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Sensemaking in sensory deprived settings: The role of non-verbal auditory cues for emergency assessment

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ABSTRACT

Emergency calls are high-stake situations characterized by volatile and time-critical conditions. The use of the telephone restricts sensory perception to a single modality—hearing—which makes both sensemaking and embodied sensemaking more difficult. Using observations, interviews, and organizational documents, we unveil how attention to the non-verbal cues of callers and their surroundings assists emergency operators to make sense of incoming calls for help. We find that operators use two practices to prioritize the calls: a frame-confirming practice and a frame-modifying practice. The practices are underpinned by configurations of verbal and non-verbal cues, wherein caller's emotional expressions and environmental sounds are both considered as distinct input. The non-verbal focus in this study extends our understanding of first-order sensemaking within the emergency domain but also in other sensory deprived settings in high-consequence industries. The contributions of this analysis to sensemaking research reside in the revelation that non-verbal cues contextualize and consequently frame the discursive elements of sensemaking. More specifically, this research offers the insight that embodied sensemaking benefits from attention being given to callers' non-verbal cues, rather than valuing only one's own bodily experiences and mere verbal descriptions about events.

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1. Introduction

Operator: Where have you been shot?

16-year-old: In the head and neck and in the hand and in the shoulder.

Operator: By what then?

16-year-old: By a gun. What the hell! Come! Please!

Operator: Are there any gunmen left on the scene?

16-year-old: No, they left five minutes ago. I am about to bleed to death.

Operator: But where in the head? How can it be that you are able to call when you, if you

16-year-old: None of your business, you need to get here! ¹

The transcript addresses a case debated in Swedish media in which the operator challenged a victim's ability to call after being shot in the head. The situation provides an example of one of the main challenges for operators: how to discriminate between cues that signify an authentic emergency from cues that signify an un-critical condition or even a hoax. The operator's understanding may be a matter of life and death for the caller. Considering the number of calls worldwide, how emergency operators make sense of not only spoken words but also non-verbal cues may save lives. The research thus has an empirical relevance.

A complicating factor for understanding emergency calls is that operators are deprived of sight, touch, smell, and taste—all cues that are important for embodied sensemaking (Cornelissen, Mantere, & Vaara, 2014; Whiteman & Cooper, 2011). It is difficult to identify vital information and difficult to assemble such information into a coherent understanding of the case. This raises

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¹ The emergency call became a high profile media case and the actual emergency call can be accessed on <http://www.dn.se/nyheter/skjuten-i-huvudet-misstrodd-av-sos-alarm/>.

questions of how sensemaking is achieved in sensory deprived environments, as well as how emergency operators use audio-based non-verbal cues to make sense of emergency calls.

The discursive focus of sensemaking (Weick, 1995, p. 4) has marginalized its non-verbal aspects (Sandberg & Tsoukas, 2015), such as emotions (Maitlis, Vogus, & Lawrence, 2013, p. 2) and materiality (Balogun, Jacobs, Jarzabkowski, Mantere, & Vaara, 2014). Overall, few studies have focused on environmental conditions (Whiteman & Cooper, 2011) or how to make sense of the “bodily sensations, felt experiences, emotions and sensory knowing” that are an integral part of our lives (Cunliffe & Coupland, 2012, p. 64).

Disregarding emotional and material cues might have dire consequences. Cornelissen et al. (2014) examined how a group of police officers made sense of the material conditions, as well as their own and others' felt and expressed emotions, while chasing and killing a suspected terrorist. The alleged terrorist was in fact innocent. Such miscarriages of justice pose even greater problems than the controversy aroused by this case. Complementing the literature, we suggest that operators refine their sensemaking of calls by interpreting the non-verbal cues juxtaposed with callers' verbal accounts. Cues such as background noise and emotional expressions provide information that operators can use to establish an account of events. More specifically, the purpose of this article is to advance the understanding of sensemaking by nuancing embodied sensemaking. We do so by asking the following: How do emergency operators make sense of emergency calls in a sensory deprived environment?

Drawing upon the literature on embodied sensemaking, we extend it by focusing on how listeners make sense of others' vocal emotions, rather than attending to their own emotions, and audio-based material conditions. This approach contributes to the discursive nature of sensemaking (Weick, 1995) by adding that attending to non-verbal conditions provides a more exhaustive understanding of a less explored area (Brown, Colville, & Pye, 2015, p. 272; Sandberg & Tsoukas, 2015).

2. Theoretical background

2.1. Sensemaking in emergency call taking

Research on emergency call taking tends to focus on the conversational sequence between callers and operators. In those studies, utterances such as greetings and recognitions are typically omitted (Zimmerman, 1992) and verbal offences, such as rudeness and direct attacks, either hindered communication or caused it to break down (cf. Imbens-Bailey & McCabe, 2000; Tracy & Tracy, 1998; Whalen, Zimmerman, & Whalen, 1988). Thus, while previous research focused on the interactional structure of emergency calls, few studies challenge the influence of non-verbal information on the operators' sensemaking process.

