

## Original articles

# Analysis of the implementation of Hearing Conservation Programs

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## ABSTRACT

**Purpose:** to assess the implementation of hearing conservation programs in two large companies.

**Methods:** an evaluative research that analyzed a type 1b implementation. The study was conducted in three stages, namely: establishing the company's degree of implementation, analyzing the companies' policies and structures, and lastly, analyzing the influence of the companies' policies and structures on their degree of implementation. The following analyses were conducted to collect data: interviews, document analysis, and observation.

**Results:** the hearing conservation program in Company A was classified as implemented (91.1%), while in Company B, it was partially implemented (62.7%). The context in Company A was favorable to implementing the program, whereas in Company B, the context was considered unfavorable, due to disadvantageous categories. Also, the characteristics of the implementation context influenced the placement of the program either positively or negatively.

**Conclusion:** there were satisfactory results regarding the implementation of the hearing conservation program in both companies assessed.

**Keywords:** Health Assessment; Noise-Induced Hearing Loss; Program Evaluation

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## INTRODUCTION

Noise-induced hearing loss (NIHL) is still one of the most prevalent occupational diseases worldwide. It affects workers in a wide range of businesses and industries, as a result of continuous or intermittent exposure to high-intensity noise, slowly developing throughout many years<sup>1,2</sup>.

In Brazil, every company is obligated to implement an Environmental Risk Prevention Program (PPRA, as abbreviated in Portuguese). If the program detects a high sound pressure level as a risk agent, the company must organize a hearing conservation program (HCP), as established by the regulatory norm no. 9<sup>3</sup>.

The HCP is a set of actions aiming to prevent or stabilize occupational hearing losses through continuous improvement processes. Based on the knowledge of a multidisciplinary team, it is developed with planned and coordinated activities involving the various sectors of the company<sup>3</sup>.

Among the HCP actions, the following are highlighted: measures to monitor and control the environmental noise at the workplace, selection and provision of hearing protection devices, audiometric monitoring, workers' training and instruction, updated records, and program assessment<sup>4</sup>.

For the HCP to be feasible and effective, all the stages must be properly carried out and coordinated. Also, it must count on the active participation of health professionals, safety personnel, managers, human resources, and especially the workers<sup>5</sup>.

Considering the complex and broad components of the HCP activities, assessing it is an emerging need, taking into account each company's context and structure particularities.

The assessment via implementation analysis is a tool that helps understand how the HCP is being put into effect in the companies. It provides information on the dynamics of the program as actually implemented, also considering the influence of contextual factors that either facilitates or hinders their implementation. Such an assessment offers the basis to plan and develop the program's activities<sup>6</sup>.

It is important to emphasize that the results of an assessment can help in decision-making regarding the continuity, modification, or interruption of the actions

being developed, organization of the work, and the practice of the professionals involved in the HCP.

Few papers are found in the literature approaching the assessment of HCP in companies. This may be due to difficulties found when implementing it or the little experience in assessing programs on the part of those responsible for the HCP<sup>5</sup>.

The study on HCP implementation analysis is part of the effort made by speech-language-hearing and public health researchers to develop evaluative pieces of research. Their purpose is to list the multiple aspects involved in the processes of implementing health policies, programs, and services<sup>7</sup>.

Hence, this study aimed to assess the implementation of the HCP in two large companies in the state of Pernambuco, Brazil.

## METHODS

This evaluative research, conducted from March to November 2019, analyzed type 1b implementations. Its objective was to understand the variations observed in the degree of implementation and its context<sup>6</sup>. The study was approved by the Research Ethics Committee of the *Universidade Federal de Pernambuco*, Brazil, under evaluation report number 3.197.976.

The strategy used was the study of multiple cases at the same level of analysis<sup>8</sup> to investigate complex social phenomena and preserve holistic and significant characteristics of real-life events.

The selected cases were two large companies, one from the public sector (Company A) and the other from the private sector (Company B), both located in the Recife Metropolitan Area (RMA), in Pernambuco, Brazil. The cases were chosen based on the following inclusion criteria: having an HCP for at least five years and being a large company<sup>9</sup> (more than 100 employees). The exclusion criterion was the company's not having an occupational medicine department responsible for the HCP activities.

