Journal of Scientific Perspectives

Volume **5,** Issue **1,** Year **2021**, pp. **25-35**
E - ISSN: **2587-3008**
URL: https://journals.gen.tr/jsp
DOİ: https://doi.org/10.26900/jsp.5.1.03
Research Article

BIOMETRIC SCREENINGS: THE ROUTE TO OCCUPATIONAL SAFETY AND HEALTH

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Received: 27 November 2020, Accepted: 07 January 2021

ABSTRACT

Biometric characteristics such as fingerprints, palmprints, iris, or face recognition have been used at organizations to identify an individual, grant access to physical or digital facilities, and to control employees' time and attendance. Nowadays, employers recognize the importance of workers' health. For this reason, wellness programs are gaining popularity among enterprises. As part of these programs, other biometric traits such as height, weight, blood samples are acquired at biometric screening events. Their main objective is to promote healthy habits within the workforce via early prevention and timely interventions of diseases. The present work goes beyond the biometric screenings' health benefits that are broadly reported and analyzes the implication of the screenings over occupational safety and health

For this purpose, a literature review was carried out. Literature research and analysis conveyed relevant information regarding the application of biometrics in the workplace via biometric screenings. The revision of pertinent scientific documents showed that biometric characteristics acquired in a biometric screening event and the subsequent results' analysis can aid in the identification of unconventional hazards that can affect occupational safety and health. Furthermore, the present study describes different examples on how a biometric screening results can be associated with occupational hazards and consequently affect occupational safety and health.

Keywords: *Biometric Screenings, Occupational, Safety, Health*

1. INTRODUCTION

Fingerprints, iris, palm print, and face recognition are biometric characteristics commonly used in the workplace for granting physical or virtual access to the facilities and controlling employees' time and attendance. The acquisition of biometric identifiers that characterize employees' health conditions is becoming prevalent in the workplace. Nowadays, companies collect different biometric traits to enhance safety and health at work via biometric screening events, which are part of workplace wellness programs.

Corporate wellness programs are gaining popularity within organizations. In the United States, 54% of employees working full time have access to a workplace health program while in Europe is 23% The tendency is to upscale the existent programs and the introduction of new ones in multinational companies(Yeung & Johnston, 2016)

Biometric screenings fall under the scope of workplace wellness programs. These screenings are defined as the process of measuring biometric characteristics such as height, weight, blood pressure, cholesterol, blood glucose, physical activity tests and more acquired at the workplace to assess the health condition of the workforce and monitor the changes throughout time(Centers for Disease Control and Prevention, 2018)

Research about wellness programs and biometric screenings is predominantly health-based(Goetzel & Ozminkowski, 2008). Regarding the employees, research focuses on health benefits such as early detection of chronic diseases(Giese, 2018)(Vanichkachorn et al., 2017), motivation into healthy behaviors(Smith, 2017), promotion of healthy lifestyles, and education (Breaux-shropshire et al., 2012)(Ryan et al., 2014). As for the company, research topics include identification of the organization's benefits such as the return of investment, cut in corporate health plans(Vanichkachorn et al., 2017)(Rameswarapu et al., 2014)(Maeng et al., 2017), ways on how to deploy effective and successful screenings via participation rate(McLellan et al., 2009)(Sherman & Addy, 2018)(Breaux-shropshire et al., 2012) and incentives (Cuellar et al., 2017)(Heathfield, 2019)(Fronstin & Roebuck, 2015).

Research about the impact of biometric screenings on safety is not well documented. Some studies focus on one or two biometric characteristics such as height and weight to identify occupational risk and linkage to work-related diseases (Poston et al., 2011; Rosen, 2014; Schulte et al., 2007; Tucker & Friedman, 1998). In other studies, self-assessment tools are used to identify relationships with occupational incidents and health risks(White et al., 2015)(Chau et al., 2009).

