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Impact of Quality and Self-Care on The Acceptance of Safety Glasses in an Organization

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ABSTRACT

The problem presented is that workers in an organization do not voluntarily accept the proper use of safety glasses (PPE). This paper attempts to define the relationship between the quality of PPE, self-care, working conditions and the type of work performed by the workers and the levels of acceptance of the proper use of PPE. The validity and reliability of the instruments "PPE evaluation data sheet" and "technical survey", applied to workers, were determined by Cronbach's alpha test, which yielded a coefficient ($\alpha > 0.75$) for both instruments. The results of the hypothesis tests ($X2 < 0.05$) show a significant relationship between the quality of PPE and self-care and the levels of acceptance of the proper use of PPE, with a greater significance with respect to working conditions and the type of work performed (diamond drilling), due to the compatibility of use and ergonomic design of PPE.

Keywords: acceptance; safety glasses (PPE); quality; self-care; relationship.

INTRODUCTION

The refusal of most workers to properly wear safety glasses during exposure to operational risks is one of the main problems to be solved by employers. In this regard, it is often observed that workers wear their safety gear because of legal requirements, the imposition of a supervisor, and to avoid punishment by the employer. Workers are exposed to the physical, chemical and/or biological risks inherent to each operating process.

The purpose of this research is to determine how the quality of safety glasses, self-care, working conditions and type of work influence the refusal of workers in an organization to properly use safety glasses.

The general hypothesis is stated as follows:

- H_0: The quality of PPE, self-care, and working conditions do not relate to or impact the refusal of workers in an organization to properly use safety glasses.
- H_a: The quality of PPE, self-care, and working conditions do relate to or influence the refusal of workers in an organization to properly use safety glasses.

The scientific contribution will allow the organization's Senior Management to implement correct and efficient policies to standardize the selection and delivery of personal protective equipment and consequently achieve the acceptance of correct and permanent use of PPE during exposure to operational risks, thus minimizing the occurrence of injuries and occupational diseases.

Background

Arias (2011) identifies that the most frequent causes of resistance to the use of personal protective equipment (PPE) are discomfort (37%) and difficulty in performing tasks (29%). He also

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suggests the acquisition of PPE that meets quality requirements, as well as safe planning and permanent supervision to ensure compliance with occupational health and safety legislation.

Medina (2014) cites discomfort, fashion, usefulness, lack of interest, inexperience, and age as the main causes of resistance to the use of PPE. He also highlights the perception that more experienced workers have of the importance of the use of PPE and recommends verifying the design, material, and characteristics of the equipment to be used, in addition to its quality.

Jimenez (2005) identified that a high percentage of workers stop using safety glasses (PPE), or only use them in the presence of their supervisors or OSH committee members, because PPE interferes with their work, in which precision is required. For this reason, he recommends considering three elements for PPE selection: protection, comfort, and ease of maintenance.

Aguilar et al. (2013) concluded that *un número elevado de trabajadores en algunas ocasiones no usa sus EPP, debido al disgusto, incomodidad, talla no apropiada, entrega inoportuna o complacencia* [a high number of workers sometimes do not use their PPE due to dislike, discomfort, incorrect size, untimely delivery, or complacency] (p. 32).

Amaro (2016) defines *el disconfort y EPP que no cumplen requisitos ergonómicos, como causas básicas para que los operarios no usen, o usen de forma incorrecta sus EPP* [discomfort and PPE that do not meet ergonomic requirements as basic causes for operators not using, or incorrectly using, their PPE] (p. 4).

Application of personal protective equipment in OSH risk prevention.

The implementation of technical, administrative, and collective controls is necessary to eliminate the risks of accidents and damage to the health of workers. As a last option, the use of personal protective equipment becomes mandatory. (Instituto Nacional de Seguridad e Higiene en el Trabajo [INSHT], 2009).

Legislation applicable to the use of personal protective equipment

According to Peruvian Law No. 29783 —articles 21°, 60° and 79°, in reference to safety implements (PPE)—, employers are obliged to provide their workers with PPE that meet the safety requirements according to the type of work and the risks inherent to the performance of their tasks. This is applicable as a last option to control work risks or their harmful effects on health. The employer must verify the effective use of PPE (Ley N.° 29783, 2011).