The study was conducted in three stages, namely: (1) establishing the company's degree of implementation; (2) studying the companies' policies and structures; and (3) analyzing the influence of the companies' policies and structures on their degree of implementation.

## Stage 1: Establishing the company's degree of implementation

The HCP actions logical model (LM)<sup>10</sup> and the HCP analysis and judgment matrix (AJM), developed and validated by specialists<sup>11</sup>, were used to establish the degree of implementation.

In this perspective, it is essential to consider the HCP basic components in order to establish the degree of implementation – i.e., it involves a phase with explanations of the resources employed and their organization (structure) and the services or goods produced (process). The LM furnishes a visual organization of how the program works and what the causal relationship between its elements is<sup>6</sup>.

The AJM presents criteria, structure and process indicators, verification parameters, and the score expected for each indicator, thus providing a quantified value for the HCP. The AJM items were used as a basis to construct this study's collection instruments. To obtain the degree of implementation (DI), three sources of evidence were used: interviews, document surveys, and direct observation.

Initially, interviews were conducted with a structured questionnaire based on the indicators listed in the AJM. The goal of the questionnaire was to gather information, such as data about the company (business, number of employees, existing health programs, and so forth), and data on the HCP structure and processes (actions) in the companies. In this stage, the key contacts for information were the occupational physician (Company A) and the occupational nurse (Company B). Both were chosen for being directly related to the hearing health activities in these companies.

The direct observation was carried out in both companies by the researcher to verify the human resources and material employed in the HCP, as informed by the administrators. The document survey aimed to verify the record of the actions developed in

the HCP, complement them, and compare them with the data obtained in the interviews.

The documents made available by the administrators and assessed by the researcher were the reports on the Occupational Health Medical Control Program (PCMSO, as abbreviated in Portuguese), Environmental Risk Prevention Program (PPRA), and HCP, copy of the audiometry, PPE approval certificate, clinical-occupational anamnesis form, accidents at work notification form, and occupational health certificate.

All the said stages were carried out in person at the companies. The researcher was welcomed to the administrators' office, where they were asked to answer all the questions and were informed that the interviews would be recorded.

Based on the data obtained from the sources of evidence, each company's DI was established, using a system of scores with a cutoff according to criteria that referred to the structure and process indicators listed in the AJM.

When the indicator reached the stipulated parameter, the full score was given; when it did not reach it, no score was given. In case the key contact did not know the answer to the question, or the activities related to that indicator, a score was not given, either. When some activity did not apply to the company's situation, the indicator was considered not applicable (NA). The score referring to this indicator was subtracted from the expected score and the final DI score.

Given the importance and complexity of the processes implemented in the HCP, the weight of these components' scores on the analysis was six, whereas that of the structure components was four. Since the number of criteria varied between the components, the score was presented in percentages for the comparison.

Hence, the score was calculated as percentages in relation to the expected score for each indicator – 100% was the highest expected percentage, using the formula presented below in Figure 1.

$$GI \text{ Total} = \left( \frac{(4 \sum E^1 + 6 \sum P^1) / 10}{(4 \sum E^2 + 6 \sum P^2) / 10} \right) * 100$$

Captions:  $\Sigma E^1$  = Sum of the scores obtained in the indicators that made up the "Structure" dimension;  $\Sigma P^1$  = Sum of the scores obtained in the indicators that made up the "Process" dimension;  $\Sigma E^2$  = Sum of the scores expected in the indicators that made up the "Structure" dimension;  $\Sigma P^2$  = Sum of the scores expected in the indicators that made up the "Process" dimension.

**Figure 1.** Formula to calculate the degree of implementation of the hearing conservation program

To judge the company's DI value, four cutoff scores were considered, as proposed by Samico<sup>12</sup>: < 25.0% - not implemented; 25.1% to 50.0% - incipient implementation; 50.1% to 75.0% - partially implemented; > 75.1% - implemented.

## Stage 2: studying the companies' policies and structures

The parameters used to judge the context in which the HCP was implemented in the companies were based on the Policy and Contingency Model, inspired on the policy and structure models, and classified as "favorable" or "unfavorable" to the implementation of the HCP<sup>13</sup>.

