

Protection Measures and Change in the Perception of Work Risks with COVID-19, in a Representative Sample of Portuguese Tattoo Artists

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Abstract

Introduction: Tattoo Artists are exposed to Occupational Hazards, but the bibliography is scarce. **Methodology:** this is a Mixed Exploratory Study carried out with a quantitative component (online questionnaire) and a qualitative component (online interview). The questionnaire was available between April 2020 and March 2021 and was distributed by the companies/professionals that work on Tattoos, main national magazines in the sector, companies that supply products and equipment and organizing committees of the main national congresses. The research project was approved by the Ethics Committee of the Faculty of Arts of the University of Porto (28.04.2020) and an informed consent was obtained. As an inclusion criterion, it was considered to carry out tattooing tasks on a paid basis. As exclusion criteria, working outside the country or not mastering the Portuguese language stood out. **Results:** 207 Tattoo Artists answered the questionnaire (25.87% of professionals registered in Portugal) and nine interviews took place. Numerous statistically significant associations were found between the variables analysed. **Final considerations:** the main weaknesses of the study are related to the difficulties inherent in data collection: as it was carried out using an online questionnaire, it was not controlled whether all respondents practiced the profession of Tattoo Artists. Furthermore, as it is a voluntary questionnaire, it is possible that the sample retained professionals who value Occupational Health issues. This investigation combined quantitative and qualitative techniques, so that it was possible to take advantage of and mitigate the disadvantages of both; in fact, the qualitative aspect sequentially completed and explored the data initially obtained in the survey, as well as it allowed to deepen issues initially not programmed, such as the possible interference of the Pandemic associated with SARS-COV2 in the general Risk Perception and compliance with the Standards of Good Practices. Re-

garding the interviews, the sample was reduced, although the answers were reasonably repeated. During those, even though the questions were posed based on what the Tattoo Artists' thoughts on what most of the colleagues considered and not having to answer only for themselves, this may still have motivated them to respond in a more politically correct manner. In the overall project, very complete data were obtained on Occupational Health applied to this professional sector, part of which had not been published before, which will certainly constitute an asset to acting more effectively. Overall, Portuguese Tattoo Artists believe that most of their colleagues try to comply with the standards of Good Practice, and this attitude was boosted by the COVID-19 pandemic.

Keywords

Tattoo, Tattoo Artists, Occupational Health, Risk Perception, COVID

1. Introduction

Tattoo Artists are often exposed to occupational hazards of a chemical nature (paints and cleaning products) [1] [2] [3] [4] [5], biological (due to possible contact with the clients' blood) [1] [3] [6] [7] [8] [9], mechanical (repetitive movements, forced/maintained postures), physical (noise and vibrations) [3] [8] and psychosocial (work stress).

Acting in compliance with so many risk factors implies mastering a wide range of knowledge, regarding Protection Measures (collective and individual), which need constant updating and close support, provided by the Occupational Health and Safety Team, capable of responding to the specific needs of the sector. Nonetheless, there is evidence that the profession may not have these protective factors available, essentially due to three situations: the minimum level of education/professional training that these workers must have in order to be able to exercise is not regulated; the obligation to maintain surveillance in terms of Occupational Health and Safety is often regulated by individual decision, since the inspection is residual; as the information available on the subject is also very scarce, so specific action on the particularities of this professional sector by occupational Health and Safety teams is generally deficient.

Thus, the question arises about what type of collective and individual Protection Measures Tattoo Artists use to protect their health, especially today, when there is a pandemic infectious disease process that's enhanced by social proximity, a factor that's implicit in the concretization of a Tattoo. Therefore, an exploratory study was developed with the purpose of knowing the perception of Tattoo Artists when it comes to the adoption/use of Labour Protection Measures, collective and individual, as also identify possible relevant changes in this behaviour in association with the COVID-19 pandemic.

2. Methodology

A Mixed Exploratory Study was performed, with a quantitative research com-

ponent, resulting from the application of an electronic questionnaire and a qualitative part, which includes the analysis of several interviews, carried out synchronously, through an online platform, since the study was performed during one of the national confinement period, related to the COVID-19 pandemic.

The questionnaire was available between April 2020 and March 2021 and was distributed by the companies/professionals that work on Tattoos, main national magazines in the sector, companies that supply products and equipment and organizing committees of the main national congresses.

For the statistical analysis, upon verification of the normality of the variables with the Shapiro-Wilk test, the Mann-Whitney and Kruskal-Wallis tests were predominantly used to investigate the differences between variables, as well as the Kendall's tau-b correlation coefficient.

The research project was approved by the Ethics Committee of the Faculty of Arts of the University of Porto (28.04.2020) and an informed consent was obtained. The study was oriented by Declaration of Helsinki.

As an inclusion criterion, it was considered to carry out tattooing tasks on a paid basis. As exclusion criteria, working outside the country or not mastering the Portuguese language stood out.

3. Presentation and Discussion of Results

A total of 207 Tattoo Artists answered to the questionnaire, which is equivalent to 25.87% of professionals registered in Portugal. Nine professionals were also interviewed.

