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Fostering workplace safety: An exploration of the priority given to safety knowledge transmission in occupational environments

Cláudia Pereira [a,*], Catherine Delgoulet [b], Marta Santos [c]

[a] Center for Psychology at the University of Porto, Faculty of Psychology and Education Sciences of University of Porto, Portugal, Rua Alfredo Allen, 4200-135 Porto, Portugal
[b] Center for Research on Work and Development (CRTD), Conservatoire National des Arts et Métiers, 41 Rue Gay Lussac, 75005 Paris, France
[c] Center for Psychology at the University of Porto, Faculty of Psychology and Education Sciences of University of Porto, Rua Alfredo Allen, 4200-135 Porto, Portugal

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ABSTRACT

Literature on occupational safety and knowledge transmission lacks the exploration of safety knowledge transmission in workplaces, including it as a possible strategy to enhance workers' occupational health and safety within professional contexts. To address this research gap, we aim to understand if the transmission of safety knowledge is a priority and if it is effectively applied in daily work activities by both novices and experts in secondary and tertiary sectors, considering their working conditions. A questionnaire was conducted to 243 participants to analyze the perception of safety knowledge transmission (what happens; and what is considered important/a priority), according to novices and experts in both activity sectors, and the factors that affect the safety knowledge transmission. Results reveal that most workers consider safety knowledge very important, although more important for novices in the secondary sector, and that the working conditions that enhance the likelihood of transmission of safety knowledge differ between activity sectors. Also, safety knowledge transmission lies in an intention field, due to individual and organizational factors. These data support the originality of this research, contributing to the empirical enrichment within occupational health and safety literature and to the reflection on policy actions in professional contexts. It reveals workers' perceptions of the real transmission of safety knowledge in their contexts and elucidates the need for awareness and intervention at the working conditions level by decision-makers in companies, to make this intention a real priority in their contexts.

1. Introduction

Numerous studies have emphasized the significance of safety in occupational environments across various aspects, such as its impact on work performance (Arzahan et al., 2022), the prevention of work accidents (Wachter and Yorio, 2014), and the workers' health (Nascimento, 2009; Vinodkumar et al., 2010). Additionally, recent research has also explored the role of digital tools, specifically video networks, in shaping safety practices (Yao et al., 2022). Despite the different contributions encountered in studies, the literature lacks research on the analysis of workers' perceptions from different professional contexts of safety knowledge transmission to discuss it as a strategy to promote occupational health and safety. Thus, our study intends to address this topic considering the priority that is given to safety knowledge transmission by novices and experts in professional contexts of the secondary and tertiary sectors. The importance of the research conducted relates to the complementarity it can provide to the body of literature and the fact that it enhances understandings of workers' perceptions, thereby facilitating appropriate interventions in workplaces (e.g., transformation of working conditions or knowledge transmission conditions) in order to foster workplace safety.

Considering this, our study lies within the domains of work psychology and ergonomics that understands workplace safety as inseparable from the activities that create it and the specific working conditions in which it exists (Leplat, 1998). Consequently, learning and transmitting safety-related issues at work should be closely tied to the context in which safety is embedded under which tasks are performed considering the working conditions related to each work activity (Chatigny, 2001). These working conditions can impose constraints on the transmission of knowledge (e.g., lack of time to transmission within contexts with high pressure to produce), particularly when it concerns safety-related knowledge (e.g., learning ways to solve problems to

* Corresponding author.
E-mail addresses: cpereira@fpce.up.pt (C. Pereira), catherine.delgoulet@lecnam.net (C. Delgoulet), marta@fpce.up.pt (M. Santos).

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protect health may take longer in the absence of transmission possibilities between experienced and novices), thereby presenting a challenge that needs to be addressed (Cloutier et al., 2012). The working constraints that may impact the transmission of emphasizes the importance of research in facilitating the transmission of safety knowledge, which in turn contributes to the preservation of health and safety at work, as well as the development of strategies for carrying out work in a safe manner (Cloutier et al., 2012).

With this understanding, our research was directed towards safety knowledge in workplaces as the object of study. In the realm of safety management approaches, safety knowledge encompasses the knowledge one acquires at work concerning the safety of oneself, others, and the surrounding context and environment (e.g., possessing the knowledge required to perform tasks safely; knowing how to avoid or minimize risks of work-related accidents; understanding the hazards associated with one's specific job) (Vinodkumar and Bhasi, 2010). This distinguishes safety knowledge from aspects related to occupational hygiene, which deal with preventing health problems in the workplace (Schulte et al., 2004). In a complementary manner, the perspective of work psychology and ergonomics highlights that safety knowledge also encompasses strategies and prudence knowledge, that is, know-how to protect one's health which is intrinsically associated with the work activity (Cru and Dejours, 1983; Rémery, 2022). Therefore, safety knowledge plays a crucial role in building experience and developing strategies to regulate work activities, including problem-solving on a daily basis, thereby preventing work accidents that could impact the worker, others and the surrounding environment, and, consequently, preserving one's health at work (Cloutier et al., 2012).

Furthermore, some studies have demonstrated the fundamental importance of safety knowledge in professional contexts in relation to performance and safety behaviors, since it promotes the construction of safe behaviors in the way of carrying out the work and, consequently, contributes to work performance (e.g., Christian et al., 2009; Huang and Yang, 2019; Basahel, 2021). However, this construct of performance and safety behaviors can be constrained since there are numerous professional contexts that suffer from ineffective systems for transferring knowledge (including safety knowledge), which impedes the workforce's ability to acquire critical knowledge necessary for addressing safety-related issues, sometimes even urgent ones (e.g., Hallowell, 2012). Consequently, addressing this problem calls for a deeper understanding of safety knowledge transmission. In this regard, research has revealed that knowledge transmission within work context extends beyond the acquisition of technical knowledge and task performance, encompassing other components, as safety issues (Ledoux et al., 2012). These consider both "regulated safety" - which focuses on formal prevention, through rules, automatisms, protective measures and equipment, training in "safe behavior"; and "managed safety" — which entails the ability to anticipate, perceive and respond to unforeseen problems by the organization, based on the skills of the operators and managers present (Rocha et al., 2015).