This study presents an extensive revision of scientific literature regarding how biometric screenings impact workplace safety and health.

2. OCCUPATIONAL SAFETY AND HEALTH

Occupational Safety and Health (OSH) comprises different scientific disciplines that focus on the analysis, recognition, and monitor of occupational hazards to protect and guarantee the workers' wellbeing. OSH examines all the parameters related to health and safety to prevent risks and hazards at work. Moreover, OSH encompasses laws and guidelines for safeguarding employees in the workplace. These laws have basic outlines but differ in severity depending on the country and region. Occupational accidents and fatalities can be prevented by the application of safety procedures and methods which contribute to considerable benefits to the society, businesses, and enterprises (Alli, 2008).

2.1 Safety versus Health

Occupational Safety and Health is treated as a unified concept regarding policies, initiatives, management, and more. Nonetheless, safety and health in the workplace share

some similarities; they differ in important aspects. Safety addresses situations that can cause immediate harm or injuries. It also involves hazards that can affect workers due to unforeseen or harsh conditions. Health mainly deals with circumstances that can cause diseases and unfavorable reactions to long term hazards that are dangerous but not that severe as an accident(Goetsch, 2011).

Although safety and health have marked differences, under the occupational scope, these two concepts cannot be analyzed and understood separately. OSH professionals should be knowledgeable in these two topics to prevent and give timely responses to challenging work-related hazards such as stress or workplace violence.

Traditionally, OSH management systems were concentrated on preventing workplace accidents by utilizing different procedures such as training staff, implementing laws and regulations, designing ergonomic machinery(Vargas Cruz et al., 2018), and others. Nowadays, this approach is becoming broader by taking into consideration the employees' wellbeing as the base of the whole safety and health efforts.

Wellness programs, including biometric screenings, are part of OSH initiatives towards the enhancement of a safe and healthy workplace environment via the improvement of workforce welfare. As a result, OSH procedures are a legal duty for the company, but most important, they are becoming a moral obligation for the employers(Ruiz Salvador & Thinh, 2016).

3. BIOMETRIC SCREENINGS

Wellness programs have become very popular among medium and large enterprises. They consist of a series of activities developed at the workplace, aiming to improve the wellbeing of the employees. Biometric screenings are an essential component of wellness and health-promoting initiatives. These tests provide an insight into the worker's health condition to arrange and put in practice prevention efforts(Cuellar et al., 2017).

Fingerprints, face, hand geometry, or palm recognition are biometric characteristics commonly used in the workplace. These characteristics are restricted to serve as identification tools. Nowadays, as part of a workplace wellness program, other biometric traits such as height, weight, blood pressure, cholesterol, and more are acquired to improve employees' welfare. This process is denominated: "Biometric Screening."

Biometric screenings provide a quantitative value of the health condition of the employees. Moreover, employers' main objectives towards the deployment of these screenings at the organization are the reduction of medical care costs and to achieve a high return of investment (ROI). For instance, biometric screenings can identify high-risk individuals who have above average or abnormal values in the screening results(Vanichkachorn et al., 2017). Appropriate healthcare solutions tailored to these individuals will cut down costs in health plans by preventing or managing the development of chronic diseases(Breaux-shropshire et al., 2012). Furthermore, the RAND corporation report on workplace wellness stated that a positive ROI value could be obtained by the introduction of wellness programs, including biometric screenings(Soeren, Mattke, Hangsheng, Liu, John P.Caloyeras, Christina Y.Huang, Kristin R. Van Busum, Dmitry, Khodyakog, Victoria, 2013).

These screenings can also disclose valuable information regarding occupational injuries, diseases, unknown or chronic health conditions that can be asymptomatic. Moreover, a screening event is probably the only opportunity a worker has to detect a chronic illness; that without intervention can result in a catastrophic event. For example, presymptomatic type 1 diabetes can be recognized by detecting abnormal values of hemoglobin A 1c and fasting glucose thanks to the analysis of a blood sample collected in a biometric screening

event(Giese, 2018). Additionally, high levels of cholesterol, blood pressure, and obesity reveal a risk of a cardiovascular disease that can lead to a heart attack or stroke. Due to timely biometric screening, these risks can be mitigated and treated(Breaux-shropshire et al., 2012).

