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Biometric Screenings: Insights and their impact on Occupational Safety and Health

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Summary

This work aims to present a detailed review of what biometric screenings are, their advantages, disadvantages, and stages of the process. Moreover, to go further from the health benefits that are broadly reported and analyze the screenings implications over occupational safety.

For this purpose, a literature review, preliminary research (survey), and a case study (biometric screenings) were 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 delivered essential insights regarding the link between the biometric characteristics collected in a screening event and hazard identification that can affect occupational safety.

Concerning the experimental procedure, preliminary research carried out at a Hungarian company displayed the importance of workplace biometric screenings. Nearly 95% of the respondents stated that biometric screenings are important; more than 88% expressed interest in participating in a screening event. More than 70% of the employees believe that it is the responsibility of the company to safeguard their health. Approximately 90 % prefer an employer with health initiatives, and 61% trust an organization concerned about the worker's health.

Additionally, in the case study done at an Ecuadorian university, primary data from 409 employees were collected through biometric screenings and analyzed using descriptive and inferential statistics. Chi-square tests established statistically significant associations between type of occupation and biometric characteristics such as gender, body mass index, blood and urine sample laboratory results, and age. Logistic regression determined two significant factors that contribute to occupational diagnosis (gender and physical exam results). The study identified clinical problems and pathologies related to mental work. These results were pivotal for identifying specific work hazards such as obesity, musculoskeletal disorders, eye problems, and metabolic diseases. Consequently, biometrics via biometric screenings enhance not only occupational health but also occupational safety by aiding in the prioritization of occupational safety procedures and policies through the identification of occupational hazards found in biometric screening results.

Summary in the Hungarian Language

Ez a kutatás egy részletes áttekintést kíván bemutatni arról, hogy mik is a biometrikus szűrések, azok előnyei, hátrányai és a folyamat szakaszai. Továbbá, a széles körben ismertetett egészségügyi előnyökön át, elemezzük a szűrések munkahelyi biztonsággal kapcsolatos következményeit. Erre a célra irodalmi áttekintés, előzetes kutatás (felmérés) és esettanulmány (biometrikus szűrések) kerültek elvégzésre. Az irodalmi kutatás és elemzés releváns információkat közvetített a biometria munkahelyi alkalmazásával kapcsolatban a biometrikus szűrések útján. A vonatkozó tudományos dokumentumok felülvizsgálata lényeges betekintést nyújtott a szűrési esemény során összegyűjtött biometrikus jellemzők és a munkahelyi biztonságot befolyásoló veszélyek azonosítása közötti kapcsolatba.

A kísérleti eljárást illetően egy magyarországi vállalatnál végzett előzetes kutatás megmutatta a munkahelyi biometrikus szűrések fontosságát. A válaszadók közel 95% -a állította, hogy a biometrikus szűrések fontosak; több mint 88% kifejezte érdeklődését egy átvilágítási eseményen való részvétel iránt. Az alkalmazottak több mint 70% -a úgy véli, hogy a vállalat felelőssége megőrizni az alkalmazottak egészségét. Körülbelül 90% -uk az egészségügyi kezdeményezéseket támogató munkáltatót részesíti előnyben, és 61% -uk bízik meg a munkavállaló egészségével törődő szervezetben.

Ezenkívül egy ecuadori egyetemen végzett esettanulmányban 409 alkalmazott elsődleges adatait gyűjtötték biometrikus szűréseken keresztül, majd leíró és következtetési statisztikák segítségével elemezték őket. A khi-négyzet tesztek statisztikailag szignifikáns összefüggéseket állapítottak meg a foglalkozás típusa és a biometrikus jellemzők, például a nem, a testtömeg-index, a vér- és vizeletminta laboratóriumi eredményei és az életkor között. A logisztikai regresszió két jelentős tényezőt határozott meg, amelyek hozzájárulnak a foglalkozás diagnózisához (nemi és fizikai vizsgaeredmények). A tanulmány a mentális munkával kapcsolatos klinikai problémákat és patológiákat azonosította. Ezek az eredmények kulcsfontosságúak voltak az olyan konkrét munkahelyi veszélyek azonosításában, mint az elhízás, mozgásszervi rendellenességek, szemproblémák és anyagcsere-betegségek. Következésképpen a biometrikus szűrések útján történő biometrikus adatok nemcsak a munkahelyi egészséget, hanem a munkavédelmet is javítják azáltal, hogy elősegítik a munkavédelmi eljárások és szabályzatok fontossági sorrendbe állítását a biometrikus szűrési eredményekből származó foglalkozási veszélyek azonosításán keresztül.