Within occupational environments, the transmission of knowledge, including safety knowledge, occurs through interaction between novice and experienced workers (Thébault et al., 2014). This encompasses sharing of stories, situations, experiences, interactions, explanations, demonstrations, and day-to-day observations (e.g., Thébault et al., 2014). In this transmission, novices and experts assume distinct roles, both fundamental. In the case of novices, they are considered as individuals with little or no experience in a specific professional (Delgoulet, 2015). As a result, they primarily draw on operative resources provided to them in workplaces and are therefore highly dependent on their working conditions (Chatigny, 2001). Under these conditions, novices tend to perform their work according to formal work rules and procedures rather than applying, from the outset, strategies created on the job to cope with the specificities of situations (Caroly and Weill-Fassina, 2004). During the phase of integration and initial learning, novices encounter common difficulties, such as the accumulation of new things to learn in a short time, familiarize themselves with the workplace, the materials, the ways of communication, work planning, problem analysis and resolution (Tourmen et al., 2012). Additionally, it is within the workplace that novices are confronted with new situations and seeks to demonstrate their problem-solving abilities (Ledoux et al., 2012). Hence, the integration and learning of new workers play a central role in the development of experience, both in terms of health and safety perspective and overall job performance (Ledoux et al., 2012). In the case of experts, they assume an essential role in the transmission to the novice, by preserving conditions that favor learning despite the production pressures (Laberge et al., 2012) and by having a vigilant role towards the novices (Rémery, 2022). Experienced workers can play a key role in the organization because they have developed strategies to preserve their health and prevent risks (Chatigny, 2001). This experience related to knowledge of the context, the activity, and technical expertise in critical situations is also recognized by novices (Ledoux et al., 2012).

The binomial interaction between novice and expert and the interaction of this binomial with the collective of workers that should be stable, that is, that does not undergo constant changes in its team members (Gaudart and Thébault, 2012) takes place within the action, the work, and its possibilities vary (in terms of time to transmit, form to transmit, and what can be transmitted) according to the conditions of work performance encountered by individuals (Ledoux et al., 2012). Concerning this matter (possibilities to transmit considering working conditions), studies have shown the role that employment and working conditions play in the possibilities of transmission, particularly the transmission of safety knowledge: both in the secondary sector (e.g., construction areas, and particularly in high-risk industries; Gagnon, 2005; Delgoulet et al., 2012) and in the tertiary sector (e.g., studies with cinema technicians, home care workers - Cloutier et al., 2012; health professionals in hospitals - Thébault et al., 2012; Thébault, 2018). We highlight those conditions that are referred to as the main constraints to transmission: high production demands and work intensification, hyper solicitation of experts in more complex and difficult tasks, frequent use of temporary workers; precarious labor contracts (e.g., Cloutier et al., 2012; Thébault et al., 2014). These constraints, which limit the possibilities of transmission, may lead to the disappointment of novices in how the learning is conducted, limiting the construction of an experience on work, health, and safety at work (Tourmen et al., 2012; Delgoulet and Vidal-Gomel, 2015). Knowing that under these constraints the possibilities for transmission are limited, there are some questions that arise: would it impact the transmission of safety knowledge? And is it understood in the same manner by novices and experts concerning their role in transmission?

In addition to the scientific contributions presented, specific studies in the secondary sector in the Portuguese context (where our research was conducted) address the intersection of safety and knowledge transmission. These studies: i) address the possibilities of developing safety strategies based on work conditions and the importance of reflecting on safety knowledge and behaviors for a work performance that allows the preservation of health at work (e.g., Duarte and Vasconcelos, 2014; Santos et al., 2019); ii) reveals that knowledge transmission and experience is considered a safety concern by workers in a high-risk industry (Pereira et al., 2022); iii) highlights the role that certain working conditions assume in the transmission, conditioning its potentialities, as is the case with time pressures and intense rhythms (Pereira et al., 2021); iv) reveal that the key players of companies, namely human resources (HR) management and leaders, have a scarce or nonexistent action in the development or support of knowledge transmission processes, including from a safety perspective (Pereira et al., 2023). These contributions align with the literature produced in different professional contexts and in other countries, as we mentioned previously (Wachter and Yorio, 2014; Arzahan et al., 2022; Rémery, 2022).

These many contributions lead us to identify a research gap in studies

on safety knowledge in occupational environments to which we expect to contribute: the analysis of workers' perceptions from different professional contexts of safety knowledge transmission, in order to allow to discuss it as a strategy to foster occupational health and safety in professional contexts. To address this gap, our exploratory study aims to understand if safety knowledge is understood as a priority for novices and experts in the transmission that takes place in professional contexts of the secondary and tertiary sectors considering their working conditions and if they mobilize it daily work. To pursue this objective, our research questions were: i) is safety knowledge transmission a real priority during the integration period in a job?; ii) does the perception about the importance of safety knowledge transmission varies according to the sector and to the role played by workers (novices and experts)? iii) does the working conditions and the role assumed by a company in the transmission process affect the priority that may be given to safety knowledge transmission?

Considering our aim with the study, certain options have been assumed and we explain them in advance. The option of considering the role assumed by the participants in their job (novice or expert) through the workers' perceptions is due to the importance of valuing their understanding of their work experience. The purpose of including the secondary and tertiary sectors is based on the fact that although it is understood that safety issues are more characteristic in the secondary sector (Jettinghoff and Houtman, 2009; Zeng and Li, 2022), since the literature also shows some studies related to the importance of safety knowledge in the tertiary sector field (Cloutier et al., 2012; Thébault et al., 2012) this sector was considered in the study. Furthermore, an additional contribution can be considered by analyzing contrasted activity sectors to show how real working conditions (more or less risky) influence the understanding of the role of safety knowledge at work and its transmission.

2. Research method

2.1. Participants

This study encompassed 243 participants, comprising individuals from the secondary (blue-collar participants) and tertiary sector (white-collar participants). The sample size corresponds to the total number of participants that it was possible to obtain during the period of data collection. Participant selection was based on a non-probabilistic snowball sampling method which involved recruiting initial participants (identified from the professional network of the authors) who referred additional participants, creating a chain referral process (Naderifar et al., 2017). This approach was employed to guarantee the inclusion of participants from diverse age groups and experiences. Specifically, the study included blue-collar and white-collar workers from different professional contexts, with participants as a novice or expert role in their workplace (inclusion criteria), as the literature shows that both novices and experts from secondary and tertiary sector can assume a relevant role in the transmission of knowledge, including safety knowledge (e.g., Gagnon, 2005; Ledoux et al., 2012; Thébault, 2018). Workers holding leadership or strategic positions (e.g., leaders; decision-makers) and workers from the primary activity sector were not considered in this study (exclusion criteria), in order to be able to meet the objective defined for the study by narrowing the analysis.

The study sample included 80 participants taking a novice role (33%) and 163 who are experts (67%). The identification of the "role" assumed by each participant (novice/expert) corresponds to their work experience. It was defined through a method of self-positioning individuals in relation to the question "*In your current job, what role do you play?*". Participants could choose between two options: novice - *I am not yet performing my job completely independently*; expert - *I have experience and I'm performing my job independently*.

The novice group is made up of 35 female participants and 45 male participants, and most of the participants have a high school degree (41%). followed by a bachelor's degree (31%) and a master's degree (17.5%). The expert group comprises 84 female participants, 78 male participants, and 1 identified as "other", and most have a high school degree (32.5%), followed by a bachelor's degree (26%) and a junior high school degree (16.6%). The following table (Table 1) shows the main demographic characteristics of the participants.