The sample consists mostly of middle-aged Tattoo Artists (68.3% were between 30 and 50 years old), male (66.7%), married or living together (60.4%), without a higher education (70.0%) and of Portuguese nationality (91.8%). In terms of professional experience, more than half had worked for less than five years, although the majority (60.9%) were exclusively dedicated to this activity and had their own establishment open to the public. It should be noted, however, that only 58% attended some sort of professional training to be able to work, which perhaps explains the express need to have more knowledge on Occupational Health and Safety, especially because about 1/3 of the individuals never had an appointment with an Occupational Physician, nor has the place where they work ever been evaluated by an Occupational Safety Technician; in spite of that, the vast majority accepts that Science/Medicine can contribute to improve the sector (**Table 1**).

All Tattoo Artists recognized the presence of risk factors associated with their work, although some of the agents listed were not always considered by the majority as being very dangerous to health or security, as is the case of handling machines in poor condition or monotonous work. On the other hand, repetitive movements and forced postures were considered important by almost all professionals, perhaps because of the presence of musculoskeletal symptoms, which could bring workers a greater degree of awareness of the risks (**Table 2**).

Table 1. Sociodemographic/professional variables.

Variables	N	Valid %
Age	[20 - 29]	63 30.7
	[30 - 39]	98 47.8
	[40 - 49]	42 20.5
	[50 - 60]	2 1.0
Gender	Female	69 33.3
	Male	138 66.7
Marital status	Single	69 33.3
	Married	61 29.5
	Living together	64 30.9
	Divorced	10 4.8
	Widow	3 1.4
Education	Basic education	22 10.6
	Secondary education	123 59.4
	Bachelor's degree	18 8.7
	Licentiate	27 13.0
	Post-graduation	8 3.9
	Master's degree	8 3.9
	Doctorate	1 0.5
Nationality	Portuguese	190 91.8
	Non-Portuguese	17 8.2
Professional experience	Between 0 and 5 years old	106 52.0
	Between 6 and 10 years old	59 28.9
	Between 11 and 15 years old	13 6.4
	Between 16 and 20 years old	15 7.3
	Above 20 years old	11 5.4
Labour exclusivity	Yes	126 60.9
	No	81 39.1
Owns an establishment	Yes	149 72.0
	No	58 28.0
Professional training	Yes	120 58.0
	No	87 42.0
Needs training in occupational health	Yes	120 59.4
	No	82 40.6
Has regular consultation with the Occupational Physician	Never happened	67 33.0
	Sporadically	29 14.3
	2/2-year consultation	107 52.7
The workplace is regularly assessed by the safety technician	Never happened	65 32.2
	Sporadically	60 29.7
	Regularly	77 38.1
Do you consider the recommendations of Medicine/Science appropriate for the Tattoo sector?	Yes	174 84.5
	No	32 15.5

Table 2. Tattoo artists' perception of occupational risk factors.

Risk factors	Health risks	
	No	Yes
Chemical agents	9.9	90.1
Forced/maintained postures	0.5	99.5
Repetitive movements	0.5	99.5
Machines capable of causing injury	9.9	90.1
Old machinery and/or in poor condition	60.9	39.1
Noise	22.7	77.3
Vibrations	10.1	89.9
Visual strain, inadequate illuminance	12.8	87.2
Biological agents	10.4	89.6
Isolated work	28.4	71.6
Monotonous work	55.7	44.3
Extended shifts	19.3	80.7
Stress	21.4	78.6

3.1. Collective Protection Measures

Several Collective Protection Measures that could have some applicability in this sector were listed and the respondent was asked to classify them in accordance with the scale: yes; no, but it would be necessary and no, because it would be unnecessary.

Even though in seven of the nine measures that were proposed, more than half of the individuals mentioned having them already at their professional context, it is possible to verify that the most valued measures are associated with the existence of breaks during working hours, use of modern and effective disinfection methods, consultation of safety data sheets and planning of appointments for large/complex Tattoos intercalated with smaller/simple projects. In an opposite scenario, there is the existence of an adjustable Electric Chair for the Tattoo Artist, the use of an Autoclave and the change to less toxic chemical agents, factors that imply not only the personal decision, but the existence of specific knowledge to do so and financial resources (see **Figure 1**).

To summarize, it appears that the Collective Protection Measures to which Tattoo Artists are less receptive add financial burdens, while those with greater acceptability are essentially at the level of behavioural change, something that's understandable, considering that most Tattoo Artists have their own establishment (72%), so they need to directly assume these costs.

To understand whether sociodemographic and professional factors could be associated with greater or lesser adherence to collective protection measures, the Mann-Whitney and Kruskal-Wallis tests were used (**Table 3**).