Focus on non-verbal cues has typically been restricted to a narrow set of mainly interruptive displays. For instance, Whalen and Zimmerman (1998) described how callers' “hysteria” was a consequence of the caller's affective stance and the operators' conformance to rules. At the same time, emergency calls did not reveal the prevalence and importance of emotional expression (hysterical callers) anticipated by the public (Clawson & Sinclair, 2001). Other studies emphasize the role of non-verbal and tacit aspects in work tasks and technology use. Greatbatch et al. (2005) claimed that the implementation of an electronic expert system partially captured what experts do and thus was downplayed by the operator's practice in ways that privileged their own expertise and personalized services. On a similar note, Fele (2012) showed that emergency operators make use of cues related to the ecology of

the workplace, such as eavesdropping and aligning emotional displays, to confirm understanding. This research thus indicates that emotional and material cues are central to how emergency operators make sense of the situation and decide on their response.

2.2. Sensemaking

Sensemaking is defined as “a process, prompted by violated expectations, that involves attending to and bracketing cues in the environment. It creates intersubjective meaning through cycles of interpretation and action, thereby enacting a more ordered environment from which further cues can be drawn” (Maitlis & Christianson, 2014, p. 67). In other words, sensemaking is a two-way process where cues are mentally framed and wrapped around data. The interaction is interdependent as cues evoke the frame and the frame facilitates recognition and selection of cues (Klein, Moon, & Hoffman, 2006), but little research has addressed the role of different kinds of cues and the sequentiality of such information.

Sensemaking has primarily been investigated through discourse and how intersubjective meanings are created (Weick, Sutcliffe, & Obstfeld, 2005), the role of action, and how sensemaking enables processes such as learning and organizational change (Maitlis & Christianson, 2014, p. 57). These bodies of research have investigated sensemaking in an unfolding crisis or in retrospect (Maitlis & Sonenshein, 2010, p. 554) using individual, group, or organizational perspectives. Thus, sensemaking has come to be essential in understanding organizational phenomena. Sandberg and Tsoukas (2015) recent review further identifies gaps in the stages of the sensemaking processes. It concludes that there are few studies that address sensemaking areas such as triggers of sensemaking (spanning a range from minor and major planned and unplanned events to hybrid ones), the processes that underpin sensemaking (creation, interpretation, and enactment), the outcomes of sensemaking (restored sense and action as well as non-sense and non-restored action); and factors influencing sensemaking (context, language, identity, cognitive frames, emotions, politics, and technology).

2.3. Emotional expressions in sensemaking

Embodied sensemaking includes both materiality and emotions and has attracted interest in academia (Maitlis & Christianson, 2014). Although it is receiving attention, the theory is underdeveloped (Brown et al., 2015, p. 272). The role of emotions in embodied sensemaking is focused on how we attend to self-experienced emotions such as a subject's fear, desperation, anxiety, panic, and other crisis-related emotions (cf. Dougherty & Drumheller, 2006). However, since emotion is a “transient feeling state with an identified cause or target that can be expressed verbally or non-verbally” (Maitlis et al., 2013, p. 223), to which the more we attend, the more vivid it is (Fox, 2012), experienced emotions may in turn be communicated to observers and are therefore an important input to the sensemaking process (cf. Hindmarsh & Pilnick, 2007). While typical crisis situations are associated with displays of intense negative emotions such as fear, panic, and desperation (Kayes, 2004), there may also be displays of less intense emotions such as sadness, gloom, or guilt (Bovey & Hede, 2001). Moreover, emotional expressions are relational as well as context-bound, and individuals use others' expressions in ambiguous or uncertain situations (Van Kleef, 2014; Van Kleef, De Dreu, & Manstead, 2010). Attending to vocal cues is crucial to interpret the intentions of others (Van Kleef, 2014). For instance, recent studies show that anger expressed in a cooperative setting reduces intentions to cooperate, but when anger is expressed in a

competitive setting, it increases intentions to cooperate. On the contrary, expressions of sadness and fear increase intentions to help in a cooperative setting but reduce it in a competitive setting (Van Kleef, 2014; Van Kleef et al., 2010). These findings are essential for the emergency domain, which is characterized by helping behaviors in situations where negative emotions are expressed.

2.4. Emotional expressions and materiality in embodied sensemaking

Schatzki (2010) argues that any practice is tied to the site in which it unfolds. The site defines, and is defined by, activities and accomplishments, and it provides the guidelines and motivations for people to act according to what makes sense to them in a given situation. These activities relate to the fact that emotional expressions are responses to situations and carry social value and therefore need to be incorporated in situational interpretations (Cunliffe & Coupland, 2012).

