



Staying silent about safety issues: Conceptualizing and measuring safety silence motives



Archana Manapragada*, Valentina Bruk-Lee

Florida International University, United States

ARTICLE INFO

Article history:

Received 30 June 2015

Received in revised form 18 February 2016

Accepted 19 February 2016

Available online 11 March 2016

Keywords:

Safety silence motives

Workplace safety

Safety communication

Perceptions of safety climate

Safety performance

ABSTRACT

Communication between employees and supervisors about safety-related issues is an important component of a safe workplace. When supervisors receive information from employees about safety issues, they may gain otherwise-missed opportunities to correct these issues and/or prevent negative safety outcomes. A series of three studies were conducted to identify various safety silence motives, which describe the reasons that employees do not speak up to supervisors about safety-related issues witnessed in the workplace, and to develop a tool to assess these motives. Results suggest that employees stay silent about safety issues based on perceptions of altering relationships with others (relationship-based), perceptions of the organizational climate (climate-based), the assessment of the safety issue (issue-based), or characteristics of the job (job-based). We developed a 17-item measure to assess these four motives, and initial evidence was found for the construct and incremental validity of the safety silence motives measure in a sample of nurses.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

The communication of safety-related information within an organization is a vital component of creating and maintaining a safe work environment. Although downward safety communication from supervisors is an important component of a safe workplace, upward communication from employees about workplace safety issues is critical to continuously promote or maintain a safe work environment. When employees speak up about safety issues at work, organizations are presented with opportunities to detect, correct, and prevent unsafe work practices or hazardous work environments before negative outcomes, such as accidents or injuries, can result.

The issue of individual-level underreporting, which occurs when employees do not report accidents and injuries to the appropriate authorities, is an important consideration for organizations in which safety is a critical concern. Over three million workplace injuries and illnesses were reported in the United States in 2013 (U.S. Bureau of Labor Statistics, 2014), and yet studies have found that 50–80% of work-related accidents and injuries go unreported by employees (Probst et al., 2008; Probst and Estrada, 2010; Rosenman et al., 2006). Receiving reports of accidents and injuries

can be valuable for organizations by allowing for the investigation of the causes of these incidents. Organizations can then take measures to decrease their accident and injury rates by learning how to prevent such events from occurring in the future.

In addition to receiving reports of accidents and injuries, organizations can benefit from receiving information about issues such as safety violations or errors, which can potentially lead to accidents, injuries, or even death. Safety violations are intentional acts of deviating from safe working rules or procedures and errors are unintentional acts that fail to accomplish a set objective (Lawton and Parker, 1998). Openly communicating to supervisors and management about the occurrence of safety violations and errors in the workplace is ideal, so that preventative action can be taken before they result in negative outcomes. In order to expand the research on safety-related communication in the workplace, it is essential to understand the factors that drive employees to remain silent about specific safety issues at work, so that measures can be taken to create workplace environments that foster this type of communication.

Variables such as employee silence and safety communication can be useful in identifying the motives behind staying silent about safety issues. Employee silence, described as a lack of upward communication regarding concerns, ideas, or opinions relating to the improvement of organizational functioning, focuses on staying silent in relation to a wide array of workplace issues (Van Dyne et al., 2003), which can range from not raising disagreements about

* Corresponding author.

E-mail address: amana008@fiu.edu (A. Manapragada).

a company's policies or practices to staying silent about abuse or harassment in the workplace (Milliken et al., 2003). In a qualitative study by Milliken et al. (2003), the top three reasons that employees did not speak up about their concerns or problems were out of fear of being viewed negatively, feeling as if they did not have enough experience or tenure to speak up, and considering their organization to have an intimidating hierarchical structure and/or an unsupportive climate. However, the motives behind staying silent about suggestions regarding general concerns can greatly differ from those behind staying silent about specific safety-related issues in the workplace. Consequently, a more situation-specific construct that directly relates to speaking up about safety issues, such as safety violations, errors, accidents, and injuries, is needed.

Safety communication, although specific to safety-related ideas and concerns, is also a fairly general construct. Safety communication can be defined as the degree to which employees are open to speaking to their supervisors about safety-related issues, opinions, and concerns, and perceive their supervisors as encouraging and accepting of employees' suggestions for improving workplace safety (Hofmann and Stetzer, 1998). Safety communication can refer to a variety of employees' communication behaviors, attitudes towards communication, and perceptions of supervisors' openness to communication. However, high safety communication does not necessarily indicate a lack of silence, since employees may have generally positive attitudes and perceptions towards safety communication, but may fail to actually communicate safety-related ideas and concerns based on several underlying motives (e.g., fear of facing negative consequences, time pressures of job, etc.). Indeed, examining perceptions of safety communication is distinct from identifying why employees may not always communicate their ideas and concerns to supervisors. Understanding the motives behind a lack of communication about safety-related issues is warranted, and measuring such a construct can be a powerful tool for organizational initiatives aimed at promoting workplace safety.

The objective of this paper is to define and measure the motives behind safety silence, which are defined in the present study as the underlying reasons for not speaking up about safety issues witnessed in the workplace. It is likely, for example, that individuals may stay silent if they feel that tension in the workplace may arise from speaking up, perceive their managers as unsupportive of hearing their concerns, or consider a safety issue to be harmless.

The present paper consists of three studies tracing the development and validation of the safety silence motives measure. We follow a well-established scale development process through which we define our construct, develop a scale to measure safety silence motives, pilot test the measure, administer and refine the measure, and finally provide evidence of validity for the measure (Spector, 1992). Study 1 consists of a qualitative study in which focus groups and interviews are conducted to identify the themes or patterns of motives behind safety silence. Study 2 involves the creation and refinement of the safety silence motives measure, during which the factor structure of the measure is established. Lastly, evidence for the construct and incremental validity of safety silence motives is collected in Study 3.

2. Study 1: defining the motives behind safety silence

2.1. Overview

Since safety silence motives have not previously been conceptualized, we chose to start with an exploratory qualitative study, which can be useful for capturing in-depth information on complex phenomena (Sofaer, 1999). In Study 1, focus groups and interviews were conducted with individuals working in organizations in which safety is a critical concern to identify themes or patterns of motives

behind safety silence. Participants were asked about instances in which they did not speak up about safety issues in their workplace, why they did not speak up about them, and what they thought would happen if they had. The results of this study yielded a total of six safety silence motives.

2.2. Method

2.2.1. Sample

Twenty six individuals employed in organizations mandated to follow the U.S. Occupational Safety and Health Administration's laws and regulations participated in this study. The majority of our sample was female (64%) and Caucasian (70.8%). Participants' ages ranged from 23 to 62 years ($M = 40$; $SD = 12.9$). Seventy six percent of participants reported working in the healthcare field, 12% in construction/utility services, and 12% in the retail industry. Participants worked an average of 40.54 hours per week ($SD = 7.84$) and had an average tenure of 13 years ($SD = 12.22$).

2.2.2. Procedure

Individuals were recruited through flyers and personal contacts. Flyers describing the study were posted and distributed at two large healthcare organizations. In addition, flyers were emailed to personal contacts who met this study's inclusion criteria. Out of the 26 individuals who volunteered for the study, 16 individuals participated in one of two focus groups and 10 participants were individually interviewed. During the focus groups and interviews, a general list of discussion questions was asked. In the last five minutes of the sessions, participants were asked to provide critical incidents in which they chose not to address a safety issue that they had witnessed in the workplace. Participants were asked to describe the three components of a critical incident: the safety issue, why they chose not to address it, and what they thought would have happened if they had addressed it. Voice recordings of the discussions during focus groups and interviews were also transcribed and scanned for critical incidents that were verbally mentioned. A total of 46 critical incidents were gathered.

2.3. Results

Data from the interviews and focus groups were coded in two phases. During the first phase, one of the investigators and a research assistant separately sorted all critical incidents into general themes. Individual findings were then discussed and a master list of themes for each component of the critical incident was compiled. The themes in the master list were then sorted independently, and some themes were combined. Individual findings were then discussed until a consensus was reached. It should be noted that since participants were allowed to provide as much detail as they felt necessary during focus groups and interviews, and critical incident responses greatly ranged in length, it was decided that each individual critical incident could be sorted into more than one theme if the coders felt that a critical incident response clearly captured more than one reason for not speaking up about a safety issue.

In order to assess the reliability of the investigator and researcher assistant's analysis of the critical incidents, five advanced graduate students familiar with the field of occupational health and safety, research methods, and psychometrics were recruited as coders, and were trained to identify themes among the critical incidents provided by participants. The coders were given a week to independently complete coding worksheets, and were asked to not discuss their coding with others. The worksheets contained critical incidents, the themes previously generated, and a description of each theme. The coders were asked to identify one or more theme(s) that each critical incident captured.