This model is guided by some questions, which were assessed as either favorable or not, based on the criteria considered and listed in each category of the analysis. The reference for the criteria established for contextual analysis is the actions considered favorable to the implementation of the HCP.

These data were obtained with a semi-structured interview with these companies' PCMSO administrators (both were occupational physicians) to analyze what strategies are offered to fully perform the program. The interviews were voice-recorded for future transcription and analysis. They were centered on the investigated theme cores, originated on the analysis categories of the policy and structure context developed for other programs, and adapted to the HCP<sup>14</sup>.

The main theme cores investigated by category were: a) Formalization of the sector responsible for planning the PCMSO and/or HCP; b) Profile of the HCP administrator; c) Attention given to innovation; d) Size; e) Centralization; f) Formalization; g) HCP planning and assessment; h) HCP implementation investments; i) Familiarity with the HCP; j) Familiarity with and follow-up on the financial resources available for the HCP actions; and k) Priority given to implementing the HCP in the company.

## Stage 3: Analyzing the influence of the companies' policies and structures on their degree of implementation

To analyze the influence the context had on the DI of the HCP, the pieces of evidence found in information gathered from the different data collection methods were mutually crossed.

## RESULTS

Figures 2 and 3 detail the process and structure indicators used to establish the DI of the HCP in both companies, and the maximum expected and achieved values in each of the components.

COMPONENT	DIMENSION	INDICATOR	EXPECTED SCORE	OBTAINED SCORE	
				COMPANY A	COMPANY B
STRUCTURE	PHYSICAL, HUMAN, AND ORGANIZATIONAL RESOURCES	1. Existence of a person or position in the company responsible for ensuring administrative resources and measures to carry out the hearing conservation program.	3.0	3.0	3.0
		2. Existence of a specialized safety engineering and occupational medicine service, either with a person or team, that at the employer's will are apt to develop projects and engineering measures.	2.0	2.0	2.0
		3. Existence of an occupational physician responsible for the occupational health medical control program.	3.0	3.0	3.0
		4. Existence of a professional or team of professionals technically skilled to develop the hearing conservation program (HCP).	3.0	3.0	3.0
		5. Existence of a specialized professional to perform the audiological examinations.	2.0	2.0	2.0
		6. Professional training completed for them to perform audiological examinations.	3.0	3.0	3.0
		7. Existence of qualified professionals to carry out educational actions.	1.0	1.0	1.0
		8. Proof that the audiometric examination is conducted in the audiometric booth(s) or acoustically treated environment(s).	3.0	3.0	3.0
		9. Existence of a risk analysis report.	3.0	3.0	0.0
		10. Existence of a report on the planning of the Environmental Risk Prevention Program (PPRA).	3.0	3.0	3.0
		11. Existence of a report on the occupational health medical control program (PCMSO).	3.0	3.0	3.0
		12. Existence of a report on personal protective equipment (PPE) attenuation trials.	3.0	3.0	0.0
		13. Existence of a report on HCP implementation.	3.0	3.0	0.0
		14. Existence of adequate PPE to each activity's risk.	1.0	1.0	1.0
		15. Existence of an approval certificate of the PPE used by the employees.	2.0	2.0	2.0
		16. Proof that the audiometric examination is conducted in duly calibrated measuring equipment.	3.0	3.0	3.0
		17. Existence of audiometric examination forms.	1.0	1.0	1.0
		18. Existence of clinical-occupational anamnesis.	1.0	1.0	1.0
		19. Existence of accident at work notification forms.	1.0	1.0	1.0
		20. Existence of individual clinical record.	2.0	2.0	2.0
		21. Existence of proof of delivery of audiometric examination.	1.0	1.0	1.0
		22. Existence of proof of delivery of hearing protection device.	1.0	1.0	1.0
		23. Existence of minutes.	1.0	1.0	1.0
		24. Existence of educational material.	2.0	2.0	0.0
		25. Existence of informational material.	2.0	2.0	2.0
		26. Instrument to measure the degree of implementation of the HCP.	2.0	0.0	0.0
<b>TOTAL VALUE</b>			<b>56.0</b>	<b>53.0</b>	<b>39.0</b>

Source: Authors of the paper.

Captions: HCP – Hearing conservation program; PPE – Personal protective equipment; PPRA – Environmental Risk Prevention Program; PCMSO – Occupational health medical control program.