Materiality can be understood in a larger sense to include embodied gestures (Maitlis & Sonenshein, 2010), physical artifacts (Stigliani & Ravasi, 2012), and natural environmental conditions (Whiteman & Cooper, 2011). This also includes the five senses (sight, hearing, taste, smell, and touch) as sensory cues, meaning that although operators are restricted to a single channel, different kinds of information may be inferred and become subject to interpretation. However, this information needs to be analyzed jointly. For example, Whiteman and Cooper (2011) re-visited Weick (1993) Mann Gulch study with a materiality lens and found that the topography of the landscape influenced the fate of the firefighters. Similarly, Ben-Shalon, Klar, and Benbenisty (2012:219) emphasized that “sensemaking in combat is influenced by the smells, sights, and sounds aroused by the proximity to danger and the physical characteristics of the combat environment.” In another example that encompassed senses rather than topography, the disaster at Bhopal (Weick, 1988) initially involved a foul smell that nobody was able to associate with a malfunctioning system (Maitlis & Sonenshein, 2010). The failure to make sense of the strange odor eventually contributed to the disaster that killed thousands of people.

This line of research finds support in Weick and Roberts (1993) who investigated the practices of people on aircraft carriers. Whereas their research did not specifically address auditory cues, they nevertheless noticed how, despite being physically separated on the flight deck and without visual contact, people picked up cues from the tone of voice of the other person or the movements of the ship. By being able to act upon nuances such as the tone of voice (emotional cues) or the intensity of the material cues, they were able to produce appropriate responses in high-pressure situations.

Taken together, the material and emotional cues indicate three important aspects for sensemaking. First, non-verbal cues are important for how they inform the sensemaking process (Maitlis et al., 2013), but their role is underemphasized and has been investigated from a discursive perspective. Second, emotions are generally viewed from an intrapersonal perspective, where one's own emotions influence sensemaking rather than how others' emotional expressions inform sensemaking (cf. Clegg, Rego, & Gomes, 2015; Maitlis & Sonenshein, 2010). Third, materiality and interpretations of others' emotions are rarely discussed as concepts that simultaneously influence the sensemaking process (cf. Cornelissen et al., 2014).

An exception to the simultaneous existence and influence of emotions—both those experienced personally and those expressed by others—along with materiality was addressed by Cornelissen et al. (2014). They found that an embodied sensemaking needs to address emotions and materiality simultaneously and asserted that

other studies only partially explain the sensemaking process. The reason for this is that material and emotional conditions both influence the construction of meaning. In line with the simultaneous influence of material and emotional cues and as a consequence of the means of communication in this study, the non-verbal cues have a two-fold conceptualization. In their sensemaking efforts, the operators need to accommodate first the sounds of the background, which are not human voices, and second, the emotional expression of the caller. Thus, the non-verbal cues are either background sounds or non-verbal cues, in terms of emotions, expressed by the caller. The common denominator in these investigations is that they preclude the influence of other sensory cues that would allow individuals to crosscheck for “true” input and how to frame that information into a coherent understanding of the situation.

3. Methodology

3.1. The context of emergency centers and research design

The number 112 is the Swedish equivalent of other emergency numbers such as the 911 (Canada/USA) or 999 (UK). By calling 112, callers reach the ambulance, fire brigade, police, air and sea rescue, mountain patrol services, or clergy. The 18 call centers are distributed within three geographical areas, and these represent the gateway to Sweden's emergency services. There are approximately 850 employees working within the organization. We retrieved data from the shifts of approximately 50 operators at two different emergency centers. The first center is located in a metropolitan area, while the other is located in a city with approximately 100 000 inhabitants. However, despite differences in size of the regions where the centers are located and number of calls they answered, operators from a smaller center may receive calls re-routed from other centers depending on their current workload. The operators are accessible 24 h a day, 365 days a year.

Annually, the organization answers and prioritizes approximately 3.5 million calls. Approximately 60% of the total number of calls are silent, wrong number, or hoax calls. Out of the remaining 1.4 million emergency calls, approximately 700 000 calls are healthcare related. This group is the focus of this study. First, although silent, wrong number, or hoax calls require sensemaking, healthcare-related calls have a medical purpose beyond the classification of the call. Second, their medical purpose sets in motion a sensemaking process where the operators need to develop the frames that allow them to come to a conclusion about the appropriate response. Third, the medical nature of calls brings certain urgency to the sensemaking process.

The research design is informed by the idea that embodied sensemaking is inter-subjective (Cornelissen et al., 2014). That is, the sensemaking process is not a ready-made representation of the physical setting but a situated co-created understanding between two or more actors (cf. Vaara & Monin, 2010). This is important for the research design for three reasons. First, by researching the operators' sensemaking processes in this particular setting, we reduce the influence of the perceptions of the physical surroundings to a narrow set of sensory (auditory) cues. Visual, tactile, olfactory, or gustatory cues that may be present in other emergency situations, such as among ambulance and law enforcement officers or firefighters, are missing here. Second, the reduction of sensory cues requires articulated interaction between the caller and the operator and/or deliberate interpretations of the caller's setting. Third, the bulk of calls, the variability of emergencies, and in-call complexities all require that the prescribed routines could be followed only if the operators are able to develop strategies to make sense of the situation. The research design thus allows us in our context to explicitly operationalize embodied sensemaking as the

interpretation of the emotional and material conditions that are transmitted through brief interactions between two individuals, filtered through workplace and personal routines.