Coders were also given the option of creating their own theme or indicating that the response was not relevant to speaking up about safety issues. Once the five coders independently sorted the critical incidents, and worksheets were submitted to the investigator, they were asked to participate in a consensus meeting in which the coded critical incidents were discussed. If 80% of the coders did not arrive at a consensus on which theme(s) each critical incident captured, it was dropped from further consideration. Five critical incidents were removed due to either (1) a lack of agreement between coders, or (2) at least an 80% agreement that the response was not relevant to staying silent about a workplace safety issue. The consensus meeting resulted in nine agreed-upon themes, which were further consolidated into the following six motives behind safety silence behavior: self-based, other-based, relationship-based, climate-based, issue-based, and job-based safety silence. A depiction of the process through which the critical incidents were sorted into safety silence themes is included in the Appendix.

Twenty percent of critical incidents contained a *self-based safety silence* component, which relates to staying silent about safety issues based on how speaking up could affect oneself or others' perceptions of oneself. Employees may display self-based safety silence if they feel that speaking up could lead to negative repercussions, such as their supervisors developing a negative image of them or coworkers considering them to be annoying or "tattletales." The following response from a participant describing a safety issue he did not speak up about was coded as self-based safety silence:

I've seen a nurse not use a gait belt when she was supposed to. Sometimes we just say 'be careful.' Nurses can decide for themselves whether it is safe or not. [My coworkers] may think 'this person is just reporting everything.' (Male, Healthcare, Age 55)

Other-based safety silence can be defined as staying silent in relation to safety issues based on sympathy towards others or how speaking up could affect others in the workplace. For example, not speaking up about a safety issue because a coworker may get fired for being involved can be considered other-based safety silence. Employees may stay silent because they feel that they could start a dispute between others, hurt a coworker's feelings, or put coworkers under pressure. Fifteen percent of responses indicated that individuals displayed other-based safety silence, and the following response from a participant was coded as such:

More than one time, I've seen somebody transfer somebody incorrectly with the assist of two but without using the gait belt. And I told them they have to use the gait belt moving forward, but I did not report it because they may have gotten fired. (Female, Healthcare, Age 55)

Relationship-based safety silence, indicated in 10% of responses, refers to not speaking up about safety issues because of how it may affect one's relationship with others in the workplace. Staying silent out of fear of causing tension or a dispute between others can be considered relationship-based safety silence. In addition, employees may stay silent about safety issues if they feel that it would make it difficult to work with their supervisors or coworkers. The following response was coded as relationship-based safety silence:

Some employees don't use gloves while indirectly handling food. I'm not going to be that guy harping on minor rules that don't matter anyway. They don't directly touch the food and they wash their hands right before and right after handling it. (Male, Healthcare, Age 30)

Climate-based safety silence can be defined as staying silent in relation to safety issues based on the organizational climate (i.e.,

organizational norms, managerial actions and support, communication channels within the organization, etc.). For example, an employee staying silent about a safety issue because it is not common for employees to speak up about it in their organization can be considered climate-based safety silence. In addition, employees may stay silent if they feel their supervisors are not open to hearing about safety issues or that their organization does not make safety a priority. Twenty percent of the critical incidents reported indicated that individuals stayed silent due to climate-based factors. The following incident was considered to display a theme of climate-based safety silence:

I've seen a nurse leave out a needle instead of disposing of it in a patient's room. The nurse was called and she just ran out to take care of something. Somebody else checking on the patient will just throw it away. Nothing happens with this kind of stuff. Nobody really writes it up. Disposing a needle is important but sometimes [a nurse] needs to run to take care of something. (Male, Healthcare, Age 55)

Issue-based safety silence, indicated in 39% of critical incidents, is the result of an evaluation of the actual event (i.e., severity of the issue, the outcome, how many people it affects, etc.). An employee may feel that a certain safety issue does not put any one at risk, does not endanger anyone, or is not life-threatening. Employees may also stay silent about a safety issue if they think that the potential danger of an issue does not affect many individuals or if no negative outcome resulted from the safety issue. The following response was coded as issue-based safety silence:

People sometimes don't wash their hands when they are supposed to. I don't say anything because it's not usually repetitive or it doesn't endanger anyone at the time. (Female, Healthcare, Age 35)

Lastly, *job-based safety silence* can be defined as staying silent in relation to safety issues because of job characteristics (i.e., job design, job duties, job responsibility, etc.). For example, not speaking up due to the time pressures or workload in a job can be considered job-based safety silence. Employees may also stay silent if they feel that speaking up is not in their job description and therefore, not their responsibility. Twenty four percent of responses displayed a job-based safety silence component. The following statement was coded as job-based safety silence:

There was an incident that involved a safety hazard with a space heater. I didn't have time to say anything about it. I was just in a hurry and had no time to go through the chain of command. (Female, Healthcare, 24)

2.4. Discussion

A total of six themes were found to capture the motives behind safety silence in Study 1. The most common motive among critical incidents was issue-based safety silence, suggesting that employees often consider some safety issues to be minor, not dangerous, or not worth addressing/reporting. Especially in industries in which employees are faced with dangerous situations on a daily basis, such as handling bodily fluids or working with dangerous tools, they may consider issues such as not wearing gloves or using the proper personal protective equipment to be minor and not as risky in comparison. Relationship-based safety silence, on the other hand, was only identified as a motive for not speaking up in 10% of responses.

Although these themes were not created to be industry-specific, it was clear that each of the industries included in our sample faced a unique set of safety issues, hazards, and stressors. The majority of our sample consisted of nurses. On a daily basis, nurses

face a number of stressors that may prevent them from taking the necessary safety precautions. The time pressures and workload in the healthcare industry, for example, can lead nurses to engage in safety workarounds, which are shortcuts taken to complete a job faster (Halbesleben, 2010). Workarounds, in turn, can result in several negative safety outcomes, such as accidents and injuries (Halbesleben and Rathert, 2008).

The healthcare and social service industry also has the highest rate of job-related injuries, with 4.5 injuries and illnesses reported per 100 full-time nurses in 2014 (U.S. Bureau of Labor Statistics, 2015). Communicating to supervisors about safety issues can be crucial in fast-paced and demanding fields such as nursing. Therefore, we decided to focus on the nursing population in the following two studies.

3. Study 2: constructing and refining the safety silence motives measure

3.1. Overview

Study 2 consisted of three phases which involved designing and refining a scale to measure safety silence motives. First, using the themes derived from Study 1, an initial pool of items was written for the safety silence motives measure (SSMM). The measure was then pilot tested and refined according to feedback given by participants in phase two. The final phase involved administering the SSMM to a working sample of nurses in order to explore the factor structure of the scale.

3.2. Method and results

3.2.1. Constructing the safety silence motives measure

To design a scale to measure safety silence, scale items were written based on the six motives found behind safety silence

in the previous study (i.e., self-based, other-based, relationship-based, climate-based, issue-based, and job-based safety silence; see Appendix). Between ten and twenty statements were written for each motive, with the following item stem: “I do NOT speak up to my supervisor(s) about safety issues when. . .” A five-point Likert scale was used for response choices, which ranged from “strongly disagree” to “strongly agree.” The following instructions were written for the measure:

Employees may witness their coworkers acting unsafely. There are several reasons that employees may not speak up to their supervisors about these safety issues. Please indicate how much you agree with the following statements.

3.2.2. Pilot testing the safety silence motives measure

Ten individuals familiar with scale construction and workplace safety were asked to participate in the pilot test for the SSMM. Participants were given the instructions, items, and response choices for the SSMM and were asked to identify any items that were ambiguous or unclear. Participants were also asked if the instructions were understandable and were provided with space to offer feedback about each item. The scale was then refined according to their feedback. If there was not at least an 80% agreement between participants on the clarity and usefulness of an item, it was discarded. Two items were dropped from the measure because an agreement was not reached. Six items were reworded based on the feedback given by participants, and a total of 18 items were added, based on suggestions from participants. All participants indicated that the instructions for the scale were clear, and therefore, the instructions were not modified. This pilot test yielded a pool of 96 items for the SSMM.

3.2.3. Refining the safety silence motives measure

3.2.3.1. Sample. A total of 329 nurses and nursing assistants participated in phase three of Study 2. The majority of participants

Table 1
Exploratory factor analysis of safety silence motives items (Study 2).