**Figure 2.** Structure indicators and expected and obtained scores in each company

COMPONENT	DIMENSION	INDICATOR	EXPECTED SCORE	OBTAINED SCORE	
				COMPANY A	COMPANY B
PROCESSES	RISK AND PLANNING ANALYSIS	27. Preliminary noise exposure assessment.	3.0	3.0	0.0
		28. Quantitative noise exposure assessment.	3.0	3.0	0.0
		29. Identification of homogeneous groups that have the same exposure characteristics.	2.0	2.0	2.0
		30. Analysis of the (co)existence of other risk agents (chemical, physical, and biological).	2.0	2.0	0.0
		31. Establishing HCP responsibilities, goals, and priorities.	3.0	3.0	0.0
		32. Establishing action strategies and methodologies.	3.0	3.0	0.0
		33. Presentation and discussion of the annual planning along with sectors involved with the HCP.	2.0	2.0	0.0
	ENVIRONMENTAL CONTROL	34. Participation in the implementation of engineering measures.	2.0	2.0	2.0
		35. Participation in the implementation of administrative measures.	2.0	2.0	2.0
		36. Selection of adequate PPE.	2.0	2.0	2.0
		37. Provision and replacement of PPE to the employees.	2.0	2.0	2.0
		38. Inspecting the use of PPE.	2.0	2.0	2.0
		39. Definition of the employees who must be paid hazard pay or special retirement due to noise exposure.	2.0	NSA	NSA
	HEARING HEALTH ADMINISTRATION	40. Warranty of the verification procedures and periodic control of the audiometer proper functioning.	3.0	3.0	3.0
		41. Carrying out occupational anamnesis.	2.0	2.0	2.0
		42. Performing ear inspection.	2.0	2.0	2.0
		43. Performing pre-employment audiometric examination.	3.0	3.0	3.0
		44. Establishing every employee's initial and/or reference audiometry.	3.0	3.0	3.0
		45. Performing sequential audiometric examinations.	3.0	3.0	3.0
		46. Performing post-employment audiometric examinations.	3.0	3.0	3.0
		47. Performing speech audiometry.	2.0	0.0	0.0
		48. Performing complementary audiological examinations.	2.0	2.0	2.0
		49. Referring for specialized assessment.	2.0	2.0	2.0
		50. Establishing differential diagnosis criteria.	2.0	2.0	0.0
		51. Analysis of the evolution and definition of the evolutive diagnosis.	3.0	3.0	3.0
		52. Records of the results of the audiological diagnosis administration.	2.0	2.0	2.0
		53. Notifying accidents at work.	3.0	3.0	3.0
		54. Records administration.	2.0	2.0	2.0
		55. Carrying out training programs, courses, debates, organizing commissions, participating in events, and other appropriate forms involving the effects on health caused by exposure to high sound pressure levels.	3.0	3.0	0.0
		56. Training the employees regarding the implementation of group and individual measures.	3.0	3.0	3.0
		57. Making available copies of the examinations and medical certificates.	2.0	2.0	2.0
	58. Listening to the employees' suggestions.	2.0	2.0	2.0	
	ASSESSMENT	59. Performing quantitative analysis of prevalence and incidence of the results of audiological examinations.	3.0	3.0	0.0
		60. Assessing the satisfaction level of the employees.	2.0	2.0	0.0
		61. Measuring the degree of implementation of the HCP through auditing.	3.0	0.0	0.0
		62. Analysis of the contextual factors that can influence HCP implementation.	2.0	0.0	0.0
<b>TOTAL VALUE</b>			<b>85.0</b>	<b>78.0</b>	<b>52.0</b>

Source: Authors of the paper.

Captions: HCP – Hearing conservation program; PPE – Personal protective equipment; NA – Not applicable.

**Figure 3.** Process indicators and expected and obtained scores in each company

Table 1 shows the summary of the expected and achieved values per component, and the DI of the HCP. It is noticed that Company A achieved better scores than Company B, as the HCP implementation

in Company A was classified as implemented (91.1%), whereas in Company B it was classified as partially implemented (62.7%).