3.2. Data collection

Our research relies on multiple data sources, including archival records (400 pages of password-protected educational material, 400 pages of annual reports, and 50 pages of policy documents), 12 in-depth interviews (18 h of recordings), and 60 h of observations (the on-site observations included informal interviews and co-listening to hundreds of authentic emergency calls). Archival records were initially collected to orient the researcher in the context and provide impetus for the observations and interviews. The educational and internal documents were gathered after full access was given to the site and served to inform data collection and contrast first hand data.

Following the initial orientation phase, eleven operators from two emergency centers were interviewed and observed. The seven operators at the first center were complemented with four operators from the second emergency center. The procedure was suggested by a (non-organizationally associated) former operator who was interviewed and fed anonymized material of current working conditions. The procedure was conducted to control for local variations in work procedures between different emergency centers. The operators' experience ranged from 2.5 years to 25 years. Thus, the use of archival records helped illuminate prescribed aspects of work (their routines), the interviews helped show how the operators perceived work, and the observations helped reveal how prescribed routines (such as rules dictated by the organization) and perceptions of work affected practice. This allowed us to capture common denominators and differences in the operators' sense-making practices through our operationalization of embodied sensemaking.

The observations focused on how operators managed the calls as well how they characterized and made assumptions about their working conditions (Silverman, 2006, pp. 88–93). Sitting next to the operators, listening in on the call, researchers made field notes that contained descriptions of the operator's physical working environment; direct observations of operator's behavior during calls (non-verbal expressions, such as posture and tone of voice); what the operators said; and, finally, interpretations of the operator's speech, behavior, and environment. The field notes were continuously revised, transcribed, and elaborated upon within 48 h (Spradley, 1980). In total, the researcher who collected data listened to hundreds of calls, which also allowed the opportunity both to pose questions to operators immediately after the calls were terminated and to have the calls played back in order to establish links between what they perceived and how they made decisions in calls.

The interviews followed a semi-structured interview protocol and focused on the daily work and the description of working strategies of the operators. In the interviews, the emotional and material experiences of operator work were addressed by specific questions on sensory cues. To facilitate reflections on current observed events, the interviews were conducted on the day of the observations. This triggered the operators to use authentic examples from their working sessions and answer questions prompted by the observations. In alignment with research practice, all 12 interviews were tape-recorded and later transcribed verbatim (Spradley, 1980), rendering a total of 350 pages of transcriptions.

3.3. Data analysis

Mirroring the original connotation of sensemaking (Weick,

1995), each instance or story about an instance was treated as an occasion for sensemaking; consequently, this multi-sentence unit was our unit of analysis. In the first phase, we looked for passages including confusion or probing cues such as “why,” “how,” or “what” happened? (Clegg et al., 2015). All calls include some form of non-verbal information since even silence may be treated as a material cue. However, it is not a matter of whether or not non-verbal cues are present but rather how emergent they are against the verbal description. Just as in sensemaking where cues are bracketed (Weick, 1988), gestalt theorizing provides explanations of how we organize our reality. In figure-ground relationships, visual perception shifts between seeing either a figure or a background in the same stimuli. This applies to the auditory sense of either perceiving non-verbal cues as a figure or as a background too (Ellis, 1999).

Initial analysis unveiled speech to be a dominant carrier of information in calls that harmonized with general prescriptions of work. However, we also noted differences between operators in how they enacted calls, making us search what information helped operators to make sense and conclude calls. This put us in the direction of examining the non-vocal cues. The insight informed the second analytical phase where we analyzed the material along a continuum of how emergent emotions and/or material cues were against verbal descriptions as well as when either one type of cue dominated the other.

We found that the parallel presence of material and emotional cues provided an increased understanding of what the call exemplified. Some of the perceptions were clearly visceral and a result of bodily functions (e.g., a wheezing sound when breathing), environmental conditions (e.g., the sound of water entering a car), or the effects of emotion on speech (such as the jitter or pitch associated with fear). Given the variety of material cues that are possible in calls, we identified when material cues were present rather than further categorizing them, either by hearing them directly in calls or when operators referred to them in conversation. Emotional expressions were first assessed by us in an open manner (cf. Martin, Knopoff, & Beckman, 1998) when data pointed either to notations of vocal expressions, such as jitter, pitch, and volume (see Juslin & Laukka, 2003 for relevant vocal cues to decode), or in verbal descriptions, e.g., when a caller expressed “I am angry,” we included it as an instance. We then categorized the emotional expressions based on Ekman (1992) basic emotions and fed the information to the non-affiliated inter-rater assessor. The inter-rater agreement was high ($K = 0.82$, see Cohen, 1960), and an example of the assessment procedure and types of expressions can be seen in Table 1. Such a procedure provided the researchers with an orientation on how common certain emotional expressions and types of calls (such as in high or low priority) were and, finally, how the configurations of material and emotional cues changed operators' understanding of the situation.