According to article 97° of the Regulations of the Occupational Safety and Health Law (D. S. N.º 005-2012-TR, 2012), *los implementos de seguridad deberán cumplir lineamientos antropométricos para uso de los trabajadores* [safety equipment shall comply with anthropometric guidelines for worker use] (p. 464869).

Article 81° of the D. S. N° 024-2016-EM establishes that:

> *Queda terminantemente prohibido el ingreso de trabajadores a las instalaciones de la unidad minera y efectuar trabajos de la actividad minera o conexa que representen riesgo para su integridad física y salud sin tener en uso sus dispositivos y EPP que cuenten con sus especificaciones técnicas y certificados de calidad. Asimismo, los EPP deben estar en perfecto estado de funcionamiento, conservación e higiene para su uso.* [It is strictly forbidden for workers to enter the facilities of the mining unit and to carry out mining or related work that represents a risk to their physical integrity and health without using their devices and PPE with their technical specifications and quality certificates. Likewise, PPE must be in perfect working order, maintenance, and hygienic conditions for its use]. (D. S. N.° 024-2016-EM, 2016, p. 595412)

According to the Basic Ergonomics and Dysergonomic Risk Assessment Procedure Standard (R. M. N.° 375-2008-TR, 2008), appendix 1, title IV, section 18, *los equipos y herramientas que componen un puesto de trabajo deben estar adaptados a las características físicas y mentales de los trabajadores, y a la naturaleza del trabajo que se esté realizando* [the equipment and tools that make up a workstation must be adapted to the physical and mental characteristics of the workers and to the nature of the work being carried out] (p. 15).

Article 105 of the Reglamento de Seguridad y Salud en el Trabajo con Electricidad (2013) states that *los implementos de protección visual (gafas o anteojos de seguridad), son indispensables en trabajos de riesgo visual: exposición a impacto de partículas voladoras, salpicadura de fluidos o polvaredas, o radiaciones* [eye protection equipment (safety glasses or goggles) is essential for work involving visual hazards: exposure to impact of flying particles,

splashes of fluids or dust, or radiation] (p. 49). In addition, eye protection equipment must comply with the following conditions:

> *Las monturas serán indeformables al calor, cómodas y de diseño anatómico sin perjuicio de su resistencia y eficacia. Cuando se trabaje con vapores, gases o polvo muy fino, deberán ser completamente cerradas y bien ajustadas al rostro; en los casos de polvo grueso y líquidos serán como las anteriores, pero llevando incorporados los botones de ventilación indirecta con tamiz antiestático; en los demás casos serán con montura de tipo normal y con protecciones laterales, que podrán ser perforadas para una mejor ventilación. Cuando exista peligro de impactos por partículas duras, podrá utilizarse gafas protectoras del tipo "panorámica" con armazón de vinilo flexible y con visor de policarbonato o acetato transparente y ser de fácil limpieza* [The frames shall be undeformable to heat, comfortable and of anatomical design without prejudice to their resistance and efficiency. When working with vapors, gases or very fine dust, they must be completely closed and well-adjusted to the face; in the case of thick dust and liquids they will be like the previous ones but incorporating the indirect ventilation valves with antistatic screen; in the other cases they will have normal frames with lateral protections, which may be perforated for better ventilation. When there is danger of impact by hard particles, "panoramic" protective goggles with flexible vinyl frame and polycarbonate or transparent acetate visor may be used and be easy to clean]. (111-2013-MEM-DM, 2013, p. 50)

Regarding PPE, Norma G.050 (2009) states:

> *El personal que labore en una obra de construcción debe contar con el EPI acorde con los peligros a los que estará expuesto. El EPI debe proporcionar una protección eficaz frente a los riesgos expuestos, sin ocasionar riesgos adicionales ni molestias al trabajador. El EPI debe cumplir con las Normas Técnicas Peruanas de INDECOPI o a falta de éstas, con normas técnicas internacionalmente aceptadas. Previo a cada uso, el trabajador debe realizar una inspección visual del EPI a fin de asegurar que se encuentre en buenas condiciones. Si por efecto del trabajo se deteriorara, debe solicitar el reemplazo del EPI dañado. Las gafas de seguridad deben tener guardas laterales, superiores e inferiores, de manera que protejan contra impactos de baja energía y temperaturas extremas. En caso de usar anteojos de medida, las gafas de protección deben ser adecuadas para colocarse sobre los lentes en forma segura y cómoda* [Personnel working on a construction site must be provided with PPE appropriate to the hazards to which they will be exposed. The PPE must provide effective protection against the exposed risks without causing additional risks or discomfort to the worker. PPE must comply with Peruvian Technical Standards or, in the absence thereof, with internationally accepted technical standards. Prior to its use, the worker must perform a visual inspection of the PPE to ensure that it is in good condition. If it deteriorates as a result of the work, the worker must request the replacement of the damaged PPE. Safety glasses must have side, top and bottom guards to protect against low-energy impacts and extreme temperatures. In the case of using measuring glasses, the safety glasses must be suitable to be placed over the lenses in a safe and comfortable way]. (pp. 18-21)

