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Review

Safety voice concept clean-up: Examining the voice that challenges us to be safer

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A B S T R A C T

Safety voice, the act of speaking up about safety concerns, is essential for preventing accidents and fostering an engaged safety culture. This study systematically reviewed 86 empirical studies of safety voice by operationalising and applying Podsakoff et al.'s (2016) four-stage framework for developing good conceptual definitions to assess its conceptual clarity, triggers, contextual variations, and measurement. This identified opportunities to refine definitions, theory, and hazard categorisation to enable proactive risk management. Current research on communication scope, directionality, and dyadic sender-receiver dynamics is fragmented which limits potential insights. Contextual disparities and Western culture biases affect generalisability. While senior leadership is key to a positive safety culture this focus is lacking. Addressing these areas through improved conceptual frameworks, hazard-voice models, and cross-industry comparisons will enhance proactive safety management, engagement, and resilience in high-risk industries.

1. Introduction

Safety voice is essential for averting accidents and safeguarding lives in high-risk industries such as healthcare, transportation, energy, and construction (Reason, 1997; Reason & Hobbs, 2003; Stolzer et al., 2010). Ignoring safety voice has contributed to some of the most severe disasters in history, including the Challenger (1986) and Columbia (2003) shuttle losses (Columbia Accident Investigation Board, 2003); the RAF Nimrod XV230 accident (2006) which revealed the absence of a "questioning culture" (Haddon-Cave, 2009, p. 569); and industrial catastrophes such as Bhopal (1984), Chernobyl (1986), Deepwater Horizon (2010), Fukushima (2011), and the Rana Plaza collapse (2013). In UK healthcare, failing to speak up resulted in preventable deaths in the Bristol Heart Scandal (1980s–1990s) (Heffernan, 2012; Kennedy, 2001; Richmond and Burgess, 2023) and at both the Mid Staffordshire (2005–2009) (Francis, 2013; Richmond and Burgess, 2023) and Southern Health (2014) (Pascoe, 2021) NHS trusts. More recent examples of where ignoring safety voice resulted in catastrophe include the Grenfell Tower fire (2017) and Boeing 737 Max accidents (2018–2019) (Sumwalt et al., 2019). Likewise, the 2024 death of a former aviation engineer reflects the difficult and often unseen personal toll that whistleblowers can face, irrespective of the circumstances or outcomes surrounding their actions (BBC News, 2024; Heffernan, 2012; Near & Miceli, 2013). This recurrent litany of avoidable tragedies underlines the urgent need for a clear, consistent conceptualisation of safety voice that addresses diverse hazard types, contextual factors, and communication challenges to ensure concerns are heard and future disasters prevented.

Defined by Tucker et al. (2008, p. 320), safety voice "(a) is communication motivated toward changing perceived unsafe working conditions that have implications for individual and organizational health, (b) can flow through formal and informal channels, and (c) can be directed toward numerous targets". It encompasses informal dialogue, formal reporting, and whistleblowing, and empowers individuals to highlight unsafe conditions or practices, enabling proactive risk management (Bazzoli et al., 2020; Bienefeld and Grote, 2012; Conchie et al., 2012; Curcuruto and Griffin, 2023). Laying the groundwork for understanding safety voice, Noort et al.'s (2019a) systematic review refined Tucker et al. (2008) original definition by considering its role within a broader system of interacting influences. Noort et al. framed safety voice as a context-specific, proactive communication aimed at preventing physical harm. They specifically differentiated *safety* voice from general *employee* voice, due to its exclusive focus on safety-related concerns and the distinct factors shaping its expression. Their review highlighted the conceptual uniqueness of safety voice, proposing an ecological framework, and addressing methodological gaps.

Whilst capturing some of the complexity of safety voice, both Tucker et al. (2008) and Noort et al.'s (2019a) definitions leave crucial elements ill defined, particularly the concepts of *safety* and *communication*. Safety is often assumed to be universally understood, yet its definitions vary considerably. The Oxford English Dictionary (2023) defined it as

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Table 1
Number of items identified through the application of search strings related to safety voice to a number of different databases. Number of relevant titles are in parenthesis.

Database		Scopus	PsycINFO (PI)	Business Source Complete (BSC)	ProQuest One Business	**Total (n)**
Search String	S1	49	23	12	7	91
	S2	328	114	112	126	680
	S3	359	127	119	133	738
		(61)	(16) PI and BSC		(3)	(80)

"freedom from danger" but this fails to account for its dynamic and systemic nature. Hollnagel (2014, p. 5) instead characterised safety as a "dynamic non-event" emphasising the need for continuous adaptation to maintain stability, a perspective that aligns with Weick (1987) notion of reliability as the temporary control of emerging issues. Communication is similarly nebulous. Fiske (2011) observed that while it is widely recognised, its definition remains elusive due to its diverse and multifaceted nature. The compounded conceptual ambiguity of both safety and communication permeates both Tucker et al. (2008) and Noort et al.'s (2019a) definitions, obscuring the boundaries of safety voice and weakening its theoretical clarity. To advance safety voice research, a deeper understanding of these foundational concepts is required.

"Concepts are integral to every argument, for they address the most basic question of social science research: what are we talking about?" (Gerring, 2012, p. 112). They represent a phenomenon's key attributes, distinguishing them from related constructs. Ambiguous definitions risk conceptual overlap, terminological proliferation, and hinder theoretical progress (Singh, 1991). Furthermore, imprecise conceptualisation often leads to operational mismatches that undermine research validity (MacKenzie, 2003). To address this, Podsakoff et al. (2016) advocated for a systematic and iterative approach to ensure conceptual clarity. Although Noort et al. (2019a) comprehensively synthesised the literature available up to 2019, the growing and diversifying body of research since then makes a compelling case for a more current, progressive evaluation. In response to this, the present review extends and advances the conversation. It applies Podsakoff et al.'s (2016) framework to evaluate the clarity and consistency of safety voice definitions, analyse how different types of hazard influence communication behaviours, compare applications across medical and non-medical domains, and address persistent challenges in measurement. By investigating these fundamental gaps, this study provides deeper insights into the conceptualisation, triggers, contexts, and applications of safety voice. It also refines the practical and theoretical relevance of speaking up in diverse, high-risk settings.

1.1. Current study

Based on Kunisch et al.'s (2023) guidance, this systematic literature review (SLR) offers a structured approach to evaluating and advancing the conceptual clarity of safety voice. It addresses critical gaps in the understanding of safety voice by evaluating how researchers have conceptualised it in their different studies through the lens of Podsakoff et al.'s (2016) four-stage framework for concept definition. First, it examines the clarity and consistency of safety voice definitions, assessing whether the construct is well-articulated and forms a coherent, distinctive framework. *How is safety voice conceptualised, and how consistent are its definitions across the literature?*

Then the review explores the critical role of hazards as initiators of safety voice, distinguishing between active failures and latent conditions and their influence on communication. It examines how these hazard types impact communication behaviours, from immediate responses to more cautious or delayed actions, and whether concerns are raised verbally, through reporting, or formal whistleblowing. *What types of hazards have been studied in relation to safety voice, and how do these hazards shape communication behaviours?*

The review also compares safety voice in medical and non-medical contexts, focusing on how the concept is understood and applied across settings. It explores the contextual factors influencing communication in healthcare, such as hierarchy and time pressures, and compares these to safety–critical settings outside healthcare. *How do the definitions, applications, and contextual factors of safety voice differ between medical and non-medical domains?*

Finally, the review evaluates how safety voice is measured, assessing the challenges of capturing such a multifaceted construct and its implications for research validity. *How is safety voice measured, and what are the key challenges associated with its measurement?*

By addressing these gaps, the review provides actionable insights into safety voice, laying the groundwork for future research and interventions in safety–critical industries. It aims to refine safety voice into a more precise, impactful tool for enhancing organisational safety.

2. Method

2.1. Search strategy

To address the review questions, an SLR methodology (Tranfield et al., 2003) was adopted. Keywords were formulated to target the primary areas of interest, specifically: *safety, harm, safety voice, speaking up, employee voice, safety silence,* and *whistleblowing*. The chosen keywords were systematically linked together to make two initial search strings (S1 and S2) using the Boolean character 'OR' and the proximity operator 'W/10′ (or 'N10′ for EBSCO host databases). Search string S1 was specifically designed to focus on safety voice and safety silence ("safe* voice*" OR "safe* silence"), while search string S2 targeted safety, harm, speaking up, employee voice, and whistleblowing ("speak* up" OR "employe* voice" OR "employe* silence*" OR "whistle blow*" OR whistleblow*) W/10 (safe* OR harm*). Then the two initial search strings were added together using the Boolean character 'OR' to create the complete combined search string S3 ("safe* voice*" OR "safe* silence") OR ("speak* up" OR "employe* voice" OR "employe* silence*" OR "whistle blow*" OR whistleblow*) W/10 (safe* OR harm*). Although not specific to safety, the terms *employee voice* and *employee silence* were incorporated into the combined search (S3) to identify articles that might describe safety voice as a form of employee voice within a safety context in the title or abstract. Articles addressing employee voice or silence outside of a safety context were excluded during the selection process.

These search strings were applied to four different databases (Scopus, PsycINFO (EBSCO), Business Source Complete (EBSCO), and ProQuest One Business (includes ABI/INFORM). Table 1 shows the number of articles found (in English scholarly peer reviewed academic journals only) for the three different searches. The final selection, based on an S3 search on 25 Mar 24, resulted in a total of 738 articles.

2.2. Screening and SLR selection

Fig. 1 presents a summary flow diagram of the SLR selection process. After removing duplicates, 557 articles were screened using inclusion and exclusion criteria (Table 2). Preliminary title and abstract screening reduced the articles to 168 for further review of the full text. Full text screening resulted in the inclusion of 28 non-medical articles and 52 medical articles, giving a total of 80 articles from database searches. Systematic, protocol-driven database searches have limited effectiveness in identifying relevant literature (Greenhalgh & Peacock, 2005), so reference lists of the 80 articles were hand-searched. This yielded a further six studies.

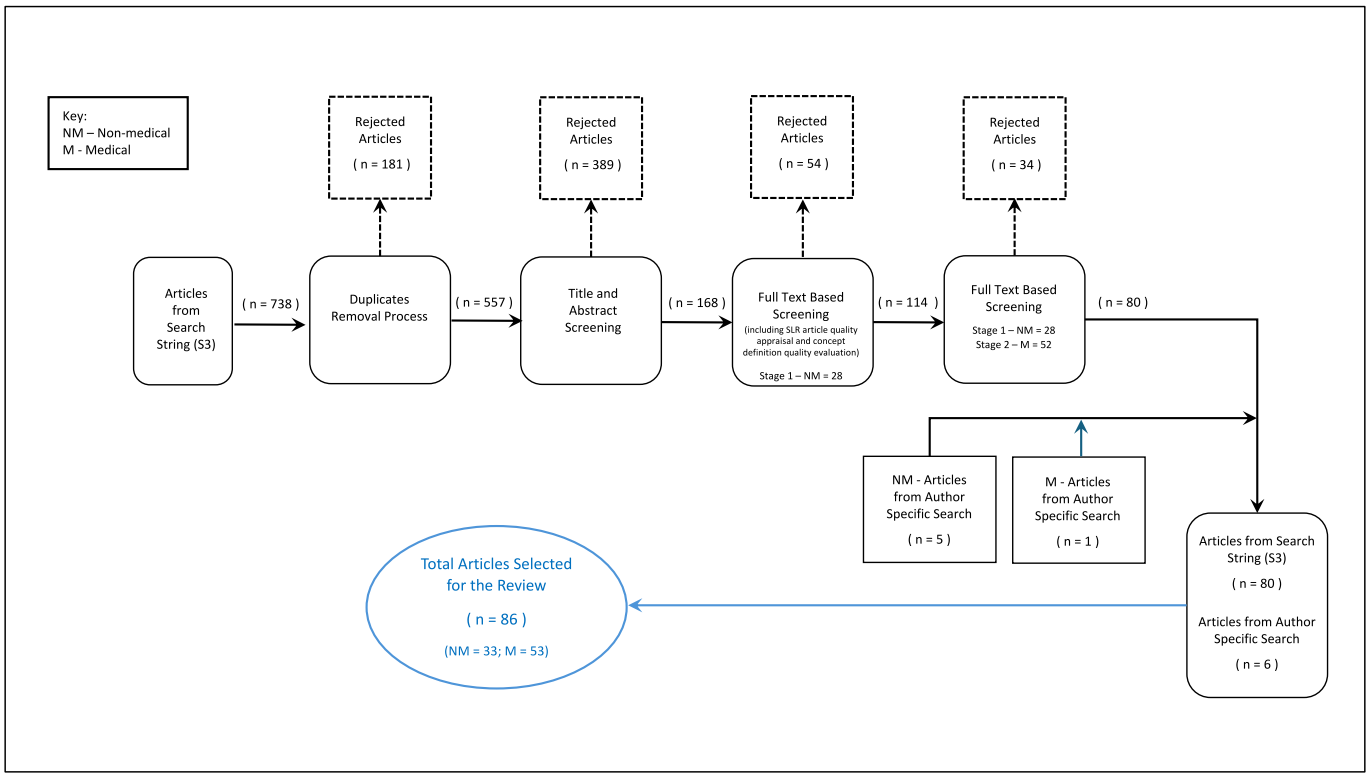

Fig. 1. Summary diagram of the selection process for a review of literature on safety voice.

2.3. Data extraction and analysis

Data from the 86 selected articles were extracted to address the review questions using the data extraction criteria in Appendix 1. Key safety voice data elements include its definition, dimensions, communication forms, and measurement quality. Data on hazard initiators captures the nature of safety concerns, their safety impact, and reasons for raising them. Information on measured aspects, such as behaviour or intent, and the scales used is also included. Participant details encompass roles, industries, hierarchy, and relationships, alongside key variables, theoretical frameworks, study findings, outcomes, limitations, and factors influencing safety voice communication (contextual, interpersonal, intrapersonal). The SLR articles were analysed as two distinct groups, non-medical (NM) and medical (M). The extracted information was synthesised to emphasise the similarities and differences between these two groups.