3.1 Biometric Screenings and Safety

OSH initiatives such as wellness programs shifted the accident causation and prevention efforts to focus on the workers' wellbeing. Biometric screenings are part of corporate wellness programs. They provide a complete characterization of the worker's health by the acquisition of various biometric measures, including blood, height, weight, and more(Fronstin & Roebuck, 2015). Furthermore, biometric screenings focus on how the work is affecting the employees' health, and according to the results taking timely and corrective actions.

Occupational Safety and Health's overarching goal is to identify, prevent, and reduce workplace hazards(Alli, 2008). However, hazards are prevalent in every work environment. An occupational hazard is defined as any object or event that has the potential to harm an employee. Hazards can be divided into two groups:

1. Safety hazards, which have the potential to harm workers physically
2. Health hazards, that have the potential for developing a disease (Government of Ontario, Ministry of Labour, 2016).

Biometric screenings take a step further in this classification by detecting nonconventional hazards such as health indicators and diseases, which not only can affect the worker's health but the ability to perform their work duties and can hinder safety behavior.

Biometric tests performed during the screenings classify each employee according to his/her health status. The early detection of health conditions such as high blood pressure, high triglycerides, and high cholesterol can prevent serious health problems such as physical and mental problems. These issues can lead to safety incidents and, in the long term, can become a burden to the company and society(PDHI, 2018).

Abnormal biometric values, such as high blood pressure levels, can indicate high levels of stress(Daniellou et al., 2012). Stressed individuals can be easily distracted from work, which can contribute to mistakes, unsafe behaviors, accidents, and workplace violence. Moreover, it can be the cause of chronic diseases such as cardiovascular events. Stressed workers are more likely to make unhealthier choices, such as alcohol and tobacco consumption(Musick, 2016) (Institute of Medicine (US) Committee on Health and & Behavior: Research, Practice, 2001)(Sauter et al., 2009).

Cotinine tests performed to a blood sample during a biometric screening event can easily detect smoking prevalence among the workforce(Quest Diagnostics, 2019). Besides the severe health issues related to tobacco usage, smoking can also be considered as an occupational hazard. Smokers take more breaks during working hours than a non-smoking employee, disrupting the working procedures. Additionally, loss of productivity due to these breaks, presenteeism, absenteeism, and health insurance costs are higher for a smoker (Berman et al., 2014)(Baker et al., 2017)(Halpern et al., 2001).

These screenings can easily detect if a person is overweight or obese by the calculation of the Body Mass Index (BMI). Obesity can also be linked to chronic diseases such as heart diseases, diabetes, sleep apnea, of cancer, and even workplace injuries(Rosen, 2014). Overweight individuals present deterioration in cognitive performance and more prolonged time reactions compared with a normal weight person (Steenbergen & Colzato, 2017). Additionally, obese people tend to unintentionally injure themselves more often and present

impairment in work activities(Rodbard et al., 2009). Overexertion and falls are the most frequent types of work-related injuries and accidents. Higher BMI values are closely connected to missed workdays and absenteeism(Tucker & Friedman, 1998). Obesity screening can be advantageous to prevent from occupational risks that can be associated with occupational asthma, the immune response to chemical exposures and diseases caused by occupational neurotoxins(Schulte et al., 2007).