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.

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[1]

Research about wellness programs and biometric screenings is predominantly health-based[2]. Regarding the employees, research focuses on health benefits such as early detection of chronic diseases[3], motivation into healthy behaviors[4], promotion of healthy lifestyles, and education [5]. As for the company, research topics include identification of the organizations benefits such as the return of investment, cut in corporate health plans[6], ways on how to deploy effective and successful screenings via participation rate[7], and incentives [8].

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. In other studies, self-assessment tools are used to identify relationships with occupational incidents and health risks[9]. However, research concerning the collection of several biometric characteristics at a biometric screening event and the subsequent analysis is incipient.

Consequently, a study detailing biometric screenings and how the health examination stimulates workplace safety is relevant. It can bring valuable insights to implementers towards new wellness practices and the importance of these biometric tests. Moreover, the inclusion of a survey and data of an actual biometric screening event complements the theoretical research. Its results can direct the establishment of specific hazards related to the type of occupation and serve as a tool for prioritizing occupational safety and health initiatives, procedures and policies.

2 Objectives

The main objectives of this study are:

- Examine how biometrics and occupational safety and health are related via biometric screenings
- Provide a detailed description of what biometric screenings are.
- Review the whole biometric screening process: before, during, and after the event. Determine essential guidelines to execute a successful screening.
- Extend the research about biometric screenings, go beyond the health benefits, and approach these practices safety benefits in the workplace.
- Perform experimental procedures detailing the importance of wellness programs and biometric screening.
- Analyze the biometric information collected in the experimental case study to find an association between characteristics.
- Identify how biometric screenings contribute to occupational safety and health.
- Unify occupational health and occupational safety concepts

3 Theoretical Framework: Biometric Screenings and Occupational Safety and Health

Occupational safety and health (OSH) initiatives such as wellness programs shifted the accident causation and prevention efforts to focus on the workers' wellbeing. Traditionally the employer believed that the sole responsibility for the workforce health is the employee. Nowadays, corporations accept the involvement in worker's health and how these health issues are affecting safety[10].

Biometric screenings are part of corporate wellness programs. They provide a complete characterization of the worker's health by acquiring various biometric measures, including blood, height, weight, and more[11].

3.1 Biometric Screenings and Hazard Detection

Occupational Safety and Health overarching goal is to identify, prevent, and reduce workplace hazards. 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[12]:

1. Safety hazards, which have the potential to harm workers physically
2. Health hazards, which can potentially lead to diseases.

Biometric screenings take a step further in this classification by detecting nonconventional hazards such as health indicators and diseases. That can affect the workers' health and their ability to perform work duties and hinder safety behavior.

Abnormal biometric values, such as high blood pressure levels, can indicate high-stress levels. Stressed individuals can be easily distracted from work, contributing to mistakes, unsafe behaviors, accidents, and workplace violence. Moreover, it can be the cause of chronic diseases such as cardiovascular affections. Stressed workers are more likely to make unhealthier choices, such as alcohol and tobacco consumption [13].