Verification of safety glasses requirements in relation to occupational health and safety

Safety glasses (PPE) must have an adjustment system, so the adaptation and regulation of the fastening system must be verified. If they are airtight, they must be ventilated to prevent fogging, and must meet optical requirements and frame design so as not to affect normal vision. To prevent visual hazards, PPE must be protected against impact from falling or projected objects and impacts against obstacles. Screens and visors should be protected against heat and/or fire for work in ovens, laminations, fires, short-circuit electric arcs, etc. They also must be protected and resist projections of melting metals, and be treated against ultraviolet and infrared radiation (INSHT, 2009, cap. 2, pp.14-15).

American Standard: American National Standards Institute ANSI / ISEA Z87.1-2015

ANSI / ISEA Z87.1 Standards (2015) prescribe the design, performance specifications and marking of eye and face safety products, including goggles, face shields and welding helmets to be used by workers in thousands of manufacturing and processing facilities as well as research laboratories and other work environments.

The standard provides guidelines for identifying and selecting the types of eye and face protectors, as well as their capabilities and limitations for the hazards. That is, it allows recognition of multiple and simultaneous hazardous exposures, so that the eye protectors chosen must be capable of protecting against the highest level of each hazard. Some protectors may not be compatible with other personal protective equipment when used together, so the end user must carefully combine the protectors with other personal protective equipment to provide the desired protection. Protectors are generally available in a variety of styles and sizes and care should be taken to ensure that the correct size is selected for a particular person, ensuring comfort and proper fit. Ill-fitting protectors will not provide the protection for which they were designed.

National Standards concerning classification, safety glasses requirements, selection and use.

In Peru, the Peruvian Technical Standards (NTP) are used as a reference:

- NTP. 399.046:1977, which offers guidelines for classifying and selecting protective glasses against flying particles, glare and eye-damaging radiation. This standard defines a series of test methods: impact-assembly, flame breakthrough, resistance to corrosion deterioration, water absorption and disinfection. Tests must be performed following a sequence of steps detailed in the standard in order to ensure the quality of safety glasses. (Instituto Nacional de Calidad [INACAL], 2017).
- NTP. 392.003:1977 defines standards for the proper selection of goggles and shields for face and eye protection. It is applicable for most operating processes and industries, with the exception of medical procedures (X-ray) or other industrial processes where gamma rays, high power radiant energy, lightning and lasers are used. Eye and face protectors must meet the minimum requirements: adequate protection against the hazards for which they are designed, comfort, adequate and firm grip without interfering with the user's movements, durability, easy to clean and store without damage. Likewise, this standard establishes PPE for people using measuring lenses: glasses with hardened corrective lenses with lens covers, type IV spectacles (cup glasses, correction spectacle covers), panoramic spectacles or face shield. It also provides recommendations for the maintenance and disinfection of safety glasses for conservation and safe use (INACAL, 2015).

Statistics on occupational accidents, with emphasis on visual impairment, according to Peruvian Ministry of Labor (MINTRA)

The Peruvian Ministry of Labor and Employment Promotion keeps a record of eye-related accidents (including eyelids, orbit and optic nerve) from 2017 to June 2021. In summary, they have a record of 1643 accidents in 2017, 2049 in 2018, 3510 in 2019, 2049 in 2020, and 1292 between January and June 2021 (Ministerio de Trabajo y Promoción del Empleo, 2021).

METHODOLOGY

The research is experimental and cross-sectional since, for a given scenario, the levels of acceptance and rejection of safety glasses of workers in an organization and the related variables are studied.

The research is also applied since it seeks to investigate and make known whether the quality of safety glasses, self-care and working conditions have an impact on the level of acceptance and/or refusal to the safe use of safety glasses by the workers of an organization (problematic situation). The results will constitute a solid scientific-technical basis for the proposal of new tools for the selection of PPE standardization and personnel awareness, which will be adopted as part of the OSH Management System.