2.4. Quality assessments

Two distinct quality evaluations were undertaken in this study at different stages. Initially, during the full-text screening phase of the selection process (Fig. 1), the quality of each article was assessed to ensure compliance with established standards for inclusion in the SLR (CASP, 2024; NSW Department of Communities and Justice, 2020). To be included in the review, each article required to achieve all the essential criteria and at least five of the desirable criteria. These are shown in Fig. 2.

Subsequently, the quality of concept definitions for safety voice and safety silence in the 86 articles was evaluated using Podsakoff et al.'s (2016) four-stage framework modified for this review. Table 3 presents the evaluation criteria for each development stage, highlighting key gaps. Questions 10 and 18 were uniquely added to this SLR: Question 10 assessed whether definitions of safety voice or speaking up explicitly identified the *hazard* i.e., the *safety-specific* initiator of safety voice communication, while Question 18 identified overly simplistic or non-safety-specific definitions. Questions marked ** were not addressed by any of the SLR articles, and those labelled * were only partially addressed in studies with multidimensional concepts at more advanced development stages. Notable deficiencies were observed in Stages 2 and 3, particularly in questions 7, 9, 10, 13, and 15.

To generate evaluation profiles for SLR articles aligned with Podsakoff et al.'s stages, a streamlined assessment process was developed (Fig. 3). Two key questions (highlighted questions 1 and 12 in Table 3) were posed to establish the range of profiles: (1) Does the SLR paper provide a concept definition? (2) Is the concept definition multidimensional? Dimensions are measurable aspects of a concept, each consisting of related traits or features. In a concept with several dimensions, each one contains similar, measurable properties (Gioia et al., 2013; Podsakoff et al., 2016). For example, Bazzoli and Curcuruto (2021) used two-dimensions (2D) of safety voice to depict four types of voice (promotive, preventative, prohibitive, and hostile) in a quadrant model. One dimension was the temporal perspective on the x-axis (present or future-orientated) and the second was regulatory focus on the y-axis (challenge or defence). Each type of voice related to a different quadrant e.g., promotive voice was future-orientated with a challenging regulatory focus.

Analysis of the 86 SLR articles resulted in four profiles, starting with Profile A representing the least mature articles, which lacked definitions of safety voice (and/or silence). The profiles then progressively evolved up to Profile D, which incorporated comparatively more mature definitions, though still falling significantly short of Podsakoff et al.'s (2016) exemplar standard. The key distinguishing feature of Profile D was the multidimensionality of the definition, while Profiles B and C contained unidimensional definitions. The distinction between Profiles B and C was based on the inclusion and quality of the definition's properties, entities, and descriptions, which should be clear, concise, safety-specific, and free from technical jargon, avoiding excessive brevity, over-simplification, or vagueness (Podsakoff et al., 2016). An example of a unidimensional Profile C definition is: "Speaking up about safety issues – or safety voice – is a proactive response whereby people at all levels of

Table 2
Inclusion and exclusion criteria for title and abstract screening, and full text screening for a review of safety voice.

Criteria	Include	Exclude	Rationale
SLR Review Question Relevance	• Raising safety concerns to another person or group of people (interpersonal communication) i.e. speaking up to prevent physical harm from hazardous situations • Verbal and written forms of communication (including computer-based reporting systems)	• Intrapersonal communication • Mass communication • Non-verbal communication • Voice technology • Physiological voice • Medical diseases • Primarily about law or ethics • Primarily about COVID-19 • Primarily about education or a medical teaching tool/ model • Primarily about finance or business • Non-safety related employee voice or whistleblowing	Both safety and communication are significant and complex research domains. This research is bounded to focus on literature relevant to safety voice defined by Tucker et al., 2008).
Language	English	All other languages	Availability of literature and researcher's language.
Publication	Peer-reviewed articles	• Duplicates • Book/literature reviews • Periodicals • Editorials, notes or letters • Dissertations • On-going, unpublished trials • Conference proceedings (e.g., keynote speeches, panel discussions)	Literature quality: peer-reviewed articles provide a suitable level of academic rigour.
Method	• Empirical, primary study • Quantitative • Qualitative	• No original data • People prompted to speak up (e.g., focus groups) • Authors advocate for a group • Calls to speak up about an issue	Only interested in research studies involving unprompted safety voice.
Participants	• From/to all staff roles or hierarchies • Concern raiser could be external to the organisation (e.g., in cases of whistleblowing) • Adults (over 18 years)	• Non-adult (under 18 years) • Mental health patients • Students • Unions or organisations advocating an issue	Encompasses range of participant roles and hierarchies. Adult (over 18 years) population only.

the organization express their worries in response to perceived hazards (Noort et al., 2019a, 2019b), emphasizing both downward and upward communication to address unsafe conditions" (Mathisen et al., 2022, p. 1). In contrast, a simplistic and ambiguous Profile B safety voice definition, lacking an explicit entity, states: "…defined here as behaviors that seek to improve safety by identifying current limitations and possibilities for positive change" (Conchie et al., 2012).

2.5. Reporting

The findings and analysis are organised into key sections, each focusing on different aspects of the safety voice literature. The descriptive analysis provides an overview of the studies, breaking them down by industry, hierarchy, geography, and methodology, while also examining participant roles and study focus. The discussion on safety voice as a concept explores theoretical inconsistencies, different definitions, conceptual dimensions, and how safety voice is communicated. The section on hazards looks at how different types of hazard influence safety voice, while the measurement section examines the various scales used to assess it. Finally, the review of theoretical perspectives and studied variables highlights the key frameworks and factors explored in the research.

3. Analysis

3.1. Description of the safety voice literature

A total of 86 articles met the inclusion criteria (Table 2), 38 % (n = 33) were non-medical and 62 % (n = 53) were medical. Overall, the articles date back to 1998; however, interest in safety voice has been increasing over the past 14 years, with 82 of the 86 articles published from 2010 onward. Details of publication outlets and dates are in Appendix 2.

After identifying an existing bias toward medical studies, the two primary groups were further analysed within the context of their respective industries (Table 4). The medical studies covered a diverse range of high-risk safety–critical clinical settings and specialities. The non-medical studies were further categorised by industry sector with the most studies in transport (n = 9): five in aviation (Aktas and Kagnicioglu, 2023; Bienefeld and Grote, 2012, 2014; Noort et al., 2021a; Perkins et al., 2014); three rail (Clarke, 1998; Kath et al., 2010; Ünder et al., 2023); and one bus study (Tucker et al., 2008). One study in hospitality, restaurant food safety (Yu et al., 2023), was unusual compared to the other non-medical studies because food safety issues present a biological hazard (i.e., food poisoning) whereas the other studies present mechanical or chemical hazards.

To analyse hierarchy, participants' positions were examined in healthcare and non-medical organisations separately (Table 4). In the non-medical group, four hierarchical levels were defined: (1) subordinate/shopfloor worker, (2) supervisor/team leader, (3) middle manager, and (4) senior manager/executive. The medical group required specific subgroups due to varying participant roles, categorised as follows: (1) doctors (consultants, registrars, and junior doctors), (2) nurses (senior, junior, and unspecified rank), (3) mixed clinicians (doctors, nurses, and support clinicians e.g., physiotherapists, social workers, radiographers, and pharmacists), (4) patients and their families, and (5) administrative/support staff. Doctors were assumed to be senior to nurses and support clinicians. Notably, unlike the non-medical group where all participants were organisation members, the medical group included patients and families as external entities. In the non-medical studies,

Key Aspects	Essential Questions	Desirable Questions
Aims	Are the aims/research questions of the study clearly stated?	Is the article written and structured in a clear and accessible way?
	Is the overall methodology appropriate to the research?	
Conceptual framework	Is there an account of the theoretical literature and/or inclusion of a literature review that demonstrates how the study is informed by or linked to an existing body of knowledge?	Does the study provide a concept definition of safety voice and/or safety silence?
Study design	Are the study design and data collection processes adequately described and justified?	Is the researcher's perspective clearly stated and taken into account?
Sampling	Are there clear criteria in participant selection?	Is there a clear description of the context and participants of the study?
	Is the selection of participants theoretically justified?	
Analysis of study findings	Are the analytical methods explicit, systematic and reproducible?	Is there a protection in place to prevent selective use of the data?
		Are both supportive and contrary evidence discussed?
Conclusion	Are evident sources of bias in the results reported and discussed?	Are the limitations of the study considered?
	Do the findings answer the original research question?	Are the findings discussed in terms of their theoretical and/or practical significance?
	Is there sufficient information provided to demonstrate that the findings and conclusions are grounded in the data?	

Quality selection criteria: Answer YES to (1) All ESSENTIAL questions (2) At least 5 DESIRABLE questions

Fig. 2. SLR article full text screening quality assessment criteria adapted from NSW Department of Communities and Justice (2020, Appendix A).

over half involved participants at the subordinate level (n = 17), with just over a quarter including both subordinate and supervisor levels (n = 9). No non-medical studies focused on senior management/executive levels. Half of the medical studies included mixed professional levels, highlighting a central research theme of hierarchy, status, and power within healthcare settings. Additionally, the medical studies exhibited a notable bias toward nursing roles, with 94 % involving nurses, including 24 % focusing exclusively on nurses.

The 86 studies were conducted over a wide range of geographical locations (Table 5): 25 countries, Europe, and one unspecified location. The USA conducted the most studies overall, followed by the UK. Among non-medical studies, China led, followed by the UK. In medical studies, the USA ranked highest, followed by Australia. Studies were categorised as reflecting predominantly Western or non-Western cultural contexts, revealing a significant Western bias: 70 % overall, with 61 % of non-medical and 76 % of medical studies adopting a Western perspective.

The methodologies of the 86 studies were categorised as quantitative, qualitative, or mixed methods. In addition, 11 of the 86 studies utilised a total of 16 vignettes, analysed separately. Methodological differences were notable between non-medical and medical studies (Table 5). Non-medical studies predominantly used quantitative approaches (97 %), with 30 of 33 employing cross-sectional questionnaires, two of which also included time-lagged designs. Four studies adopted mixed methods combining questionnaires with interviews or observations. One non-medical study was purely qualitative, analysing 172 cockpit voice recorder transcripts to explore aviation safety communication (Noort et al., 2021a). Mixed method studies included laboratory experiments simulating "Walking the Plank", offering real-time behavioural insights but with limited realism and non-industry participants (Noort et al., 2019b, 2021b). Medical studies demonstrated more methodological balance. Vignettes were predominantly used in medical studies, focusing on hand hygiene (HH) and personal protective equipment (PPE), with two studies combining these scenarios to examine hierarchical dynamics in healthcare safety voice. The sole non-medical vignette study explored safety voice responses to varying leadership styles (Bazzoli et al., 2020).

Table 3
Concept definition evaluation questions adapted from Podsakoff et al. (2016) and applied to safety voice and silence.

Stage 1	**1**	**Is there a definition?**
Identify potential attributes by collecting a representative set of definitions	2	Is the concept defined in a way that is not solely expressed in terms of examples?
	3	Is the concept defined in a way that is not based exclusively on a description of its consequences or antecedents?
	4a	Are the techniques used to collect a representative set of definitions (e.g., survey the literature, interview subject matter experts, case studies, compare the construct with its opposite pole, etc.) described in the paper?
	4b **	If so, is it clear how the researchers used the techniques to develop the concept's definition?
	5	Does the paper operationalise the concept?
Stage 2	6 *	Does the definition describe the theme(s) of the concept?
Organise potential attributes by theme and identify any necessary and sufficient or shared ones	7a **	For the part of the concept having a necessary and sufficient concept structure, does the definition specify: [a] the concept's essential (necessary) attributes/characteristics?
	7b **	For the part of the concept having a necessary and sufficient concept structure, does the definition specify: [b] the concept's unique (sufficient) attributes/ characteristics?
	8 *	Has a theoretical framework that helps organise attributes along their defining dimensions been identified?
	9 **	Are there criteria that should be used to decide which attributes to include (and which to exclude) in the concept's definition?
Stage 3	**10**	**Does the definition specify the hazard not solely in generic terms? (That is, does it go beyond stating a generalised safety concern or a threat and explicitly specify what the threat is e.g., an imminent active failure or a latent condition?)**
Develop a preliminary definition of the concept	**	
	11a	Does the definition describe the type of property the concept represents? (Does the definition specify the nature of the phenomenon (e.g., intrinsic characteristics, thoughts, feelings, perceptions, actions, or performance metrics) to which the focal concept refers?)
	11b	Does the definition describe the entity to which the property applies? (Does the definition specify the object or event [e.g., person, task, process, relationship, dyad, group, team, organization, culture, etc.] to which the property applies?)
	12 *	**Does the definition specify the dimensionality of the concept?**
	12a *	If so, are the properties, entities, and conceptual themes of the subdimensions adequately described?
	12b *	If so, is it clear whether the subdimensions are conceptualized as manifestations or defining characteristics of the higher-order concept?
	13 **	Does the definition specify the stability of the concept? (That is, does the definition specify whether the concept is fairly stable or fairly dynamic over time and across situations?)
	14 *	Does the definition explain how the focal concept differs from related concepts?
	15 **	Does the definition identify which attributes of the focal concept are not possessed by (or shared with) related concepts and include a discussion of this in the paper?
Stage 4	16 **	Does the definition of the concept exclude the use ambiguous, vague, or ill-defined terms? (Ask "What do we mean by that?" until all the ambiguity in the words used to define the focal concept have been resolved.)
Refine the conceptual definition of the concept	17	Is the concept's definition clear, concise, and relatively devoid of technical jargon?
	18	**Is the concept's definition sufficiently detailed and not too simple, brief, and/or broadly defined?**
	19	Can a lay-person, not expert in the domain, understand the definition?