These screenings can easily detect if a person is overweight or obese by calculating the Body Mass Index (BMI). Obesity can also be linked to chronic diseases such as coronary affections, diabetes, sleep apnea, certain types of cancer, and even workplace injuries[14]. Over-weight individuals present deterioration in cognitive performance and more prolonged time reactions than normal-weight persons [15]. Additionally, obese people tend to unintentionally injure themselves more often and present impairment in work activities[16]. Overexertion and falls are the most frequent cause of work-related injuries and accidents. Higher BMI values are closely connected to missed workdays and absenteeism[17].

Prediabetes and diabetes can be quickly spotted at a biometric screening event by reading the results on blood glucose levels[18]. Prediabetes can often be reversed if it is timely diagnosed and health-based corrective actions are taken in place. Diabetes is an indicator of serious complications such as blindness, kidney failure, heart disease, stroke, and loss of toes, feet, or legs[19]. Vision loss, dizziness, and loss 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[20].

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 in firefighters[21].

Furthermore, as computers are becoming an essential tool for executing any job, sitting, sedentary work, and low activity workplaces are rapidly expanding. Biometric screenings can detect sedentary behavior among employees by analyzing biometric characteristics such as waist circumference, body mass index, triglyceride levels. 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 an occupational hazard[22].

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, prevent and treat them via specific safety and health interventions in machinery or workspace design[23].

3.2 Biometric Screenings: Overlapping concepts between Health and Safety at Work

Occupational safety and health are two elements that are interconnected. Workforce health is closely linked to performance and safety in an organization. Employees that enjoy good health are more productive, resilient, and less prone to safety incidents. Screenings boost morale within 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[24].

McLellan et al. study [25] found that participation rates in biometric screenings are positively correlated with safety perception 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 workforce necessities

and direct towards customized initiatives. Thus, biometric screenings and safety in the workplace operate together in a cycle where safety perception is enhanced as biometric screenings are implemented.

4 Hypotheses

The following hypotheses were formulated considering and understanding the theories and concepts described in the theoretical framework presented in the previous chapter:

- Hypothesis 1: Biometrics via workplace biometric screenings can serve as a tool for improving workforce health and occupational safety by prioritizing occupational safety and health initiatives, procedures, and policies.
- Hypothesis 2: Biometric characteristics can be related to the employees' ability to perform their job.
- Hypothesis 3: Biometric screening results can help identify hazards that affect Occupational Safety and Health.

5 Experimental Procedure

The experimental procedure primary objectives were to test the hypotheses enumerated in the previous section and gain experiential knowledge regarding biometric screenings in the workplace and the analysis of two case studies listed below:

5.1 Preliminary Research

This study explored the employees' perceptions regarding wellness programs, especially biometric screenings. It also captures their opinions and needs concerning wellness programs and ways to improve them. Workers' involvement at every wellness program implementation stage promotes safety and health outcomes. Suggestion programs and surveys are beneficial because they collect data from the most reliable source. Moreover, these programs empower employees and get them actively involved in safety and health initiatives[26].

The study consisted of a thirty-one-question survey. The questions included demographic data, Likert scale questions, close and open-ended questions. The data analysis highlighted the workers' perception concerning the importance of biometric screenings, participation, and the potential to implement these kinds of events in the company.

5.2 Case Study: Biometric screenings results analysis

This study was performed at Universidad Tecnica de Cotopaxi (UTC), located in Latacunga - Ecuador. It consisted of biometric data collection through an occupational screening event and statistical data results analysis. This research had a hands-on approach. Workers' biometric characteristics were acquired and processed. The biometric screenings results were compiled and statistically analyzed to get a picture of workforce health, identify how these characteristics relate, influence the worker's ability to perform his/her job duties, and ultimately contribute to the workplace's safety health. Microsoft Excel and SPSS were used to calculate means, standard deviations, frequencies, percentages, and inferential statistical tests (Cronbach's alpha coefficient reliability test, chi-square test, and logistic regression).

Regarding the participants' characteristics, males constitute a larger percentage of employees compared with females. Concerning age group, participants in the range of 15 to 41 years represent a higher percentage than their colleagues over 41 years old. A relatively small number of participants (12%) perform physical work than mental work (88%). This matter is explained by the fact that the study was executed in a university where office work is prevalent for professors, assistants, and office managers.