Item stem: I do NOT speak up to my supervisor(s) about safety issues when. . .		Scale dimension/factor (Study 2)			
Study 1 subscale	Item	1 Relation-ship	2 Climate	3 Issue	4 Job
Self	*I feel that it could lead to a negative perception of me	.88	.11	-.04	-.10
Other	*I don't want to start a dispute between others	.88	-.09	.09	-.09
Other	*I think that my coworker(s) will lose respect for me	.85	.06	.01	-.05
Rel.	*I feel that others may retaliate against me for speaking up	.84	.04	-.06	.02
Rel.	*I feel that speaking up will make it difficult to work with others	.84	.07	-.03	.01
Other	I feel like it could hurt a coworker's feelings	.81	-.13	-.01	.14
Self	I don't want others to think that I am annoying	.75	.07	.05	-.04
Other	It will put my coworkers under pressure	.65	.09	.03	.12
Climate	*My supervisors are not open to hearing about safety issues	-.02	.84	.07	-.08
Climate	*My supervisors are not strong supporters of safety	-.08	.82	.05	.01
Climate	*I feel that my supervisor(s) won't take action	.02	.77	.02	.01
Climate	*My organization does not make safety a priority	-.03	.76	.07	-.01
Job	*I feel that I cannot speak honestly and openly in my organization	.10	.69	-.06	.00
Climate	There is no clear process to report safety issues in my workplace	.02	.61	.12	.06
Climate	*I feel like my supervisors are not doing their job to address the issue	.12	.59	-.06	.12
Job	I do not feel comfortable enough with my supervisor	.26	.56	-.12	.10
Issue	*The safety issue does not put anyone at risk	-.08	.01	.81	.04
Issue	*The safety issue does not endanger anyone	-.10	.16	.80	-.17
Issue	*The safety issue does not affect other people	-.07	.09	.73	-.01
Issue	There was no negative result from the safety issue	.15	-.08	.72	0.01
Issue	Nothing bad resulted from the safety issue	.16	-.06	.65	.05
Issue	The safety issue is not life-threatening	.13	-.07	.63	.20
Job	*I have a heavy workload	-.03	.00	-.05	.93
Job	*I am too busy at work to speak up	-.04	.04	-.02	.87
Job	*I am under heavy time pressures at work	.04	.04	.07	.78
Job	I don't feel like it is in my job description to do so	.07	.08	.04	.60

Note. All items displayed in Table were retained in Study 2. The highest factor loadings are indicated in bold. Items with asterisks were retained in Study 3 for the final version of the SSMM. N = 329.

were female (62%), and Caucasian (63%). Participants' ages ranged from 18 to 69 years ($M=30.85$, $SD=8.60$). Fifty four percent of participants were registered nurses, 30.7% were certified nursing assistants, and 15.8% were licensed practical nurses. A majority of participants were either staff or bedside nurses (44%) or charge nurses or shift supervisors (18%), and worked in direct patient care (72%). Participants had an average tenure of 4.05 years ($SD=3.90$) and worked an average of 39.89 hours per week ($SD=9.56$).

3.2.3.2. Procedure. Qualtrics Survey Software was used to create an online survey with a unique web address for the SSMM item pool. Participants were recruited through Amazon's Mechanical Turk (mTurk), which is an online labor marketplace in which registered users are able to post tasks for other users to anonymously complete in return for a wage through Amazon's payment system. A post describing the task to be completed, a link to the survey, and the compensation for completing the survey (\$1) was posted on the mTurk website. To participate, mTurk users were required to be nurses or nursing assistants, above the age of 18, work at least part time (i.e., 20 or more hours per week), and work in the United States. Five validity checks were placed throughout the survey, which asked participants to choose a certain response option (e.g., please select "strongly agree"). The responses of 36 participants who did not pass four out of five validity checks or completed the survey more than once were removed from our dataset.

3.2.3.3. Results. A reliability analysis was first conducted for each subscale. One item from issue-based subscale and one item from the relationship-based subscale were removed from the SSMM due to the resulting increase in the alpha coefficient. An exploratory factor analysis (EFA) was then conducted to determine the number of subscales in the SSMM and assess its internal consistency. A promax rotation was used, since the SSMM subscales were expected to be correlated. Only items that loaded onto a primary factor at .50 or above and no other factor at .32 or above were retained, which indicates that no more than about 10% of the variance explained overlaps across factors (Tabachnick and Fidell, 2001). In addition, if two items were intercorrelated at .80 or above, the item with the lower factor loading was removed from the SSMM. This resulted in a total of 28 items. Since the SSMM was designed to measure the motives behind more general safety issues, two additional items that targeted a particular safety violation (e.g., "I feel that it is normal to violate a certain safety rule") were removed from the SSMM. All factor loadings for the items retained are shown in Table 1.

Results of the EFA showed four factors to have eigenvalues greater than 1, and a scree plot of the eigenvalues showed a clear "elbow" or break in the graph after four data points. These four

factors explained 64.52% of the total variance, with factor 1 explaining 49.08%, factor 2 explaining 6.45%, factor 3 explaining 5.20%, and factor 4 explaining 3.79% of variance. The factors were labeled as relationship-based, climate-based, issue-based, and job-based safety silence, respectively, based on the item content of each.

A total of eight items were retained for the relationship-based subscale. Although only two items originally written for the relationship-based subscale loaded onto factor 1, it was clear through the wording of the other six items that a fear of altering relationships with others was the root of the safety silence reflected in each statement. Four items written for the other-based subscale and two items written for the self-based subscale also converged onto this factor. Table 1 also shows the subscale that each item was originally written for.

A total of eight items were retained for the climate-based subscale. Six out of these eight items were originally written for the climate-based subscale, and two items were originally written for the job-based subscale. All items for the issue-based subscale, containing a total of six items, and the job-based subscale, containing four items, were originally written for that particular subscale. Cronbach's alpha for the relationship-based, climate-based, issue-based, and job-based subscales were .95, .92, .89, and .90, respectively.

3.3. Discussion

A well-established scale development process (Spector, 1992) was followed to create and refine the SSMM. A total of 96 items for a six-dimensional construct were first written and pilot tested. Items were then administered to a sample of nurses in order to refine the SSMM. This study resulted in a 26-item SSMM measure with four dimensions: relationship-based, climate-based, issue-based, and job-based safety silence.

4. Study 3: confirming the factor structure and validity testing

4.1. Overview

Our final study had two objectives. First, our aim was to confirm the factor structure of the SSMM in a sample of nurses, independent from the one in Study 2, to determine whether the four subscales established in the previous study stayed consistent across samples. Our second aim was to examine the relationships between safety silence motives, employee silence, and several traditional constructs in the safety literature to gather evidence for the construct and incremental validity for this new construct.

Table 2
Correlation's among Study 3 variables.

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Gender	1.98	.11														
2. Age	32.48	9.47	-.05													
3. Tenure	3.83	4.41	.01	.56*												
4. Hours	37.50	7.53	-.13*	.15*	-.02											
5. Employee voice	2.87	.72	.10	.12*	.11	.05	(.88)									
6. Safety climate	3.55	.77	-.01	-.03	-.05	.03	.40*	(.86)								
7. Safety communication	3.66	.79	.00	.03	-.03	.03	.54*	.64*	(.93)							
8. Safety performance	4.01	.56	-.06	.10	.03	.06	.25*	.31*	.25*	(.89)						
9. Safety knowledge	4.21	.48	-.04	.14*	.08	.04	.18*	.29*	.23*	.53*	(.85)					
10. Safety motivation	4.53	.48	-.08	.19*	.10	.00	.03	.17*	.12*	.43*	.52*	(.92)				
11. Relationship-based SS	2.75	.90	-.03	-.09	-.04	-.11*	-.43*	-.44*	-.50*	-.24*	-.22*	-.09	(.87)			
12. Climate-based SS	2.57	.91	.06	-.02	.04	-.07	-.42*	-.66*	-.66*	-.20*	-.17*	-.08	.62*	(.90)		
13. Issue-based SS	2.42	.92	.14*	-.07	.04	-.10	-.19*	-.19*	-.25*	-.25*	-.21*	-.17*	.41*	.34*	(.89)	
14. Job-based SS	3.20	1.05	-.05	-.09	.03	-.10	-.31*	-.48*	-.46*	-.27*	-.17*	-.09	.59*	.58*	.35*	(.85)

Note: Cronbach's alphas are given along the diagonal. N = 311.

* p < .05.

Table 3
Correlation comparisons (Study 3).