Prediabetes and diabetes can be quickly spotted at a biometric screening event by reading the results on blood glucose levels(Adams et al., 2015). Prediabetes can be often reverted if it is timely diagnosed, and health-based corrective actions are taken in place(Centers for Disease Control and Prevention, 2014). Diabetes is an indicator of serious complications such as blindness, kidney failure, heart disease, stroke, and loss of toes, feet, or legs(Diabetes UK, 2019). Vision loss, dizziness, and loose of consciousness due to a glucose imbalance can be potential hazards for occupational incidents. Diabetes significantly impacts the ability to work; it can increase absenteeism and production loss. Diabetic individuals are more susceptible to fatigue, overweight, early retirement, and disability(Tunceli et al., 2005)(Fit for Work, 2017)(Trotto, 2015).

Biometric screenings offer a snapshot of the physical capabilities of the employees. This aspect is relevant in companies where manual labor is required, and fitness can be a breaking point in work safety, such as the case of firefighters(Poston et al., 2011).

Furthermore, as computers are becoming an essential tool for executing any job, sitting, sedentary work, and low activity workplaces are rapidly expanding(Parry & Straker, 2013). Biometric screenings can detect sedentary behavior among employees by analyzing biometric characteristics such as waist circumference, body mass index, triglyceride levels, and others. Since workers spend at least eight hours per day sitting in an office without counting the commuting time to the workplace, sedentarism can be considered as an occupational hazard(Strakeer et al., 2016)(Coenen et al., 2017)(Carr et al., 2016). Sedentary behavior can lead to non-communicable chronic diseases such as diabetes, cardiovascular diseases, cancer, and premature mortality. Moreover, musculoskeletal disorders, overweight, obesity, poor cognitive function can also be associated with a sedentary work environment(Owen et al., 2010)(González et al., 2017)(Middelbeek & Breda, 2013)(Panahi & Tremblay, 2018).

Biometric screenings serve as an assessment tool to check if the workplace conditions are safe. Screenings report common health trends among the employees that can be caused by the work environment. These commonalities can pinpoint unsafe conditions such as ergonomic problems or lack of safety procedures. Additionally, as these screenings are performed every year, it is possible to detect an increasing trend in work-related illnesses due to the workplace environment and the possibility to prevent and treat them via specific safety and health interventions in machinery or workspace design(Carr et al., 2016)(NIOSH, 2018).