The research design is explanatory since the independent variables will be manipulated. The research seeks to determine whether the quality of safety glasses, workers' self-care and working conditions influence the levels of acceptance and/or worker refusal to properly use safety glasses.

The measurement instruments used were a questionnaire or technical survey on the level of acceptance of the use of PPE and a technical risk assessment and management sheet on the use of PPE. Both instruments were applied to workers during the workday.

The Cronbach's alpha test will be applied for the reliability of the measurement instruments.

The chi-square test will be used for general and specific hypothesis testing.

RESULTS

Validity and Reliability

To determine the reliability of the (mentioned) measurement instruments, the internal consistency

coefficient (Cronbach's α) was used. The results ≥ 0.75 were considered favorable.

Table 1 shows the results of the reliability test applied to the measuring instrument “Risk management evaluation sheet, use of Personal Protective Equipment - Safety glasses”.

The “Risk management evaluation sheet, use of Personal Protective Equipment - Safety glasses” yields a result of Cronbach's α = 0.839, an acceptable value for the application of such measurement instrument.

Table 2 presents the results of the reliability test applied to the measurement instrument “Technical survey regarding the level of acceptance of the use of safety glasses".

The “Technical survey regarding the level of acceptance of the use of safety glasses” yields a result of Cronbach's α = 0.832, an acceptable value for the application of such measurement instrument.

Frequency Tables

Table 3 shows the ages of the workers of the organization surveyed.

91.7% of the workers surveyed ranged from 34 to 41 years old and only 4.2% and 4.2% of the workers were in the 18 to 25 and 42 to 49 age brackets respectively.

Table 4 shows results related to the type of work performed by the organization's employees.

The results of the survey show that the type of work performed by the organization's workers is diamond drilling outdoors (open pit).

Table 5 shows the jobs related to the workers surveyed.

The highest percentage of workers surveyed (45.8 %) corresponds to “drilling assistants”, followed by 16.7 %, which corresponds to “drillers”.

Table 1. *Reliability Test 1.*

Cronbach's α	Cronbach's α based on standardized elements	No. of elements
.839	.869	15

Source: Prepared by the author.

Table 2. *Reliability Test 2.*

Cronbach's α	Cronbach's α based on standardized elements	No. of elements
.832	.855	15

Source: Prepared by the author.

Table 3. *Worker Age.*

		Frequency	Percentage	Valid Percentage	Accumulated Percentage
Valid	From 18 to 25 years old	1	4.2	4.2	4.2
	From 34 to 41 years old	22	91.7	91.7	95.8
	From 42 to 49 years old	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Source: Prepared by the author.

Tabla 4. *Type of Work Performed.*

		Frequency	Percentage	Valid Percentage	Accumulated Percentage
Valid	Diamond Drilling (Outdoor)	24	100.0	100.0	100.0

Source: Prepared by the author.

Table 6 shows the results of the job experience of the workers surveyed.

The results show that 100% of the workers have more than 1 year of experience and 58.3% of the workers surveyed have more than 5 years of experience. This is in accordance with the inclusion and exclusion terms considered for this study.

General Hypothesis Test

- H_0: The quality of PPE, self-care, and working conditions do not relate to or impact the refusal of workers in an organization to properly use safety glasses.
- H_a: The quality of PPE, self-care, and working conditions do relate to or influence the refusal of workers in an organization to properly use safety glasses.

  $Z_{0.05}$: Confidence level (95%) indicating acceptance of the value found ≤ 0.05 = H_0

  $Z_{0.05}$: Confidence level (95%) indicating the rejection of the value found ≥ H_a

  e: Error assumed at the evaluator's discretion (5%)

  p: Probability of acceptance (50 %)

  q: Probability of rejection (50 %)

Table 7 presents the results of cross-tabulation between the risk management performed by the organization for the use of safety glasses and the level of acceptance of safety glasses by the organization's workers.

The results show a rating of 29.2% level of acceptance of the use of safety glasses by the organization's workers if the organization does not perform risk management on the use of safety glasses, and 45.8% level of acceptance of the use of safety glasses by the organization's workers if the organization performs risk management on the use of safety glasses. Acceptance levels are related to risk management.

Table 8 presents results of the chi-square test ($\chi 2$) to define whether the general hypothesis is accepted or rejected.