Outcome variable	Comparisons		z-score	p
	Variable 1	Variable 2		
Safety climate	Relationship-based	Climate-based	5.68	<.001
	Relationship-based	Issue-based	-4.39	<.001
	Relationship-based	Job-based	.90	.18
	Climate-based	Issue-based	-8.80	<.001
	Climate-based	Job-based	-4.50	<.001
	Issue-based	Job-based	4.93	<.001
Safety communication	Relationship-based	Climate-based	4.22	<.001
	Relationship-based	Issue-based	-4.54	<.001
	Relationship-based	Job-based	-.91	.18
	Climate-based	Issue-based	-7.76	<.001
	Climate-based	Job-based	-4.96	<.001
	Issue-based	Job-based	3.58	<.001
Safety performance	Relationship-based	Climate-based	-.83	.20
	Relationship-based	Issue-based	.17	.43
	Relationship-based	Job-based	.61	.27
	Climate-based	Issue-based	.79	.21
	Climate-based	Job-based	1.39	.08
	Issue-based	Job-based	.32	.37
Safety knowledge	Relationship-based	Climate-based	-1.03	.15
	Relationship-based	Issue-based	-.17	.43
	Relationship-based	Job-based	-.99	.16
	Climate-based	Issue-based	.63	.27
	Climate-based	Job-based	.00	.50
	Issue-based	Job-based	-.63	.26
Safety motivation	Relationship-based	Climate-based	-.20	.42
	Relationship-based	Issue-based	1.31	.10
	Relationship-based	Job-based	.00	.50
	Climate-based	Issue-based	1.39	.08
	Climate-based	Job-based	.19	.42
	Issue-based	Job-based	-1.25	.11

Note. $p < .05$ indicates that the correlation between variable 1 and the outcome variable is significantly different from the correlation between variable 2 and the outcome variable. A negative z-score indicates that variable 1 is more strongly correlated with the outcome variable than variable 2. $N = 311$.

4.2. Construct validity

Construct validation is necessary to assess the extent to which the scale for a new construct measures what it was designed to measure (Cronbach and Meehl, 1955). To gather evidence for the construct validity of the SSMM, relationships between the four motives and six commonly cited variables in the employee silence and safety literature were examined. A variable capturing a more general form of silence regarding ideas, concerns, or disagreements about organizational matters (i.e., employee silence) was examined in relation to safety silence motives to determine whether the reasons for staying silent about safety issues related to the broader concept of silence in employees. Key constructs in the safety literature, such as perceptions of safety climate, safety communication, safety performance, safety knowledge, and safety motivation, were also examined in relation to safety silence to

Table 5
Relative importance analysis (Study 3).

	Raw relative weight	Rescaled relative weight	CI lower bound	CI upper bound
Perceptions of safety climate	.03	8.58	.004	.087
Safety communication	.01	3.87	-.003	.036
Safety knowledge	.16	43.77	.089	.238
Safety motivation	.09	25.48	.053	.141
Relationship-based	.01	3.36	-.002	.031
Climate-based	.01	1.85	-.010	.014
Issue-based	.02	6.46	.001	.062
Job-based	.02	6.63	.002	.056

Note. $R^2 = .37$; If 0 is not included in confidence intervals, relative weight is significant.

Table 4
Hierarchical multiple regression (Study 3).

	B	SE (B)	β	R	R^2	ΔR^2
Step 1				.59	.34 [†]	
Constant	.62	.28				
Safety climate	.10	.05	.14 [†]			
Safety communication	.04	.04	.05			
Safety knowledge	.44	.07	.37 [†]			
Safety motivation	.23	.06	.20 [†]			
Step 2				.61	.37 [†]	.03 [†]
Constant	1.02	.39				
Safety climate	.11	.50	.15 [†]			
Safety communication	.03	.50	.04			
Safety knowledge	.41	.07	.35 [†]			
Safety motivation	.22	.06	.19 [†]			
Relationship-based	-.01	.04	-.02			
Climate-based	.07	.05	.12			
Issue-based	-.06	.03	-.10			
Job-based	-.07	.03	-.13 [†]			

Note. $N = 311$.
[†] $p < .05$.

examine whether these motives were related to other employee safety-related behaviors and attitudes.

4.2.1. Employee silence

As previously discussed, employee silence can be defined as an employee's act of not voicing concerns and opinions that could improve the functioning of an organization (Van Dyne et al., 2003). Individuals that generally do not feel comfortable speaking to their supervisors about their concerns regarding broader organizational policies and practices may also be less likely to speak up about specific safety issues witnessed at work. Some motives of safety silence may also be reflected in motives behind employee silence behavior. For example, if an employee perceives their organization as unsupportive of speaking up about safety issues, they may also feel that their organization does not value their opinions and concerns about more general workplace issues.

Hypothesis 1. Safety silence motives will be positively related to employee silence.

4.2.2. Perceptions of safety climate and safety communication

Safety climate can be defined as employees' collective perception of safety-related policies, procedures, and practices in their organization or group (Zohar, 1980; Zohar, 2000). Safety climate has been consistently found to have a negative relationship with workplace accidents (Hahn and Murphy, 2008; Probst et al., 2008; Christian et al., 2009). In addition, Probst et al. (2008) found that in organizations with a poor safety climate, 81% of reportable injuries were underreported, while only 47% of injuries were underreported in organizations with a positive safety climate.

The current study focuses on individual-level perceptions of safety practices, policies, and procedures in the workplace (Christian et al., 2009), which we refer to as "perceptions of

safety climate." Negative perceptions of safety climate indicate that employees perceive safety as a low priority within their organization, and that supervisors, management, and/or other employees are not concerned about workplace safety. This may lead employees to feel that they do not need to address safety issues because their organization will not be willing to take the appropriate actions to correct and prevent such events from occurring again.

Safety communication has often been examined in relation to safety climate (Hofmann and Stetzer, 1998; Kath et al., 2010; Kines et al., 2010; Zohar and Polachek, 2014). Much of the research on safety communication has focused on the benefits of fostering downward communication. As a whole, this body of research has assessed the benefits of improved leader-based safety communication for overall safety climate, employee safety performance, and/or workplace injuries (Kines et al., 2010; Zohar, 2000; Zohar and Polachek, 2014). In addition, leaders who express the importance of safety in their exchanges with employees can influence upward communication from employees as well, since the safety priorities of managers have been found to influence employees' safety-related behaviors and attitudes (Kines et al., 2010; Zohar, 2008)

The current study approaches safety communication from an employee perspective. High safety communication indicates that employees are open to sharing their ideas and concerns about workplace safety with their supervisors, and feel that their supervisors are accepting and open to this type of communication (Hofmann and Stetzer, 1998). Positive safety climates in which management is committed to and supportive of employee safety can foster safety communication by sending both explicit and implicit messages to employees about the importance and value of workplace safety. In more negative safety climates, employees may feel that their organization does not value their safety-related ideas or concerns, and therefore may be less keen on sharing their opinions with supervisors out of fear of speaking out of place or facing negative repercussions (Hofmann and Stetzer, 1998; Kath et al., 2010).

Individuals may be more willing to speak up about specific safety issues observed at work if they generally feel comfortable discussing their ideas and concerns about workplace safety with their supervisors, and perceive their management as encouraging and supportive of employee safety. In addition, employees that have more positive perceptions of safety climate and safety communication may be less likely to fear negative consequences from speaking up. Working in a positive safety climate may also allow employees to be more aware of safety issues in the workplace and understand the importance of taking the time to speak with supervisors about them.

Hypothesis 2. Safety silence motives will be negatively related to perceptions of safety climate.

Hypothesis 3. Safety silence motives will be negatively related to safety communication.

4.2.3. Safety knowledge and safety motivation

Safety knowledge and safety motivation are both expected to be negatively related to safety silence motives. An employee can be said to have safety knowledge if he or she is well-informed about the safety policies and procedures in the workplace. One component of safety knowledge is being familiar with methods in which to maintain and/or improve workplace safety, and understanding how to reduce the risks of accidents and injuries (Neal et al., 2000). Employees that have greater safety knowledge are more likely to recognize the importance of employee safety and how workplace safety can be improved by bringing up safety issues to supervisors. Without the proper knowledge of how to act safely and promote

workplace safety, employees may be more likely to stay silent about safety issues.

Hypothesis 4. Safety silence motives will be negatively related to safety knowledge.

Safety motivation, on the other hand, describes an individual's willingness to engage in activities that promote workplace safety (Neal et al., 2000; Neal and Griffin, 2006). Being motivated to maintain and improve safety may be a key component in safety-related speaking up behavior. Employees that lack safety motivation may be less likely to donate time and effort to communicating with their supervisors about safety issues witnessed at work. Even if employees have safety knowledge and understand the importance of speaking up, not being motivated to promote safety may prevent them from addressing workplace safety issues. In addition, a lack of motivation may intensify safety silence motives. If employees are not motivated to improve workplace safety, they may be more likely to stay silent, especially if they feel workplace relationships could be altered, their climate does not support speaking up, an issue is not severe, or they do not have the time.

Hypothesis 5. Safety silence motives will be negatively related to safety motivation.