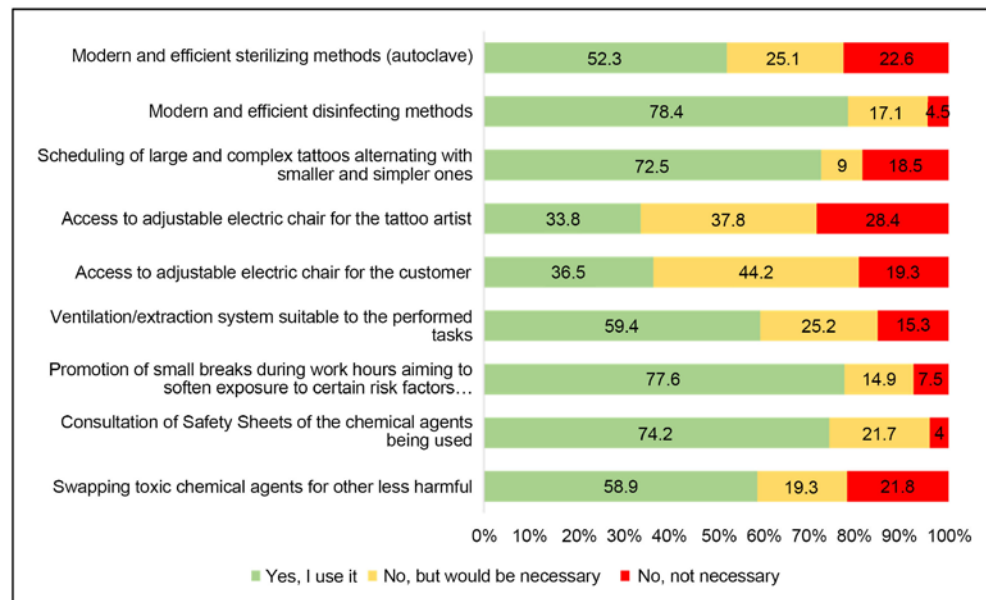


Figure 1. Collective protection measures used by tattoo artists.

Table 3. Factors that potentially influence the adoption of Collective Protection Measures.

	Age	Gender	Nationality	Professional experience	Labour exclusivity	Professional training	Needs training	Medical practitioner	Safety technician	Science Recommendations
Sterilization Methods: Use of Autoclave	0.008*	0.530**	0.044**	<0.001*	0.084**	0.575**	0.894**	0.250*	0.024*	0.319**
Modern and effective disinfection methods	0.927*	0.293**	0.929**	0.037*	0.066**	0.825**	0.615**	0.791*	0.517*	0.033**
Tattoo Scheduling	0.100*	0.492**	0.031**	0.029*	0.120**	0.049**	0.016**	0.395*	0.029*	0.019**
Electric chair for tattoo artist	0.426*	0.168**	0.316**	0.005*	0.076**	0.139**	0.896**	0.786*	0.598*	0.246**
Electric chair for customer	0.599*	0.761**	0.012**	0.047*	0.228**	0.099**	0.642**	0.508*	0.272*	0.419**
Ventilation/extraction system	0.504*	0.093**	0.049**	0.708*	0.173**	0.814**	0.445**	0.306*	0.082*	0.103**
Promotion of short work breaks	0.791*	0.416**	0.284**	0.809*	0.085**	0.666**	0.089**	0.156*	0.089*	0.599**
Consultation of safety data sheets	0.034*	0.926**	0.756**	0.085*	0.319**	0.706**	0.810**	0.455*	0.172*	0.133**
Swapping more toxic chemicals	0.364*	0.372**	0.950**	0.252*	0.009**	0.682**	0.009**	0.625*	0.708*	0.378**

* Kruskal-Wallis test ** Mann-Whitney test.

It appears that in terms of age, the Kruskal-Wallis test reveals that there are significant differences, showing a greater probability of older tattooists considering useful to consult the safety data sheets of chemical products ($p = 0.034$) and these are also those who use the Autoclave to sterilize materials the most ($p = 0.008$), probably because of their greater economic stability, which facilitates the acquisition and maintenance of more sophisticated and expensive equipment [10].

In terms of gender, there were no significant differences that would make it possible to distinguish adherence to Collective Protection Measures.

The same does not happen with nationality, as it appears that non-Portuguese Tattoo Artists tend to have access to a greater number of resources, and also value them more, such as the autoclave ($p = 0.044$), the electric chair for the client ($p = 0.012$), ventilation and an extraction system ($p = 0.049$), as well as scheduling of Tattoos: more complex intercalated with simple ones ($p = 0.031$); it is inferred that these differences can be justified either by the fact that the majority of foreign workers are employed by other, in larger and more structured studios, with access to more resources, and perhaps by the fact that, in the country of origin, they were already using these means.

Analysing Professional Experience (number of years as a Tattoo Artist) there are also significant statistical differences that allow to deduce that individuals with fewer years in the profession are more likely to do not have access to Electric Chairs for the client ($p = 0.047$) and for the Tattoo artist ($p = 0.005$), autoclave and to sterilize materials ($p \leq 0.001$), despite considering them important—which may be justified by more financial limitations [10] and/or having to yet to gather clientele. At the same time, those with fewer years of practice are also more likely to consider unnecessary the adoption of effective methods for surface disinfection ($p = 0.037$); on the other hand, the most experienced are those who are more likely to consider unnecessary to intercalate extensive and complex tattoos with others that are faster and simpler to perform ($p = 0.029$); which may be justified by the fact that, as age/years of work/experience advances, the valuation of the Good Practice Standards may be different [11] [12], because they can feel more semiology associated with Occupational Risks and have more knowledge about it [11] [13] [14], or the opposite: valuing less for feeling more experienced and in control of the work environment.