The third analytical phase included mapping the analytical frames with the specific cues and prioritization of calls. Given the reasons that individuals make emergency calls, the operator's default frame is an emergency (E). However, their understanding of the exchange may then confirm an emergency (E) or cause them either to reject the call as a non-emergency (N) or to modify frames back and forth (E-N-E) between these assessments. A brief description of emergency events, responses, and actions can be seen in the left column of Table 2. The non-verbal content that was identified along the continuum of how emergent material and emotional cues were is seen in the third column and labeled as verbal figure-contextual background or contextual figure-verbal background. This implies that cues that are categorized as the figure dominate the calls and the background. In turn, this means, for instance, that when non-verbal cues were clearly perceived as

Table 1
An inter-rater sample of assessments of emotional expressions and presence of material cues in emergency calls.

Item Description	Inter-rater 1	Inter-rater 2	Presence of Material Cue
1. One could hear the person's feeling [emphasizes the feeling] at the other end of the line. So if someone yells that the baby is ... seriously hurt you can hear the voice of this death cry [emphasizes death cry]. So there the pitches will ... play a very important role ... that is how I react emotionally ...	Fear	Fear	No
2. Yes it is ... ehh ... it may well be both ... but one can often hear the anxiety in his voice ... ehmm ... then you know that it's probably bad ... breathing problems are also quite easy ... the heart is much more difficult ... but the anxiety that one hears often indicates whether ... if it's a heart condition ...	Fear	Fear	Yes
3. ...it was probably an angry mother ... or angry relatives ... and angry family members can of course ring ... for example, if it is an elderly couple with a daughter or son that have become very provoked by the parents and when they [....] when they call here they put that on us ...	Anger	Anger	No
4. They are at the peak of what they can handle in their life ... and then they call for help ... and then it is obvious that it is very tense from the caller side ... Will I get any help ... I have read in the newspapers that you get no help when calling 112 ... So many are aggressive for that reason ... they've already decided that you would not help me if I am not clear enough ... and they can be very aggressive for that reason ...	Anger	Anger	No
5. One can, e.g., hear " ... I do not want to get too close, he smells bad, or smell booze" or bluntly: "I do not know him." The caller's emotional state may change during the call and the operator can help to manage the caller. In an acute event, the first 15 s of the call, you must get the caller to understand that the ambulance is on the way and then you can "(...) bring them down a bit"	Disgust	Disgust	Yes
6. An operator mutes a caller and then overhears the sounds of the caller talking to somebody else. The caller says, "She said just wait I will connect you. I mean it is 112, what the hell is this shit, it is still 112 right." The operator turns to the researcher and says "That's what you hear if you stay on the line. What does he think I do, not working anyway [making a funny face]."	Anger	Anger	Yes
7. An operator expresses successful management of calls: "I am glad if they say ... ooohh you have been to kind and thank you ... you've been kind ... then you become happy about the job".	Happiness	Happiness	No
8. The screaming, yelling, and swearing ... They are concentrating more on ... 'SEND THE GOD-DAMN CAR!' ... they must understand that I have to get an idea of what it is about ... how urgent it is and where I am going ... they cannot just scream to send something ... I have to know what to send.	Anger	Anger	No
9. Yes, it's almost the most difficult to deal with ... I'd rather have those who are angry ... and ... angry and screaming and yelling at you ... and call you bad things ... it is still in affect ... ehh ... or because of abuse or because of a mental illness that makes them actually in no way responsible for what they say [...] ... but those who call to destroy ... although they may not realize that they destroy [...] ... I mean, they know that they call 40 times so ... [pause 0.5 s]	Anger	Anger	No
10. Hysterical screaming: "It is sinking ... oooh, my mother!" "It took me a while to realize that it was a car that was sinking, one can hear how it bubbles around her". The operator changes voice [illustrating hysterical] 'I am sitting in the car and it is sinking! Ooh, my mother!' [operator explains] as she begins to talk about the mother's car ... 'What is it about your Mum's car?' [Illustrates the woman again] 'It is sinking!'	Fear	Fear	Yes
11. You cannot miss it ... I think ... then someone else can find it really hard ... but no anger, you hear that directly because usually they have a higher tone ... just a bit above what they need ... but then it's the one that found the mother dead ... those who only sob directly ... but then it is the one that also found someone dead ... who is ice cold ... but it was expected ... you can hear it most of the times.	Anger	Sadness	No
12. Yes, but that you can hear ... it was like her we had before ... it was the jitter in the voice ... but it's also a matter of training ... that is not a skill you find in a new employee ... it's something that comes with age that you hear the difference between the voices when there is panic ... and some when they just scream you want someone right next to them to just pinch them ... or give them a little slap in the face to get them to calm down ... [..]	Fear	Fear	No

being the figure, either emotional expressions or the background sounds may drive interpretations of the call. In other words, the contextual information (material and emotional expressions) may dominate verbal descriptions as well as each other.