The table shows that novices have an age mean of 29 years and a mean of 8 months of seniority in their current job. This indicate that novices tend to be younger and have less seniority in their current positions compared to experts, as would be globally expected. However, it should be noted there are two types of situations. On the one hand, there are situations of experts with very low seniority in the function (e.g., 1 year), which is explained by the participants' experience acquired in other functions/work contexts for the current function. On the other hand, there are situations of novices of a high age (e.g., 63 years) or with several years of seniority (e.g., 4 years) and experts of a young age (e.g., 23 years) or with few years of seniority (e.g. 1 year), which is explained by the fact that the passage from novice to expert or vice-versa is dependent on the experience that one has in performing an activity (Delgoulet, 2015). In this regard, it is relevant to point out that most of the novices are between 19 and 24 years old (40%) and between 25 and 34 years old (42.5%), and most of the experts are between 45 and 54 years old (33.7%) or 55 and older (28.8%).

Concerning the distribution of participants by sectors of activity, both groups are present in both sectors of activity, although with a higher percentage of participants working in the tertiary sector. From the secondary sector, 59,8% of the participants work in manufacturing industries (e.g., production line operators; glazier) and 11,8% in construction (e.g., construction helper, painter, welder). In the tertiary sector, 11,3% of the participants work in consulting, scientific, technical, and similar activities (e.g., telecommunication technicians, accountants, human resources consultants, and training for companies), and 12,1% in other service activities.

2.2. Instruments and data collected

Data were collected using a questionnaire designed as part of a larger study conducted to understand the processes of learning and knowledge transmission among workers of different ages and seniorities. Considering the objective of the present study, aimed at the perceptions of a large number of workers from two contrasted activity sectors, the questionnaire was considered the most appropriate type of instrument to use. This instrument was approved by the Ethics Committee of the university to which the principal investigator belongs (Ref[a] 2020/07–07) and some example questions are presented further in this section.

Prior to the release of the questionnaire for completion, a cognitive interview (Willis and Artino, 2013) was conducted with five participants with identical characteristics to those of the target group (e.g., workers from secondary and tertiary sector, considering age, seniority, and role diversity). This cognitive interview is an oriented method for studying the way in which individuals respond to questionnaires, considering the comprehension of a questionnaire, through the verbalization of

Table 1
Participants' characterization.

Role assumed	Age	Seniority in current job	Activity sector
Novices	29 years (mean) [min 19; max. 63]	8 months (mean) [1 month - max 4 years]	34% secondary sector; 66% tertiary sector
Experts	46 years (mean) [min 23 – max 74]	13 years (mean) [min 1 – max. 43]	46% secondary sector; 54% tertiary sector

participant's thoughts while they answer the questions (Willis and Artino, 2013). The purpose was to verify the appropriateness of the items for the intended analysis, serving as evidence to confirm, revise, delete or replace items, as well as to anticipate possible problems and respective solutions, for later administration to the total sample. This interview proved to be important to understand and improve issues related to the items' intelligibility, adequacy, interest, completeness, and comprehensibility. Globally, the participants considered the instrument as pertinent, a promoter of reflection on their individual situation, and important as a previous step for constructing improvement actions in the work contexts at the level of the knowledge transmission processes.

From the content analysis of the questionnaire with this cognitive interview, its final structure consisted of 6 groups of questions: 1) sociodemographic characterization; 2) relation between workers' current job and knowledge transmission; 3) learning and training for the current job; 4) knowledge transmission in day-to-day life; 5) facilitators and obstacles to knowledge transmission; 6) other transmission conditions. Examples of questions relating to each of these groups are provided in the table below (Table 2).

For this study, three items concerning occupational safety and health issues were selected to represent the study of safety knowledge:

i) "*is knowledge that can prevent work accidents from occurring the most important type of knowledge to transmit/learn in your activity?"* – item 1 related to what participants think would be most important to transmit (the priority perceived), by comparison to other types of knowledge (knowledge about work procedures, knowledge to solve problems, strategies to do the job, knowledge to prevent errors from occurring, and knowledge to preserve health);

ii) "*while you are/were learning, are you being/were you taught gestures or strategies on how to do the job to protect health and safety?"* – item 2 related to the moment of transmission at the initial stage of learning the job (what actually happens), compared to other types of knowledge (work procedures and instructions; knowledge to solve problems at work; technical content about equipment/machinery; knowledge about the impact of workers' activity on the work process; explanations about why tasks are done in a certain way);

iii) "*what type of knowledge was transmitted to you?"* – item 3 related to what was actually transmitted (work procedures and/or instructions; strategies on how to do certain tasks or solve problems; theoretical content on work equipment/machinery; gestures or strategies to protect your health; knowledge about the impact of their activity on the work process; knowledge about their colleagues' activity in the work process; explanations about why tasks are done in a certain way).

The types of knowledge included in the study intend to cover the full range of knowledge that may be present in professional contexts and following the literature review conducted previously for this purpose (the types of knowledge are presented in the results section). However, participants could add others that were not listed or add some comments (e.g., do not remember, in cases where the initial learning took place a considerable time ago; or do not want to answer).

Taking into account the study's objective and considering the issues of working conditions central to the understanding of safety knowledge transmission, other variables were considered in the analysis in a complementary manner to characterize the sample and the main characteristics of the work they perform. These variables were: "activity sector" (secondary or tertiary), "role" (novice or expert), and "characteristics of their work" (monotonous, repetitive, autonomous, unpredictable, with constant interruptions; complex; stimulating; boring; subject to time pressures; collaborative; dependent on the work of others; continuous learning; work that can be considered well done; no career progression).

Table 2
Examples of questions from each group of questions of the questionnaire.

Group of questions	Examples of questions
1) sociodemographic characterization	• Sector of activity; • Age, seniority in the company and in the function, gender, employment contract and work time.
2) relation between workers' current job and knowledge transmission	• What are the characteristics of your work? • How does your work affect your health?
3) learning and training for the current job	• While you are/were learning, are you being/were you taught gestures or strategies on how to do the job to protect health and safety?
4) knowledge transmission in day-to-day life	• Is knowledge that can prevent work accidents from occurring the most important type of knowledge to transmit/learn in your activity? • What type of knowledge was transmitted to you?
5) facilitators and obstacles to knowledge transmission	• Indicate if you have been exposed to aspects concerning employment and working conditions, health and safety conditions, the role of team, managers, human resources and those who were mentors to you, and whether this exposure has hindered or facilitated the day-to-day transmission of knowledge between you and your colleagues.
6) other transmission conditions	• Does the company you work for provide the necessary resources to support your role as an expert? • Does the company you work for provide specific moments in the workplace for you and your colleagues to share experiences and knowledge?

2.3. Procedure

2.3.1. Data collection

Data were collected in 2021 and 2022, online and in interview format, in cases where participants did not feel comfortable filling out the questionnaire digitally. The study was advertised in the professional networks of the researchers and on social media. This data collection period was preceded by a participant recruitment procedure to achieve the desired sample type. This corresponded to a non-probabilistic snowball sampling method after the first group of participants identified within the research team's professional network.