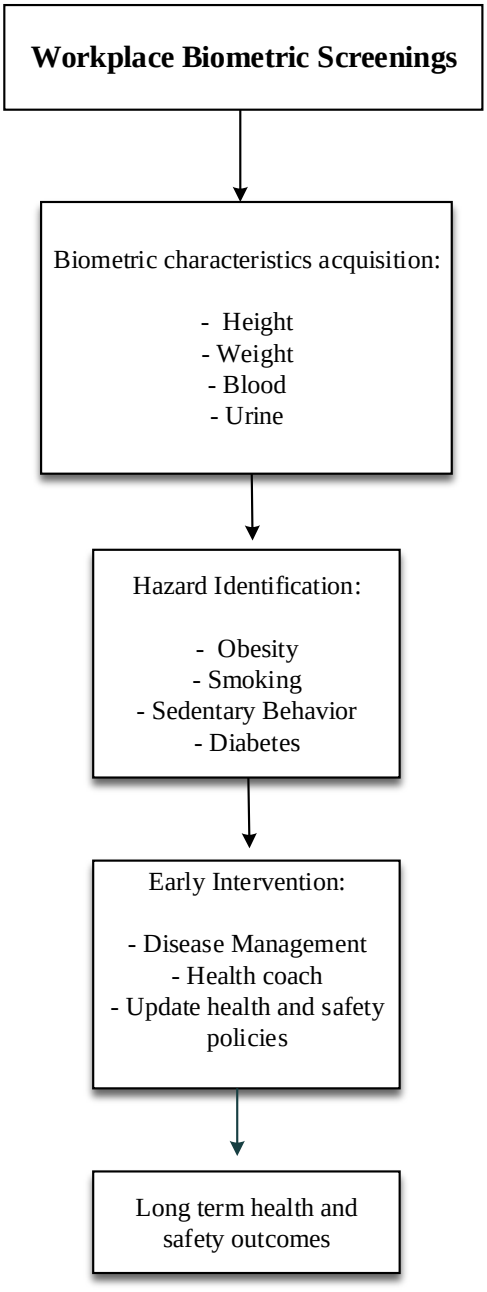
4. HEALTH AND SAFETY AT WORK: OVERLAPPING CONCEPTS

Occupational safety and health are two elements that are interconnected. Workforce's health is closely linked to performance and safety in an organization(Daniellou et al., 2012). Employees that enjoy good health are more productive, resilient, and less prone to safety incidents. Screenings boost morale among the workers. They understand and appreciate the organization's efforts towards their health, which is translated into employee retention, a feeling of ownership to the business, and motivation towards safety behaviors(Goetzel et al., 2007). Furthermore, according to the survey on the future of wellness at work, employees that recognize the company is paying attention to their health report improvement in factors such as stress level and job satisfaction(Yeung & Johnston, 2016).

McLellan et al. study (McLellan et al., 2009) found that participation rates in biometric screenings are positively correlated with the perception of safety at work. A combination of a positive perception of safety and an adequate health plan in the organization anticipates higher participation rates in biometric screenings. High participation rates are decisive for measuring the effectiveness and success of a program. It also contributes to a fair promotion and instauration of safety and health policies that benefit the majority of the employees. If a predominant number of employees participate in a biometric screening event, the results will sufficiently portray the necessities of the workforce and direct towards customized initiatives. Thus, biometric screenings and workplace safety operate together in a cycle where the perception of safety is enhanced as biometric screenings are implemented in the workplace.

Figure 1 shows a summary of the main aspects of how biometric screenings contribute to occupational safety and health outcomes.

Figure 1: Biometric Screenings Towards Workplace Health and Safety Outcom



5. DISCUSSION

Research on biometric screenings is mainly oriented to the health benefits given to employees and the organization. The purpose of this study was to explain in detail which biometric screenings are, but also go beyond the health approach and analyze the benefits of these tests in occupational safety and health. As described in the previous sections, health and safety at the workplace are directly connected since healthy employees are motivated to safety behaviors, which decrease work-related accidents.

Screening results provide critical health information to prevent and execute timely interventions regarding diseases and unhealthy habits within the workforce. Additionally, the processes that come after the tests such as education, health provider's appointments, follow-ups, and medical resources are essential for the success of the screenings.

The literature review indicates that biometric screening results can identify intrinsic hazards in the employees, which not only affect their health but can contribute to unsafe behaviors.

Furthermore, biometric screenings can be a primary tool for choosing or keeping employees in safety-sensitive positions. Work roles such as operating heavy machinery, jobs where firearms are employed or driving emergency vehicles in which not only the individual, coworker, and public safety are at risk.

6. CONCLUSIONS

Biometrics' purpose is to serve as a means of identification. The present work wanted to extend this concept into not just identifying the person itself but the hazards within the employee and how these hazards affect occupational safety and health.

The workforce is a crucial element in organizations and for the economy. Employees spend at least a third of the day in a company without counting the commuting or extra hours. For this reason, health-promoting programs are becoming a must at any organization. Employees' health is highly connected to productivity, satisfaction, safety practices, and savings in healthcare costs. Nevertheless, these benefits, the employer has the moral duty to provide a safe and healthy environment in a workplace.

Biometric screenings constitute a vital part of the wellness programs since, at one event, it is possible to collect several biometric characteristics such as height, weight, blood pressure, heart rate, and others. The screening results provide a holistic vision of the workforce's health status. Moreover, it represents an opportunity to detect chronic diseases or health risk factors to prevent and treat them. The impact of this specific program keeps present after the screenings. It goes beyond health benefits because it also aids in the identification of hazards, which are critical elements in risk analysis and consequently enhance safety behaviors at the workplace.

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