Next, a first- and second-order interpretation of events is seen in column four and five, and these episodes were then considered in relation to the change of understanding the cues provided and beyond single sensemaking episodes into practices of sensemaking. The entire coding procedure was done by the researchers and later validated by sending excerpts to operators, the quality manager at the emergency center, and other academics. Out of the complete data set, we display 22 instances that illustrate the emotional and/or material sensemaking passages and the qualitative difference of *frame confirming* and *frame modifying* practices.

4. Findings

Although all calls are considered to be potential emergencies and may last several minutes, operators typically form their perception about the call within 30 s. The quality manager stated, "Operators prioritize the calls rather quickly, categorizing what kind of an emergency it is and they notify ambulances. Then they can use the time to gather more information." Thus, the operators aim to recognize patterns quickly and then refine and adjust their assessments based on these initial ideas. Consequently, prescriptions

that call taking should proceed in a linear and rational problem-solving manner are complemented with a more intuitive stance of recognizing patterns, iterations, and sensemaking of cues that may be either few or ambiguous. An experienced operator described this as, "You have to learn to listen to what is not said too ... you should listen to your intuition, but maybe in a manner where you add things together in order to get it right." Thus operators consciously search for complementary cues that may confirm or reject the authenticity of an emergency, for example, by listening to emotional expressions of fear, anger, disgust, shame, sadness, calmness, apathy, surprise, and shock. Positive expressions, such as joy and elation were mainly perceived toward the end of calls and as a consequence of successful management rather than being a framing activity. The most common emotional expressions in the empirical findings were anger (33%) followed by fear (30%) and calmness (14%).

Operator [Female, experienced²]: "When the operator encounters apathy and silence, it can be difficult to assess the severity of the situation. It is rare that someone who is injured is calm. In

² The level of experience refers to the number of years working as an operator. Operators claim it takes approximately two years for new operators to become autonomous and approximately eight years to become experienced, and beyond eight years, they are considered very experienced.

Table 2
Data structure of verbal, material and emotional configurations in emergency call taking.

Empirics: descriptions of events/source of information	Initial coding	First-order interpretation of event	Second-order interpretation of event	Change of emergency perception	Practice
1. On characteristics of non-complicated calls: "There are simple tasks ... straightforward calls where the patient is kept within a specific template or framework and answers correctly and adequately to questions as well as meets the symptoms we are looking for. Then advice is very simple ... if you can fill in all the markers, it is the easiest".	Verbal Figure- Contextual Background	When information is structured, coherent, and aligned with the emergency routine, calls are easy to manage.	Routines and call perception alignment	E-E	Frame- confirming Practice
2. On characteristics of non-complicated calls: "Really simple tasks are when you receive property information from a location where they have no heat. 'I'm taking names, phone numbers, addresses, and they'll be in touch with you.'"	Verbal Figure- Contextual Background	Non-complicated calls conform to existing routines.	Routines and call perception alignment	E-E	Frame- confirming Practice
3. Perceptions of ideal callers: "It is best when they actually respond to the issues that we actually are asking about ... not answering 'yes' to every question because you think it's faster because ... which, of course, is not an unusual phenomenon ..."	Verbal figure- Contextual Background	Ideal callers respond verbally to questions by the operator.	Routines and call perception alignment.	E-E	Frame- confirming Practice
4. On characteristics of non-complicated, but severe, calls: The caller calls on behalf of her mother explaining that her mother was having a heart attack [she talks rather rapidly and to the point, with some distress]. Her mother was pale and had pressure across her chest with radiating pain towards her arm. Given this information, the operator interrupts the caller and assigns an ambulance.	Verbal Figure- Contextual Background	The caller provides structured and coherent information with slight fear and few material cues when stating symptoms. There is little need for sensemaking, and the operator relies on verbal information.	Routines and call perception alignment.	E-E	Frame- confirming Practice
5. Matching principle of operators' decision making: "Emotional expressions contribute to the image of the event that the operator obtains from the call; you sum up all the sounds in the background and then you create an image of the incident. This can be anything from background noise that you can hear to how the caller breathes to determine what type of help that is needed."	Contextual Figure- Verbal Background	The operator explains that a matching principle between material and emotional cues contributes to verbal descriptions.	Matching principle to reduce uncertainty.	E-E	Frame- confirming Practice
6. Desired information in operator's decision making: "[...] it's probably that you hear from the caller that it is serious ... fear, confusion, pitches ... how it sounds in the background. If there is a f-cking sound there? [...] ... when it is extremely quiet, it can be very difficult to get accurate information ... you are supposed to be calm, but I still think you might get a better understanding of how it might look on the scene or how it is on the site and everything like that ... if you become affected ..."	Contextual Figure- Verbal Background	Describes a preference for affected callers and material cues as well as difficulties in assessing calls when emotional and material cues are missing.	Preference for non-verbal information.	E-E	Frame- confirming Practice
7. The Sinking Car: Hysterical screaming: "It is sinking ... ooh, my mother!" "It took me a while to realize that it was a car that was sinking, one can hear how it bubbles around her." The operator changes voice [illustrating hysterical] "I am sitting in the car and it is sinking! Ooh, my mother!" [operator explains] as she begins to talk about the mother's car ... "What is it about your Mum's car?" [Illustrates the woman again] "It is sinking!"	Contextual Figure- Verbal Background	Verbal accounts are initially insufficient for sensemaking. The combining and matching of non-verbal information, emotions (hysterical screaming), and material cues (the sound of bubbles when water enter into the car) both point in the direction the verbally described emergency.	Primacy for non-verbal over verbal information.	E-E	Frame- confirming Practice
8. On what triggers operators' decision making: "Yes it is ... it may well be both ... but one can often hear anxiety in the voice ... then you feel that it's probably bad. Breathing problems are quite easy to hear, but the heart is much more difficult ... but, the anxiety that one hears frequently ... that is a heart condition ..."	Contextual Figure- Verbal Background	The operator refers to listening to non-verbal cues in terms of breathing (material) and emotions (fear-related) and make inferences about specific and severe medical problem (heart condition).	Non-verbally cued inferences.	E-E	Frame- confirming Practice
9. The suicide: The caller opens the call by saying that she suspects something is wrong in her daughter's apartment [distress in a cracking voice]. The caller cries and explains that she found the daughter lying motionless in bed. The caller then tries to find out if her daughter is awake and breathing [the clicking of high heels across parquet flooring reveals rapid walking].	Contextual Figure- Verbal Background	Initially, there are no verbal accounts of what kind of emergency it is, but the cracking voice (emotion), clicking of high heels indicates rapid pace (material), screams of despair (sadness), and rustling of plastic (material) bag aid in strengthening the emergency frame.	Non-verbally cued inferences.	E-E	Frame- confirming Practice