**Table 1.** Distribution of the expected and obtained scores per component and degree of implementation of the hearing conservation program in each company

COMPONENT	EXPECTED SCORE	OBTAINED SCORE		DEGREE OF IMPLEMENTATION (%)	
		COMPANY A	COMPANY B	COMPANY A	COMPANY B
STRUCTURE	56.0	53.0	39.0	91.1% = Implemented	62.7% = Partially implemented
PROCESS	87.0	78.04	52.0		

Source: Authors of the paper

The dimension with the best scores among those assessed (Table 2) was “hearing health administration” in both companies. “Assessment”, on the other hand, obtained the lowest scores in both companies

– Company B did not score in any of the indicators, followed by “Risk Analysis and Planning”, in which it scored in only one indicator.

**Table 2.** Distribution of the expected and obtained scores per dimensions

COMPONENT	DIMENSION	EXPECTED SCORE	OBTAINED SCORE	
			COMPANY A	COMPANY B
STRUCTURE	PHYSICAL, HUMAN, AND ORGANIZATIONAL RESOURCES	56.0	53.0	39.0
	RISK AND PLANNING ANALYSIS	18.0	18.0	2.0
PROCESSES	ENVIRONMENTAL CONTROL	10.0	10.0	10.0
	HEARING HEALTH ADMINISTRATION	47.0	45.0	40.0
	ASSESSMENT	10.0	5.0	0.0

Source: Authors of the paper

Regarding the context in which the implementation takes place in the companies, Figures 4 and 5 present the analysis categories, analysis parameters, and the classification of each company’s context. The evidence described was gathered in the interviews, document surveys, and direct observation.

The results of the analysis revealed that Company A’s implementation context was favorable, as most of the analysis categories were presented as favorable to

implementing the HCP. In contrast, Company B’s was unfavorable, as most of the analysis categories were presented as disadvantageous to it.

In both companies, the structural context proved to be less favorable to the HCP implementation, with fewer favorable categories than the policy context. The “Attention given to innovation” and “Centralization” were the ones that were considered unfavorable in both companies.

Research question	Variable	Category	Analysis parameters	Context evidence and classification	
				Company A	Company B
Do the characteristics of the administrators, environment, and organization favor the implementation of the intervention?	Organizational attributes	Formalization of the responsible sector	There is a sector responsible for the functioning and planning of the Occupational Health Medical Control Program and/or Hearing Conservation Program.	There is an occupational health sector in the company Source: Direct observation + interview with the administrator <b>Context favorable to the implementation</b>	There is an occupational health sector in the company Source: Direct observation + interview with the administrator <b>Context favorable to the implementation</b>
	Administrators' attributes	Profile of the HCP administrator	Has a higher education degree; is specialized in occupational health or related areas; has previous experience in the field of Occupational Health or Hearing Conservation Program.	Medical school degree and specialization in Occupational Health and Family Health Source: Interview with the administrator <b>Context favorable to the implementation</b>	Medical school degree and specialization in Occupational Health Source: Interview with the administrator <b>Context favorable to the implementation</b>
		Attention given to innovation	Seeks to bring and/or support new HCP actions.	Improvement courses; reported the need and desire to improve the group protective equipment. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Improvement courses. Source: Interview with the administrator <b>Context favorable to the implementation</b>
			Seeks partnerships with other networks to develop occupational hearing health actions.	No evidence was found. <b>Context unfavorable to implementation</b>	No evidence was found. <b>Context unfavorable to implementation</b>
		Environmental attributes	Size	The number of professionals involved in carrying out the HCP is proportional to the demand of employees included in the program's actions	Number of professionals proportional to the demand Source: Interview with the administrator <b>Context favorable to the implementation</b>
	Fully carries out the HCP actions or needs support from other third-party company(ies)			Does not fully carry out the HCP actions, needs support from third-party companies. There are coordination and communication between the program administrator and the providing company. Source: Interview with the administrator + document analysis <b>Context favorable to the implementation</b>	Does not fully carry out the HCP actions, needs support from third-party companies. There is neither coordination nor communication between the program administrator and the providing company. Source: Interview with the administrator <b>Context unfavorable to implementation</b>
	Centralization		Decision-making and planning regarding HCP actions involve all the sectors with a direct or indirect relationship with the program.	The decisions are made by those involved in the HCP: Occupational Health and Safety sectors. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Decision-making depends on the Human Resources department, to which those involved in the program are subordinated. Source: Interview with the administrator <b>Context unfavorable to implementation</b>
			The HCP actions give priority to all the stages planned.	Little investment in group protective equipment. Source: Interview with the administrator <b>Context unfavorable to implementation</b>	Restricted to administering audiological diagnosis and few hearing health educational actions. Source: Interview with the administrator <b>Context unfavorable to implementation</b>
	Formalization		The actions proposed in the HCP and their results (annual report on the administration of audiological diagnosis) are presented and discussed by those involved.	Takes place annually. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Does not take place. Source: Interview with the administrator <b>Context unfavorable to implementation</b>
			There is a control of employees with occupational hearing loss onset and worsening, emitting notifications of accidents at work	They maintain such control and emit the notification. The date of the last such notification was informed. Source: Interview with the administrator + document analysis <b>Context favorable to the implementation</b>	They maintain such control and emit the notification. The date of the last such notification was informed. Source: Interview with the administrator <b>Context favorable to the implementation</b>
	Planning and Assessment	Actions to monitor and assess the HCP are periodically conducted.	The HCP is not assessed. Source: Interview with the administrator <b>Context unfavorable to implementation</b>	The HCP is not assessed. Source: Interview with the administrator <b>Context unfavorable to implementation</b>	