Participants in the safety voice communication process were categorised as transmitters (message senders), receivers (message recipients), or both (transmitter–receiver dyads) (Table 5). Across the combined non-medical and medical studies, a transmitter-focused bias was evident, with 77 % transmitter-focused, 5 % receiver-focused, and 19 % addressing the transmitter–receiver dyad. None of the non-medical studies were receiver-focused.

3.2. Safety voice conceptual analysis

The safety voice literature lacked conceptual clarity and consistency as indicated by the application of the evaluation criteria (Table 3). In Stage 2, several critical deficiencies were identified. These included the lack of a clear specification of the concept's essential (necessary) and unique (sufficient) attributes, with many definitions offering, at best, characteristics broadly associated with the concept. Additionally, there was an absence of theoretical frameworks to organise these attributes along defining dimensions, as well as vague or undefined criteria for inclusion and exclusion within the concept's definition (Table 3: Questions 7–9). Stage 3 further emphasised the gaps identified in Stage 2. Inconsistencies in the dimensionality of the concept were observed, likely due to the absence of an underpinning theoretical framework. Other issues included uncertainty regarding the temporal stability of safety voice, such as whether it escalates over time, and insufficient differentiation between safety voice and related constructs, such as employee voice. Additionally, ambiguity remained concerning the conceptual relationship between safety voice and safety silence, particularly whether they represent a dimensional continuum or independent constructs (Table 3: Questions 12–15).

3.2.1. Concept definitions

Using the simplified evaluation process described in Fig. 3, the progression of articles was categorised into four profiles (Fig. 4), reflecting varying levels of conceptual maturity in defining safety voice and safety silence. Overall, 25 % of the SLR articles had no definition, Profile A; 27 % were Profile B; 36 % were Profile C; and 12 % were multidimensional, Profile D. The (Profile D) multidimensional definitions included one four-dimensional (4D) model of safety silence and four different models of safety voice: one 3D construct and three 2D variations (Table 6). A comparison of conceptual maturity between non-medical and medical publications indicated more robust development in the former.

3.2.2. Concept dimensions

In terms of safety voice multidimensional perspectives, the 3D model (Curcuruto and Griffin, 2023) included *promotive*, *preventative*, and *proscriptive* safety voice. *Promotive* voice involves proposing improvements to enhance safety. *Preventative* voice highlights risks linked to unintentional factors, such as technological failures or stress-related errors. *Proscriptive* voice addresses deliberate violations of safety protocols. The predominant 2D framework (n = 5) (Lee et al., 2023, Lee et al., 2024; Seo and Lee, 2022; Sun et al., 2024; Yu et al., 2023) draws

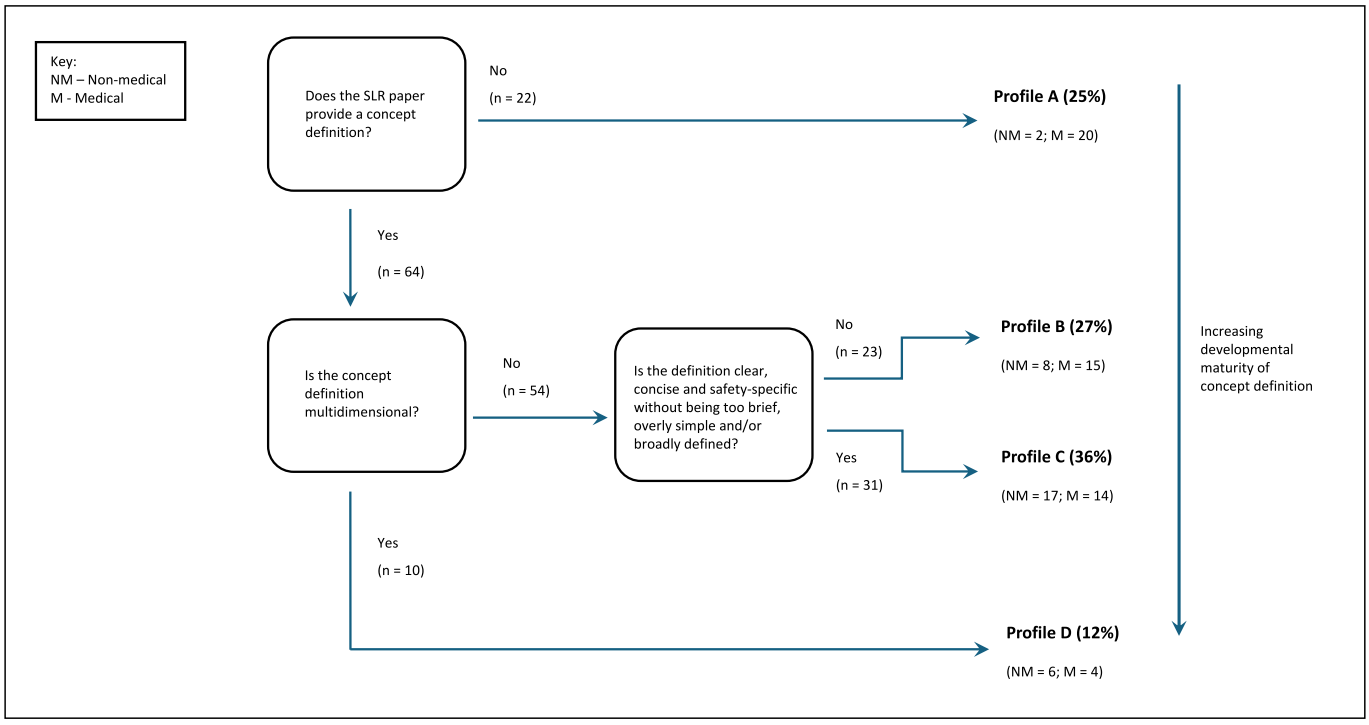

Fig. 3. Concept definition quality evaluation criteria applied to studies of safety voice.

on employee voice literature and distinguishes between *promotive* and *prohibitive* voice (Liang et al., 2012). *Promotive* voice is characterised by suggestions for positive changes, while *prohibitive* voice focuses on preventing harm. Even though *prohibitive* voice reflects positive intent, it may be perceived less favourably (Yu et al., 2023). An alternative 2D model (n = 2) adopted a quadrant structure based on dimensions of *temporal perspective* (past or future) and *regulatory focus* (challenge or defence) (Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021). Each quadrant represented one of four different voice types: *promotive* voice was challenge/future-oriented, *preventative* was defence/future-oriented, *prohibitive* was defence/present-oriented, and *hostile* was challenge/present-oriented. A third 2D model (n = 1) (Richmond and Burgess, 2023), also based on employee voice literature (Morrison, 2014; Van Dyne et al., 2003), differentiated *prosocial* and *defensive* voice. *Prosocial* voice aims to improve workplace conditions and reflects cooperative motives. *Defensive* voice, driven by self-protection, redirects blame and attention to others.

Considering safety silence, only one article adopted a multidimensional approach by identifying four distinct dimensions of safety silence: *non-reporting based on relational and prosocial factors, fear and defensiveness, quiescence and acquiescence,* and *disengagement*. However, the authors (Ünder et al., 2023) did not provide explicit definitions for each dimension. Instead, the intent and characteristics of these dimensions must be inferred from the findings derived from a scale that measures each dimension. Alternatively, two studies provided a nuanced unidimensional perspective by conceptualising safety voice and silence as endpoints of a continuum, with *muted safety voice* in between (Noort et al., 2021b; Perkins et al., 2014). Muted safety voice was defined as "the degree to which safety concerns are withheld during hazardous scenarios" (Noort et al., 2021b, p. 2). This behaviour, Noort et al. (2021b, p. 2) argued, is "best labelled 'muted safety voice' (i.e., in contrast to 'strong safety voice')", reflecting a state in which safety concerns are 'on mute' with interventions adjusting the degree of safety voice or silence.

The next level of concept development maturity, below multidimensional definitions, comprised unidimensional Profiles B and C (Fig. 4). Like Profile D, some definitions in Profiles B and C offered characteristics potentially linked to the concept, but none explicitly stated its essential and unique attributes or clarified which attributes were not shared with related concepts, as recommended by Podsakoff et al. (2016). Non-medical articles generally presented more mature unidimensional definitions (Profile C) compared to medical articles, which offered overly broad and brief definitions, often focused on a specific clinical context (e.g., "Speaking up is defined as an important patient safety behavior exhibited when staff express concerns about patient safety." (Soyer Er and Gül, 2024, p. 1).

3.2.3. Communication form

The reviewed articles used 'safety voice' and 'speaking up' interchangeably, defining them as communication (n = 30) aimed at preventing harm and enhancing safety. Tucker et al. (2008) widely cited unidimensional definition (n = 14) described safety voice as both formal and informal communication. Applying Podsakoff et al.'s (2016) Stage 4 questions 16 and 18 (Table 3) revealed conceptual ambiguities due to imprecise and brief definitions across all the articles. Specifically, terms like 'communication' and 'voice' introduce interpretive variability regarding how safety messages are conveyed in terms of message format (verbal, written reporting, or whistleblowing) and directional flow.

The articles comprise diverse formats of safety voice, spanning a continuum of formality, with no consensus on its exact nature. Verbal speaking up occupies the least formal end, progressing to incident reporting (typically formalised in reporting system databases), and escalating to whistleblowing, where concerns are directed to higher authorities after other avenues fail (Near & Miceli, 2013). Whilst 3 % of the reviewed articles explicitly defined the communication as verbal (Noort et al., 2021b; Perkins et al., 2014; Samuelsson et al., 2023), Fig. 5 indicates 78 % of studies focused entirely on verbal safety voice. Non-verbal reporting accounted for 14 % of the studies. Whistleblowing was included under 'reporting' within medical studies; two exclusively addressed whistleblowing (Ahern and McDonald, 2002; Jackson et al., 2010), while two included it alongside incident reporting (Martin et al., 2018; Reader, 2022).

Regarding directionality, 65 % of the reviewed articles did not clearly detail a directional focus within their conceptual definitions. In

Table 4
Descriptive information of articles included in the review of safety voice showing key differences between non-medical and medical studies.

Non-medical (n = 33)			
Industry/Setting	**n**	**Participant Hierarchical Levels**	**n**
Transport: Aviation	5	Subordinate/shopfloor worker	17
Transport: Bus and rail	4	Subordinate/shopfloor worker and supervisor/ team leader	9
Construction	4	Subordinate, supervisor, and middle manager	5
Petroleum	3	Senior manager/executive	0
Chemical	3	Not applicable	2
Mining	2		
Non-industry-based (laboratory experiments)	2		
Manufacturing	1		
Metal and craft	1		
Not known	1		
Restaurant	1		
Mixed:Manufacturing and construction; Manufacturing and construction; Manufacturing, mining and drilling; Service, construction, and technology; Manufacturing, dangerous chemicals, pharmaceuticals, construction, electroplating and metallurgy; High risk industries (e.g. mining and construction)	6 (n = 1 for each group)		
Medical (n = 53)			
Industry/Setting	**n**	**Participant Hierarchical Levels**	**n**
Healthcare:	53	(Senior) consultant, registrar, and junior doctor	1
The medical studies covered a diverse range of high-risk safety–critical clinical settings and specialities e.g., hospitals (including public, private, university, and psychiatric); specialist departments (e.g., emergency, oncology, cardio, surgery, and anaesthesiology); support clinics (e.g., rehabilitation and mental health); home healthcare support; and intensive care units (e.g., neonatal, NICU).		Junior doctor	1
		Senior & junior nurses	3
		Junior nurse	2
		Nurse (unspecified rank)	13
		Mixed levels and mixed clinicians	16
		Mixed levels of doctors and nurses only	11
		Patients and family	3
		Mixed levels and mixed clinicians, and admin/ support staff	1
		Mixed levels and mixed clinicians, and patients & family	1
		Mixed levels of doctors and nurses, patients and family, and admin/support staff	1

relation to the primary research directional focus (Fig. 6): 51 % treated safety voice as multidirectional (assuming direction of voice to co-workers can be horizontal and down) and 31 % approached safety voice exclusively as upward communication (including patients and their families speaking to medical staff). Variations in tone were also noted, with 14 studies, predominantly in medical contexts, emphasising assertiveness. Moreover, definitions conflicted regarding whether safety voice is discretionary. Over half the studies (53 %) did not mention the discretionary nature of safety voice in their definition. Fifteen studies (17 %) explicitly described it as discretionary behaviour, while five (6 %) suggested legal or regulatory mandates in specific scenarios. This legal framing appeared in three non-medical, multidimensional concept frameworks in relation to *preventative* voice (Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Curcuruto and Griffin, 2023) and was further articulated in two medical studies addressing whistleblowing (Ahern and McDonald, 2002; Reader, 2022).

3.3. Hazard

Understanding the nature of hazards is crucial when examining definitions of 'safety voice' or 'speaking up'. A key consideration is whether hazards, the safety-specific instigators of communication, are explicitly identified. Hazards can be differentiated into imminent active failures or latent conditions, which are long-standing or systemic issues. This distinction raises questions about how different types of hazards influence the form and progression of communication, from verbal expressions to formal reporting or whistleblowing.

Of the 86 articles reviewed, 64 included definitions (Profiles B, C, and D), all of which offered only generic descriptions of hazards, without specifying the precise nature of the threats involved. A limited subset of medical 'speaking up' definitions (n = 7) implied the need for immediate action. Typical generic hazard descriptions included: "Safety silence is the act of withholding safety concerns during hazardous scenarios …" (Noort et al., 2021b, p. 2); "the prevention of error and/or harm (physical and/or psychological) to healthcare staff and patients" (Barlow et al., 2023b, p. 1); and "expression or withholding of information about threats to patient safety" (Mawuena and Mannion, 2022). None of these definitional descriptions specified the hazard, the harm or the threat explicitly. However, Table 7 details 23 articles where the type of hazard being studied could be identified and categorised.