The recruitment procedures were the same for all participants within the non-probabilistic snowball sampling method. The criterion for participation was to be individuals working, in Portugal, in the secondary or tertiary sector of economic activity. As mentioned previously, the choice of the secondary and tertiary sectors was motivated by an interest in highlighting potential distinctions between sectors regarding safety knowledge at work issues. After the identification of the potential participants, these were invited to participate and previously agreed to a free and informed consent, which reflected the purpose of the study, the approximate duration of completing the questionnaire (about 15 min), how the results would be treated and reported back, and issues of anonymity and confidentiality. The confidentiality of the collected dataset was ensured, with the survey link being accessed only via a secure university service.

2.3.2. Data analysis

Descriptive analyses of the data were carried out according to the role played by the participants in their current job (novice or expert) and to the sector of activity in which they work (secondary or tertiary). These considered the working conditions and the positioning of the participants about the three analyzed items from the questionnaire concerning safety knowledge (type of knowledge that would be most important to transmit; transmission of safety-related knowledge in the initial stage of learning the job; type of knowledge related to what was actually transmitted).

It is important to note that the reliability and validity of the questionnaire used were previously verified, with the data being within the tolerable parameters. In the case of reliability, Cronbach's alpha corresponds to 0.70, a value considered acceptable (Cronbach, 1951; Bland and Altman, 1997). In the case of validity, the KMO value is 0.74, a value also considered acceptable (Kaiser, 1974). In a complementary manner, a binary logistic regression was performed to find out the conditions that could be influencing the obtained results concerning the transmission of safety knowledge.

The choice of a binary logistic regression was due to the fact that it is a statistical method commonly used for binary outcomes that predict the likelihood of an event (binary) from a set of variables (Field, 2005). In our study, the binary event (dependent variable) was "transmitting gestures or strategies to protect the health and safety of workers" and the variables analyzed as potential predictors of likelihood of the event were related to: i) working conditions – "monotonous", "repetitive", "varied", "autonomous", "unpredictable", "with constant interruptions", "complex", "stimulating", "tedious", "subject to time pressures", "collaborative", "dependent on the work of others", "continuous learning (allows you to learn new things)", "that allows you to do a job that you consider well done; "with no prospects for career progression"; ii) to the role of the company in transmission "company promotes the transmission between workers"; and to the importance attributed to the transmission of knowledge that prevents the occurrence of work accidents – "transmission of knowledge to prevent the occurrence of work accidents as a priority".

The binary logistic regression was performed for the sample of participants from the secondary and tertiary sectors, according to the "enter" method. This method was chosen because it allowed us to understand whether the data from our sample could meet the contributions from the literature, namely about the role of working conditions in transmission (e.g., Cloutier et al., 2012) and the importance of the transmission of safety knowledge (e.g., Rémery, 2022). The requirements for performing the binary logistic regression were met, namely, none of the variables exhibits multicollinearity, as none of the variance inflation factor (VIF) test values are close to or exceed the threshold of 10 (Bowerman and O'Connell, 1990). The analyses were performed using IBM SPSS Statistics 27 for Windows software.

2.3.3. Process of research method

To provide a comprehensive understanding of the overall process of the research methodology, a research flowchart is presented in Fig. 1. This sequential illustration outlines the various components considered in this study, offering a visual representation of the overall process.

Regarding the logistic regression, the probability of y occurring is predicted based on a set of independent variables (x_1, x_2, …, x_k). Thus, the equation for this model is as follows:

$$\mathrm{Logi(y)} = \log\left(\frac{p}{1-p}\right) = b_0 + b_1x_1 + b_2x_2 + \cdots + b_kx_k$$

$$p = probability = \frac{e^{b_0 + b_1x_1 + b_2x_2 + \cdots + b_kx_k}}{1 + e^{b_0 + b_1x_1 + b_2x_2 + \cdots + b_kx_k}}$$

where Logi(y)represents the odd ratio between the probability of event y occurring (p) and the probability of event y not occurring (1 – p), $\{b_0, \ldots, b_k\}$ denote the coefficients corresponding to independent variables, and $\{x_1, \ldots, x_k\}$ represent the independent variables used in binary logistic regression. This procedure enables modeling the relationship between the independent variables and the probability of the binary event y occurring (Yigitcanlar et al., 2022).

3. Results

3.1. Work characteristics in the secondary and tertiary sector

To support the understanding of the main results, it is important to know the main characteristics of the participant's work. Table 3 shows the participants' responses regarding their working conditions in the secondary and tertiary sector. From the 14 working conditions analyzed, the main ones identified by more than half of the sample mostly differ according to the sector of activity as explained next.

In the secondary sector (42% of participants), the respondent sample indicates that their work is mostly a varied job (64,7%), subject to time pressures (63,7%); a job that allows them to do work that they consider to be well done (61,8%); collaborative (60,8%); complex (56,9%);

Table 3
Working conditions in the secondary and tertiary sector (% of participants).

Working conditions	Secondary sector	Tertiary sector
Autonomous	32%	26%
Collaborative	**61%**	48%
Complex	**57%**	43%
Dependent on the work of others	**57%**	33%
Job considered well done	**62%**	40%
Monotonous	13%	5%
Of continuous learning	**57%**	**58%**
Repetitive	37%	23%
Stimulating	47%	48%
Subject to time pressures	**64%**	**59%**
Tedious	15%	4%
Unpredictable	**52%**	46%
Varied job	**65%**	**51%**
With constant interruptions	33%	21%
No prospects for career progression	25%	21%

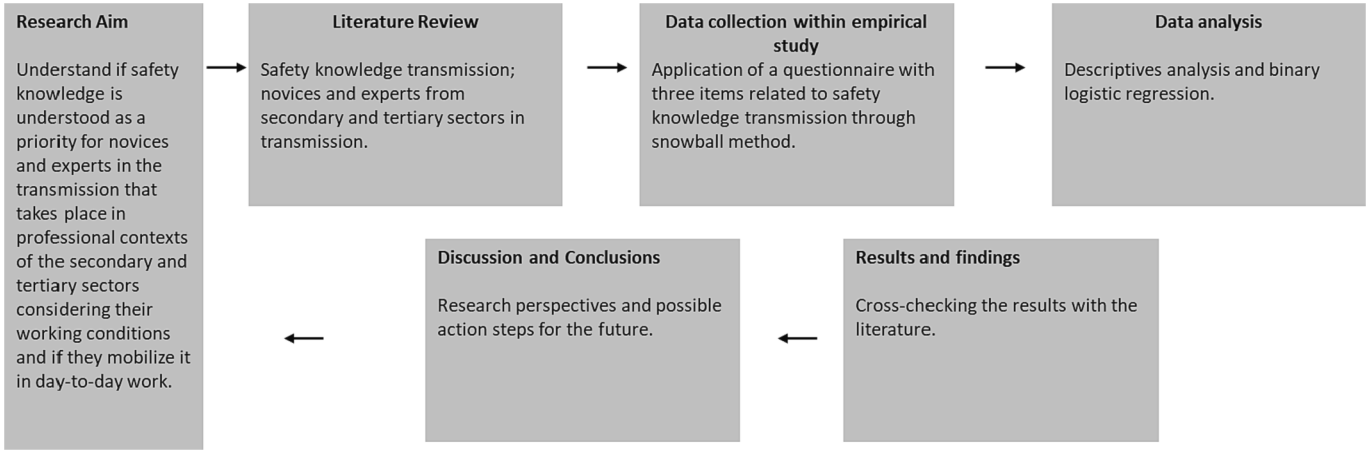

Fig. 1. Research flowchart.