Source: Authors of the paper.

Caption: HCP – Hearing conservation program

**Figure 4.** Analysis of the structural implementation context of the hearing conservation program.

Research question	Variable	Category	Analysis parameters	Context evidence and classification	
				Company A	Company B
Do the strategies of those involved favor or hinder the implementation of the intervention?	Support given by those involved in the intervention	Investments to implement the HCP	Investment is made on human, financial, and material resources for the HCP so that implementing the HCP is feasible.	Available resources are proportional to the necessary HCP services. Source: Interview with the administrator <b>Context favorable to the implementation</b>	No resources specifically for the HCP, only for the Occupational Health sector (including audiometry, hearing protection devices). Source: Interview with the administrator <b>Context unfavorable to implementation</b>
	Control in the organization to make the intervention functional	Familiarity with the HCP	The administrators know what the HCP is, as well as its objectives, activities, and results; the main documents that guide its implementation.	Is familiar with the HCP and the main documents that guide its implementation. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Is familiar with the HCP and the main documents that guide its implementation. Source: Interview with the administrator <b>Context favorable to the implementation</b>
		Familiarity with and follow-up on the financial resources available to the HCP actions	The HCP administrators are familiar with the financial values available to implement and develop HCP actions and follow up on how these resources are spent.	Is familiar with the resources made available every year to the HCP actions. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Is familiar with the resources made available every year to the Occupational Health sector (including audiometry, hearing protection devices). Source: Interview with the administrator <b>Context favorable to the implementation</b>
Are those in charge of the organization in favor of implementing the intervention?	Relationship between the underlying reasons to support the intervention and the associated objectives	Considers the HCP implementation a priority in the company	The administrators consider the importance of implementing an HCP to prevent and/or stabilize occupational hearing losses	Considers the implementation of the HCP important to prevent and/or stabilize occupational hearing losses. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Considers the implementation of the HCP important to prevent and/or stabilize occupational hearing losses. Source: Interview with the administrator <b>Context favorable to the implementation</b>
			They follow up on the HCP annual results.	Follows up on the results and discusses them with the speech-language-hearing therapist responsible for administering the audiological diagnoses. Source: Interview with the administrator <b>Context favorable to the implementation</b>	Follows up on the results within the PCMSO. Source: Interview with the administrator <b>Context unfavorable to implementation</b>

Source: Authors of the paper.

Captions: HCP – Hearing conservation program; PPE – Personal protective equipment; PCMSO – Occupational Health Medical Control Program.

**Figure 5.** Analysis of the policy implementation context of the hearing conservation program.

In the “Search for partnerships with other networks to develop Occupational Hearing Health actions”, under “Attention given to innovation”, the administrators did not know whether there was any partnership with other health networks. In its turn, “HCP actions give priority to all the planned stages”, under “Centralization”, was considered unfavorable, as the administrators informed that the audiological monitoring stages are given priority, whereas others, such as health education and HCP assessment, were little explored or not given any attention.

