupational safety training and the adequacy of the measures taken should be reviewed. It should not be forgotten that besides the existence of sources of danger for a work accident, necessary measures should not be taken and there should be a lack of attention. It has been observed that such situations can be prevented with these and similar studies. The limitation of the work is the number of workers and the working conditions where the track is created. Since the construction works bring along specific working conditions, performing similar works in different construction site conditions will contribute to the decrease in the number of work accidents and the prevention of deaths and injuries caused by work accidents.

Since the track set up in the experiment contains the most important risk sources in the construction site, based on this experiment the riskiest areas in the construction site can be determined and the risk level can be measured. In addition, an effective occupational safety training can be developed according to these results. An effective training module can be created with the help of VR glasses, especially for the dangers that workers do not pay much attention to.

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