unpredictable (51,9%); dependent on the work of others (56,8%), and of continuous learning (56,8%). In the tertiary sector, there is a smaller number of characteristics signaled by half of the participants. Of the 58% of participants in the tertiary sector sample, more than half indicate that their work is subject to time pressures (58,8%), is of continuous learning (58,2%), and is a varied job (51%).

It can be noticed that certain working conditions strongly characterize both sectors. These working conditions are "being a varied job" (65% in the secondary sector; 51% in the tertiary sector), a job "of continuous learning" (57% in the secondary sector; 58% in the tertiary sector), but also a job "subject to time pressures" (64% in the secondary sector; 59% in the tertiary sector). On the other hand, a low percentage of participants consider their work "monotonous" (13% in the secondary sector and 5% in the tertiary sector) or "tedious" (15% in the secondary sector and 4% in the tertiary sector).

3.2. Importance of the transmission of safety knowledge: novices' and experts' perceptions

Regarding the first research item "is knowledge that can prevent work accidents from occurring the most important type of knowledge to transmit/learn in your activity?", the main results show that this type of knowledge is considered the second most important (out of the six presented for ordering by importance). Approximately half of the participants (49%) consider that the most important type of knowledge to transmit is work procedures, followed by 17,6% who consider transmitting knowledge to prevent work accidents the second most important type of knowledge to transmit.

Despite this broad result, the data by activity sector and role illustrate a difference in the perception of novices and experts, particularly in the secondary sector, that we present below in Table 4. Results of the secondary sector show that novices (41%) consider the transmission of knowledge to prevent work-related accidents as the most important type of knowledge that should be transmitted. The experts consider this to be the second most important (15%; compared to 46% of experts who consider work procedures and instructions as the most important). In the tertiary sector, work procedures remained the most important type of knowledge to transmit (59% of novices; 49% of experts), followed by the transmission of knowledge to prevent the occurrence of work accidents and knowledge to solve problems (16% of novices; 15% of experts, in each type of knowledge).

In addition to the results related to the safety knowledge transmission, it should also be noted the result found about the transmission of knowledge to preserve health. The results show that there is a difference of approximately 10% in both sectors of activity regarding the perception of experts and novices on the importance of transmitting knowledge to preserve health. This is more valued by experts in the secondary sector (14% compared to 4% of novices) and in the tertiary sector (11% compared to 2% of novices).

Table 4
Percentage (%) of participants by importance of type of knowledge to transmit.

	Secondary sector		Tertiary sector	
Types of knowledge most important to transmit	**Novices**	**Experts**	**Novices**	**Experts**
Knowledge on work procedures and instructions	37%	**46%**	**59%**	**49%**
Knowledge to prevent work-related accidents	**41%**	15%	**16%**	15%
Knowledge to solve problems	7%	7%	16%	15%
Knowledge on strategies to do the job	4%	8%	4%	5%
Knowledge to prevent errors from occurring	7%	10%	4%	7%
Knowledge to preserve health	4%	14%	2%	11%

3.3. Safety knowledge transmission in the initial learning phase of a new job: What actually happens

The results on the second and third item are presented in this section. About the first safety knowledge item: "while you are/were learning, are you being/were you taught gestures or strategies on how to do the job to protect health and safety?", results indicate that 70% of the participants referred the absence of safety knowledge transmission in their initial learning phase in their current job. Of the remaining, who answered affirmatively, 70% were those who are currently experts. This means that at the time of their initial learning (on average, about 12 years ago, considering the data on the seniority in the current job of these workers), their mentors, co-workers, leaders who shared the knowledge for learning the job transmitted safety knowledge to them.

The distribution of these main results by activity sector and role is presented in Table 5. These results show that this trend is visible in the secondary sector, where 70% of novices and 60% of experts say they have not been transmitted safety knowledge in the initial learning phase of a new job. In the case of the tertiary sector, the results are slightly reversed, with the experts indicating a higher percentage regarding the lack of transmission of safety knowledge in the initial learning phase of a new job (76%), compared to the novice group (74%).

The general results on the third item, indicate that the most transmitted type of knowledge in the initial transmission phase is "work procedures" (mentioned by 78% of the sample), followed by "strategies on how to perform certain tasks" (58%).

This perception is shared in the secondary and tertiary sectors by experts and novices, as shown in Table 6, with the exception of the experts in the tertiary sector. For these latter, the second most transmitted type of knowledge is the transmission of explanations about why tasks are done in a certain way (47%). The results also show that the transmission of strategies to protect health and safety at work shows lower percentages in both sectors. In the case of the secondary sector, 30% of the novices say that they have been taught this type of knowledge and 40% of the experts say that they have transmitted this type of knowledge. In the tertiary sector, the percentages are 26% of novices and 24% of experts.

The results of both items complement each other: safety knowledge was not a mobilized priority in the knowledge transmission that occurred in the initial learning phase of a new job, with priority given to procedural/technical components and formal instructions. These results, combined with the previous ones we presented, reveal a gap between what the workers consider as important and therefore prioritize in transmission (safety knowledge) and what actually happens. This gap will be addressed in the discussion section to reflect what possible factors affect what actually happens in the transmission.

3.4. Conditions affecting the possibility to transmit safety knowledge

To address the gap found between what happens in the transmission and what the participants think would be important/a prority to transmit, we performed a logistic regression to understand the effects of working conditions and the role of the company in the likelihood of "transmitting gestures or strategies to protect the health and safety of workers". This logistic regression was performed for the secondary and tertiary sectors to ascertain the effects of the "working conditions" (14

Table 5
Percentage (%) of novices and experts, by sector of activity about the research item "while you are/were learning, are you being/were you taught gestures or strategies on how to do the job to protect health and safety".

	Secondary sector		Tertiary sector	
	Novices	**Experts**	**Novices**	**Experts**
Yes	30%	40%	26%	23%
No	**70%**	**60%**	**74%**	**76%**

Table 6
Percentage (%) of types of knowledge transmitted, by activity sector and role.