In “HCP actions are fully carried out or support from third-party company(ies) is required”, under “Size”, although both needed such support, only Company A’s HCP administrator knew the speech-language-hearing therapist responsible for performing audiometry, who annually discussed with him its results.

Company B’s administrator did not know the person responsible for performing the audiometric examinations, neither did they specifically discuss the results of the audiological monitoring. Although no contradictions were found between the administrators’ statements and the evidence gathered from the other sources, Company A’s administrator gave briefer and more restrict answers, while Company B’s gave longer and more detailed answers about the program.

Figure 6 shows the relationship between the DI and the implementation context. It is noticed that the DI was influenced by the context, as the company that had a favorable context (Company A) achieved a higher DI than the one with an unfavorable implementation context (Company B).

COMPANY	DEGREE OF IMPLEMENTATION		CONTEXT OF IMPLEMENTATION	
	%	CLASSIFICATION	CATEGORIES FAVORABLE TO IMPLEMENTATION	CLASSIFICATION
<b>A</b>	91.1%	<b>Implemented</b>	Formalization of the sector responsible; Profile of the HCP administrator; Attention given to innovation; Size; Centralization; Formalization; HCP implementation investments; Familiarity with the HCP; Familiarity with and follow-up on the financial resources available to the HCP actions; Considers the HCP implementation a priority in the company.	<b>Favorable</b>
<b>B</b>	62.7%	<b>Partially implemented</b>	Formalization of the sector responsible; Profile of the HCP administrator; Attention given to innovation; Formalization; Familiarity with the HCP; Familiarity with and follow-up on the financial resources available to the HCP actions; Considers the HCP implementation a priority in the company.	<b>Unfavorable</b>

Source: Authors of the paper.

Caption: HCP – Hearing conservation program

**Figure 6.** Relationship between each company's degree of implementation and the context of implementation

## DISCUSSION

Given the complexity and variability of the HCP actions, it is necessary to conduct assessments that consider the implementation context in which the program takes place. This type of analysis was chosen because the evaluative processes need to consider the different stages planned in the program, thus identifying and understanding the aspects that affect its results and effects<sup>6</sup>.

Even though the DI achieved by Company A was considered implemented, some gaps were still found in it (such as in "Assessment") – as well as in Company B, since neither of them invests in sturdier assessments that specifically consider the HCP actions and their variabilities.

In this regard, this seems to be a limitation of assessments that only consider the audiological results, which would possibly not be able to fully expound the effectiveness or quality of the HCP actions. The combined qualitative and quantitative assessments contribute to a more concise evaluation of the HCP quality and effectiveness<sup>15,16</sup>.

Among the dimensions assessed, "Hearing health administration" was the one with the highest score. This may be explained by the concentration of audiological monitoring actions in this dimension, as the companies often focus their attention almost entirely on these actions.

Although the audiometric examinations (which are the main tool to monitor the workers' hearing) are important hearing health indicators to the HCP, it must

be taken into account that they are only functional when they aim preventive actions and measures. Also, audiometric monitoring alone does not characterize an implemented program<sup>17</sup>.

The companies' DI results allow for an association between the characteristics of the organizations (companies) and of the administrators as elements that can either positively or negatively influence the implementation of the HCP.

It was observed that the DI was influenced by the context, as the more favorable the context (as in Company A), the higher the DI was. This contrasted with Company B's unfavorable context and lower DI. Such findings are coherent with the results of other studies<sup>18,19</sup>, in which the implementation of other health programs was influenced by the context, with these two variables occurring in direct proportion.

The structural context proved to be less favorable to the HCP implementation than the policy one. Theoretically, an organization's structural characteristics work either antagonistically or synergically to the implementation of the program<sup>13</sup>. Even though Company A had some unfavorable categories in the structural context, its HCP was well-coordinated and planned, with satisfactory final results, based on the collected evidence.

Company A's policy context was completely favorable, unlike that of Company B. According to Company A's program administrator, they care for their workers' health and invest in it. It was also stated that they do not face many program decision-making and administration limitations, as the company's

organizational structure enables the actions to be planned and carried out in a decentralized yet coordinated way.