According to the chi-square results, the significant value is 0.019 < 0.05 (0.019 < 0.05), which supports the rejection of H_0 and acceptance of H_a. Conclusion: “The quality of PPE, self-care, and working conditions do relate to or influence the refusal of workers in an organization to properly use safety glasses”. Higher levels of acceptance in the use of safety glasses by workers in an organization are obtained if quality standards are met for the selection of safety glasses, evidence of higher levels of

Table 5. *Job Position.*

		Frequency	Percentage	Valid Percentage	Accumulated Percentage
Valid	Driller	4	16.7	16.7	16.7
	Drilling Assistant	11	45.8	45.8	62.5
	Supervising Engineer	2	8.3	8.3	70.8
	SSOMA Supervisor	1	4.2	4.2	75.0
	Driver	1	4.2	4.2	79.2
	Mechanic	2	8.3	8.3	87.5
	Nurse	2	8.3	8.3	95.8
	Logistics	1	4.2	4.2	100.0
	Total	24	100.0	100.0	

Source: Prepared by the author.

Table 6. *Experience in the Job Position.*

		Frequency	Percentage	Valid Percentage	Accumulated Percentage
Valid	From 1 to 2 years	3	12.5	12.5	12.5
	From 3 to 5 years	7	29.2	29.2	41.7
	More than 5 years	14	58.3	58.3	100.0
	Total	24	100.0	100.0	

Source: Prepared by the author.

Table 7. *Cross-Tabulation: Risk Management - Safety Glasses Use*Safety Glasses Acceptance Level.*

			Safety Glasses Acceptance Level						Total
			2	4	5	6	7	8	
Risk Management - Safety Glasses Use	NO	Count	0	0	4	2	0	1	7
		% of total	0.0%	0.0%	16.7%	8.3%	0.0%	4.2%	29.2%
	YES	Count	0	0	7	2	2	0	11
		% of total	0.0%	0.0%	29.2%	8.3%	8.3%	0.0%	45.8%
	2	Count	0	0	1	0	0	0	1
		% of total	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	4.2%
	3	Count	0	1	1	0	0	0	2
		% of total	0.0%	4.2%	4.2%	0.0%	0.0%	0.0%	8.3%
	4	Count	0	0	2	0	0	0	2
		% of total	0.0%	0.0%	8.3%	0.0%	0.0%	0.0%	8.3%
	5	Count	1	0	0	0	0	0	1
		% of total	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%
Total		Count	1	1	15	4	2	1	24
		% of total	4.2%	4.2%	62.5%	16.7%	8.3%	4.2%	100.0%

Source: Prepared by the author.

Table 8. *Chi-Square (X^2) Testing.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.787[a]	25	.019
Likelihood Ratio	21.324	25	.674
Linear-by-Linear Association	7.637	1	.006
N of Valid Cases	24		

a. 35 cells (97.2%) have expected countless than 5. The minimum expected count is 0.04.

Source: Prepared by the author.

self-care and if operational/locative risk management and compatibility of use of safety glasses with other PPE are considered for the selection and use of safety glasses.

Table 9 presents the symmetric measures to define the acceptance or rejection of the general hypothesis.

The symmetry results show a high significant statistical association, which evidences a direct proportionality (K = 0.797, $p < 0.05$). Support for rejecting H_0 and accepting H_a.

Specific Hypothesis 1 Testing

H_a: The standard of safety glasses, related to the quality of PPE does have an impact on workers' refusal to properly use safety glasses in an organization.

H_0: The standard of safety glasses, related to the quality of PPE does not have an impact on workers' refusal to properly use safety glasses in an organization.

Table 10 presents the results of cross-tabulation between the quality of safety glasses and the level of acceptance of safety glasses by the organization's workers.

The results show a higher rating of 83.3% acceptance level if the organization considers quality criteria in the selection of safety glasses to be used by its workers. The levels of acceptance of the use of safety glasses are related to the quality of the safety glasses.

Table 11 presents the results of the X^2 test to define if the specific hypothesis 1 is accepted or rejected.

According to the chi-square results, the significant value is 0.02 < 0.05, which supports the rejection of H_0 and acceptance of Ha. Conclusion: “The stan-

Tabla 9. *Symmetry Indicators.*

		Value	Approximate significance
Nominal x Nominal	Pearson's correlation coefficient (K)	.797	.019
N of valid cases		24	

Source: Prepared by the author.