4.2.4. Safety performance

Safety performance consists of positive safety-related practices that individuals engage in at work. Safety performance has two components: safety compliance and safety participation. Safety compliance is considered the act of following the core safety protocols and procedures that are necessary to maintain safety in the workplace (Griffin and Neal, 2000; Neal et al., 2000). Safety participation, on the other hand, consists of behaviors that are not required by the job, such as exerting extra effort to improve workplace safety or helping coworkers follow safety guidelines (Neal et al., 2000). Safety participation can be considered a form of organizational citizenship behavior, since engaging in this behavior is neither mandatory nor formally rewarded (Probst et al., 2013).

Employees who are poor safety performers may be less likely to speak up about safety issues in the workplace. Individuals who do not comply with safety guidelines themselves may not be keen on addressing safety issues, since doing so may bring their own unsafe behavior to light. Hypocritically speaking up about safety issues while engaging in unsafe practices may also cause individuals to feel that harming relationships with coworkers and supervisors is a probable outcome. These individuals may also assume that many safety issues are not severe or life-threatening, since they do not follow safety rules and guidelines themselves.

In addition, individuals that actively try to promote workplace safety (i.e., are high in safety participation) may strive to improve safety within their organization by addressing safety issues that they have witnessed. Taking the time to speak up about safety issues is neither mandatory nor formally rewarded, and can be considered a safety citizenship behavior. Therefore, individuals who are not willing to exert extra effort to improve workplace safety are more likely to stay silent about safety issues witnessed at work.

Hypothesis 6. Safety silence motives will be negatively related to safety performance.

4.3. Incremental validity

Incremental validity can be conceptualized as the amount of predictive validity that a construct adds to previously established constructs (Sackett and Lievens, 2008). Examining the incremental validity of safety silence motives can be useful in determining whether this new construct is able to explain unique variance in key criteria, and in justifying its inclusion in future research

as distinct from other commonly cited variables. Therefore, this study also assessed whether safety silence motives make a valuable contribution in predicting safety performance, one of the most studied behavioral outcomes in workplace safety research, above and beyond perceptions of safety climate, safety communication, safety knowledge, and safety motivation.

Indeed, safety climate has consistently been found to be related to safety performance. Neal et al. (2000) investigated the relationships between safety performance and safety climate in hospital employees and found safety climate to be related to both safety compliance and safety participation. Safety climate was also found to predict safety performance in a study by Griffin and Neal (2000) involving the manufacturing and mining industry. In a meta-analysis by Clarke (2006), safety climate was found to be significantly related to both components of safety performance.

Similarly, safety communication has often been found to have a relationship with safety performance (Cigularov et al., 2010; Griffin and Neal, 2000; Parker et al., 2001). Employees that are proactive in sharing ideas to improve workplace safety with their supervisors may also be more likely to engage in other safety citizenship behaviors such as safety-related helping or initiating safety-related change. In addition, employees who are willing to exert extra effort to communicate with supervisors about their ideas are likely to be safe performers, since those that do not follow safety policies and guidelines themselves are not likely to speak up about safety-related concerns or opinions.

Lastly, studies have consistently found support for safety knowledge and safety motivation predicting safety performance (Christian et al., 2009; Larsson et al., 2008; Neal et al., 2000; Neal and Griffin, 2006). Knowing how to perform safely is a precursor to behaving safely. In addition, working safely is guided by an individual's willingness to comply with safety rules and engage in safety citizenship behavior. Therefore, safety knowledge and safety motivation are considered proximal person-level antecedents of safety performance (Christian et al., 2009).

Examining new predictors of safety performance not only contributes to our understanding of workplace safety behaviors, but also has several practical implications for improving the health and safety of employees. Indeed, safety performance has consistently been found to be related to occupational accidents and injuries (Christian et al., 2009; Clarke, 2010), which can have detrimental organizational and individual-level outcomes. Therefore, we propose that safety silence motives can explain variance in safety performance that cannot be explained by some traditional safety-related variables. While we hypothesized relationships between safety silence motives and perceptions of safety climate, safety communication, safety knowledge, and safety motivation, each of these four safety-related predictor variables do not explain the reasons for which employees may remain silent. Speaking up about safety issues requires extra effort and arguably promotes an organization's safety initiatives, which is considered an important component of safety performance.

Hypothesis 7. Safety silence motives will explain incremental variance in safety performance above and beyond perceptions of safety climate, safety communication, safety knowledge, and safety motivation.

4.4. Method

4.4.1. Sample

A total of 311 nurses participated in Study 3. The majority of participants were female (98%) and Caucasian (88%). Participants' ages ranged from 21 to 61 years ($M = 32.49$, $SD = 9.47$). The majority of nurses were registered nurses (91.3%), worked in direct patient care (90.4%), and had a role as a staff or bedside nurse in their

organization (73%). Participants had an average tenure of 3.83 years ($SD = 4.41$) at their organization and worked an average of 37.5 hours per week ($SD = 7.53$).

4.4.2. Measures

4.4.2.1. Safety silence motives. The 26-item SSMM developed in Study 2 was further shortened in the present study (see Study 3 results). The final version of the SSMM contained a total of 17 items, which were divided into four subscales capturing different motives behind safety silence. The relationship-based safety silence subscale ($\alpha = .87$) included five items, the climate-based safety silence subscale ($\alpha = .90$) included six items, the issue-based safety silence subscale ($\alpha = .89$) included three items, and the job-based safety silence subscale ($\alpha = .85$) also included three items. All items were measured on five-point Likert scale, ranging from "strongly agree" to "strongly disagree." Higher scores indicated a greater motive to stay silent in relation to safety issues.

4.4.2.2. Employee silence. A seven-item scale developed by Vakola and Bouradas (2005) was used to measure the extent to which employees did not speak up about their disagreements at work. Four items asked participants to indicate the frequency of the instances in which they expressed their disagreements to their managers about company, department, and job issues. Participants were asked to respond on a five-point scale ranging from "never" to "always." The other three items assessed the ease at which participants speak up about issues regarding their company, department, or job. For these three items, participants were asked to respond on a five-point scale ranging from "very difficult" to "very easy." All items were reverse scored so that higher scores indicated more employee silence behavior.

4.4.2.3. Perceptions of safety climate. Employee perceptions of safety climate was assessed through a six-item scale developed by Hahn and Murphy (2008). Items such as "workers and management work together to ensure the safest possible conditions" were included in this scale. Items were measured on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." Higher scores indicated more positive perceptions of safety climate.

4.4.2.4. Safety communication. Safety communication was measured using a seven-item scale (Hofmann and Morgeson, 1999; $\alpha = .93$) in which participants were asked about the extent to which they felt comfortable sharing their safety-related ideas and concerns with their supervisors and how open and supportive their supervisors are of this type of communication. For example, one item asked to what extent participants "feel comfortable discussing safety issues with [their] supervisor." Participants were asked to respond on a five-point scale, ranging from "not at all" to "a very large extent." Higher scores indicated more positive views of safety communication.

4.4.2.5. Safety performance. Safety performance was measured with an eight-item measure, which consisted of two subscales (i.e., safety compliance and safety participation; Neal et al., 2000; $\alpha = .89$). The safety compliance subscale included items such as "I use the correct safety procedures for carrying out my job," and the safety participation included items such as "I put in extra effort to improve the safety of the workplace." The measure was rated on five-point Likert scale ranging from "strongly disagree" to "strongly agree." Higher scores represented better safety performance.

4.4.2.6. Safety knowledge and safety motivation. A four-item scale developed by Neal et al. (2000) was used to measure safety knowledge. The scale included items such as "I know how to perform my job in a safe manner." Safety motivation was also assessed through

a four-item measure developed by Neal et al. (2000, and included items such as “I put in extra effort to improve the safety of the workplace.” Participants were asked to respond on a five-point Likert scale ranging from “strongly disagree” to “strongly agree.” Higher scores indicated higher safety knowledge or safety motivation.

4.4.3. Procedure

Nurses were recruited through nursing listservs for professional nursing organizations, social media, and personal contacts. Qualtrics Survey Software was used to create an online survey containing the abovementioned measures. A link to the survey and a brief description of our study was sent to potential participants and nursing organizations via email, and was also posted on social media pages relating to the nursing industry. Participants were required to be nurses practicing in the U.S., be above the age of 18, and work at least part-time (i.e., 20 or more hours per week). We inserted a total of five validity checks throughout the survey, which asked participants to choose a certain response option (e.g., please select “strongly disagree”). Participants that did not pass four out of five validity checks were removed from our dataset. All nurses received a \$10 e-gift card for participating in this study.