Table 2 (continued)

Empirics: descriptions of events/source of information	Initial coding	First-order interpretation of event	Second-order interpretation of event	Change of emergency perception	Practice
The caller screams in despair [and there is a sound of rustling a plastic bag].					
10. Suspected stroke: A slightly distressed elderly woman explains that her husband has been to a dancing class, and after coming home, he slept for two hours. When he woke up, he passed out again. "Did he have a stroke?" she wonders, and the operator become silent. She asks, "Hello are you there?" The operator ask for vitals, such as if he is breathing, and the woman accounts for blood pressure and pulse. The operator asks again about that the man had some physical exercise and then slept, which the woman confirms. The operator again confirms that he is fully awake now and that he looks and talks as usual, and the woman fills in that he had something to eat as well. The operator asks about if the man have had something similar and the woman answers no but that he is hypertensive and has problems with his back (from years ago) but has diminished the dose of medicine that takes care of the pain.	Verbal Figure- Contextual Background	The woman's initial distress makes the operator suspicious that the call might be an emergency despite her somewhat vague initial descriptions. The caller's verbal descriptions then indicate that there is nothing wrong with the man's vitals and then provides irrelevant information about previous conditions, which causes the operator to dismiss the call and then re-assign the call to another operator who makes a clinical decision about what type of help the caller should get.	Incongruent verbal and non-verbal expressions	E-N	Frame-modifying Practice
11. The potential abuser. A young man calls and claims (in a slightly aggressive tone) to have beaten up his partner, but states "it is not too serious" since he claimed to just have pushed her into a concrete wall. The operator hovers on the button to prioritize the call and asks the man to further elaborate. The woman talks in the background, while the man talks with the operator on the phone. Suddenly, the man hangs up. The operator turns to the researcher and says, "she actually did say hang up the phone."	Verbal Figure- Contextual Background	A potentially dangerous situation, yet little non-verbal information confirmed such an instance. When hearing the verbal request from the woman in the background, she decided not to follow-up on the call.	Incongruent expressions.	E-N	Frame-modifying Practice
12. Suspected heart attack: A slightly distressed woman calls, saying she had a call from her daughter who is claiming she is having a heart attack. The operator wonders why the woman is calling and not the daughter. The woman rapidly responds that the daughter does not have anyone else to call. The operator again questions the caller by saying that the daughter could always call the emergency number. The woman pushes back saying the operator could call the daughter himself and rapidly provides the number.	Verbal Figure- Contextual Background	The operator becomes suspicious about how to prioritize the call and questions the caller for additional information. The response of the woman causes the operator to re-consider that the call might actually be an emergency call.	The verbal elaboration on the daughter's condition causes the frame switch of the operator.	E-N-E	Frame-modifying Practice
13. The calm man: An elderly man calls and explains (in a very calm manner) that his wife has pressure-like symptoms across her chest and that it would not pass. He moves on by saying that she seems to be unaffected (sounding surprised). The operator decides to try to talk to the wife instead.	Verbal Figure- Contextual Background	The operator is puzzled by the incongruent expression as the verbal account (symptoms of a heart attack) and the emotional display (calmness and surprise) seem to point in opposite directions.	Incongruent expressions.	E-N-E	Frame-modifying Practice
14. Preventing suicide attempt: First there was incomprehensible speech; then the operator heard that the man was walking (fast paced). The operator was puzzled, but stayed on the line. A train was honking its horn and then there was silence. The operator assumed that the man was hit by the approaching train. Later the operator found out that the man tried to rescue his partner from committing suicide on the railway tracks but accidentally killed himself.	Contextual Figure- Verbal Background	Initially, the operator did not make sense of the call. There was a lack of speech-related cues but a sequence of salient material cues. Sounds of rapid walking, honking of horn, but also silence cued the operator to start thinking about an emergency.	Material cued attention grabber.	E-N-E	Frame-modifying practice
15. A deaf caller: The operator could not make sense of the mumbling and thought about hanging up as he believed the caller was drunk but hesitated and engaged a colleague. The two operators discussed the call and agreed that it could be a person speaking Thai, and they engaged another colleague who spoke Thai. In turn, this operator was able to dismiss the theory that the caller was Thai. Suddenly, the operator realized it was a deaf person, picked up a private mobile phone, and texted the caller.	Contextual Figure- Verbal Background	The operator's first intention to hang up was delayed due to the mumbling. The operators' collectively tried to make sense of the call by probing alternatives such as whether the mumbling could be Thai before realizing that the caller's voice may be an indication of deafness.	Materially cued attention grabber.	E-N-E	Frame-modifying practice