Types of knowledge transmitted	Secondary sector		Tertiary sector	
	Novices	Experts	Novices	Experts
Explanations of why tasks are done in a certain way	48%	48%	60%	**47%**
Knowledge about the impact of his/her activity on the work process	19%	45%	42%	35%
Knowledge of his/her colleagues' activity in the work process	52%	35%	47%	40%
Strategies on how to do certain tasks	**56%**	**64%**	**77%**	43%
Technical content about equipment/machinery	30%	56%	45%	42%
Strategies for protecting health and safety at work	30%	40%	26%	24%
Work procedures/instructions	**78%**	**77%**	**87%**	**74%**

items), "role of the company to promote knowledge transmission conditions" (1 item) that is, the HR, health and safety departments or productions leaders, and "importance attributed to the transmission of knowledge that prevents the occurrence of work accidents" (1 item) on the likelihood of "transmitting gestures or strategies to protect the health and safety of workers". The results are shown below, in Tables 7 and 8.

In the secondary sector (Table 7), the logistic regression model was statistically significant, $\chi 2(17, N = 102) = 41{,}760, p = .001$. The model explained 46,8% (Nagelkerke R^2) of the variance in transmitting safety knowledge (transmission of gestures or strategies to protect health and safety) and correctly classified 81% of cases. The transmission of safety knowledge was: i) nine times more likely to occur when the workers consider transmission of knowledge to prevent the occurrence of work-related accidents the most important type of knowledge to transmit ($p = .009$; OR = 9.08, 95%CI [1.74, 47.28]); ii) and five times more likely to occur when their company promotes the transmission between workers ($p = .028$; OR = 5.17, 95%CI [1.2, 22.44]).

In the tertiary sector (Table 8), the logistic regression model was statistically significant, $\chi 2(17, N = 141) = 35{,}81, p = .005$.

The model explained 33,6% (Nagelkerke R^2) of the variance in transmitting safety knowledge and correctly classified 79% of cases. The transmission of safety knowledge was: i) three times more likely to occur when their work is of continuous learning ($p = .005$, OR = 3.15, 95%CI [1.01, 9.84]) and when it is varied ($p < .005$, OR = 3.72, 95%CI [1,23, 11.18]); ii) eight times more likely to occur when there are no prospects for career progression ($p = .001$; OR = 8.13, 95%CI [2.34, 28.26]). Although these were the only statistically significant variables, the model indicates that this transmission of safety knowledge is twice as high when the company promotes the transmission (OR = 2.39, 95%CI [0.53, 10.69]). The remaining variables were not significantly associated with the transmission of safety knowledge.

4. Discussion

4.1. What happens in safety knowledge transmission vs. What should happen: A gap that needs to be addressed

In the study sample, differences were found between the perceptions of novices and experts and by activity sector, concerning safety knowledge transmission as a priority and what is effectively transmitted in daily work. About this, the safety knowledge transmission was found to be mostly an intention, particularly in the secondary sector. In this sector, safety knowledge transmission is regarded as important but it is not a real priority. It is not what is transmitted in most cases, especially during the initial learning phase for novices, due to perceived obstacles in the context. These findings provides additional insight into safety issues and transmission of safety knowledge by exploring what happens and what would be important to happen regarding types of knowledge to be transmitted, as perceived by both novices and experts, and on the conditions that affect what happens and, by consequence, hinders what is considered as a priority.

The results on the absence of safety knowledge transmission in both sectors can be explained by different reasons. Mainly because safety issues are related to the type of activity and requirements that characterize the jobs, and it is known that the characteristics of work in the secondary and tertiary sectors differ. In the case of the tertiary sector, the emphasis is primarily on the transmission of work procedures knowledge rather than safety knowledge. This can be attributed to the type of work performed in this sector that tends not to be characterized by conditions (e.g., excessive physical workload; operating around machinery) or environments (e.g., high-risk industries) that potentiate accidents or greater exposure to safety hazards unlike the secondary sector (Schreuder et al., 2008; Jettinghoff and Houtman, 2009; Zeng and Li, 2022). As a result, safety knowledge transmission is less relevant in daily work than other types of knowledge. In the case of the secondary sector, safety knowledge transmission is not a real priority mobilized on a daily basis. This finding aligns with a study on construction sites, which indicated inadequate safety knowledge among workers (Huang and Yang, 2019). Given some of the main working conditions reported by the workers (subject to time pressures, unpredictable, and dependent on the work of others), we can hypothesize that the priority lies in transmitting work procedures to enable workers to meet task demands

Table 7
Results on the logistic regression concerning the likelihood of "transmitting gestures or strategies to protect the health and safety of workers" in the secondary sector.

Variables tested	B	S.E.	Wald	Sig.	Exp (B)	95% C.I. for Lower	95% C.I. for Upper
Monotonous	0,06	1,12	0,00	0,96	1,06	0,12	9,43
Repetitive	0,68	0,70	0,96	0,33	1,98	0,50	7,81
Varied	1,45	0,80	3,27	0,07	4,26	0,89	20,47
Autonomous	0,78	0,69	1,28	0,26	2,17	0,57	8,33
Unpredictable	0,80	0,66	1,46	0,23	2,23	0,61	8,21
With constant interruptions	−0,63	0,74	0,71	0,40	0,53	0,12	2,30
Complex	0,55	0,68	0,64	0,42	1,73	0,45	6,59
Stimulating	0,47	0,71	0,43	0,51	1,60	0,39	6,45
Tedious	0,79	1,05	0,57	0,45	2,21	0,28	17,36
Subject to time pressures	1,58	0,83	3,60	0,06	4,83	0,95	24,58
Collaborative	0,06	0,68	0,01	0,93	1,06	0,28	4,01
Dependent on the work of others	−0,09	0,64	0,02	0,89	0,91	0,26	3,21
Continuous learning (allows you to learn new things)	0,30	0,78	0,15	0,70	1,35	0,29	6,22
That allows you to do a job that you consider well done	0,24	0,78	0,09	0,76	1,27	0,28	5,81
No prospects for career progression	0,38	0,78	0,24	0,63	1,46	0,32	6,77
Company promotes the transmission between workers	1,64	0,75	4,80	0,03*	5,17	1,19	22,44
Transmission of knowledge to prevent the occurrence of work accidents as a priority	2,21	0,84	6,86	0,01**	9,08	1,74	47,28

Note: *p < 0.05; ** p < 0.010; *** p < 0.001.

Table 8
Results on the logistic regression concerning the likelihood of "transmitting gestures or strategies to protect the health and safety of workers" in the tertiary sector.