4.5. Results

4.5.1. Confirmatory factor analysis

A confirmatory factor analysis (CFA) was conducted using SPSS AMOS v.20 to confirm the factor structure of the SSMM established in Study 2. The following five fit indices were used to evaluate model fit: chi-squared divided by degrees of freedom (CMIN/DF), comparative fit index (CFI), Tucker-Lewis Index (TLI), standardized root mean square residuals (SRMR), and the root-mean-square error of approximation (RMSEA). Models with a CMIN/DF less than 3, CFI and TLI of .95 or greater, a SRMR of .06 or less, and RMSEA of .05 or less are thought to have good fit (Hu and Bentler, 1999). Given that multiple models were examined, Akaike’s Information Criterion (AIC; Akaike, 1987) was also used to examine each model’s fit in relation to alternative models. The model with the lowest AIC value was the preferred model.

Two models were tested to determine which had the best fit. Model 1, containing 26 items with four first-order factors representing the four safety silence motives (i.e., relationship-based, climate-based, issue-based, and job-based) was found to have poor fit (CMIN/DF=2.92, CFI=.88, TLI=.87, SRMR=.08, RMSEA=.08, AIC=971.63). According to Garson (2015), indicators should ideally have weights of at least .70 on their latent factor. Model fit drastically improved after removing three items from the relationship-based subscale, two items from the climate-based subscale, three items from the issue-based subscale, and one item from the job-based subscale, with loadings below .70 in model 2. This model was found to have adequate fit (CMIN/DF=2.18, CFI=.96, TLI=.95, SRMR=.06, RMSEA=.06, AIC=325.82). Therefore, only 17 items were retained for the final measure (retained items are marked with asterisks in Table 1).

4.5.2. Construct validity

Means, standard deviations, and correlations between all study variables are displayed in Table 2. All safety silence motives were found to have a significant positive correlation with employee silence and a negative correlation with perceptions of safety climate, safety communication, safety performance, and safety knowledge, supporting hypotheses 1, 2, 3, 4, and 6. However, only issue-based safety silence was found to have a relationship with safety motivation. Hypothesis 5 was not supported.

Further, we tested the relative strength of correlations between safety silence motives and study variables to explore differential relationships across the SSMM’s four subscales. Steiger’s z-tests

were used to test the differences between two dependent correlations with a common variable. Using software developed by Lee and Preacher (2013), correlation coefficients were first transformed into z-scores, which were then utilized to conduct z-tests using the covariance of the estimates calculated using Steiger’s equations three and ten (Steiger, 1980). z Scores greater than an absolute value of 1.96 indicate a significant difference between two correlations. The results of the z-tests are shown in Table 3.

The correlation between climate-based safety silence and perceptions of safety climate was significantly greater than the correlations between the other three safety silence motives and perceptions of safety climate. Both climate-based and relationship-based safety silence subscales were more strongly related to safety communication than issue-based safety silence. In comparison to the job-based safety silence subscale, only relationship-based safety silence was more strongly related to safety communication. Finally, the correlations between the four safety silence subscales and safety performance and safety knowledge were not significantly different.

4.5.3. Incremental validity

A hierarchical multiple regression was conducted to assess hypothesis 7, concerning the incremental validity of safety silence motives (see Table 4). Perceptions of safety climate, safety communication, safety knowledge, and safety motivation were entered into a regression model in step 1, and the four safety silence motives in step 2, which resulted in a significant increase in R^2 ($\Delta R^2 = .03$, $p = .02$). Of the four safety silence motives, job-based safety silence ($\beta = -.13$, $p = .04$) was found to explain unique variance in safety performance.

When predictors are correlated, examining only the beta weights associated with each predictor makes it difficult to distinguish the unique contribution of each predictor to the model R^2 . Therefore, in order to examine the relative contribution of each predictor to the total variance explained in safety performance, a relative importance analysis was conducted (Tonidandel and LeBreton, 2015). We utilized Tonidandel and LeBreton’s (2011) methods for computing the proportion of variance in safety performance attributable to each predictor (i.e., relative weights) and the percentage of variance in safety performance attributable to each predictor (i.e., rescaled relative weights). Bootstrapped 95% confidence intervals around each relative weight were obtained to test for statistical significance. All predictors of interest (i.e., perceptions of safety climate, safety communication, safety knowledge, safety motivation, and the four safety silence motives) were entered into the relative importance analysis simultaneously, and were collectively found to explain 37% of the variance in safety performance. Perceptions of safety climate, safety knowledge, safety motivation, job-based safety silence, and issue-based safety silence were found to have statistically significant relative weights. Of the 37% of variance explained in safety performance, 2% was attributable to job-based safety silence and another 2% was attributable to issue-based safety silence. Full results of this analysis can be found in Table 5. Taken together, the results of the hierarchical multiple regression and relative importance analysis partially support hypothesis 7.

4.6. Discussion

Study 3 confirmed the four factor structure of the SSMM established in Study 2 using an independent sample of nurses. This study resulted in a 17-item version of the SSMM. A total of nine items were removed from the measure, resulting in a five-item relationship-based safety silence subscale, a six-item climate-based subscale, a three-item issue-based subscale, and a three-item job-based sub-

scale. Initial evidence of construct and incremental validity of safety silence motives was found against widely cited safety constructs.

All four safety silence motives were found to have significant relationships with employee silence, perceptions of safety climate, safety communication, safety performance, and safety knowledge. Only relationship-based and issue-based safety silence, however, displayed significant relationships with safety motivation. In addition, climate-based safety silence, compared to the other three dimensions, was found to have the strongest relationships with perceptions of safety climate and safety communication.

Finally, our findings show that safety silence motives do explain incremental variance in safety performance above and beyond several well-established variables in the safety literature. Job-based safety silence, in particular, was found to explain unique variance in safety performance. In addition, supplemental analyses showed that issue-based safety silence also makes a significant unique contribution to the prediction of safety performance relative to all other predictors included in our analyses. Taken together, the findings from Study 3 present initial evidence for the validity of the SSMM, and support its usefulness in assessing motives for not speaking up about safety-related issues. Understanding safety silence motives appears to have critical importance in our understanding of safety among nurses.

5. General discussion

The overall objective of our paper was to conceptualize safety silence motives, develop a tool to measure these motives, and gather initial evidence for the validity of the SSMM. These aims were met through three studies. Our qualitative study allowed us to explore the themes within safety silence to properly define the motives behind it. We found that there were several reasons that employees refrained from speaking up about safety issues, such as the fear of altering relationships, perceiving management as unsupportive, assessing issues as nonthreatening, and having heavy time pressures or excessive workloads. These themes were then used to construct the SSMM. In Studies 2 and 3, items for the SSMM were developed, the scale was pilot tested, the factor structure of the measure was examined and confirmed, and initial evidence for the validity of the SSMM was gathered.

The findings from this series of studies support the importance of examining the motives behind safety silence, which can be relationship-based, climate-based, issue-based, or job-based. All four motives were found to be related to several safety-related constructs such as perceptions of safety climate, safety communication, safety knowledge, and safety performance. Interestingly, relationship-based, climate-based, and job-based safety silence were not found to have relationships with safety motivation. This may suggest that for individuals that are highly motivated to promote safety within their workplace, a fear of harming workplace relationships, having perceptions of a poor safety climate, and job-related constraints do not deter their safety-related speaking up behavior.

In order to evaluate the predictive ability of the SSMM beyond several additional safety-related predictors, the incremental validity of the four safety silence motives in predicting safety performance was assessed. We found that issue-based and job-based safety silence were important contributors to the prediction of safety performance, which is not surprising given the distinctness of these two constructs. Job-based safety silence captures unique components of a job design's, job duties, or work tasks that may influence an individual's safety silence, and suggests a need for job redesign and/or alternative work arrangements. Issue-based safety silence refers to the idea that employees may not be fully aware of risks or safety issues in the workplace, and sug-

gests the need for training or interventions to increase knowledge and awareness of potential risks. In addition, job-based and issue-based safety silence have relatively lower correlations with some of the other safety-related constructs in our analyses, giving them a greater opportunity to explain unique variance in safety performance. These findings suggest that subscales of the SSMM can be useful additions to preexisting measures of safety variables in predicting employees' compliance with safety-related procedures and participation in promoting workplace safety.

Neither relationship-based nor climate-based safety silence were found to predict additional variance in safety performance beyond the other safety-related constructs examined. A possible explanation could be that relationship-based motives, such as the fear of harming one's relationships with coworkers, do not largely affect individual's safety compliance and participation, given that these safety performance behaviors may not necessarily put relationships within the workplace at risk. In essence, being concerned about how speaking up about safety issues affect one's relationships with others may not have a large impact on whether an individual performs safely at work. Further, while climate-based safety silence did not reach significance, it may be acting as a suppressor variable by both increasing the beta weight of perceptions of safety climate, and displaying a positive beta weight despite its negative correlation with safety performance (Ludlow and Klein, 2014). Models in which there is evidence for a suppression effect should be reevaluated (Maassen and Bakker, 2001) to determine whether a variable is truly a suppressor (Ludlow and Klein, 2014). At this stage, it is impractical to draw conclusions about suppression effects without evidence of such effects from multiple studies. Therefore, additional research is needed to further understand climate-based safety silence's incremental contribution to the prediction of safety performance above and beyond perceptions of safety climate.