Considering the adoption of Collective Protection Measures due to the existence of professional exclusivity, it appears that those who work less in this area are more likely to devalue the toxicity of Chemical Agents, being generally not available to switch to less toxic products ($p = 0.009$), perhaps because the exposure time is shorter, they present less semiology and the symptoms are of late onset-leading to a lower Perception of Risk [14] or because they are less informed about the problem, since Tattooing is just a complementary activity. Although the Mann-Whitney test did not reveal statistical associations related to the use of electric chairs for Tattoo Artists and clients, it is possible to identify the exis-

tence of these differences through the application of the chi-square test, where we are able to verify, from the contingency table that, whoever works exclusively at Tattooing is more likely to have a chair adapted for the Tattoo Artist ($p = 0.002$) and for the client ($p = 0.040$), while the rest, despite considering it important, still do not have access to these materials, possibly due to lower economic stability [10] and the less intense awareness of Occupational Risks and their medical consequences, which are generally enhanced with aging, more years of work and/or the existence of more pathologies/symptoms [11] [13] [14].

Through the analysis of the frequency of previous professional training, no statistical associations were found that could justify significant differences in the adoption of Collective Protection Measures (except for the scheduling of Tattoos, $p = 0.049$), a fact that corroborates the idea that the offer of professional Training (Workshops), in addition to being optional, may not suit the needs of Tattoo Artists, since the simple data debit, even if eventually well linked and argued, is not enough for all professionals to change their behaviour [15]. Furthermore, despite having made a distinction between Technical (how to do a Tattoo) and Occupational Health and Safety Training, perhaps the individuals in the sample did not make a clear distinction.

Analysing the potential influence that the contact with the Occupational Physician and the Safety Technician can have, in the adhesion/valorisation of these protection measures, it appears that the first did not seem to have any influence at this level, but the visit of the Technician to the work places can influence the adoption of adequate sterilization techniques, such as the acquisition of an autoclave ($p = 0.024$), as well as the organization and planning of the schedule ($p = 0.029$); despite not being statistically significant, the analysis of the contingency table still allows us to state that the intervention of these professionals can have a positive effect, tending to be associated with those who have a ventilation/extraction system ($p = 0.082$) and with those who take breaks from the tattooing tasks regularly ($p = 0.089$), which seems to be logical, that is, even though the presence of this professional is mandatory, it is more likely to happen among Tattoo Artists who are more concerned with the Standards and with greater financial capacity.

Finally, the results show that Tattoo Artists who consider the Medicine/Science Recommendations to be adequate are more likely to consider the different Collective Protection Measures, highlighting the scheduling of more complex and lengthy procedures with shorter and simpler ones ($p = 0.019$) and the use of suitable materials for disinfection of surfaces and equipment ($p = 0.033$), meaning that the more the Recommendations are valued, the greater the compliance with the Protection Measures [16].

The relationship between Risk at work versus adherence to Collective Protection Measures was analysed through Tau-b Kendall test (Table 4).

The results show that, as the perception of chemical risk increases, is greater the adoption of different measures of adequate protection ($p = 0.014$), as taking breaks during the work ($p = 0.046$). Simultaneously, the appreciation of pauses is

Table 4. Correlations between risk perception and adherence to collective protection measures.

		Chemical products	Forced and/or maintained postures	Repetitive movements	Machines capable of causing injury	Old machinery/in poor condition	[Noise	[Vibrations	Visual strain/inadequate illuminance	Biological agents	Isolated work	Monotonous work	Extended shifts	Stress
Swapping toxic chemical agents	Cc	-0.062	-0.017	-0.067	0.031	-0.090	-0.108	-0.140	-0.090	-0.017	-0.036	0.056	-0.087	0.106
	Sig	0.330	0.800	0.309	0.619	0.164	0.092	0.030	0.153	0.793	0.573	0.387	0.165	0.093
Safety Data Sheets	Cc	-0.028	0.158	-0.061	-0.085	-0.010	-0.055	-0.019	-0.115	-0.079	-0.036	0.003	-0.034	0.035
	Sig	0.671	0.022	0.373	0.193	0.882	0.407	0.778	0.074	0.225	0.585	0.966	0.600	0.592
Breaks at work	Cc	-0.129	-0.167	-0.130	0.058	-0.025	0.115	0.073	0.007	-0.059	0.053	0.166	-0.059	-0.027
	Sig	0.046	0.015	0.054	0.369	0.707	0.078	0.264	0.915	0.361	0.413	0.012	0.352	0.677
Ventilation system	Cc	-0.155	-0.031	-0.031	0.028	-0.027	0.057	0.073	0.019	0.025	0.083	0.066	-0.037	0.051
	Sig	0.014	0.636	0.639	0.655	0.675	0.372	0.254	0.766	0.693	0.189	0.308	0.547	0.414
Electric chair for customer	Cc	-0.105	-0.062	0.133	-0.085	-0.029	-0.073	-0.055	-0.136	-0.056	0.064	-0.013	-0.023	-0.009
	Sig	0.096	0.354	0.044	0.177	0.654	0.254	0.386	0.030	0.373	0.312	0.843	0.715	0.891
Electric chair for tattoo artist	Cc	-0.047	-0.053	0.094	-0.083	-0.027	-0.056	0.030	-0.021	0.036	0.018	-0.033	-0.010	-0.068
	Sig	0.446	0.421	0.146	0.179	0.667	0.370	0.632	0.734	0.566	0.770	0.607	0.868	0.272
Tattoo scheduling	Cc	-0.100	0.028	0.020	-0.076	-0.113	-0.063	-0.124	-0.016	-0.040	0.050	0.077	0.014	0.003
	Sig	0.120	0.682	0.765	0.237	0.085	0.328	0.057	0.806	0.538	0.436	0.242	0.820	0.963
Disinfection methods	Cc	-0.066	0.056	-0.070	-0.038	-0.067	-0.115	-0.018	-0.101	-0.085	-0.093	-0.004	-0.168	-0.085
	Sig	0.309	0.414	0.300	0.557	0.311	0.082	0.783	0.115	0.189	0.155	0.947	0.009	0.191
Autoclave to sterilize	Cc	-0.065	0.049	-0.075	0.005	-0.064	-0.003	0.048	-0.021	-0.064	.133	-0.034	-0.119	-0.094
	Sig	0.301	0.464	0.253	0.934	0.323	0.963	0.454	0.731	0.312	0.035	0.601	0.055	0.133