A fundamental distinction between process safety and personal safety is inherently shaped by the nature of the hazard, however, none of the articles reviewed expressly distinguished between these safety types. Analysis (Fig. 7) showed that most studies (58 %) addressed both personal and process safety, while personal safety alone was exclusively examined in non-medical articles. Process safety was the sole focus in 20 medical studies and one non-medical study on food safety (Yu et al., 2023). The two laboratory experiments were deemed not applicable as the simulated nature of the scenario and the actual risk to personal safety were not considered relevant in this case.

3.4. Measurement

Four articles involved measurement scale development and 59 employed previously validated measurement scales, rather than scales uniquely designed for their respective studies (Table 8). In studies examining multidimensional constructs, multiple scales were often employed to assess distinct dimensions or types of voice. For example, Bazzoli et al. (2020) and Bazzoli and Curcuruto (2021) utilised four different scales to capture four types of safety voice. Among the studies utilising validated scales, 27 distinct scales were identified, three of which were applied in both non-medical and medical contexts (Hofmann et al., 2003; Liang et al., 2012; Manapragada and Bruk-Lee, 2016). However, these scales were not necessarily originally designed for or dedicated to measuring safety voice or safety silence. Instead, safety voice was often conceptualised as a subset of broader constructs.

Table 5
Descriptive information of articles included in the SLR of safety voice shared by non-medical and medical studies.

Country	Western or Non-Western Culture	n (NM)	n (M)	Method		n (NM)	n (M)	Participant Role	n (NM)	n (M)
USA[a]	Western	3	11	Quantitative	Questionnaire/survey only	28	25	Transmitter	25	41
UK[a]	Western	5	7							
Australia	Western	–	8	Qualitative	Interview only	–	13	Receiver	–	4
Switzerland	Western	–	7		Focus Group only	–	1			
China	Non-Western	7	–		Observation only	–	1	Both (transmitter and receiver dyad)	8	8
Korea	Non-Western	–	6		Interview and focus group	–	2			
Ghana	Non-Western	3	2		Interview and observation	–	2			
Europe[b]	Western	4	–		CVR[c] transcript (actual response)	1	–			
Turkey	Western	2	1		Other[d]	–	2			
Italy	Western	2	–		Interview and other	–	1			
Norway	Western	2	–							
Canada[a]	Western	1	1	Mixed	Questionnaire/survey, interview and focus group	–	2			
Japan	Non-Western	–	2		Questionnaire/survey and interview	1	3			
Sweden	Western	1	–		Questionnaire/survey and observation	3	–			
Pakistan	Non-Western	1	–		Questionnaire/survey, interview and observation	–	1			
Indonesia	Non-Western	1	–							
Saudi Arabia	Non-Western	–	1	Vignettes	Leadership styles (3 vignettes in one study)	3	–			
Israel	Non-Western	–	1		PPE and HH (2 vignettes in one study)	–	4			
Netherlands	Western	–	1		HH	–	5			
Cyprus	Western	–	1		Medication concern	–	1			
Greece	Western	–	1		Foetal heart rate concern and HH (2 vignettes in one study)	–	2			
Belgium	Western	–	1		Concern suicide risk assessment not completed	–	1			
New Zealand	Western	–	1							
Hong Kong	Non-Western	–	1							
Ireland	Western	–	1							
Austria	Western	–	1							
Not known	N/A	1	–							

Abbreviations: PPE – personal protective equipment; HH – Hand hygiene; CVR – cockpit voice recorder.
Notes: a. In 'Medical (M)' category: 2 studies specify dual locations: (1) USA and UK (2) USA and Canada. b. Europe not broken down into separate countries. c. Thematically coding and analysing 172 CVR transcripts of historic aviation accidents between 1962 and 2018 (Noort et al., 2021a). d. Qualitative "other" includes a simulation-based study; content analysis of inquiry findings; a review of investigative documents; and analysis of organization development assessments.

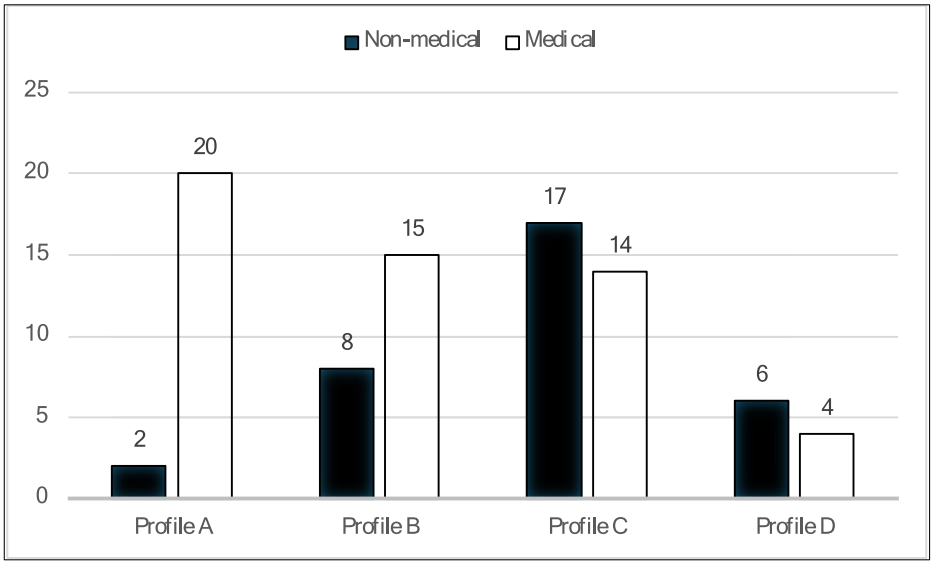

Fig. 4. Concept definition quality evaluation profiles of studies of safety voice.

Table 6
SLR articles with a multidimensional concept definition of safety voice.

Multidimension	Dimensions		Non-medical (NM) Total	Non-medical (NM) Article	Medical (M) Total	Medical (M) Article
4D (SS)	(1) Relational and prosocial silence(2) Fear and defensive silence(3) Quiescence and acquiescence silence(4) Disengaged silence		1	(Ünder et al., 2023)	–	–
3D (SV)	(1) Promotive voice(2) Preventative voice(3) Proscriptive voice		1	(Curcuruto and Griffin, 2023)	–	–
2D (SV)	(1) Promotive voice(2) Prohibitive voice		2	(Sun et al., 2024; Yu et al., 2023)	3	(Lee et al., 2023, 2024; Seo and Lee, 2022)
2D (SV)	(1) Temporal perspective (present or future-orientated) (2) Regulatory focus (challenge or defence)	Quadrant model representing four types of voice:(1) Promotive voice(2) Preventative voice(3) Prohibitive voice(4) Hostile voice	2	(Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021)	–	–
2D (SV)	(1) Prosocial voice(2) Defensive voice		–	–	1	(Richmond and Burgess, 2023)

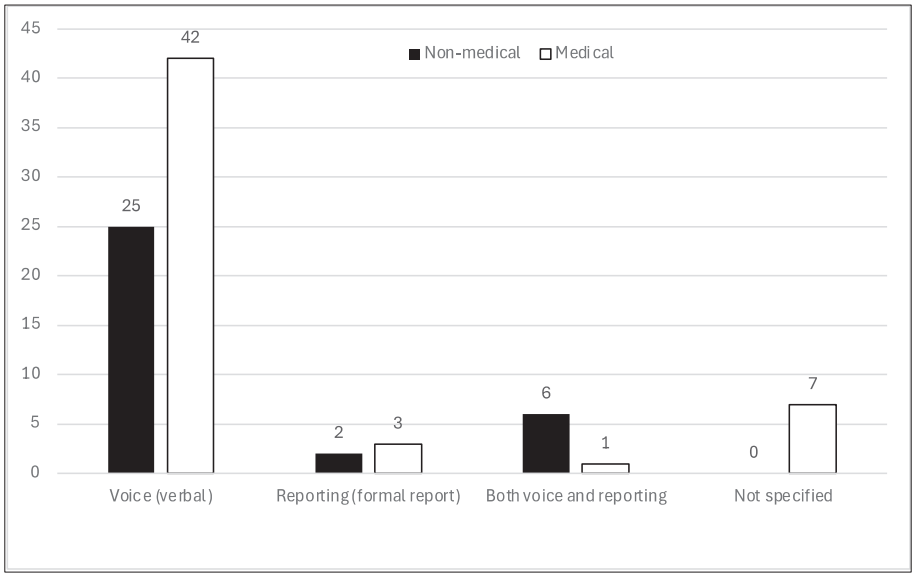

Fig. 5. Communication form of safety voice: voice or reporting.

For example, a number of the validated scales were originally designed to measure constructs such as: employee voice (EV) and employee silence (ES) (LePine & Van Dyne, 1998; Maynes & Podsakoff, 2014; Tangirala & Ramanujam, 2008); safety citizenship behaviour (SCB) (Curcuruto and Griffin, 2018; Hofmann et al., 2003); communication openness (Reader et al., 2007; Smits et al., 2008); safety participation behaviour (SPB) (Curcuruto et al., 2015); safety voice climate (SVC) (Mathisen and Tjora, 2023); and safety silence motive measures (SSMMs) (Manapragada and Bruk-Lee, 2016).

In the non-medical studies, the most frequently employed scale was Tucker et al., 2008) whereas in the medical studies, it was Richard et al. (2021). Among the scales applied in both non-medical and medical contexts, Hofmann et al. (2003) was the most frequently used. Notably, the Tucker et al., 2008) scale, the most utilised instrument overall, is unidimensional. Its safety voice component consists of five items, extracted from an 11-item scale, comprising brief, subjective statements open to interpretation. All five items, such as *"I make suggestions about how safety can be improved"* and *"I inform the union/boss when I notice a potential driving hazard"* (Tucker et al., 2008, p. 324) lack specificity regarding the nature of the hazard. The Richard et al. (2021) scale is a patient safety questionnaire explicitly tailored to medical contexts. Meanwhile, the Hofmann et al. (2003) scale was originally developed to measure SCB, with safety voice conceptualised as a subset of change-oriented SCB.

Fig. 8 illustrates the distribution of studies measuring actual voice behaviour versus the intention to voice. Most of the studies (77 %) focused on measuring actual voice behaviour; in contrast, 15 % exclusively assessed the intention to voice. Only medical studies measured both actual voice behaviour and the intention to speak up.

3.5. Theoretical perspectives and variables studied

Among the 86 reviewed studies, the majority focused on safety voice (n = 68: 7 NM, 41 M), followed by studies addressing both safety voice and silence (n = 11: 2 NM, 9 M), and a smaller subset on safety silence alone (n = 7: 4 NM, 3 M).

3.5.1. Theoretical perspectives

Theoretical frameworks were explicitly stated in all non-medical studies, except for two (Bienefeld and Grote, 2014; Perkins et al., 2014). In contrast, 38 % of medical studies (n = 33) did not adopt a theoretical stance. Across the studies, 29 distinct theories were identified, with social theories being predominant (n = 35). These included: Social Exchange Theory (SET), Socially Desirable Response Theory, and

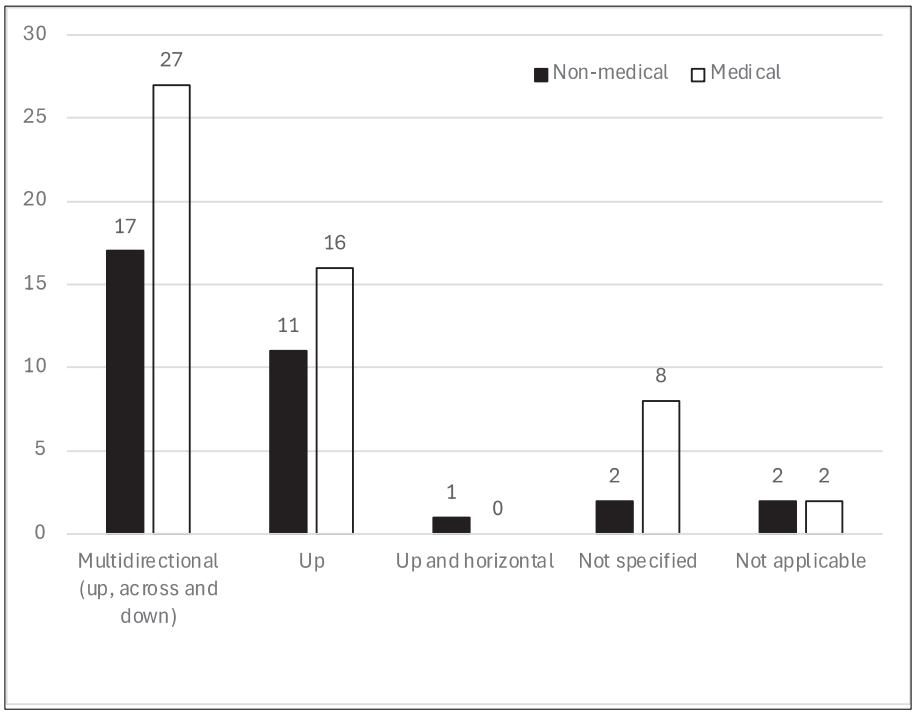

Fig. 6. Communication form of safety voice: voice direction.

Table 7
Type of safety and hazard information in studies of safety voice.