5.1. Practical implications

Ultimately, the purpose of developing the SSMM is to aid in the improvement of workplace safety by helping to identify why employees may stay silent about safety issues witnessed at work. This measure can be used to detect some of the barriers to fostering a work environment that promotes the communication of safety issues. By identifying safety silence motives, organizations can also use their resources more efficiently by taking more targeted action.

A variety of prevention efforts can be taken if certain safety silence motives are found to be high in organizations. For example, if employees are found to be high in climate-based safety silence, organizations may wish to consider making changes at the supervisor or organizational-level by training managers and supervisors to be more encouraging of voice behavior and by promoting transformational leadership, which has been found to have a positive association with safety participation (Clarke, 2013). Organizations may benefit from focusing on creating, arranging, or designing tasks that are qualitatively and quantitatively appropriate for employees' skill level and time if job-based safety silence is found to be high. If relationship-based safety silence is a concern, the implementation of an anonymous reporting system could be useful. If employees are high in issue-based safety silence, organizations may benefit from creating more well-organized procedures or policies for reporting safety issues. High issue-based safety silence may also indicate a need for risk assessment training to aid employees in accurately identifying safety issues or hazards in the workplace.

5.2. Limitations and future directions

Organizational climate, types of safety issues, attitudes towards reporting behaviors, and types of workplace stressors can greatly differ across organizations, and much more across industries. While

our measure was not created to be industry-specific, we chose to focus only on the nursing population in our second and third studies, given that the healthcare industry faces a unique set of safety issues. Therefore, the results of these studies should not be generalized across industries. Future research should examine safety silence motives across industries in which safety is a critical concern, such as construction, manufacturing, and mining, among others, and validate the SSMM across these different sectors. The SSMM can also be used to assess whether different motives behind safety silence are more salient in one industry compared to another.

For our construct validation study (Study 3), data were gathered using self-report measures, making common method bias a possible limitation (Podsakoff et al., 2003). Future studies should consider the use of more objective measures and other-report data for assessing variables such as safety climate, safety communication, and safety performance. Supervisors could be asked to provide information about their support for organizational safety, encouragement of employee communication about safety issues, and ratings of employees' safety behaviors. In addition, more objective data from employees' records (e.g., number of accidents or injuries reported) could be used to measure safety performance, and knowledge-based tests could be used to measure the degree to which employees are familiar with safety-related policies and procedures. Using self-report measures to assess safety silence motives and safety motivation, however, is most appropriate, given that employees are the most familiar with their own thoughts, feelings, and attitudes.

In addition, future studies examining safety silence motives should work to integrate these motives into a larger model of workplace safety. Future research should embed this construct into existing theory through modeling the relationships between the constructs studied in the present paper. For example, the influence of safety knowledge and safety motivation on individuals' safety silence motives, and whether these motives partially mediate the relationship between safety knowledge and safety motivation's well-established relationships with safety performance should be further explored.

Additional evidence for the construct validity of safety silence motives can be gathered by examining their relationships with other safety-related speaking up behaviors such as accident reporting and safety voice. Accident or incident reporting is an employee's act of formally reporting injuries, damage, illnesses, or potentially hazardous safety-related situations to the appropriate authority. Safety silence motives should influence an individual's accident-reporting behavior as well, since similar barriers, such as climate-based or job-based concerns, are likely to be faced when reporting accidents.

Safety voice is change-oriented communication intended to increase workplace safety, which includes making suggestions to improve safety, informing supervisors of safety hazards, reporting safety violations, etc. (Tucker et al., 2008). Ideally, to foster safety voice, the motives behind staying silent should first be assessed to determine why employees may not feel comfortable speaking up about safety issues. Hence, research should assess whether safety silence motives predict safety voice above and beyond more general communication behaviors such as employee voice and safety communication. In addition, the differential relationships between safety silence motives and safety voice should also be examined to determine whether some motives more strongly predict change-oriented safety-related communication than others.

Future studies should also identify additional situational and attitudinal factors that can impact safety silence motives, such as job satisfaction, burnout, job security, and organizational support. Different safety and organizational outcomes, such as accidents, injuries, and turnover, should also be explored in relation to safety silence motives. The use of the SSMM will allow researchers to gain a better understanding of the impact that safety silence can have in organizations, and the factors that can influence one's motivation to speak up about safety issues at work.

5.3. Conclusion

The upward communication of safety issues within an organization is an important component of a safe work environment. When employees speak up to their supervisors about safety-related issues, organizations are presented with additional opportunities to correct these issues and take preventative action against accidents and injuries. Studying the motives behind safety silence can help researchers to better understand why employees may not feel comfortable speaking up about safety issues in the workplace, so that more targeted action can be taken to foster such communication.

Acknowledgments

This study was funded in part by CDC/NIOSH through the Sunshine Education and Research Center (ERC) at USF (T42-OH008438). The opinions expressed are those of the authors and do not represent either NIOSH or USF.

Appendix.

See Fig. 1A.

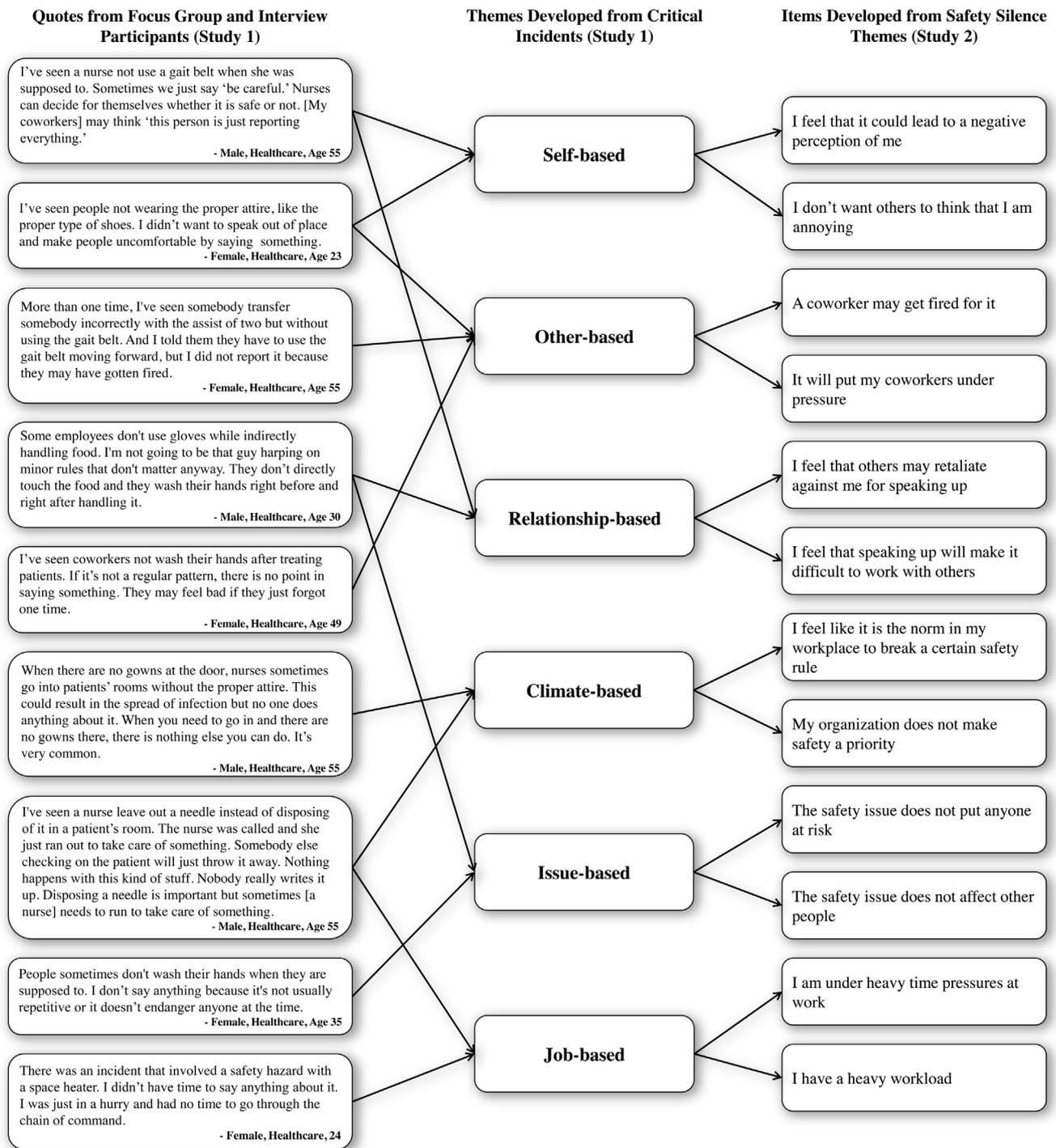


Fig. 1A. Process through which critical incidents were used to write scale items.