Cc—Correlation coefficient | Sig—Statistical significance.

also correlated with a perception of risk attributed to repetitive movements ($p = 0.054$), forced/kept postures ($p = 0.015$) and monotonous work (0.012), which may indicate the existence of adherence to collective protection, intensified by musculoskeletal symptomatology, given that this is one of the procedures that softens this risks [17].

3.2. Personal Protective Equipment

Some examples of Personal Protective Equipment were highlighted and the respondent was asked to apply the following scale: “not necessary; it is necessary, but I don’t own it; it is necessary, I own it, but I do not use it; it is necessary, I own it, but I use it little and it is necessary, I own it and I use it frequently” (Figure 2). The most valued and used agents were Gloves (for biological agents, cleaning surfaces/instruments and chemicals), Masks, Aprons and Cuffs. In the opposite situation there were Auricular Protection; Scrub Cap or equivalent; Anti-vibration gloves; as well as Uniform and Visor.

Upon analysis of the use of some personal protective equipment in terms of sociodemographic and personal data, there were some relationships with gender and nationality, but which seem to do not have a specific meaning (Table 5). There are no significant differences related to age. Based on what is described in the literature, it is reasonably expected that females, those older/with more years of experience and/or that are national tattooists globally use more PPE, due to

the perception of risk being generally higher among females [11] [13] [14] [18] and older/with more years of experience or even with more illnesses and/or symptoms [11] [14]; additionally, emigrants/workers with a more precarious or non-existent professional contract accept worse working conditions and higher occupational risks more easily [19]; when there is an economic reward the worker usually accepts danger more easily [14].

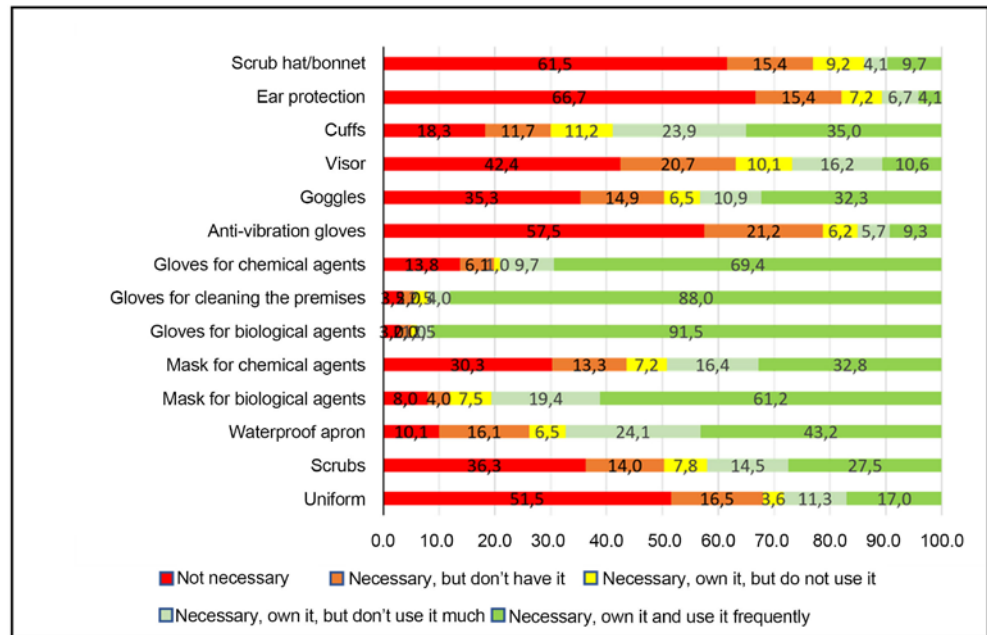


Figure 2. Personal protective equipment used by Tattoo Artists.

Table 5. Factors that potentially influence the adoption of personal protective equipment.