Non-medical **Type of Hazard Hazard Specified in SLR Article**	**Active Failure Articles**	**Latent Condition Articles**
Specified (outside context of vignette (s))	**n = 3** (Bienefeld and Grote, 2014; Clarke, 1998; Noort et al., 2021a)	–
Lab experiments	**n = 2** (Noort et al., 2019b, 2021b)	–
Medical **Type of Hazard Hazard Specified in SLR Article**	**Active Failure Articles**	**Latent Condition Articles**
Specified (outside context of vignette (s))	**n = 7** (Rainey et al., 2015; Reader, 2022; Richmond and Burgess, 2023; Schwappach and Gehring, 2014; Szymczak, 2016; Tarrant et al. (2017); Vauk et al. (2022))	**n = 1** (Mawuena and Mannion, 2022)
Specified (within context of vignette (s))	**n = 10** (Barlow et al., 2023a; Barlow et al., 2023c; Bsharat and Drach-Zahavy, 2017; Dendle et al. (2013); Entwistle et al., 2010; Lyndon et al. (2012), Lyndon et al., 2017; Niederhauser and Schwappach, 2022; Schwappach (2018); Schwappach and Niederhauser, 2019)	–

Leader-Member Exchange (LMX), with representation across the sample (n = 17: predominantly favouring NM, n = 14). Furthermore, other relational behavioural theories (e.g. Planned Behavioural Theory) were examined (n = 13), with a similar bias observed towards NM (n = 11). Additional social theories explored by single studies included Social Impact Theory, Social Cognitive Theory, Social Capital Theory, and Theory of Interaction Ritual Chains. Identity theories were the second most common perspective (n = 8: 2 NM, 6 M), encompassing Organizational Identity (OID), Social Identity Theory (SIT), Perceived Insider Status (PIS), and Relational Identification Theory. Other frequently cited theories were Communication Accommodation Theory (n = 3), Attribution Theory (n = 3), Conservation of Resource (COR) Theory (n = 3), Job Demands-Resources (JD-R) Theory (n = 2), and Regulatory Focus Theory (n = 2). The diversity of theories highlights conceptual challenges, suggesting the need for clearer definitions of safety voice and silence.

3.5.2. *Variables studied*

Nearly half of the studies (n = 42) examined safety climate/culture, or safety voice climate (SVC), predominantly in medical contexts (n = 33). Frequently studied variables with a medical bias included: social interaction (n = 33: 7 NM, 26 M), hierarchy/status/power distance (n = 32, 5 NM, 27 M), psychological safety (n = 23: 7 NM, 16 M), organisational support (n = 20, 4 NM, 16 M), risk perception and hazard identification (n = 16, 3 NM, 13 M), and national culture (n = 12: 2 NM, 10 M). Medical studies were unique in studying patient advocacy (n = 8) and external patient safety voice (n = 6). In non-medical contexts, the most frequently examined variable was safety leadership (n = 29: 17 NM, 12 M). Additional variables studied by fewer articles included work colleague encouragement (n = 9: 2 NM, 7 M) and dispositional traits (n = 9: 3 NM, 6 M). This distribution underscores the diversity in theoretical and empirical approaches to safety voice and silence across medical and non-medical domains.

4. Discussion

The originality of this study stems from its dual focus: the operationalisation and application of Podsakoff et al.'s (2016) four-stage concept definition development process and a comparative analysis of safety voice across the non-medical and medical sectors. The following sections synthesise the findings, highlighting theoretical gaps, practical implications, and avenues for future research. Table 9 provides a summary of the main discussion points.

4.1. *Foundational concept development weaknesses*

4.1.1. *Voice origins, scope, and relationship with employee voice*

Safety voice originates from Hirschman (1970) concept of voice,

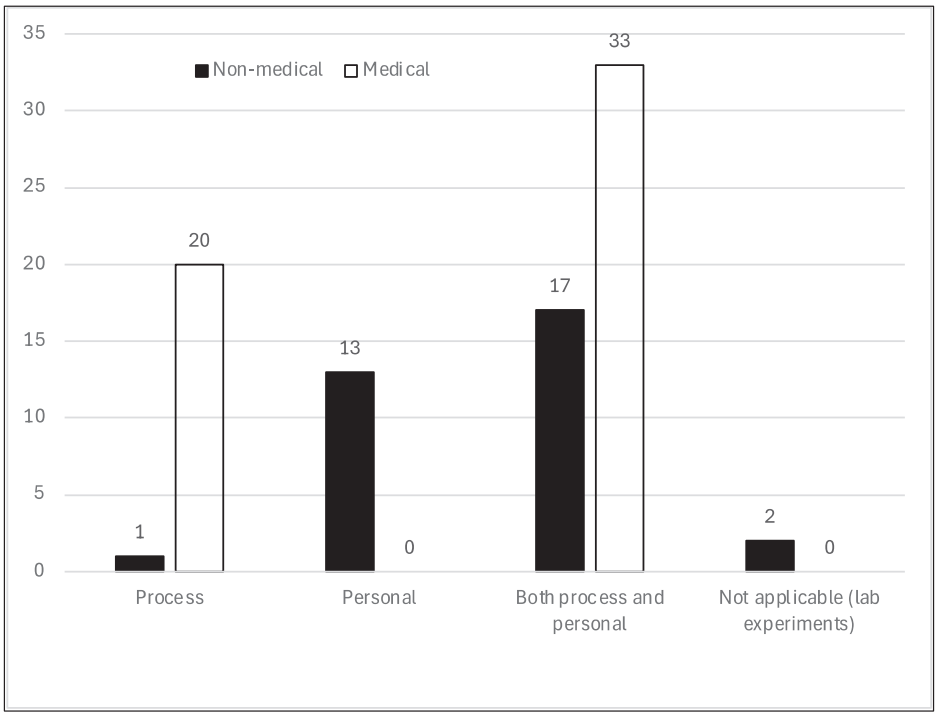

Fig. 7. Process and personal safety in studies of safety voice.

where expressing dissatisfaction drives change rather than exit, and aligns with Morrison (2011, p. 375) definition of employee voice as the "discretionary communication of ideas, suggestions, concerns, or opinions about work-related issues with the intent to improve organizational or unit functioning". However, safety voice focuses specifically on hazards, meaning conditions that could cause harm (ICAO, 2018; Kumamoto & Henley, 1995). Its scope extends beyond organisations to external stakeholders, including patients, the public, and regulators (Noort et al., 2019a; Schwappach and Gehring, 2014; Tucker et al., 2008), blurring its boundaries, especially in healthcare and when whistleblowing. This study supports (Noort et al.'s, 2019a) conclusion that safety voice is related to but distinct from employee voice due to its focus on safety, wider stakeholder involvement, and unique methodologies, antecedents, and outcomes. Furthermore, unlike employee voice, which is discretionary and usually tied to long-term concerns like job satisfaction (Morrison, 2014), safety voice can be both discretionary and mandatory. When safety violations require legal action, safety voice is essential for risk reduction, compliance, and accountability. However, definitions in the reviewed articles conflicted on whether safety voice is discretionary: over half did not address this aspect, 15 defined it as discretionary, while five linked it to legal or regulatory mandates (Ahern and McDonald, 2002; Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Curcuruto and Griffin, 2023; Reader, 2022). Moreover, Mathisen et al. (2022) suggest that expressing safety voice is harder than general voice due to social risks, as it often involves preventing incidents and may be seen as criticism, requiring stronger leadership support and perceived control.

4.1.2. Dimensions of safety voice

The conceptual maturity of definitions varied significantly across the reviewed literature revealing the nascent stage of theoretical development of safety voice. Only 12 % of studies presented the most theoretically sophisticated definitions, with multidimensional frameworks such as Curcuruto and Griffin (2023) three-dimensional model and three different variations of two-dimensional models. In contrast, 63 % of studies relied on unidimensional definitions that overlooked the multifaceted nature of safety voice. Bazzoli et al. (2020) support this finding, noting that safety voice is largely seen as unidimensional, unlike employee voice, which is multidimensional with over 12 identified forms (Maynes & Podsakoff, 2014). Medical literature demonstrated weaker conceptual maturity than non-medical research, often providing overly broad definitions confined to specific clinical contexts (Soyer Er and Gül, 2024).

The variation among multidimensional models reflects alternative theoretical perspectives and dimensional interpretations of safety voice. Curcuruto and Griffin (2023) three-dimensional model distinguished between promotive, preventative, and proscriptive voice. Promotive voice suggests safety improvements, preventative voice highlights risks from unintentional factors like errors or system failures, and proscriptive voice addresses deliberate safety violations. The two-dimensional model (Lee et al., 2023, Lee et al., 2024; Seo and Lee, 2022; Sun et al., 2024; Yu et al., 2023), which differentiated promotive and prohibitive voice, has been widely adopted, drawing on earlier employee voice literature such as that of Liang et al. (2012) and Van Dyne et al. (2003). Promotive voice involves suggestions for improving safety, whereas prohibitive voice focuses on preventing harm but may be perceived negatively due to its emphasis on restrictions and rule enforcement (Yu et al., 2023). Alternative frameworks introduced additional complexity by incorporating temporal and regulatory perspectives, as seen in the quadrant model developed by Bazzoli and Curcuruto (2021), which considered whether safety voice is future or present-focused and whether it operates as a challenge or defensive mechanism. Another approach, put forward by Richmond and Burgess (2023), distinguished prosocial safety voice, which seeks collective improvement, from defensive safety voice, which is driven by self-protection and the avoidance of blame. The existence of these competing frameworks highlights ongoing theoretical fragmentation, reinforcing the need for greater conceptual clarity. While social exchange theory, relational behaviour models, and social identity frameworks have been employed to explore safety voice, there is no unified theoretical foundation to provide consistency across studies.

4.1.3. Voice, silence, and safety citizenship behaviour

Podsakoff et al. (2016) explained the importance of clearly distinguishing between conceptual opposites, cautioning that without clear

Table 8
Measurement scales used in studies of safety voice.

Non-medical Scales (n = 15) Scale(* denotes scale development)	Type of Scale:e.g., SV, SS, SCB	Measuring:e.g., SV, SS, SCB	Studies using the Scale	Studies (n)
Tucker et al., 2008*	SV	Unidimensional SV	(Ashraf et al., 2023; Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Curcuruto et al., 2020; Curcuruto and Griffin, 2018, Curcuruto and Griffin, 2023; Ni et al. (2023); Sun et al. (2022a), Sun et al. (2022b), Sun et al. (2022c); Tucker et al., 2008*)	11
Simard & Marchand, 1995	Safety initiatives	SV	(Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Curcuruto and Griffin, 2023)	3
Tucker & Turner, 2011	Preventative SV	Preventative SV	(Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021)	2
Maynes & Podsakoff, 2014	EV	SV	(Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021)	2
Curcuruto and Griffin, 2018	SCB	SV	(Dodoo et al., 2021, 2023)	2
Mathisen and Tjora, 2023*	SVCS	SVC	(Mathisen and Tjora, 2023)*	1
LePine & Van Dyne, 1998	EV	EV	(Amponsah-Tawiah et al., 2020)	1
Cox et al., 2011	SS (Mum effect)	SS	(Credo et al., 2016)	1
Pousette et al., 2008	Safety climate & voice	SV	(Samuelsson et al., 2023)	1
Under, 2016	VNR factors [Turkish]	VNR	(Ünder et al., 2023)	1
Curcuruto et al., 2015	SPB	SV & whistleblowing	(Wang et al., 2019)	1
Hofmann & Morgeson, 1999	Raising safety concerns with supervisors	Upward safety comms	(Kath et al., 2010)	1
Petroleum Safety Authority Norway, 2017	RNNP – Risk level	SV index	(Mathisen et al., 2022)	1
Milliken et al., 2003	Reasons for silence	SS	(Bienefeld and Grote, 2012)	1
Sun et al., 2024*	Promotive & prohibitive ESVS	SV(Chinese context)	(Sun et al., 2024)*	1
Medical Scales (n = 9)				
Richard et al., 2021	Speaking Up about Patient Safety Questionnaire (SUPS-Q)	SV & SS (hypothetical voice behaviour assessed through a vignette)	(Alshraim and Alrashed, 2023; Lee and Dahinten, 2021b; Niederhauser and Schwappach, 2022; Schwappach (2018); Schwappach et al., 2018; Schwappach and Niederhauser, 2019; Schwappach and Richard, 2018)	7
Tangirala & Ramanujam, 2008 based on (Van Dyne et al., 2003)	EV & ES	SS	(Gkorezis et al. (2016); Kritsotakis et al., 2022; Lee et al., 2024)	3
Martinez et al., 2015	SUC-Safe Scale & SUC-Prof Scale (climate)	SV (patient concerns & professional behaviour)	(Feldman et al. (2022); Soyer Er and Gül, 2024)	2
Lee and Dahinten, 2021a	Speaking up (frequency)	SV	(Lee and Dahinten, 2021b; Seo and Lee, 2022)	2
Kim (2010)	Intention to report (frequency)	SV – Reporting(intention to report)	(Lee and Dahinten, 2021b)	1
Smits et al., 2008	Comms openness	SV	(Alingh et al., 2019)	1
Edmondson, 1999	Psychological safety	SVC	(Nembhard and Edmondson, 2006)	1
SPR Center, 2005	Voice climate	Voice climate	(Nembhard et al. (2015))	1
Reader et al., 2007	Comms openness	SV (comms openness)	(Ng et al., 2017)	1
Both Non-medical and Medical Scales (n = 3)				
Hofmann et al., 2003	SCB	Promotive & preventative SV; whistleblowing	NM: (Aktas and Kagnicioglu, 2023; Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Conchie et al., 2012; Curcuruto and Griffin, 2023; Wang et al., 2019; Yu et al., 2023) M: (Hu and Casey, 2021)	7 1
Liang et al., 2012	2D Promotive & prohibitive EV	EV	NM: (Yu et al., 2023) M: (Lee et al., 2023, Lee et al., 2024; Seo and Lee, 2022)	1 3
Manapragada and Bruk-Lee, 2016*	SS Motives Measures (SSMM)	SS	NM: (Ansori et al., 2021) M: (Manapragada and Bruk-Lee, 2016)*	1 1

Abbreviations: NM – Non-medical; M – Medical; SV – Safety voice; SS – Safety silence; EV – Employee voice; ES Employee silence; SCB – Safety citizenship behaviour; SPB – Safety proactivity behaviour; SVC; Safety voice climate; SVCS – Safety voice climate scale; ESVS – Employee safety voice scale; VNR – voluntary non-reporting.

definitions, the nuances of their interrelations can be obscured. This is particularly relevant in safety contexts, where safety voice and safety silence (withholding risk-related information) significantly influence outcomes (Lee et al., 2024; Manapragada and Bruk-Lee, 2016; Noort et al., 2021b; Schwappach and Richard, 2018). Although notionally connected, the relationship between voice and silence in organisations has sparked significant debate, with three perspectives emerging: the bipolar opposites view, the continuum view, and the independent constructs view.