Concerning the measured biometric traits such as height and weight, the mean height values for males and females are within the normal ranges for Ecuadorians, which are 1.67 and 1.54 meters, respectively, according to WHO. The mean body mass index (BMI) values for females (25.83) and males (27.11) fall into the range of pre-obesity, according to WHO (25-29.9), which shows that the workforce is slightly overweight. The standard deviation values are high, which is essential to pay attention to employees under extreme BMI classifications, such as obesity and morbid obesity. Besides, the overall BMI classification shows a considerable percentage (60%) of overweight or obese employees, and nearly 40% have a normal BMI.

The laboratory exam results show that nearly 25 % are within the normal parameters regarding the blood and urine samples, while almost 50% of the participants present 1 or 2 abnormal results. In contrast to 0.7%, that has 7 or 8 problems of the 11 analyzed results. The physical exams indicated that 50% of the employees do not have physical issues, and just 1% have 5 or 8 problems over the 18 problems presented in the whole university community.

Clinical problems such as polycythemia, sedentarism, hypercholesterolemia, and hypertriglyceridemia are prevalent among university workers. As for the pathologies, metabolic, hematologic are predominant. Ophthalmologic and musculoskeletal pathologies comprise significant percentages (38.6 %, 19%), respectively.

Alcohol and tobacco consumption presented minimal values of 8% and 3%. Finally, the occupational analysis revealed that nearly 84% of the employees are apt to work in their current job position, more than 16% are apt to work but with specific restrictions. Consequently, there are no cases of employees that are classified as unfit to work.

Concerning inferential statistics, Cronbach's alpha coefficient reliability test value is 0.797, which is considered a reasonably high value[27]. Chi-Square tests for independence determined that gender, BMI classification, laboratory results, and age are statistically dependent on the type of occupation. Likewise, biometric characteristics such as gender and physical exam results are statistically dependent on occupational diagnosis. Logistic regression was used to model the relation between occupational diagnosis and the biometric characteristics acquired in the biometric screening event. As a result, the model including all the predictors was statistically significant $\chi^2= 46.694$, degree of freedom (df) = 11, $p<0.001$, N=409. The two main factors influencing occupational diagnosis are gender $p=0.000$ and physical exam results $p=0.000$. The odds ratio for gender is 0.295 and for physical exam results is 3.879. These values indicate that being a male employee decreases by a factor of 0.295 the odds of being diagnosed as Fit with limitations. While employees having problems in the physical exams were 3.879 times more likely to be diagnosed as Fit with limitations than those without problems in the physical exam, controlling all of the other factors in the model. The rest of the biometric characteristics do not significantly contribute to the variable occupational diagnosis.

6 Discussion

6.1 Preliminary Research

The preliminary research objective was to acquire a baseline regarding wellness programs aspects, especially biometric screenings, via a survey. This survey helped the company know about the employees' perceptions of health programs and their primary needs regarding its health initiatives. A high percentage of the respondents trust and prefer an employer concerned about workforce health. Employees suggested health-based wellness programs such as

screenings and health coaches. Furthermore, it served as a baseline to create an action plan towards workplace health necessities and avoid dispersed wellness activities.

One of the critical findings in the survey was to know how important these screenings are for the employees regarding biometric screenings. More than 90% of the respondents think biometric screenings are very important, important, or moderately important. A significant percentage of the respondents expressed their interest in participating in this type of event, while just nearly 16% participated in a biometric screening in the company. Therefore, it opened an opportunity to plan and execute a biometric screening event in the company and constituted the first step to researching biometric screenings and their impact on occupational safety and health.

6.2 Case Study Biometric Screenings: Data analysis

The biometric data collection and analysis described in the case study was valuable for understanding the impact of biometric characteristics on the occupational diagnosis. Regarding blood and urine collection and the subsequent laboratory results, the dominant problems detected in the laboratory exams were: high hematocrit, high cholesterol, and high triglycerides.