Table 10. *Cross-Tabulation: Quality of Safety Glasses*Acceptance Level of Use of Safety Glasses within the Organization.*

			Acceptance Level of use of safety glasses within the Organization					Total
			4	5	6	7	8	
Quality of Safety Glasses	YES	Count	0	1	0	0	0	1
		Expected count	.0	.7	.2	.1	.0	1.0
		% of total	0.0%	4.2%	0.0%	0.0%	0.0%	4.2%
	2	Count	1	15	4	0	0	20
		Expected count	.8	13.3	3.3	1.7	.8	20.0
		% of total	4.2%	62.5%	16.7%	0.0%	0.0%	83.3%
	3	Count	0	0	0	2	1	3
		Expected count	.1	2.0	.5	.3	.1	3.0
		% of total	0.0%	0.0%	0.0%	8.3%	4.2%	12.5%
Total		Count	1	16	4	2	1	24
		Expected count	1.0	16.0	4.0	2.0	1.0	24.0
		% of total	4.2%	66.7%	16.7%	8.3%	4.2%	100.0%

Source: Prepared by the author.

Table 11. *Chi-Square (X2) Testing.*

	Valor	gl	Significación asintótica -Bilateral
Pearson Chi-Square	24.375[a]	8.0	.002
Likelihood Ratio	18.644	8.0	.017
Linear-by-Linear Association	12.794	1.0	<.001
N of Valid Cases	24		

a. 14 cells (93.30%) have expected countless tan 5. The minimum expected count is .04.

Source: Prepared by the author.

dard of safety glasses, related to the quality of PPE does have an impact on workers' refusal to properly use safety glasses in an organization". This is because there are higher levels of acceptance in workers who were given safety glasses that meet quality standards than in workers who were given safety glasses that do not meet quality standards.

Table 12 presents the symmetric measures to define the acceptance or rejection of the specific hypothesis 1.

The symmetry results show a high significant statistical association, which evidences a direct proportionality (K = 0.710, $p < 0.05$). Support for rejecting H_0 and accepting H_a.

Specific Hypothesis 2 Testing

Ha: The manner and time of safety glasses use related to self-care does have an impact on workers' refusal to properly use safety glasses in an organization.

Ho: The manner and timing of safety glasses use related to self-care does not have an impact on workers' refusal to properly use safety glasses in an organization.

Table 13 shows the results of the cross-tabulation between self-care on the use of safety glasses and the level of acceptance of safety glasses by the organization's workers.

Table 12. *Symmetric Measures.*

		Value	Approximate significance
Nominal x Nominal	Pearson's correlation coefficient (K)	.710	.002
N of valid cases		24	

Source: Prepared by the author.

Table 13. *Cross-Tabulation: Self-Care on the Use of Safety Glasses*Level of Acceptance of Safety Glasses by the Organization's Workers*

			Level of Acceptance of Safety Glasses by the Organization's Workers					Total
			4	5	6	7	8	
Self-care on the use of safety glasses	YES	Count	0	2	0	0	0	2
		Expected count	.1	1.3	.3	.2	.1	2.0
		% of total	0.0%	8.3%	0.0%	0.0%	0.0%	8.3%
	2	Count	1	14	3	1	0	19
		Expected count	.8	12.7	3.2	1.6	.8	19.0
		% of total	4.2%	58.3%	12.5%	4.2%	0.0%	79.2%
	3	Count	0	0	1	1	0	2
		Expected count	.1	1.3	.3	.2	.1	2.0
		% of total	0.0%	0.0%	4.2%	4.2%	0.0%	8.3%
	4	Count	0	0	0	0	1	1
		Expected count	.0	.7	.2	.1	.0	1.0
		% of total	0.0%	0.0%	0.0%	0.0%	4.2%	4.2%
Total		Count	1	16	4	2	1	24
		Expected count	1.0	16.0	4.0	2.0	1.0	24.0
		% of total	4.2%	66.7%	16.7%	8.3%	4.2%	100.0%

Source: Prepared by the author.

The results show a higher rating of 79.2% level of acceptance if workers consider safe self-care practices related to the use of safety glasses. Acceptance levels of safety glasses use are related to self-care.

Table 14 presents the results of the X^2 test to define if the specific hypothesis 2 is accepted or rejected.