The bipolar opposites view posits that voice and silence are mutually exclusive, the presence of one precludes the other. This perspective, central to Morrison & Milliken's (2000) work, suggests that certain organisational climates render voice futile or dangerous, fostering silence. Brinsfield (2013) supports this binary framing, while critics like Pinder & Harlos (2001) argue that silence cannot simply be defined as the absence of voice. The continuum view treats voice and silence as part of a spectrum, shaped by contextual factors like psychological safety and managerial openness. This view extends Morrison & Milliken's (2000) work, recognising that employees move fluidly between voice and silence, influenced by both emotional and situational factors (Detert & Edmondson, 2011; Milliken et al., 2003). Similarly, Morrison (2011) emphasised the dynamic interplay between the two constructs based on individual-level and contextual influences. The independent constructs view sees voice and silence as distinct but co-occurring behaviours (Morrison, 2023). Van Dyne et al. (2003) argued that silence involves intentional withholding, driven by motives like fear or altruism, while voice can stem from cooperative problem-solving or self-protection. This view is supported by Sherf et al. (2021), who emphasised the distinct antecedents and regulatory mechanisms of each behaviour.

This same conceptual ambiguity surrounding voice and silence applies to safety voice and safety silence. Some studies position them as endpoints on a continuum, while others treat them as distinct constructs. Notably, Noort et al. (2021a, 2021b) and Perkins et al. (2014) introduced the concept of *muted safety voice*, where safety concerns are partially or indirectly communicated, challenging the traditional binary model of voice and silence. Counterintuitively, although muted safety

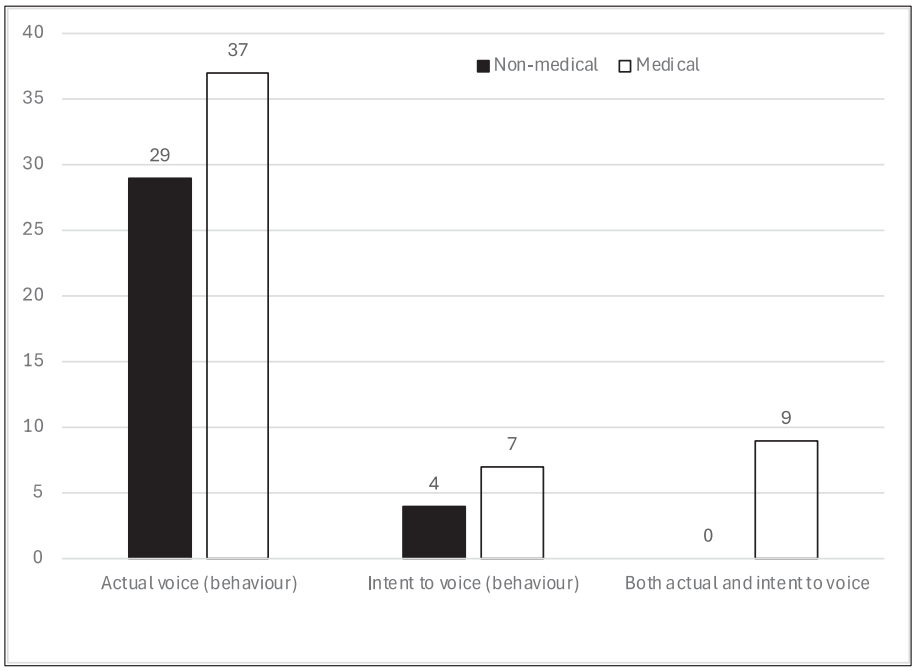

Fig. 8. Actual voice behaviour and intent to voice in studies of safety voice.

voice may be seen as suboptimal, it could reflect adaptive, strategic behaviour, such as subtle signalling in hierarchical environments to mitigate risks without direct confrontation, especially in high power-distance cultures. This reframing challenges the preference for explicit voice and calls for further research into the dynamics of muted expression. Moreover, as Podsakoff et al. stressed the importance of examining conceptual opposites to deepen understanding, ongoing debates about safety voice and silence hinder such insights, complicating concept development. Alternatively, Ünder et al. (2023) developed a multidimensional model of safety silence that included non-reporting due to relational concerns, fear, quiescence, and disengagement. However, the authors did not provide explicit definitions for these dimensions, leaving room for further theoretical refinement. This ongoing lack of clarity in the relationship between voice, silence, and intermediate states such as muted voice further illustrates why safety voice research has struggled to establish itself as a well-defined construct.

Further complicating its conceptualisation, safety voice shares an intricate relationship with SCB (Noort et al., 2019a), a collection of voluntary, proactive, and prosocial actions fostering a safety culture that extend beyond formal requirements (Didla et al., 2009). Safety voice embodies the communicative and advocacy dimensions driving SCB's broader objectives. Scholars view this relationship differently. Didla et al. (2009) treated safety voice as a subset of SCB, integral to proactive risk management. Curcuruto and Griffin (2018) positioned it as a proactive dimension of SCB, driven by psychological ownership and affective commitment. Conchie et al. (2012) proposed safety voice mediates the link between transformational leadership and SCB, with trust and supportive leadership amplifying voice. The dual role of safety voice, both as a distinct behaviour improving safety and as a mechanism within broader SCB efforts, makes it challenging to conceptualise and separate from SCB.

In summary, the application of Podsakoff et al.'s (2016) framework identified significant flaws in the conceptual clarity and consistency of safety voice. Many studies failed to specify the necessary and unique attributes of safety voice, leading to broad and often vague definitions. The absence of a unified theoretical framework resulted in inconsistencies in defining the concept's dimensionality and its relationship with related constructs such as employee voice, safety citizenship behaviour (SCB), and safety silence. Notably, the distinction between safety voice and safety silence remained ambiguous, with ongoing debate regarding whether they form opposite ends of a continuum or exist as independent constructs.

The relevance of these findings extends to both theoretical and practical domains. Conceptual ambiguities hinder the development of robust theoretical frameworks, limiting the ability to measure and compare safety voice across contexts. The lack of consensus on dimensionality affects practical applications, such as organisational interventions to promote safety voice. For instance, the 3D model proposed by Curcuruto and Griffin (2023) suggests that organisations should differentiate between promotive, preventative, and proscriptive safety voice to tailor interventions effectively. Similarly, Noort et al. (2021a, 2021b) concept of muted safety voice highlights the importance of addressing partial expressions of safety concerns, which could inform training programmes to encourage more explicit safety communication.

Given these implications, advancing safety voice research requires greater theoretical precision. Future studies should focus on refining multidimensional models, clarifying the relationship between safety voice and related constructs. Addressing these gaps will enhance both academic understanding and practical efforts to advance proactive safety management within organisations, sustained by an open and engaged safety culture.

4.2. Communication form anomalies

4.2.1. Formality, directionality, and stability

The review indicated that there is no consensus on three core communication form-related attributes of safety voice: formality, directional focus, and temporal stability. First, there is no agreement on whether safety voice includes only verbal expressions or extends to written reporting and whistleblowing. Second, its directional focus is contested, with some studies treating it as an exclusively upward process, while others recognised horizontal, downward, or multidirectional communication. Third, the temporal stability of safety voice remains underexplored, raising questions about whether concerns escalate from informal verbalisation to formal reporting over time. Applying Podsakoff et al.'s (2016) Stage 4 questions 16 and 18 (Table 3) revealed conceptual ambiguities due to imprecise and brief definitions across all the articles. Using "safety voice" and "speaking up" interchangeably, 35

Table 9
Summary of key issues, future research and practical resolution benefits.

Key issues	Future research	Practical benefits of resolving key issues
1) Foundational concept development weaknesses: Ambiguity and lack of consensus: • Definition diversity • Competing theoretical foundations • Concept overlap **2) Communication form anomalies:** Scope variability and omissions: • Voice interpretation • Directionality • Stability • Sender-centric focus	**Improve concept development to clarify definition and enhance coherence:** Adopt a rigorous systematic approach e.g., by applying Podsakoff et al.'s (2016) framework: • Theoretical specification • Construct delineation • Unified and comprehensive scope • Dyadic sender-receiver perspective	**Clear, comprehensive and well-substantiated baseline:** To underpin and advance the fundamental aspects of effective safety management: • Safety-specific strategy and policy • Engaged safety culture • Proactive risk management • Communication and engagement • Training, competence, and capability • Assurance • Resilience and sustainability
3) Hazard indeterminacy: Insufficient understanding of the critical initiator of *safety* voice: • Hazard categorisation • Reactive bias	**Investigate hazard specificity and threat perception implications for voice:** • Define hazard severity levels and types in conceptual development • Establish a hazard-voice relationship framework • Investigate proactive safety voice	**Advanced safety risk management and proactive safety culture:** Enables progressive risk management: • Pre-emptive hazard identification • Effective risk prioritisation, mitigation, and control • Sophisticated reporting strategies
4) Context-dependent considerations: Bias and lack of comparability between key contextual factors: • Non-medical vs. medical • Western culture bias • No senior leadership level studies	**Expand research across diverse cultural and industry settings:** • Compare studies across industries to assess relevance and generalisability • Investigate safety voice dynamics in non-Western, collectivist cultures • Examine senior leadership influence on safety voice in different contexts	**Holistic contextual insights enhancing versatility and engagement:** • Improved generalisability across various high-risk sectors • Tailored safety communication for diverse industries and cultures • Enhanced understanding of executive impact on safety voice and culture

% of the reviewed articles' definitions included the word "communication". *Communication* and *voice* are open to interpretation, leading to varied understandings of how safety messages are conveyed. *Speaking up* may refer to either literal upward verbal communication or broader accountability actions, such as incident reporting or raising formal concerns.

Whilst Tucker et al. (2008) widely cited unidimensional definition described safety voice as both formal and informal communication, the reviewed articles included diverse physical formats of safety voice, spanning a continuum of formality, with no mutual understanding of its exact nature. The dominance of verbal communication in the reviewed studies highlights a key issue: 78 % examined safety voice as verbal interaction, yet only 3 % explicitly defined it as such. This supports Richmond and Burgess (2023) observation, based on Okuyama et al. (2014), that in healthcare voice occurs more in daily interactions than through formal channels. Schwappach and Gehring, 2014, p. 4) also found that voicing concerns in healthcare is driven by urgency, with professionals speaking up primarily to prevent immediate harm to "individual identifiable patients". While informal verbal warnings are essential for fostering proactive safety cultures (Detert & Burris, 2007), formal reporting mechanisms remain critical, particularly in high-risk industries such as aviation (ICAO, 2018), healthcare (Kumah et al., 2024), construction (Saurin et al., 2015), and manufacturing (Lander et al., 2011; Nielsen et al., 2006). However, the reviewed literature seldom explored whether employees escalate safety concerns through distinct stages, limiting insight into how safety voice evolves over time.

Directionality further complicates the conceptualisation of safety voice. The term "speaking up" implies an upward flow of communication, with 31 % of reviewed studies explicitly defining safety voice exclusively as upward communication, reinforcing hierarchical assumptions. In contrast, 51 % of studies recognise safety voice as multidirectional, incorporating horizontal and downward exchanges alongside upward reporting. Peer-to-peer safety voice has been identified as crucial for proactive risk mitigation (Detert & Burris, 2007), but its role is often overshadowed by traditional top-down models. The failure to adequately capture the full range of directional exchanges limits the development of interventions that reflect real-world safety communication dynamics.

Pandolfo et al.'s (2025) recent conceptual work reinforced the view that safety voice extends beyond merely challenging authority figures and encompasses the discretionary act of raising concerns about potential risks, often amidst ambiguity and uncertainty. They emphasised that while safety voice is crucial for hazard prevention, it remains ineffective unless accompanied by corresponding *safety listening*. As they explained, "safety voice acts are necessary to stop accidents and ensure safety, they are also insufficient: incident analyses often highlight how voice can go unheard before and during major institutional failures" (Pandolfo et al., 2025, p. 94). Echoing this concern, Cleary & Doyle (2015, p. 60) argued that a persistent "deaf effect" within healthcare organisations impedes meaningful action on raised concerns, and they called for cultivating "hearer courage" among managers, that is the bravery to not only listen to difficult truths but to act on them responsibly. Pandolfo et al.'s (2025) integrated conceptual review positioned safety listening as an essential behavioural response that transforms voice into meaningful organisational action, not solely from leaders, but from any individual capable of intervening in risky contexts. This reinforces the point that the effectiveness of safety voice lies not only in the courage to speak up but in the quality, presence and courage of listening behaviours within the organisation. This reframes safety communication as a dynamic, conversational process rather than a one-way act of speaking up to leaders alone.