The hematocrit test is a blood characterization analysis that evaluates the proportion of red blood cells. It can detect diseases such as anemia and certain cancers. Factors such as genetics, smoking, and respiratory problems can affect hematocrit levels. Another factor contributing to this abnormality is living in high altitudes, such as Latacunga- Ecuador (2760 meters), where this research was executed. This aspect can explain the prevalence of high hematocrit count in laboratory exams. Abnormal results in cholesterol and triglycerides coincided with the BMI values stating that the university employees are pre-obese.

The alcohol and tobacco screening results exhibit a low consumption percentage of 8.3% and 3.2%, respectively. These results do not coincide with the national percentage of alcohol consumption: 41% and tobacco: 8.8%. This issue can be explained by the fact that self-assessment questionnaires were administered.

During the physical exam, a decrease in visual acuity was detected as its most recurrent issue. Nearly 160 workers presented this problem, which indicates that the employee needs to wear glasses or change the eye prescription. Mental workers are prone to eye problems due to extended hours in front of a screen, which is typical for the job position they perform. Additionally, upper body problems such as back, neck, wrists, and hands are also predominant in employees performing mental work.

Since the majority of the acquired data are categorical, non-parametric statistical techniques were carried out and discussed below:

Cronbach's alpha coefficient reliability test

The first test performed on the data was the Cronbach's alpha reliability test. It aims to measure the consistency strength of the studied items towards a concept, particularly occupational diagnosis. The elements used for calculating this coefficient comprise the data and results obtained through biometric screenings. The coefficient value calculated was 0.797. It shows that the collected biometric characteristics are indeed measuring occupational diagnosis.

Chi-Square Tests

The Chi-Square test constitutes a first approach to determine the association between the biometric characteristics analyzed. Statistically significant relationships at $p < 0.05$ were established. Table 1 enumerates the relations identified between the type of occupation, occupational diagnosis, and several biometric characteristics.

	Gender	BMI Classification	Laboratory Results	Age	Physical Exam Results
Type of Occupation	Dependent	Dependent	Dependent	Dependent	Independent
Occupational Diagnosis	Dependent	Independent	Independent	Independent	Dependent

Table 1: Summary Chi-Square Results

As Table 1 portrays, type of occupation showed a robust association with four of the five biometric traits examined: gender, age, BMI classification, and the results obtained via blood and urine tests, while physical exam results are independent. Occupational diagnosis is statistically related to gender and physical exam results, while characteristics such as BMI classification, laboratory results, and age do not share a relationship with occupational diagnosis. Conversely, gender is statistically dependent for type of occupation and occupational diagnosis. Furthermore, the chi-square test performed between the type of occupation and occupational diagnosis determined that these two characteristics are statistically independent.

Logistic Regression

Logistic regression is popular among health sciences. In comparison to Chi-square tests that analyze two categorical variables simultaneously, logistic regression can analyze a mix of variables (continuous, categorical) and determine their effect on a discrete outcome.

For the case study, logistic regression was performed to assess the factors that influence occupational diagnosis. The biometric characteristics acquired during the biometric screening event were used in the model. The model comprises eleven predictors: nine categorical variables (gender, age, alcohol, tobacco consumption, laboratory results, physical exam results, pathologies, clinical problems, and type of occupation) and two continuous variables (height and weight). The model was statistically significant ($\chi^2 = 46.694$, $df = 11$, $p < 0.001$, $N = 409$), which means that it could differentiate between the employees diagnosed as fit to work and fit with limitations to work. The two major factors influencing occupational diagnosis are gender and the results obtained via physical exams.

6.3 Hypotheses Discussion

Hypothesis 1: Biometrics via workplace biometric screenings can serve as a tool for improving workforce health and occupational safety by prioritizing occupational safety and health initiatives, procedures, and policies.