According to the chi-square results, the significant value is 0.01 < 0.05, which supports the rejection of H_0 and acceptance of H_a. Conclusion: "The manner and time of safety glasses use related to self-care does have an impact on workers' refusal to safely use safety glasses in an organization.". This is because there are higher levels of acceptance in experienced workers trained in the use of safety glasses than in less experienced workers who were not trained in the use of safety glasses.

Table 15 presents the symmetric measures to define the acceptance or rejection of the specific hypothesis 2.

The symmetry results show a significant, high statistical association, which evidences a direct proportionality (K = 0.757, $p < 0.05$). Therefore, "H_0" is rejected and "H_a" is accepted.

Specific Hypothesis 3 Testing

Ha: The working conditions and type of work performed do have an impact on workers' refusal to properly wear safety glasses in an organization.

Ho: The working conditions and type of work performed does not have an impact on workers' refusal to properly wear safety glasses in an organization.

Table 16 shows the results of the cross-tabulation between working conditions and type of work performed and the level of acceptance of safety glasses by the organization's workers.

Table 14. *Chi-Square (X2) Testing.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.211[a]	12	.001
Likelihood Ratio	15.785	12	.201
Linear-by-Linear Association	10.981	1	<.001
N of Valid Cases	24		

a. 19 cells (95.0%) have expected countless than 5. The minimum expected count is 0.04

Source: Prepared by the author.

Table 15. *Symmetric Measures.*

		Value	Approximate significance
Nominal x Nominal	Pearson's correlation coefficient (K)	.757	.001
N of valid cases		24	

Source: Prepared by the author.

Table 16. *Cross-Tabulation: Working Conditions and Type of Work Performed*Level of Acceptance of Safety Glasses by the Organization's Workers Level of Acceptance of Safety Glasses by the Organization's Workers.*

			Level of Acceptance of Safety Glasses by the Organization's Workers					Total
			4	5	6	7	8	
Working conditions and type of work performed	NO	Count	1	0	0	0	0	1
		Expected Count	.0	.7	.2	.1	.0	1.0
		% of total	4.2%	0.0%	0.0%	0.0%	0.0%	4.2%
	YES	Count	0	13	1	1	1	16
		Expected Count	.7	10.7	2.7	1.3	.7	16.0
		% of total	0.0%	54.2%	4.2%	4.2%	4.2%	66.7%
	2	Count	0	3	3	1	0	7
		Expected Count	.3	4.7	1.2	.6	.3	7.0
		% of total	0.0%	12.5%	12.5%	4.2%	0.0%	29.2%
Total		Count	1	16	4	2	1	24
		Expected Count	1.0	16.0	4.0	2.0	1.0	24.0
		% of total	4.2%	66.7%	16.7%	8.3%	4.2%	100.0%

Source: Prepared by the author.

The results show a higher rating of 66.7% level of acceptance if the organization manages the risks related to the working conditions and type of work performed for the use of safety glasses by its workers. The levels of acceptance of the use of safety glasses are related to the working conditions and type of work performed.

Table 17 presents the results of the X^2 test to define if the specific hypothesis 3 is accepted or rejected.

According to the chi-square results, the significant value is 0.001<0.05; therefore, H_0 is rejected and Ha is accepted. Conclusion: “The working conditions and type of work performed do have an impact on workers' refusal to wear safety glasses safely in an organization”. This is because there are higher levels of acceptance in outdoor/open sky work (diamond drilling), where it is evident that, for the selection of safety glasses, the management of local/operational risks, lighting, heat, wind, dust, and compatibility of the use of safety glasses with other PPE (helmet and ear muffs) was considered, as opposed to manual excavation work where the worker is affected by lighting and heat that causes fogging, in addition to the compatibility of the use of safety glasses with other PPE (helmet and respirator).

Table 18 presents the symmetric measures to define the acceptance or rejection of the specific hypothesis 3.

Table 17. *Chi-Square (X2) Testing.*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.826[a]	8	<.001
Likelihood Ratio	13.867	8	.085
Linear-by-Linear Association	2.431	1	.119
N of Valid Cases	24		

a. 14 cells (93.3%) have expected countless than 5. The minimum expected count is 0.04.

Source: Prepared by the author.

Table 18. *Symmetric Measures.*

		Value	Approximate significance
Nominal x Nominal	Pearson's correlation coefficient (K)	.744	<.001
N of valid cases		24	

Source: Prepared by the author.