Variables tested	B	S.E.	Wald	Sig.	Exp (B)	95% C.I. for Lower	95% C.I. for Upper
Monotonous	−20,97	27266,93	0,00	1,00	0,00	0,00	
Repetitive	0,56	0,61	0,86	0,35	1,76	0,53	5,81
Varied	1,31	0,56	5,47	0,02*	3,72	1,24	11,18
Autonomous	−0,02	0,57	0,00	0,98	0,98	0,32	3,00
Unpredictable	−0,37	0,51	0,53	0,47	0,69	0,25	1,88
With constant interruptions	−0,72	0,70	1,07	0,30	0,49	0,12	1,90
Complex	−0,23	0,56	0,17	0,68	0,80	0,27	2,37
Stimulating	0,52	0,50	1,07	0,30	1,68	0,63	4,52
Tedious	0,32	31601,00	0,00	1,00	1,38	0,00	
Subject to time pressures	−0,71	0,61	1,37	0,24	0,49	0,15	1,61
Collaborative	0,61	0,53	1,31	0,25	1,83	0,65	5,19
Dependent on the work of others	0,69	0,57	1,46	0,23	2,00	0,65	6,17
Continuous learning (allows you to learn new things)	1,15	0,58	3,90	0,05	3,15	1,01	9,84
That allows you to do a job that you consider well done	0,61	0,51	1,48	0,22	1,85	0,69	4,98
No prospects for career progression	2,10	0,64	10,87	0,00***	8,13	2,34	28,26
Company promotes the transmission between workers	0,87	0,77	1,29	0,26	2,39	0,53	10,69
Transmission of knowledge to prevent the occurrence of work accidents as a priority	−0,63	0,72	0,77	0,38	0,53	0,13	2,19

Note: *p < 0.05; ** p < 0.010; *** p < 0.001.

and objectives. This proposition is supported by various studies indicating that meeting production goals takes precedence over other dimensions, such as learning and skill development, in which health and safety issues can be integrated (e.g., Cloutier et al., 2012; Pereira et al., 2021). Moreover, the absence of transmission of safety knowledge that characterizes this sample of workers hampers the development of their 'managed safety' (Rocha et al., 2015), which encompasses individual and collective strategies for effectively applying safety rules based on acquired experience.

The perception of both novices and experts regarding the importance of transmitting knowledge to prevent work accidents is noteworthy. In the case of experts, it was expected that this type of knowledge would be important, due to the fact that they possess experience and have experienced critical situations, possibly have had or witnessed an accident at work, and seek, in the transmission, to prevent others - novices - from going through the same critical situations. However, it was not considered the most important type of knowledge (in relation to work procedures) which may indicate that workers probably already integrate prudent knowledge in their daily practice and in how they apply the procedures to accomplish tasks to prevent their safety and health. This can be based on the experience that is gained with strategies built over time to solve problems and accomplish tasks because safety knowledge is intrinsically linked to activity (Cru and Dejours, 1983).

In contrast, novices perceive safety knowledge as the most important type of knowledge to be transmitted, signaling the need for increased attention on this topic in workplaces. That is, novices have less experience in their current work, therefore possessing fewer strategies for handling the work (Delgoulet, 2015), including strategies for doing the work safely and avoiding accidents with impact on themselves, others, the environment, and even the company's own business. Considering this perception, the present study adds that safety knowledge transmission show be a real priority in workplaces. This prioritization not only could promote the learning and development namely of novices in work and consequently improve their performance in a safer way, but also contributes to the prevention of work-related accidents aligning with the European Union's strategy for improving the health and safety of workers (European Union, 2021). Additionally, this emphasis on safety knowledge transmission among novices can be attributed to their growing awareness of the consequences of work on their health and potential impact on their aging process whereby they seek to protect their health to stay at work (or in that job) longer, as previous studies have mentioned (Delgoulet and Vidal-Gomel, 2015).

The gap between what happens and what is considered important to happen, as perceived by workers, can be interpreted in light of Hollnagel's contribution about "Work-as-Imagined" and "Work-as-Done" (2016). The notion of "what is considered important to happen" in safety knowledge can be understood in relation to the "Work-as-Imagined" category under the Safety I perspective. It is an "idealized view" in which safety knowledge would only be possible when things and systems are functioning as intended (Hollnagel, 2016). However, given the challenges of the contexts and the impacts of specific working conditions, as mentioned previously, it will be essential to consider "what happens" in practice. That is, what really happens from the possibilities of the workers - the "work-as-done" - instead of an ideal supported by perfect systems. It will be from what is done and under the Safety II perspective, in which adjustments are considered essential to work performance (Hollnagel, 2016), that the future and potential approaches to address what workers perceive as important can be explored.

In order to have a deeper understanding for such a gap it is essential to comprehend the underlying reasons. It is evident that one's will (what would be important) may not always correspond to what is possible (what happens) and that the will to transmit is not enough for the transmission to occur (Laberge et al., 2012), which could be posed as a reason for the gap found. But, we anticipate, from the outset and in line with what the literature also shows (e.g., Cloutier et al., 2012; Thébault et al., 2014), that the working conditions under which transmission occurs can have their share of responsibility in the results found. As mentioned previous, several studies indicate that conditions such as high production demands and work intensification, hyper-solicitation of experts in more complex and difficult tasks, and frequent use of temporary workers do not favor transmission (e.g., Cloutier et al., 2012; Thébault et al., 2014; Pereira et al., 2021). In this study, it was evident that safety knowledge transmission is a perceived priority that can be made real, especially when accompanied by an active role by the company (e.g., decision-makers; leaders) and the worker's own will/intention to prevent accidents from occurring. This leads us to believe that the mobilization of this priority consideration is or can be blocked, not necessarily due to the level of difficult/critical working conditions, but more to an organizational dimension (in particular in the secondary sector) - to the role of the company in promoting transmission conditions (e.g., providing time and/or material resources for transmission; supporting workers in the process) - and individual dimension - to the workers' own perception and concern in assuming the prevention of the occurrence of work accidents as a priority. This understanding of safety knowledge as a hindered priority is a contribution that sheds light on safety knowledge transmission as a challenge within professional contexts and the broader field of occupational safety and health.

4.2. Perspectives to enhance safety knowledge as a real priority in professional contexts

The results of this study led us to return to a 2015 discussion on the "new era of safety" in work contexts (Dekker, 2015), which reconsidered the role of people in creating safety as fundamental, particularly by valuing their experience. Our data indicates that this envisioned era of safety still appears distant from becoming a widespread reality in the sense that the transmission of safety knowledge does not seem to yet be a global reality in Portuguese professional contexts, even though European entities are progressively recognizing it as a strategy to address global challenges (OSHA, 2016; International Labour Organization/ILO, 2020). Although this is not a new issue (e.g., Pueyo, 2000; Pueyo et al., 2011), it is understood that for this new era to flourish in contexts, the conditions for its existence must be established. These conditions necessarily include awareness, analysis and reflection on the employment and working conditions. They also include repositioning and action on the part of key players in companies, like HR, Occupational Safety and Health departments, or production managers, regarding safety management in the sense of promoting the conditions for transmission (e.g., providing time and/or resources for the transmission to occur; rethinking production times and demands in order to provide an environment that enhances the sharing of safety strategies). Additionally, it is important to contemplate the continued presence of experienced workers in the workforce, ensuring their safety, while also paying attention to the newcomers, particularly those from the secondary sector. These workers showed a concern toward learning safety knowledge and the possibility of interaction between both, namely informally – as also demonstrated in other recently developed studies with the same type of participants - which enhances the learning of the latter (e.g., Goodbrand et al., 2021).