Research on biometric screenings is mainly oriented to the health benefits given to employees and the organization. This study aimed to explain what biometric screenings are, go beyond the health approach, and analyze the benefits of these tests in occupational safety.

In the case study examined, biometric screening results analysis and data visualization indicate workforce primary health conditions. Descriptive statistics pointed out preponderant issues suffered by the university employees. More than half of the workers are overweight or obese. This fact explains the major clinical problems encountered, such as sedentarism, hypercholesterolemia, and hypertriglyceridemia. Eyes and upper body affections are the most frequent physical examination problems, which can trigger two of the dominant pathologies (ophthalmological and musculoskeletal).

Moreover, logistic regression identified two significant factors that impact occupational diagnosis: gender and physical exam results. Occupational diagnosis is an assessment that reports if the employees can perform the job or task safely for what they were hired. The physical examination reports upper body problems as the second leading issue within the employees.

The outcomes generated by the descriptive and inferential statistical analysis were submitted to the university occupational safety and health area for revision. The biometric screening results analysis aided in making several decisions regarding occupational safety and health initiatives.

For example, the university implemented a pilot plan focusing on musculoskeletal disorders in the upper body. This plan consisted of training regarding active pauses during the work schedule; hand, wrists, forearm exercises; ergonomic mouse usage; and a trimestral follow-up. Musculoskeletal disorders in the upper body constitute a main occupational problem in mental work (administrative, office jobs) shared by a high percentage of university employees.

Consequently, based on the theoretical framework and the case study results described in section two. The following thesis can be formulated:

Thesis 1: Biometrics via workplace biometric screenings can serve as a tool for improving workforce health and occupational safety by prioritizing occupational safety and health initiatives, procedures, and policies.

Hypothesis 2: Biometric characteristics can be related to the employees' ability to perform their work

The case study presented in section two collected different biometric characteristics of 409 university employees in Ecuador: occupation, gender, age, height, weight, blood, urine, and body examination. These characteristics were analyzed, and biometric screening results were summarized and presented in the following categories: BMI classification, blood and urine laboratory test results, and physical exam results. Additionally, after reviewing the results, the occupational doctor categorized the employees into two groups: fit to work and fit to work but with limitations. There was not any case of employees that were not fit to work.

Chi-Square tests are used for hypothesis testing. In the specific case study analyzed, the type of occupation and occupational diagnosis were tested with the following biometric characteristics: gender, age, BMI classification, laboratory results, and physical exam results.

The null hypotheses are:

- Type of occupation is not statistically related to the biometric characteristics: gender, age, BMI classification, laboratory results, and physical exam results
- Occupational diagnosis is not statistically related to the biometric characteristics: gender, age, BMI classification, laboratory results, and physical exam results

The alternative hypotheses are:

- Type of occupation is statistically related to the biometric characteristics: gender, age, BMI classification, laboratory results, and physical exam results
- Occupational diagnosis is statistically related to the biometric characteristics: gender, age, BMI classification, laboratory results, and physical exam results.

Chi-square test results indicated a significant association between the type of occupation and gender, BMI classification, laboratory results, and age. Physical exam result was the only characteristic when the null hypothesis was accepted, signifying that the occupation type is independent of physical exam results. Conversely, regarding occupational diagnosis, the alternative hypothesis was accepted for gender and physical exam results. The null hypothesis was accepted for BMI classification, laboratory results, and age, meaning that these traits do not share a statistical relationship with the occupational diagnosis. In addition, logistic regression identified two main factors that impact the occupational diagnosis: gender and physical examination. Therefore, in this specific case having problems in the physical exam and gender can influence the ability to perform a job.

Based on the inferential statistical analysis described, the following thesis can be formulated:

Thesis 2: Biometric characteristics are related to the employees' ability to perform their job.