	Age	Gender	Nationality	Professional experience	Labour exclusivity	Professional training	Needs training	Medicine Recommendations
Uniform	0.773*	0.991**	0.267**	0.808*	0.821**	0.585**	0.003**	0.292**
Scrubs	0.343*	0.125**	0.335**	0.457*	0.998**	0.430**	0.552**	0.507**
Waterproof apron	0.286*	0.473**	0.036**	0.568*	0.974**	0.239**	0.536**	0.162**
Mask for biological agents	0.620*	0.067**	0.064**	0.368*	0.473**	0.374**	0.002**	0.019**
Mask for chemical agents	0.413*	0.017**	0.935**	0.036*	0.022**	0.694**	0.339	0.671**
Gloves for biological agents	0.871*	0.799**	0.093**	0.481*	0.791**	0.217**	0.079	<0.001**
Gloves for cleaning	0.319*	0.980**	0.059**	0.622*	0.264**	0.492**	0.486**	0.011**
Gloves for chemical agents	0.298*	0.802**	0.680**	0.298*	0.094**	0.624**	0.894**	0.111**
Anti-vibration gloves	0.065*	0.127**	0.712**	0.248*	0.781**	0.008**	0.788**	0.243**
Protective goggles	0.345*	0.465**	0.061**	0.501*	0.739**	0.007**	0.217**	0.270**
Visor	0.784*	0.873**	0.464**	0.300*	0.446**	0.621**	<0.001**	0.654**
Cuffs	0.931*	0.384**	0.742**	0.699*	0.528**	0.331**	0.357**	0.010*
Ear protection	0.311*	0.628**	0.265**	0.515*	0.802**	0.929**	0.085**	0.273**
Scrub hat/bonnet	0.841*	0.936**	0.010**	0.653*	0.264**	0.386**	0.015**	0.370**

* Kruskal-Wallis test **teste Mann-Whitney test.

It appears that those working for longer ($p = 0.036$) and those who dedicate themselves exclusively to Tattooing ($p = 0.022$) are more likely to do not value the use of a mask for protection when it comes to contact with Chemical Agents, with no other significant differences being verified, because the experience, on the one hand, may lead to the trivialization of Risk [15]; it is inferred, however, that, given the current moment, putting on a mask for biological protection can probably already give a greater sense of security compared to the pre-pandemic period.

Considering previous professional training, those who frequently had some events recognized the importance of wearing protective eyewear ($p = 0.007$), although they did not always use them, and did not value the use of anti-vibration gloves to handle machines ($p = 0.008$)—this can be explained considering that the materials of these gloves are usually bulky, so they can decrease the capability of executing the design and painting the skin.

As for the domain of knowledge in Occupational Health, Tattoo Artists who report needing more training, as a rule, appear to be more compliant, due to a greater appreciation of risk, with statistically significant differences with the use of uniform ($p = 0.003$), mask for biological agents ($p = 0.011$), visor ($p < 0.001$) and scrub cap ($p = 0.015$). Greater risk perception/valuation generally implies greater compliance with individual protection norms/measures [20].

Finally, the results show that the Tattoo Artists who consider the recommendations of Medicine/Science adequate are more likely to use most PPE, especially the Mask ($p = 0.019$) and Gloves for Biological Agents ($p < 0.001$), as well as gloves for Cleaning Surfaces in the establishment ($p = 0.011$) and Cuff Sleeves ($p = 0.010$). That is, the more the Risk is valued, more individual protection measures they adopt [16] [20].

It was analysed, by calculating Kendall's tau-b correlation coefficient, whether adherence to PPE varied as a function of Risk Perception (Table 6).

It appears that, as the Perception of Chemical Risk increases, so does the use of Uniform ($p = 0.002$), Mask ($p \leq 0.001$) and Gloves to handle these agents ($p = 0.002$), for example; which makes sense, given the association between Risk Perception and compliance with the Standards [16], already highlighted.

In terms of Noise, a positive correlation ($p = 0.024$) stands out, which indicates that the higher the Risk Perception, the greater the probability of using hearing protectors. In the same way, Tattoo Artists, as the perception of risk in relation to vibrations increases, as they are emitted by the same instrument that also produces noise, are more likely to also use ear protectors ($p = 0.002$).

Still in terms of exposure to vibrations, it appears that those who consider the use of old machines or equipment in poor condition are also more receptive to the use of anti-vibration gloves ($p = 0.019$), although this does not happen for those who value the risk associated with vibrations in general ($p = 0.451$); perhaps Tattoo Artists feel that modern tattoo machines do not produce enough vibrations to pose a risk to their health.

Table 6. Correlations between risk perception and the use of personal protective equipment.