References

Akaike, H., 1987. Factor analysis and AIC. *Psychometrika* 52 (3), 317–332.

Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M.J., 2009. Workplace safety: a meta-analysis of the roles of person and situation factors. *J. Appl. Psychol.* 94 (5), 1103–1127.

Cigularov, K.P., Chen, P.Y., Rosecrance, J., 2010. The effects of error management climate and safety communication on safety: a multi-level study. *Accid. Anal. Prev.* 42 (5), 1498–1506.

Clarke, S., 2006. The relationship between safety climate and safety performance: a meta-analytic review. *J. Occup. Health Psychol.* 11 (4), 315–327.

Clarke, S., 2010. An integrative model of safety climate: linking psychological climate and work attitudes to individual safety outcomes using meta-analysis. *J. Occup. Organ. Psychol.* 83, 553–578.

Clarke, S., 2013. Safety leadership: a meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviours. *J. Occup. Organ. Psychol.* 86 (1), 22–49.

Cronbach, L.J., Meehl, P.E., 1955. Construct validity in psychological tests. *Psychol. Bull.* 52 (4), 281–302.

Garson, G.D., 2015. *Structural Equation Modeling*. Statistical Publishing Associates, Asheboro, NC.

Griffin, M.A., Neal, A., 2000. Perceptions of safety at work: a framework for linking safety climate to safety performance, knowledge, and motivation. *J. Occup. Health Psychol.* 5 (3), 347–358.

Hahn, S.E., Murphy, L.R., 2008. A short scale for measuring safety climate. *Saf. Sci.* 46, 1047–1066.

Halbesleben, J.R.B., 2010. The role of exhaustion and workarounds in predicting occupational injuries: a cross-lagged panel study of health care professionals. *J. Occup. Health Psychol.* 15 (1), 1–16.

- Halbesleben, J.R.B., Rathert, C., 2008. The role of continuous quality improvement and psychological safety in predicting work-arounds. *Health Care Manag. Rev.* 33 (2), 134–144.
- Hofmann, D.A., Morgeson, F.P., 1999. Safety-related behavior as a social exchange: the role of perceived organizational support and leader-member exchange. *J. Appl. Psychol.* 84 (2), 286–296.
- Hofmann, D.A., Stetzer, A., 1998. The role of safety climate and communication in accident interpretation: implications for learning from negative events. *Acad. Manag. J.* 41 (8), 644–657.
- Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* 6 (1), 1–55.
- Kath, L.M., Marks, K.M., Ranney, J., 2010. Safety climate dimensions, leader-member exchange: and organizational support as predictors of upward safety communication in a sample of rail industry workers. *Saf. Sci.* 48, 643–650.
- Kines, P., Anderson, L.P.S., Spangenberg, S., Mikkelsen, K.L., Dyreborg, J., Zohar, D., 2010. *J. Saf. Res.* 41, 399–406.
- Larsson, S., Pousette, A., Törner, M., 2008. Psychological climate and safety in the construction industry: mediated influence on safety behaviour. *Saf. Sci.* 46, 405–412.
- Lawton, R., Parker, D., 1998. Individual differences in accident liability: a review and integrative approach. *Hum. Factors* 40 (4), 655–671.
- Lee, I.A., Preacher, K.J., 2013. Calculation for the Test of the Difference Between Two Dependent Correlations with One Variable in Common [Computer software]. Available from <http://www.quantpsy.org>.
- Ludlow, L., Klein, K., 2014. Suppressor variables: the difference between 'is' versus 'acting as'. *J. Stat. Educ.* 22 (2), 1–24.
- Maassen, G.H., Bakker, A.B., 2001. Suppressor variables in path models: definitions and interpretations. *Sociol. Methods Res.* 30 (2), 241–270.
- Milliken, F.J., Morrison, E.W., Hewlin, P.F., 2003. An exploratory study of employee silence: issues that employees don't communicate upward and why. *J. Manag. Stud.* 40 (6), 1453–1476.
- Neal, A., Griffin, M.A., 2006. A study of the lagged relationships among safety climate, safety motivation, safety behavior, and accidents at the individual and group levels. *J. Appl. Psychol.* 91 (4), 946–953.
- Neal, A., Griffin, M.A., Hart, P.M., 2000. The impact of organizational climate on safety climate and individual behavior. *Saf. Sci.* 34, 99–109.
- Parker, S.K., Axtell, C.M., Turner, N., 2001. Designing a safer workplace: importance of job autonomy, communication quality, and supportive supervision. *J. Occup. Health Psychol.* 6 (3), 211–228.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88 (5), 879–903.
- Probst, T.M., Brubaker, T.L., Barsotti, A., 2008. Organizational injury rate underreporting: the moderating effect of organizational safety climate. *J. Appl. Psychol.* 93 (5), 1147–1154.
- Probst, T.M., Estrada, A.X., 2010. Accident under-reporting among employees: testing the moderating influence of psychological safety climate and supervisor enforcement of safety practices. *Accid. Anal. Prev.* 42, 1438–1444.
- Probst, T.M., Graso, M., Estrada, A.X., Greer, S., 2013. Consideration of future safety consequences: a new predictor of employee safety. *Accid. Anal. Prev.* 55, 124–134.
- Rosenman, K.D., Kalush, A., Reilly, M.J., Gardiner, J.C., Reeves, M., Luo, Z., 2006. How much work-related injury and illness is missed by the current national surveillance system. *J. Occup. Environ. Med.* 48, 357–365.
- Sackett, P.R., Lievens, F., 2008. Personnel selection. *Annu. Rev. Psychol.* 59, 419–450.
- Sofaer, S., 1999. Qualitative methods: what are they and why use them? *Health Serv. Res.* 34 (5), 1101–1118.
- Spector, P.E., 1992. *Summated Rated Scale Construction: An Introduction*. Sage Publications, Inc, Newbury Park, CA.
- Steiger, J.H., 1980. Tests for comparing elements of a correlation matrix. *Psychol. Bull.* 87, 245–251.
- Tabachnick, B.G., Fidell, L.S., 2001. *Using Multivariate Statistics*. Allyn and Bacon, Boston, MA.
- Tonidandel, S., LeBreton, J.M., 2015. RWA Web: a free, comprehensive, web-based: user-friendly tool for relative weight analyses. *J. Bus. Psychol.* 30, 207–216.
- Tonidandel, S., LeBreton, J.M., 2011. Relative importance analysis: a useful supplement to regression analysis. *J. Bus. Psychol.* 26, 1–9.
- Tucker, S., Chmiel, N., Turner, N., Hershcovis, M.S., Stride, C.B., 2008. Perceived organizational support for safety and employee safety voice: the mediating role of coworker support for safety. *J. Occup. Health Psychol.* 13 (4), 319–330.
- U.S. Bureau of Labor Statistics, 2014. Employer-Reported Workplace Injury and Illness Summary. Retrieved from http://www.bls.gov/news.release/archives/osh_12042014.pdf.
- U.S. Bureau of Labor Statistics, 2015. Industries at a Glance: Health Care and Social Assistance. Retrieved from <http://www.bls.gov/iag/tgs/iag62.htm>.
- Vakola, M., Bouradas, D., 2005. Antecedents and consequences of organizational silence: an empirical investigation. *Empl. Relat.* 27 (5), 441–458.
- Van Dyne, L., Ang, S., Botero, I.C., 2003. Conceptualizing employee silence and employee voice as multidimensional constructs. *J. Manag. Stud.* 40 (6), 1359–1392.
- Zohar, D., 2008. Safety climate and beyond: a multi-level multi-climate framework. *Saf. Sci.* 46, 376–387.
- Zohar, D., 2000. A group-level model of safety climate: testing the effect of group climate on microaccidents in manufacturing jobs. *J. Appl. Psychol.* 85 (4), 587–596.
- Zohar, D., 1980. Safety climate in industrial organizations: theoretical and applied implications. *J. Appl. Psychol.* 65 (1), 96–102.
- Zohar, D., Polachek, T., 2014. Discourse-based intervention for modifying supervisory communication as leverage for safety climate and performance improvement: a randomized field study. *J. Appl. Psychol.* 99 (1), 113–124.