The symmetry results show a significant, high statistical association, evidencing a direct proportionality (K =0.744, $p < 0.05$). Therefore, "H_0" is rejected and "H_a" is accepted.

DISCUSSION

- The reliability of the aforementioned measurement instruments, applying the internal consistency coefficient by means of Cronbach's alpha yielded values above 0.75, which is considered acceptable. Therefore, contributing with specific measurement instruments to be used in further studies related to the research study.
- The way and time of use of safety glasses (self-care), in addition to the working conditions in which the safety glasses are used, have a greater incidence (significance levels of 0.001) than the quality of the safety glasses (significance level of 0.002) in the acceptance and safe use of safety glasses by the organization's workers during the performance of their work. The reason for this is that experienced and trained workers with greater "self-care" who were given safety glasses according to the conditions of operational/locative risks of their work and compatibility of use with other PPE (helmet, earmuffs and respirator) show greater acceptance than workers with less experience and without training in the use of safety glasses, even though they are given glasses that meet quality standards. Such finding is related to the potential causes "discomfort and difficulty during the execution of tasks when using PPE", which are the workers' arguments for not using their PPE, as concluded by Arias (2011).
- Compatibility of safety glasses with the use in conjunction with other personal protective equipment (safety helmet, ear protectors, face shields and face masks) has a major bearing on the acceptance of the permanent use of safety glasses by the organization's workers. The opposite happens if safety glasses are not compatible with other PPE. This should be approached as a follow-up study to the present research study.

CONCLUSIONS

- The quality of safety glasses, self-care and working conditions are related to or have an impact on workers' refusal to properly use safety glasses in an organization. Higher levels of acceptance in the use of safety glasses by workers in an organization are obtained if quality standards for the selection of safety glasses are met, higher levels of self-care are demonstrated, and if operational/locational risk management and compatibility of use of safety glasses with other PPE are considered for the selection and use of safety glasses.
- The quality of safety glasses is related to or influences workers' refusal to properly use safety glasses in an organization, because there are higher levels of acceptance in workers who are given safety glasses that meets quality standards than in workers who

are given safety glasses that does not meet quality standards.

- Self-care on the use of safety glasses is related to or influences workers' refusal to properly use safety glasses in an organization, because there are higher levels of acceptance in experienced workers trained in the use of safety glasses than in less experienced workers who did not receive training in the use of safety glasses.
- The working conditions and type of work performed are related to or influence the workers' refusal to properly use safety glasses in an organization, since there are higher levels of acceptance in outdoor/open sky work (diamond drilling), where it is evident that, for the selection of safety glasses, the management of local/operational risks, lighting, heat, wind, dust, and the compatibility of the use of safety glasses with other PPE (helmet and ear muffs) was considered, as opposed to work in manual excavations where worker is affected by lighting and heat that causes fogging, in addition to the compatibility of the use of safety glasses with other PPE (helmet and respirator).
- The way and time of use of safety glasses (self-care), in addition to the working conditions in which the safety glasses are used, have a greater incidence (significance levels of 0.001) than the quality of the safety glasses (significance level of 0.002) in the acceptance and proper use of safety glasses by the organization's workers during the performance of their work. The reason for this is that experienced and trained workers with greater “self-care” who were given safety glasses according to the conditions of operational/locative risks of their work and compatibility of use with other PPE (helmet, earmuffs and respirator) show greater acceptance than workers with less experience and without training in the use of safety glasses, even though they are given glasses that meet quality standards.

RECOMMENDATIONS

Further research study with specific scopes should be conducted on the compatibility of safety glasses with the use of other personal protective equipment (safety helmets, ear muffs, face shields and face masks) to determine the levels of acceptance or rejection of the proper use of safety glasses by workers in an organization.

Further the research study with specific scopes in relation to the ergonomic model of safety glasses to determine the levels of acceptance of the permanent use of safety glasses by workers in an organization.

Implement management systems with specific scopes to manage compliance with quality standards and ergonomic design of personal protective equipment, with emphasis on safety glasses.

Implement management systems with specific scopes to manage compliance with specific training programs in the use and maintenance of personal protective equipment, with emphasis on safety glasses, to contribute to the scope of self-care.

Implement management systems with specific scopes to manage compliance with risk management standards related to working conditions and type of work performed. Monitor the levels of acceptance of the permanent use of PPE, especially safety glasses.

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