The issue of temporal stability is also underexamined (Culiberg & Mihelič, 2017; Nicholls et al., 2021). While some studies acknowledged that safety concerns may escalate from informal verbalisation to formal incident reporting (Bazzoli et al., 2020; Bazzoli and Curcuruto, 2021; Hu and Casey, 2021; Reader, 2022), our findings indicate little empirical investigation into whether such a pattern holds. This gap is particularly relevant in distinguishing whistleblowing from other forms of safety voice. Near & Miceli (1995) defined whistleblowing as reporting unethical or illegal activities to external authorities, often when internal

mechanisms fail. While some scholars highlighted its prosocial intent (Dozier & Miceli, 1985), others emphasised its risks, particularly in hierarchical structures where it can be perceived as disloyalty (Jubb, 1999). Lewis et al. (2015) emphasised its dual nature, with outcomes ranging from promoting accountability to causing reputational damage. Understanding whether whistleblowing is an endpoint in the escalation of safety voice is essential for refining theoretical models and improving organisational response mechanisms. For example, establishing clear escalation patterns helps to streamline reporting processes, making it easier for employees to voice concerns and enabling timely action.

Podsakoff et al.'s (2016) framework explained how definitional vagueness leads to interpretive variability. The lack of clarity around safety voice hampers the development of frameworks that address its form, flow, and timing. While informal expressions generally highlight immediate hazards, structured reporting systems are essential for identifying and addressing persistent risks. Understanding and valuing different forms of safety voice fosters an open communication culture that captures a broad spectrum of hazards. This comprehensive approach enables organisations to proactively mitigate risks and enhance overall safety management. Acknowledging the multidirectional nature of safety voice promotes communication at all levels and fosters an inclusive safety culture that values diverse perspectives, improving safety engagement strategies and collaboration among employees. Understanding its temporal progression can expose barriers to escalation, empowering employees to report concerns. Future research could explore whether safety voice follows a predictable trajectory and identify the factors that influence it.

4.2.2. *The neglected role of the receiver*

Safety voice research has predominantly focused on the sender, overlooking the crucial role of the receiver in shaping communication outcomes. Supporting the need for a dyadic approach to safety voice, Fiske (2011) defined communication as a reciprocal process, and Reason (1997) described how safety voice must function as a continuous feedback loop to be effective. If concerns are dismissed or ignored, this loop is disrupted, leading to disengagement and increased risk. The review identified that while 77 % of studies examined the act of voicing concerns, only 5 % addressed how these concerns are received and acted upon. This imbalance presents a significant gap, as bidirectional communication is central to theories such as social exchange theory, which underpins many of the reviewed studies (Conchie et al., 2012; Curcuruto and Griffin, 2018; Kritsotakis et al., 2022; Mathisen and Tjora, 2023; Tucker et al., 2008) and emphasises mutual reciprocity in communication. Without an understanding of how safety concerns are interpreted, responses may be ineffective or even punitive, deterring future reporting and weakening organisational safety cultures (Reason, 1997; Reason & Hobbs, 2003).

Pandolfo et al. (2025) highlighted that the determinants of safety voice and the responses it elicits are rooted in individual, interpersonal, and organisational dynamics. While research has traditionally emphasised promoting voice behaviours, increasing attention is being paid to the factors shaping how such voice is heard and acted upon. Psychological safety and perceived legitimacy influence not only willingness to speak up but also how listeners interpret and respond. As Pandolfo et al. (2025, p. 96) noted "individuals often engage in voice acts depending on their attitudes and skills for managing safety (Salas et al., 2020) and psychological safety where they believe speaking-up will lead to change (Morrison, 2014) and will not result in negative consequences (Edmondson, 1999)". Crucially, these same conditions shape listeners' responsiveness, suggesting that psychologically safe environments promote both voicing and effective listening. This receiver perspective remains underexplored, though emerging evidence underscores its significance. Interactional dynamics, including power disparities, stress, and perceptions of voicer legitimacy, substantially influence outcomes (Pandolfo et al., 2025). These findings point to the need for a more holistic, iterative model of safety communication, in which antecedents like psychological safety predict both voice and listening behaviours, better bridging sender and receiver dynamics in high-stakes organisational settings.

In non-medical contexts, there was a notable absence of research on senior management's role in fostering a receptive environment for safety concerns. This was a critical oversight, as leadership shapes organisational safety culture (Detert & Burris, 2007) and, along with social norms, determines whether concerns drive action (Reason & Hobbs, 2003, p. 145):

> A safety culture is the 'engine' that continues to drive the organization towards the goal of maximum attainable safety regardless of current commercial pressures or who is occupying the top management posts. The commitment of the Chief Executive Officer and his or her immediate colleagues exerts a powerful influence upon a company's safety values and practices, but top managers come and go, and a truly safe culture must endure despite these changes.

In medical settings, where safety voice can involve advocating for vulnerable patients, emergency situations requiring immediate action can further elevate the stakes (Alshraim and Alrashed, 2023; Ng et al., 2017; Schwappach et al., 2018; Schwappach and Gehring, 2014; Schwappach and Richard, 2018). Nurses and frontline healthcare workers frequently raise urgent time-critical concerns, but if leadership fails to acknowledge or act promptly, patient safety is jeopardised. Moreover, rigid hierarchies in healthcare can reinforce power imbalances, silencing lower status professionals (Nembhard and Edmondson, 2006). Therefore, understanding how senior leaders respond to safety voice is essential for fostering an engaged and enduring safety culture in both medical and non-medical contexts. Training programmes that equip leaders at all levels to elicit, interpret, and respond constructively to safety voice could enhance organisational resilience. In medical settings, fostering leadership approaches that empower nurses and other frontline staff to voice concerns without fear of dismissal is essential. In non-medical industries, incorporating receiver-focused strategies into safety management frameworks could promote more effective risk mitigation.

Future research should prioritise a receiver-centric perspective to develop a more holistic understanding of safety voice. Investigating how managerial support, hierarchical structures, and social norms shape responses to safety concerns could yield valuable insights. Furthermore, integrating proactive safety voice models, focusing on systemic risk identification rather than solely reacting to failures, could strengthen organisational safety cultures. By bridging this critical research gap, safety voice can evolve into a truly reciprocal process, ultimately leading to more effective timely safety interventions and improved outcomes across various industries.

4.3. *Understanding hazards: Exploring the catalyst for safety voice*

The failure to specify hazards explicitly was a significant conceptual gap across all the articles. Even though hazards serve as the primary initiators of safety voice, most studies provided only generic descriptors, omitting distinctions between active failures and latent conditions. This omission compromises conceptual clarity and measurement validity, as survey items such as "I raise concerns to my supervisor" fail to account for risk severity or immediacy. Conceptually, this limits the ability to differentiate safety voice from employee voice, as the defining feature of safety voice is its association with hazards and risk. Without detailed hazard categorisation, safety voice research lacks the precision needed to assess how different types of risk shape communication behaviours.

Hazards determine the initiation, form, and effectiveness of safety-related communication. Whether addressing immediate risks or systemic vulnerabilities, clear hazard recognition ensures that safety voice can successfully contribute to proactive risk mitigation. The variability in hazard definitions across disciplines, from occupational health and safety risks (Zanko & Dawson, 2012) to environmental threats (Chartres

et al., 2019) and aviation safety (ICAO, 2018), complicates employees' understanding of what constitutes a reportable concern. Schwappach and Gehring, 2014, p. 28) stated that "Obviously, there exists an imaginary threshold of potential harm (likelihood and severity) which enters the "internal calculus" whether and how to voice concerns." Operationally, hazards are sometimes evaluated using risk matrices that assess likelihood and severity (ICAO, 2018; Kumamoto & Henley, 1995), further influencing hazard perception and communication behaviours.

A critical but under-examined distinction in safety management is the hazard-dependent difference between personal and process safety. Grote (2012) argued these domains involve distinct causal mechanisms, safety indicators, and management strategies, with their relationship shaped by task and industry context. While organisational systems often separate them, in practice (especially in healthcare) they are deeply intertwined. This poses a challenge for safety voice research: theoretical models may bifurcate personal and process safety, but frontline workers typically experience and respond to them as interconnected. Although this complexity has historically been overlooked, recent literature calls for clearer differentiation. Grote (2012) noted that while frontline staff rarely consciously categorise concerns this way, management systems and regulatory frameworks do, determining which risks attract attention and action. The lack of conceptual and empirical clarity around how these domains interact, and how interventions in one affect the other, creates blind spots in organisational safety governance. Grote (2012) warned that neglecting this, as starkly illustrated by the BP Texas City explosion (Hopkins, 2009), can allow process safety hazards to persist despite strong personal safety performance. Therefore, it is important that future safety voice research incorporates this distinction to avoid reinforcing such vulnerabilities.

None of the reviewed studies separated personal from process safety. Personal safety concerns involve immediate self-preservation, such as construction workers advocating for hard hats. Process safety risks, however, are often temporally and physically distant, reducing personal urgency, for example, fatigued aircraft technicians whose errors may endanger passengers, not themselves. Both domains can also involve concern for others; nurses urging hand hygiene, for instance, protect both patients and medical staff. Failing to differentiate these safety types limits understanding of how individuals prioritise and communicate safety concerns. Szymczak, 2016, p. 336) observed that "hospital-acquired infections are not as 'dramatic' as other types of medical harm, such as wrong-site surgery or a medication error leading to an overdose" with harm perception weakening when consequences are temporally or causally distant. Similarly, Schwappach and Richard (2018) noted that when cause and effect are diffuse or delayed, accountability diminishes, lowering risk salience and motivation for precautionary action. In such contexts, where feedback is limited and systemic safeguards can erode vigilance, proactive safety behaviours become critical.

The complexity deepens when distinguishing between active failures and latent conditions. Active failures occur at the "sharp end" of operations, with immediate and visible consequences (Reason, 1997, p.10). They prompt direct and informal safety voice, i.e., verbal warnings, as seen in the reviewed transport studies (Bienefeld and Grote, 2014; Clarke, 1998) and laboratory simulations (Noort et al.. 2019b, 2021b). In contrast, latent conditions are systemic flaws originating from organisational decisions, often existing for years before causing an incident. These "resident pathogens" (Reason, 1997, p. 10) tend to remain hidden, surfacing only after prolonged exposure, requiring formal reporting mechanisms and strong organisational support to address systemic inertia and normalisation of risk (Reason & Hobbs, 2003). When latent conditions align with active failures, they can breach safety defences, leading to adverse events (Reason, 1997). The review exposed minimal coverage of latent conditions. Schwappach and Gehring, 2014, p. 4) observed that "saving future unknown "lives" (e.g., by improving safety standards in the unit) was not mentioned as motivation for speaking up at all." This immediacy of voice behaviour illustrates a reactive rather than proactive approach to patient safety. Latent conditions, such as systemic resource shortages, require structured reporting pathways due to their prolonged and concealed nature. Barriers to safety voice, such as fear of retribution or the perception of insurmountable systemic issues, further complicate addressing latent conditions.

The lack of specificity in hazard definitions has practical implications for safety interventions. Without clear differentiation between hazard types, safety voice initiatives may fail to address the full spectrum of risks employees encounter. Generic hazard descriptions introduce ambiguity into measurement tools, making it difficult to assess whether safety concerns warrant immediate action or systematic policy changes. Future research could integrate hazard specificity into safety voice frameworks to enhance both measurement accuracy and proactive risk management. A more granular approach might differentiate verbal and formal reporting, recognising that active failures generally require urgent responses, while latent conditions, if identified early, allow for proactive intervention or sustained escalation, though some may still demand immediate action. Furthermore, distinguishing between personal and process safety concerns will clarify the motivational and psychological factors influencing safety voice behaviours.

By addressing these gaps, safety voice research can evolve into a more robust and applicable field, ensuring that interventions are appropriately tailored to the diverse risk scenarios employees face. A refined approach that explicitly incorporates hazard categorisation will enhance theoretical coherence, improve measurement validity, and inform more effective safety management strategies.

4.4. Context-dependent issues and biases

The applicability of safety voice literature is limited by two key contextual issues. First, safety voice dynamics differ across industries, yet most research focuses on medical settings, raising concerns about generalisability to other high-risk sectors. Second, much of the existing literature is biased toward Western, individualistic cultures, overlooking how collectivist societies approach speaking up in the workplace. Addressing these gaps is essential for developing inclusive, context-sensitive safety voice models that enhance workplace safety across diverse cultural and industry settings.

4.4.1. Comparing non-medical versus medical contexts

Noort et al. (2019a) examined safety voice across diverse environments, underscoring the need to account for context in its research and application. They identified a research bias toward healthcare. Our review found notable differences in how safety voice is conceptualised and applied in medical versus non-medical settings, shaped by distinct stakeholder dynamics, hierarchical structures, and accountability frameworks. Recognising these differences is essential for developing effective interventions tailored to each domain.

Non-medical industries treated safety voice as an internal process, where employees report operational risks within structured, organisational systems. Consequently, non-medical studies overlooked external stakeholders, such as accountability relationships with regulators or clients, that could shape safety decisions. Also, research in this context focused on subordinate-supervisor interactions, with no attention to senior leadership perspectives. The absence of studies on senior management's role limits insights into how leadership responses influence safety voice cultures.

Conversely, in medical settings, a few studies extended safety voice beyond internal reporting to include advocacy for vulnerable patients who may be unable to voice concerns themselves (Entwistle et al., 2010; Jeong and Kim, 2023; Lyndon et al., 2017; Rainey et al., 2015; Reader, 2022). Nurses, positioned at the frontline of patient care, often experience moral and relational complexities when raising safety concerns, particularly in hierarchical structures where lower-status professionals may feel discouraged from speaking up (Nembhard and Edmondson, 2006). This dual accountability, to both institutional policies and patient

welfare, adds an ethical dimension that is less pronounced in non-medical contexts (Aydon et al., 2016; Jackson et al., 2010; Laari and Duma, 2023; Lee et al., 2024). Nembhard et al. (2015) found that nurses hold a unique role in healthcare by reversing traditional hierarchies; while they may rank lower in technical expertise, they play a higher role in shaping patients' service experiences and ensuring patient-centred care. However, the medical safety voice research was disproportionately centred on the exceptional role of nurses, often neglecting the perspectives of doctors, allied health professionals, and external stakeholders such as patients and families. This narrow focus limits a comprehensive understanding of safety voice across healthcare teams and its applicability outside medical contexts.