		Chemical products	Forced and/or maintained postures	Repetitive movements	Machines capable of causing injury	Old machinery/in poor condition	Noise	Vibrations	Visual strain/inadequate illuminance	Biological agents	Isolated work	Monotonous work	Extended shifts	Stress
Uniform	Cc	0.195	0.062	0.059	0.097	0.069	-0.001	0.032	0.047	0.071	0.051	0.173	-0.016	-0.106
	Sig	0.002	0.344	0.360	0.116	0.279	0.981	0.610	0.449	0.250	0.413	0.007	0.794	0.085
Scrubs	Cc	0.081	0.057	-0.012	0.053	0.034	-0.036	-0.110	-0.031	0.034	0.012	0.036	-0.017	-0.063
	Sig	0.186	0.379	0.857	0.382	0.582	0.565	0.076	0.608	0.574	0.840	0.566	0.781	0.295
Waterproof apron	Cc	0.009	-0.027	-0.039	-0.060	-0.039	-0.105	-0.076	-0.112	-0.046	-0.029	-0.100	-0.030	-0.041
	Sig	0.886	0.672	0.540	0.324	0.528	0.086	0.218	0.063	0.452	0.631	0.112	0.613	0.496
Mask for biological agents	Cc	0.128	-0.132	-0.201	-0.050	0.062	-0.034	-0.129	0.000	0.046	0.051	-0.039	0.007	-0.038
	Sig	0.040	0.044	0.002	0.426	0.324	0.589	0.041	0.997	0.463	0.413	0.540	0.913	0.539
Mask for chemical agents	Cc	0.296	0.008	-0.056	0.054	0.146	-0.008	-0.073	0.051	0.004	0.045	-0.023	-0.005	-0.092
	Sig	0.000	0.895	0.380	0.375	0.018	0.894	0.235	0.401	0.942	0.454	0.718	0.935	0.128
Gloves for biological agents	Cc	0.062	0.086	-0.013	-0.063	-0.035	-0.025	-0.115	-0.043	0.012	0.048	-0.158	0.048	0.051
	Sig	0.339	0.211	0.852	0.332	0.597	0.702	0.081	0.510	0.855	0.463	0.018	0.457	0.429
Gloves for cleaning	Cc	0.006	-0.029	-0.070	-0.023	-0.080	-0.086	-0.122	-0.044	-0.024	-0.004	-0.149	-0.024	0.009
	Sig	0.930	0.677	0.299	0.718	0.227	0.192	0.065	0.496	0.707	0.956	0.026	0.706	0.888
Gloves for chemical agents	Cc	0.200	-0.042	0.012	0.043	0.012	-0.030	-0.046	0.092	0.104	0.014	0.000	0.016	0.012
	Sig	0.002	0.535	0.852	0.492	0.853	0.640	0.471	0.143	0.101	0.831	0.994	0.793	0.846
Anti-vibration gloves	Cc	0.293	-0.002	-0.031	0.111	0.150	0.063	0.048	0.079	-0.022	0.073	0.107	0.063	0.032
	Sig	0.000	0.976	0.642	0.075	0.019	0.319	0.451	0.204	0.722	0.242	0.097	0.308	0.606
Protective goggles	Cc	0.046	0.103	0.064	0.056	-0.039	-0.129	-0.098	-0.025	0.009	-0.097	0.017	-0.002	-0.018
	Sig	0.447	0.106	0.309	0.352	0.530	0.034	0.108	0.676	0.886	0.109	0.779	0.968	0.761
Visor	Cc	0.122	-0.031	-0.030	0.017	0.004	-0.078	-0.119	-0.048	-0.029	-0.074	-0.097	-0.098	-0.155
	Sig	0.044	0.628	0.634	0.773	0.953	0.203	0.052	0.421	0.632	0.217	0.120	0.103	0.010
Cuffs	Cc	-0.007	0.046	-0.095	-0.058	-0.052	-0.103	-0.060	-0.050	0.009	-0.053	-0.078	-0.034	-0.104
	Sig	0.914	0.473	0.133	0.334	0.397	0.090	0.327	0.405	0.887	0.382	0.209	0.566	0.082
Ear protection	Cc	0.139	0.095	0.028	0.086	0.201	0.145	0.201	0.115	-0.018	0.012	0.017	0.068	-0.032
	Sig	0.029	0.156	0.673	0.173	0.002	0.024	0.002	0.067	0.779	0.852	0.793	0.278	0.608
Scrub hat/bonnet or equivalent	Cc	0.182	0.020	0.006	0.070	0.113	0.032	0.041	0.020	-0.007	-0.031	0.070	0.012	-0.047
	Sig	0.004	0.764	0.932	0.264	0.077	0.613	0.520	0.744	0.909	0.618	0.276	0.843	0.447

Contrary to what would be expected, the perception of Work Stress and Biological Risk do not correlate with the adoption of any Individual Protection Measure, and it should be noted that the greater the perception of stress by Tattoo Artists, the less is the use of visor ($p = 0.010$).

It was also analysed whether the frequency of workers' contact with the Occupational Health and Safety Team would have any influence on adherence to PPE (see **Table 7**). It can be concluded that the frequency of contact with the Occupational Doctor does not significantly influence the adherence to PPE by workers, except for the cuffs; on the contrary, as the contact with the Safety Technician increases, so does the adherence to the use of waterproof apron ($p = 0.006$), gloves for biological risk ($p = 0.023$), for cleaning surfaces ($p = 0.024$) and for chemical agents ($p = 0.032$), as well as the use of cuffs ($p = 0.016$).

Table 7. Correlations between access to occupational health and safety services and the use of personal protective equipment.

		Uniform	Scrubs	Waterproof apron	Mask for biological ag	Mask for chemical ag	Gloves for chemical ag	Cleaning gloves	Gloves for chemical ag	Anti- vibration gloves	Goggles	Visor	Cuffs	Ear protection	Scrub hat
Occupational Physician	Cc	0.012	0.037	0.095	-0.011	-0.023	0.059	0.112	0.060	-0.050	0.025	-0.025	0.156	-0.112	-0.009
	Sig.	0.852	0.559	0.129	0.862	0.717	0.382	0.093	0.360	0.436	0.685	0.689	0.012	0.087	0.887
Safety technician	Cc	0.086	0.076	0.170	-0.025	0.009	0.151	0.148	0.138	0.069	0.075	0.070	0.147	0.009	0.099
	Sig.	0.172	0.222	0.006	0.697	0.880	0.023	0.024	0.032	0.278	0.218	0.254	0.016	0.886	0.119

3.3. Adherence to Protection Measures during the COVID-19 Pandemic

Given that the study was carried out during the COVID-19 pandemic, it was intended to know whether this phenomenon significantly affected both the overall risk perception of most Tattoo Artists, as well as the adherence to safety recommendations, with respondents unanimously answering “yes”. In the following question, they were asked to specify the main changes they came and the answers differed:

(...) I didn't change almost anything in my studio because I was already doing everything they told me to do...I even did more than they told me to do...if I were to comply with what they are saying, I would have to reduce my level of care...I defend that we have to do what is right...you cannot put people's lives at risk, much less mine (...)