Hypothesis 3: Biometric screening results can help identify hazards that affect Occupational Safety and Health

The literature review and the experimental procedure described in the previous chapters indicate that biometric screening results can identify intrinsic hazards in the employees, affecting their health and contributing to unsafe behaviors. In the case study carried out in an Ecuadorian university, most employees perform mental work (88%) such as office assistant, professor, administrative work, and others. This type of occupation is linked to specific hazards due to the nature of the work. In this particular case study, the following mental-related work hazards were identified and presented in Figure 1.

In the case study, inferential statistical methods such as logistic regression pointed the main aspects that affect an employee's fitness to work. Consequently, it creates awareness of these unexpected hazards in the early stages, digs more in-depth on the root causes, and leads to the

planning of timely interventions because workplace accidents do not occur unexpectedly. They happen for one or multiple reasons.

BMI Classification	Abnormal Laboratory Results	Problems in Physical Examination	Clinical Problems	Pathologies
<ul style="list-style-type: none"> • Pre obesity • Overweight • Obesity • Morbid Obesity 	<ul style="list-style-type: none"> • High cholesterol • High triglycerides • High hematocrit 	<ul style="list-style-type: none"> • Eyes • Back • Neck • Hands • Wrists • Knees 	<ul style="list-style-type: none"> • Sedentarism 	<ul style="list-style-type: none"> • Musculoskeletal disorders

Figure 1: Mental work hazards

As a consequence of the pandemic started in 2020, mental work drifted to households, posing different challenges and changing the occupational safety and health dynamics. Teleworking has several advantages, such as schedule flexibility, lack of commuting, and the possibility of working from any location. However, it can provoke several problems such as more distractions, less productivity, loneliness, and unsafe work environments in terms of ergonomics, extended screen time, and difficulty disconnecting from work tasks. Biometric screening results can help identify home office hazards and the real health and safety consequences among workers due to the Covid-19 outbreak.

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 the individual and coworkers and public safety are at risk. Furthermore, new high-risk jobs regarding the level of exposure to the virus emerged amid the Covid-19 crisis drifting healthcare staff and essential workers as professions that require immediate occupational safety and health protection[28].

Based on the theoretical framework and experimental work, the following thesis can be formulated:

Thesis 3: Biometric screening results help identify hazards that affect Occupational Safety and Health

7 Conclusions

Biometric screenings constitute a vital part of wellness programs. 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.

Nowadays, biometric screenings are utterly needed to assess the remote and onsite workers' wellbeing and analyze how the pandemic is affecting them. Screenings can detect long-term effects in an infected employee case or identify specific health conditions in workers more vulnerable to the virus to instate preventive measures and plan better treatment options. Moreover, it is vital to pay extra attention to new high-risk professions such as essential service employees that comprise healthcare, the food industry, and public transportation. These covid-19 risk jobs take a disproportionate toll on racial and ethnic minorities that require occupational safety protection. OSH initiatives and policies, including safety procedures during biometric screening events, need to be generated and adapted to the new workplace reality to supply safe and healthy workspaces.

8 Applicability of new scientific results

The present study constitutes the first approach to linking health and safety in the workplace. It uses actual biometric data instead of self-assessment data collected in surveys or questionnaires to evaluate the extent to which work affects the employees and, therefore, the safety of the organization. It opens up the opportunity to discuss until what point the employer is responsible for the worker's health, lifestyle choices, and habits.

Demographic shifting worldwide will affect workplace practices. By 2020 in the European Union, people 60 years and older will account for one in five population. Additionally, by 2050 people older than 60 will represent 22% of the world's population. Thus, there will be a considerable proportion of workers aged 60 and over with daunting expectations of health problems and chronic diseases. Biometric screenings can contribute to change this phenomenon and aid employees to live a longer and healthier life. Moreover, reach sustainable employment targets, pension systems, and reduction of occupational injuries and accidents.

Biometric screening results and, therefore, hazard identification direct to proactive operations concerning workplace safety and health. Anticipation, timely elimination, and hazard control prevent long-term safety incidents in contrast to a reactive approach when the reaction occurs as the problem happens and can cause economic costs, demands, and more.

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10 Scientific publications related to the thesis

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