These contextual disparities have significant practical implications. In non-medical industries, broadening research to include leadership perspectives and external influences could enhance safety voice effectiveness. Organisations may benefit from integrating multi-stakeholder considerations into their safety frameworks and further fostering cultures where senior management actively supports and responds to safety concerns. In medical settings, interventions that prioritise reducing hierarchical barriers and empowering nurses and other healthcare professionals to voice concerns, without fear of retribution, could be valuable. Leadership training that emphasises ethical advocacy may help ensure that institutional safety policies align with patient-centred care. Future research could adopt a comparative approach, identifying cross-sector patterns while maintaining awareness of sector-specific challenges. By refining safety voice strategies to address sector-specific needs, organisations can foster more effective safety cultures, ultimately improving safety outcomes across diverse professional settings.

4.4.2. Western culture bias

The safety voice literature primarily reflects Western, individualistic perspectives, where assertive communication is encouraged (Ng et al., 2017). This bias overlooks collectivist cultures, where indirect or consensus-driven approaches are preferred. In many non-Western contexts, particularly in Confucian-influenced societies, hierarchical structures and respect for authority discourage direct confrontation (Sun et al., 2024). Confucianism emphasises harmony, duty, and deference to superiors, meaning that raising safety concerns may be perceived as disrespectful rather than responsible. As the Chinese proverb states *"The nail that sticks out gets hammered down."* (Omura et al., 2018b, p. 293). Research that fails to account for these cultural norms risks misinterpreting silence as disengagement rather than as an adaptive social strategy. For instance, in Japan, the cultural value of "*wa* (harmony)" (Omura et al., 2018a, p. 286) discourages direct confrontation, influencing how professionals raise safety concerns. Rather than speaking up assertively, Japanese nurses rely on non-verbal cues and "*nemawashi (*groundwork)" preparation, to build consensus before voicing concerns (Omura et al., 2018a, p. 287). Similarly, in Hong Kong intensive care units, speaking up is facilitated by respect and the absence of rigid hierarchies, rather than assertiveness alone (Ng et al., 2017). These findings challenge Western-centric models that assume directness is universally effective.

This bias has practical consequences. Safety interventions based on Western norms may be ineffective, or even counterproductive, in collectivist cultures, where direct assertiveness can be seen as disruptive. Future research should develop culturally adaptive strategies, such as trust-based communication and leader-endorsed feedback mechanisms. By expanding research beyond Western contexts, scholars and practitioners can refine safety voice models to be more inclusive. A culturally nuanced approach would improve safety outcomes in multinational organisations, ensuring that all workers, regardless of cultural background, can voice concerns effectively without compromising social harmony.

4.5. Measurement challenges

Measurement challenges in safety voice research stem from conceptual weaknesses and contextual variations. Podsakoff et al. (2016) describe how vague definitions lead to flawed measures, introducing systematic and random errors. This review identifies key issues, including unclear safety voice definitions, reliance on repurposed scales, and contextual differences between medical and non-medical studies. These factors undermine measurement validity, raising concerns about contamination and deficiency (MacKenzie, 2003; MacKenzie et al., 2011) in assessing safety voice behaviours.

The review highlights that the repurposing of employee voice (LePine & Van Dyne, 1998; Liang et al., 2012; Maynes & Podsakoff, 2014) and SCB (Hofmann et al., 2003) scales risks conflating safety voice with broader organisational behaviours, thereby distorting empirical findings. The widespread reliance on unidimensional scales further exacerbates this issue. The Tucker et al., 2008) scale, despite its frequent use, consists of five broad, subjective statements lacking specificity in communication form and hazard severity, making it prone to interpretation bias. The review also demonstrates that when assessing multidimensional constructs, multiple scales were often used to measure different facets of safety voice, further complicating comparability. These tools fail to capture the nuanced dimensions of safety voice, with many survey items relying on vague, highly subjective descriptors.

Hazard ambiguity also contributes to measurement errors, as generic survey items, such as "I raise safety concerns" fail to differentiate between personal and process safety concerns or hazard severity. The lack of specificity in existing tools results in oversimplified insights, limiting the effectiveness of risk prioritisation efforts. Additionally, the dominance of broad, subjective statements, especially in the most frequently used scales, introduces risk perception biases that further compromise measurement validity. This issue is particularly problematic in healthcare, where safety voice spans both formal incident reporting and informal advocacy for patient safety (Lainidi et al., 2023). Without refined, multidimensional scales that account for hazard specificity and escalation dynamics, safety voice research remains vulnerable to measurement contamination and misinterpretation.

A further challenge lies in the lack of standardisation across different domains. The reviewed literature identified 27 distinct safety voice scales, with limited overlap between medical and non-medical studies. The absence of industry-wide standardisation impairs cross-sector comparability, leading to fragmented research findings. Future research may benefit from developing a dedicated, multidimensional safety voice measure. This could involve gathering items from existing voice-related scales, with expert review to select those capturing key aspects such as hazard type, reporting formality, communication mode, context and target. The structure could be explored using exploratory factor analysis (EFA) or principal components analysis (PCA), then tested in new samples with confirmatory factor analysis (CFA). Reliability could be assessed through internal consistency (Cronbach's alpha) and test–retest checks, with construct validity examined against existing measures (Beus et al., 2019). It may also be valuable to explore whether different versions are needed to accommodate domain-specific idiosyncrasies. This approach would help improve clarity, precision, and comparability in future safety voice research.

5. Conclusion

Expanding on Noort et al. (2019a, 2019b) review and challenging prevailing assumptions, this study offers fresh perspectives and outlines new research directions to enhance both the conceptualisation and practical application of safety voice (Table 9). To advance conceptualisation, this review addressed safety voice definitional inconsistencies, contextual variations, and measurement challenges. By operationalising and systematically applying Podsakoff et al.'s (2016) framework, we identified critical gaps in how safety voice is defined,

operationalised, and differentiated from related constructs such as employee voice and safety silence. The findings highlight the need for a more rigorous, multidimensional approach that accounts for hazard specificity, escalation pathways, and the role of receivers in shaping safety voice outcomes. Practical implications extend across high-risk industries, where safety voice plays a pivotal role in identifying and mitigating risks. A refined understanding of its dynamics can enhance organisational safety cultures, ensuring that both active failures and latent conditions are addressed effectively. Future research, prioritising the development of standardised measurement tools and culturally adaptive frameworks, could improve cross-sector applicability. Ultimately, fostering an open and engaged safety culture is essential for preventing organisational accidents. By integrating proactive reporting mechanisms, leadership responsiveness, and inclusive communication strategies, organisations can strengthen their defences against preventable failures and build resilient safety systems.

Note: Studies included in the review are denoted with an asterisk in References.

CRediT authorship contribution statement

Jeanne Paul: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Colin Pilbeam:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Anna Smallwood:** Writing – review & editing, Supervision.

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.

Appendix 1

See Table 1A.

Table 1A
Data extraction criteria.

Relevance to SLR Review Question	Extraction Data
Basic information	• Author(s), date, title, publication, keywords • Industry/sector or context, country, national culture • Participants • Method
Safety voice conceptualisation	• Definition • Dimensionality • Direction • Communication form (e.g., verbal, formal reporting, and whistleblowing) • Hazard (i.e., the safety voice communication process trigger) • Measurement (i.e., what is being measured and what scale is being used) • Quality (in relation to Podsakoff et al.'s (2016) 4-stage recommendations for creating better concept definitions)
Hazard	• What triggers the safety voice communication process?
Measurement	• What safety concern is being raised? (i.e. specifically and/or generically) • Why is the concern being raised? (e.g., fear, anxiety, resentment, frustration, moral obligation, and legal obligation) • Process or personal safety? (i.e., does the concern or hazard relate directly to the primary work task (process safety) or does it impact the human operator (personal safety) (Grote, 2012)) • What is being measured in relation to safety voice? • What measurement scale is being used? • How is the scale being used? (e.g., safety voice may only be measured by a few items as a subset within a broader context scale, such as a safety citizenship behaviour scale) • Is actual voice (behaviour) or intent to voice (behaviour) being measured? • Is the voice verbal or more formal written reporting?
Key topics/variables and theories	• Key topics/variables • Theories
Who are the participants? Who says what to whom?	• Number of participants • Role in the study (e.g., transmitter or receiver) • Profession/industry/sector • Position/role (in organisational hierarchy or external to the organisation in the case of patients in healthcare) • Relationship between the participants
With what effect? What is the outcome of the study?	• Key findings and conclusions • Limitations
When and under what circumstances?	• When does safety voice/speaking up occur? • Under what circumstances?
What factors influence the safety voice communication process?	• Hazard (i.e. active failure or latent condition, temporal nature of the threat) • Communication form (e.g., tone, formal or informal communication) • Intrapersonal factors • Interpersonal factors • Contextual factors

Appendix 2

The non-medical articles date back to 1998, with two published before 2010 (Clarke, 1998; Tucker et al., 2008) and 23 published in the past four years (Fig. 1A). The medical articles date back to 2002, with two published before 2010 (Ahern and McDonald, 2002; Nembhard and Edmondson, 2006) and 25 published in the past four years.

The publication outlets were diverse for both the non-medical and the medical articles spread over a total of 53 journals (Table 2A). The non-medical articles were spread over 19 journals with the most publications (12 out of 33) in *Safety Science*. The medical articles were spread over 36 journals with the most publications in *Journal of Advanced Nursing* (7 out of 53) followed by *BMJ Quality and Safety* (5 out of 53). Two journals, *Journal of Risk Research* and *Frontiers in Psychology*, had both non-medical and medical articles (one article of each type in each journal). Almost a quarter of the journals had the word "nursing" in the title.

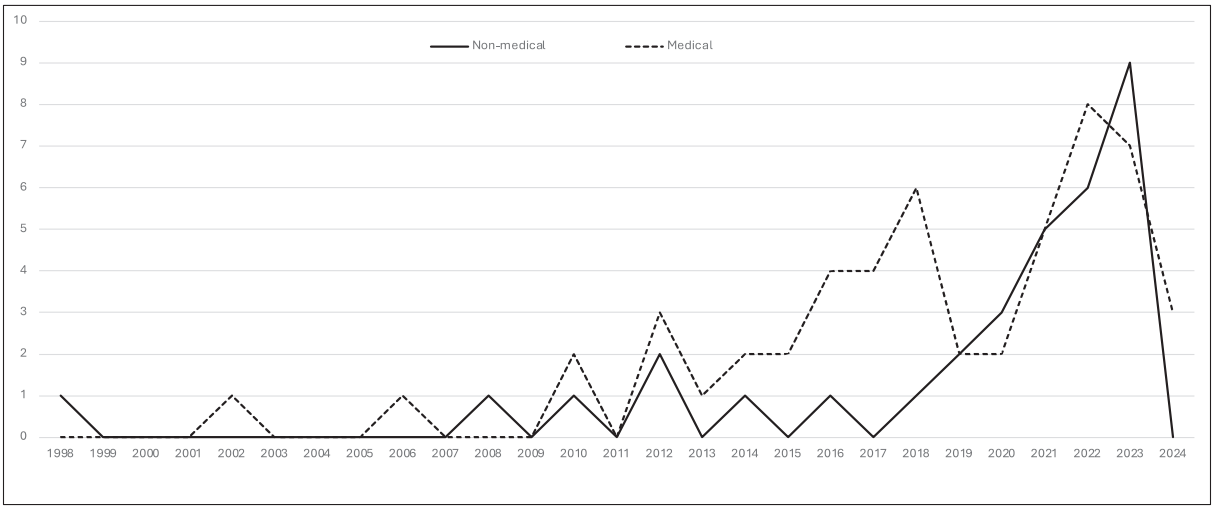

Fig. 1A. Publication dates of articles on safety voice included in the review.

Table 2A
Publication outlets of articles on safety voice included in the review.

Non-medical (n = 33)	
Journal	**n**
Safety Science	12
International Journal of Environmental Research and Public Health	3
Journal of Occupational Health Psychology	2
Frontiers in Psychology; Journal of Risk Research; Sustainability (Switzerland); Journal of Risk Research; Journal of Safety Research; International Journal of Workplace Health Management; Safety and Health at Work; Engineering Construction & Architectural Management; American Journal of Management; International Journal of Occupational Safety and Ergonomics; International Journal of Aviation, Aeronautics, and Aerospace; Promet – Traffic and Transportation; International Journal of Hospitality & Tourism Administration; Work & Stress; Aviation Psychology and Applied Human Factors; Journal of Management & organisation	16 (n = 1 for each journal)
Medical (n = 53)	
Journal	**n**
Journal of Advanced Nursing	7
BMJ Quality and Safety	5
Journal of Nursing Management	3
British Journal of Anaesthesia	3
BMJ Open	2
Journal of Health Organization and Management	2
Nursing and Health Sciences	2
Frontiers in Psychology; Journal of Risk Research; Accident Analysis & Prevention; BMC Nursing; Journal of Interprofessional Care; Journal of Applied Behavioral Science; Journal of the Liaquat University of Medical and Health Sciences; Journal of Clinical Nursing; Healthcare Infection; Quality and Safety in Health Care; International Journal for Quality in Health Care; BMC Health Services Research; American Journal of Infection Control; Journal of Patient Safety and Risk Management; Healthcare (Switzerland); Nursing Ethics; Asian Nursing Research; International Journal of Nursing Studies; Journal of Nursing Scholarship; Journal of Applied Psychology; JOGNN – Journal of Obstetric, Gynecologic, and Neonatal Nursing; Journal of Organizational Behavior; Health Care Management Review; Health Science Reports; Health Expectations; International Journal of Mental Health Nursing; Journal of Perianesthesia Nursing; Sociology of Health and Illness; Social Science & Medicine	29 (n = 1 for each journal)

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Safety voice concept clean-up: examining the voice that challenges us to be safer

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