According to Chiavenato<sup>20</sup>, centralization and decentralization refer to the hierarchical level in which decisions are made within an organization. Centralization means that decision-making takes place at the top of the organization, whereas in decentralization it takes place at lower levels of the organization. In the study of organizations, decentralization is more valued, as it helps decisions to be made faster by the very people who put the actions into effect; also, those who make the decisions are the best-informed ones about the program.

In the case of Company A, decentralization appears as a positive quality. Besides the decision-making autonomy given to the HCP administrator, such decisions are shared and coordinated with other sectors of the company, which facilitates the implementation of the program.

In Company B, on the other hand, the decisions related to Safety and Occupational Medicine are made in another sector of the company. Moreover, the administrator stated that the very actions of the program are centralized at the unit in the state's capital. Hence, other working units located inland are given little attention and investment for the program, due to the geographical distance and the delayed or inexistent communication between the units' administrators.

Therefore, centralized decision-making and actions seem to be limiting factors for HCP implementation. These findings corroborate other studies, in which decentralized occupational health actions help them to be integrated and positively contribute for results to be achieved<sup>21,22</sup>.

Another limiting aspect of Company B listed by the administrator was the lack of agreement between the Safety and Occupational Medicine sectors, as the quantitative noise analysis data are obsolete – i.e., they had not been updated in the company for 10 years. As a consequence, those involved in the health actions refuse to continue the HCP actions because the quantification of the noise levels at the various work settings is not updated. Those responsible for the Occupational Safety sector do not give priority to updating these quantitative noise analyses – a limiting factor for the continuity of HCP actions, generating an unfavorable context for the implementation of the program.

In this scenario, these results agree with the study by Rabinowitz et al.<sup>16</sup>, whose authors found a

significant association between the HCP administrators' commitment and the program's effectiveness. They further highlighted that it is important that managers give priority and be committed to the implementation of preventive actions at the workplace, so the effectiveness of the HCP is not affected.

In short, companies can implement effective programs; however, all the people involved must effectively participate in it. The health professionals and administrators must instruct and encourage the workers regarding the importance of hearing health<sup>23</sup>.

As for the follow-up of HCP costs and investments, Company A's administrator said he was familiar with and followed up such resources. This is a favorable category, as the available resources are proportional to the necessary HCP services. In contrast, Company B had no specific resources for the HCP, only for the Occupational Health sector as a whole, which includes the costs with audiometry and hearing protection devices provided to the employees.

Financial resources must be directed to the HCP to ensure human resources and material. A study assessed the cost and investments related to the HCP in 14 American companies<sup>24</sup> and concluded that the cost and adequate investment distribution are related to the positive HCP results. In other words, the greater the company's investment, the less prevalence of hearing losses among the employees.

Also, there is evidence that even after the HCP had been implemented in companies there is a substantial risk of hearing loss, as the implementation does not ensure effectiveness because the planned actions may not be fully carried out. More rigorous observation of the country's existing legislation regulating HCP actions and the more effective participation of the professionals involved in the program may reduce the noise levels at the workplace, improving the effects of the program in the long run<sup>25</sup>.

In many countries, companies must meet the requirements of governmental regulations to control noise exposure at the workplace and implement HCP<sup>26</sup>. However, despite these regulations, evidence shows that the HCP still needs to be continuously improved, and innovative strategies need to be developed, assessed, and disseminated<sup>27</sup>.

In the Brazilian context, the situation is not different. In the few studies that portray HCP assessments, the results present a distance between what is required and what takes place<sup>28,29</sup>. This reinforces the importance of all those involved in the program increasing their efforts

to achieve better results, preventing the main problem, the occupational hearing loss.

## CONCLUSIONS

Satisfactory results were verified regarding the HCP implementation in both companies assessed. "Assessment" was the dimension that obtained the lowest scores in both companies, which reinforces the need for greater investments and knowledge of health program evaluative processes in companies.

Despite each company's particularities, characteristics of the implementation context either positively or negatively influenced the functioning and results of the HCP. Context characteristics such as investments to implement the HCP, administrator's profile and centralized decision-making were listed as strongly influencing the DI.

In this scenario, there needs to be even more incentive on the part of the organizations and those involved in the program to make the implementation and functioning of the HCP feasible.

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