Furthermore, it is known that safety management perspectives and safety culture in professional contexts have therefore been considered fundamental for the safe actions of workers (e.g., Arezes and Miguel, 2008) and for the identification of practices that foster accident prevention, health preservation and, consequently, work performance (e.g., Stemn et al., 2019; Arzahan, 2022). Considering the obtained results of this study, we assert that the transmission of safety knowledge can be a valuable strategy to be considered in safety management practices and in the development of a safety culture within professional contexts. In this regard, several clues emerge from this study, serving as starting points for improvements in this domain, despite not being exclusive to a certain sector. For the secondary sector, actions must involve investing in the recognition of the importance that the transmission of knowledge has in preventing accidents and in the role that companies can play in facilitating such transmission. This wouldn't leave transmission only to the possibilities of the workers and to the respective constraints that are associated with it on a day-to-day basis due to production demands. Instead, the company and its key players with the power of decision and action should establish the conditions for such transmission among workers, making knowledge transmission on accident prevention a real possibility and priority in their daily work. Regarding the tertiary sector, efforts should be directed towards maintaining or creating opportunities for continuous on-the-job learning and ensuring that the work is varied, thus ensuring that the transmission of safety knowledge is maintained.

It should be remarked that the obtained results reflect the perception of the workers who perform the work on a daily basis and face the constraints associated with their work and with occupational health and safety issues. This reinforces the importance of thinking about intervention and strategic policies in work contexts. Building upon the insights provided in the preceding paragraphs, this study's findings can contribute to the reflection about actions that can be thought out and situated in real contexts by decision-makers in companies. This can be especially pertinent when considering future challenges, such as those stemming from digital and technological transformations with impact on the management of workers' safety and sustainability of the occupational environments themselves (Pinto da Costa and Costa, 2021). For instance, it would be important to develop initiatives that prioritize the understanding of the importance of intervention at the level of working conditions from the point of view of decision-makers and in a supported way (for example, by work psychologists or ergonomists). By discussing the outcomes of this study, fostering workplace safety, through a closer collaboration, for instance, between Human Resources or Health and Safety teams and operational work areas, or by involving and recognizing the role of experienced workers and their knowledge, particularly in the realm of safety knowledge, integration and training of new workers can be enhanced. Consequently, this research creates favorable conditions for a safety knowledge transmission that can become a real (implemented) priority (and not a hindered priority), contributing to the preservation of occupational health and safety of novices and experts throughout their working lives.

5. Conclusions

This study addresses safety in occupational environments from a human-centered point of view considering knowledge as a mean to achieve it. It was focused on understanding if safety knowledge is understood as a priority for novices and experts in the transmission that takes place in Portuguese professional contexts of the secondary and tertiary sectors considering their working conditions and if they mobilize it in the daily work. This study intended to contribute to safety knowledge related literature and to the reflection in workplaces by key players to pursue appropriate interventions concerning workplace safety considering the role of workers and their knowledge as a means to achieve it.

The main results reveal that safety knowledge transmission remains challenging in certain Portuguese professional contexts, aligning with previous scientific reflections on safety knowledge transmission in professional contexts in other countries (Cloutier et al., 2012; Ledoux et al., 2012; Rémery, 2022). The fact that the study considered both novice and experienced workers (workers at different stages of experience and with different job responsibilities) also allowed to clarify both perceptions, highlighting that there seem to be more similarities than discrepancies in their perceptions of safety knowledge transmission. However, differences in perceptions were found between secondary and tertiary workers. While most workers consider safety knowledge very important, it was deemed more important for novices in the secondary sector. Despite this perceived importance, the actual transmission of this type of knowledge does not occur, particularly in the initial learning phase of the job. It was understood that the permanence of the safety knowledge transmission as a hindered priority left in the intention field may be related to individual factors like the workers' own perception and concern in assuming the prevention of work-related accidents as a priority (which falls secondary to what is actually being transmitted), and organizational factors, like the role of the decision-makers from companies that can lack the promotion of conditions for transmission. This contribution sustains the originality of this study, since it allows to intersect, through the perception of novices and experienced workers from different professional contexts, what actually happens with what is considered important by them and sometimes cannot be achieved concerning issues of knowledge transmission within matters of occupational safety and health.

The findings of our study can contribute to the reflexion with decision-makers and leaders leading to possible implications in occupational environments, such as foster the creation of awareness about novices' and experts' perceptions regarding the importance of safety knowledge transmission and their understanding and prioritization of safety knowledge beyond institutional norms and rules. This can impact

the management of the work itself, the learning of strategies to perform work in a safer manner, and, consequently, the achievement of the company's strategic or production goals. However, it is worth noting that the study was carried out with a sample of workers and that there is an idiosyncrasy associated with each context, work activity and state of maturity about the effective possibilities of safety knowledge transmission. Thus, the findings and contributions of the study should be interpreted in a contextualized and situated manner and not extrapolated as a general representation for all secondary and tertiary sector contexts.

Future research could consider exploring additional individual and/or organizational factors to complement the obtained results. For instance, about the use of different tools to support knowledge transmission or about the HR' teams or leaders perceptions on safety knowledge transmission. This could allow links with other studies that addressed the issues of safety and knowledge transmission in different professional contexts, for example, in relation to the role of Human Resources departments, at an organizational level (e.g., Hamey and Alkhalaf, 2020), in relation with the aging or seniority of workers, at an individual level (e.g., David et al., 2001), or about the use of chatbots to support knowledge transmission and the workers' awareness about safety hazards (Zhu et al., 2022). Additionally, it should also be noted that this study is based on a sample of the working population (novices and experts) that was possible to obtain, in the Portuguese context, considering certain characteristics (secondary and tertiary sector). Further studies with this type of participants (novices and experts from different occupational environments) and in other areas of activity and countries would be necessary to discuss and confirm the obtained results.

Overall, the main contributions of this study are based on highlighting what companies can consider to promote the maintenance or development of safety knowledge among workers in the secondary and tertiary sectors. It contributes to enriching literature within occupational health and safety on novices' and experts' perceptions about safety knowledge transmission and its relation to working conditions. It also raises awareness for decision-makers and reflections on possible company actions and policies to foster workplace safety and health considering the perceptions of novices and experts about the importance of safety knowledge transmission and how it is understood and prioritized by workers in their daily work.

CRediT authorship contribution statement

Cláudia Pereira: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Conceptualization. **Catherine Delgoulet:** Writing – review & editing, Supervision, Conceptualization. **Marta Santos:** Writing – review & editing, Supervision, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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