Some considered that the General Norms became more complied (in addition to the specific norms in relation to the Pandemic) only due to social pressure and because they thought that the client expected to find these measures:

(...) I would like to believe that COVID has changed Tattoo Artists' perception of risk...but I think that a Tattoo Artist who previously did not respect the rules, will now comply because it is mandatory...there it is...it's the misinformation...by not knowing what could happen in case of contagion and microorganisms, they also don't understand why they use personal protective equipment...or disinfectant gel at the door...I think it's something that should always have existed, at least in our field and I think that nowadays it is merely used because it is mandatory...I would like to believe that Tattoo Artists have become more aware, but unfortunately, I think the misinformation continues (...)

Still others, more optimistic, consider that this occurs due to a greater perception and awareness of the risk involved; giving some concrete examples of what has changed in the studio:

(...) we started to wear a mask daily and at all times...if we wanted to, we could do it earlier...however the adaptations were minimal compared to the care we already had before COVID...and hand disinfection became a more aggressive factor...COVID came to value the responsibility of the hygienic part...and also made the customer feel safer (...)

(...) it wouldn't be honest of me to say it's the same...I believe that if we were all already trying to have a sanitized and clean studio, I think now we try to fulfil those expectations more...but, in general, we already cared for most of these de-

tails (...)

(...) I think there was an analysis here of what it was...what was being done...I watched the opening moment in the studios after the confinement and verified that the rules were reinforced...it seems to me that they were not reinforced just for obligation, but also for fear and prevention...for example, the use of a mask or plastic foot protection was not very common, while these things have always existed...and now it is a completely normal thing in any studio (...)

(...) it changed for me...I already followed all the rules before, but I do even more now...everything is more thoroughly disinfected...I only see one person per day, because of COVID and my clients...I think the other Tattoo Artists now comply more with the rules (...)

(...) not much has changed in particular, but some things have changed...sharpening some edges...I think society has started to value us a little more...I have some clients who tell me: I still come here because I know that you didn't have to change anything from what you were doing before...and now clients give more importance to the care I have (...)

(...) maybe this applies to those who didn't have as many safety rules, yes...they started to use them more...Tattoo artists are very familiar to hygiene issues...what I changed the most was the mask...but even so, there were lots of Tattoo artists who already used them...I didn't had that habit...but it makes me think about the future...maybe it makes sense to use them, even after COVID...and aprons and foot covers too, but everything else remained the same (...).

However, one of the interviewees clearly pointed out that, even at this time, there are still Tattoo Artists who do not comply with the basic rules of the sector and sometimes post videos on social networks performing Tattoos where several nonconformities are easily proven:

(...) however, through Instagram, and by following other Tattoo Artists, I noticed that there were some who were not shaken at all...footwear protection, for instance...I think it's a minority...there are Tattoo Artists who are not concerned about complying with the rules, not even with this increased perception of COVID risks...we adapt some rules: for example, the customers now cannot bring companion, which makes the dynamic change a lot...the environment is a little bit sadder, but that's it (...).

4. Final Consideration

This study is part of a broader investigation that aims to portray the Tattoo Artist profession in terms of Occupational Health and Safety; it was possible not only to characterize the Risk Perception of Portuguese Tattoo Artists, but also to highlight their position regarding the adoption of different Collective and Individual Protection Measures.

The main weaknesses of the study are related to the difficulties inherent in data collection: as it was carried out using an online questionnaire, it was not controlled whether all respondents practiced the profession of Tattoo Artists.

Furthermore, as it is a voluntary questionnaire, it is possible that the sample retained professionals who value Occupational Health issues, leaving out those who comply least with the Protection Measures. Nonetheless, taking into account the length of the questionnaire (it took more than twenty minutes to complete it), it is unlikely that individuals, who are not Tattoo Artists, have made themselves available to answer it in full.

This investigation combined quantitative and qualitative techniques, so that it was possible to take advantage of and mitigate the disadvantages of both; in fact, the qualitative aspect sequentially completed and explored the data initially obtained in the survey, as well as it allowed to deepen issues initially not programmed, such as the possible interference of the Pandemic associated with SARS-COV2 in the general Risk Perception and compliance with the Standards of Good Practices.

Regarding the interviews, the sample was reduced, although for this purpose, the answers were reasonably repeated around the different conclusions drawn and already reported. During those, even though the questions were posed based on what the Tattoo Artists' thoughts on what most of the colleagues considered and not having to answer only for themselves, this may still have motivated them to respond in a more politically correct manner.

In the overall project, very complete data were obtained on Occupational Health applied to this professional sector, part of which, to the author's knowledge, had not been published before, which will certainly constitute an asset to acting more effectively.

Overall, Portuguese Tattoo Artists believe that most of their colleagues try to comply with the standards of Good Practice, and this attitude was boosted by the COVID-19 pandemic.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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