(continued on next page)

Table 2 (continued)

Empirics: descriptions of events/source of information	Initial coding	First-order interpretation of event	Second-order interpretation of event	Change of emergency perception	Practice
16. The role of traffic cues: "If it is a mobile call and you hear sounds of traffic in the background, then you can prepare for a traffic accident. So, the background sound determines to a high degree how severe you think it is."	Contextual Figure- Verbal Background	The operator describes the procedure for taking calls and actively searching for material cues, such as the type of call (mobile) in relation to in-call characteristics, such as traffic noise.	Disruptive material zooming factor.	E-N-E	Frame modifying practice
17. A suicide attempt: A 12-year-old boy was found hanging by a skipping rope from the trellis in the family house. During the emergency call, the grandfather (who found the boy) received CPR instructions, and the operator was puzzled by a suspicious pounding sound. First, it was believed that it was the skipping rope that struck the floor, but it later turned out to be the boy's head bumping on the doorstep due to chest compressions.	Contextual Figure- Verbal Background	The operator was puzzled by the pounding sound in relation to the CPR instructions. By attending to the material cue the operator (sound of head bumping) was able to confirm that CPR instructions were received as intended by the caller.	Disruptive material zooming factor.	E-N-E	Frame modifying practice
18. A pulmonary edema: A caller claims not feeling well. The operator is puzzled by the vague description further investigating the caller by probing questions on breathing and circulation. Suddenly, she comforts the caller saying help is on the way, asking if the caller wants her to stay on the line. After the call, the operator turns to the researcher saying, "Did you hear that?" She plays back the call saying "listen, that wheezing sound when talking is most likely a pulmonary edema".	Contextual Figure- Verbal Background	Initial confusion about vague symptoms. Questions narrow down the issue to breathing related, but it is not until after the call that the operator reveals what cued the inference.	Disruptive material zooming factor.	E-N-E	Frame modifying practice
19. Triggers of operators' decision making: "It is the context ... it's the whole thing ... you listen to what the caller says, how the caller sounds, how it sounds around them If someone says that there is a fire and you hear giggling in the background, then it is not so likely to be severe. If you hear there is fire and people are running around screaming in the background, then perhaps it is more likely to be something."	Contextual Figure- Verbal Background	The operator emphasizes that the sounds of the environment and how the caller sounded increase the probability of an emergency. The operator signals differentiation of emotions as signals.	Mismatch/matching principle.	E-N-E	Frame modifying practice
20. Emotions as information: An operator describes how emotions can disrupt information gathering "The screaming, yelling, and swearing ... They are concentrating more on ... 'SEND THE GOD-DAMN CAR!' ... they must understand that I have to get an idea of what it is about ... how urgent it is and where I am going ... they cannot just scream to send something ... I have to know what to send."	Contextual Figure- Verbal Background	Emotions may inform operators by being interruptive and alter the framing of reference.	Interruptive emotional factor.	E-N	Frame modifying practice
21. Emotions as re-appraisal cues: "Yes, that is ... you have got to try to convince yourself that they are angry because they are afraid ... ehh ... if you are able to convince yourself about this you have won [...] but some callers are impossible to talk to ... they are just barking and screaming ... and it's really hard ... it's really hard."	Contextual Figure- Verbal Background	Some expressions are more desirable than others in order to manage calls. The operator describes re-framing of the situation based on the emotional expression.	Interruptive reframing factor.	E-N-E	Frame modifying Practice
22. Emotions as information: "When callers are aggressive they can have a bad conscience for some reason, for example, that they might be the reason for what has happened. They can also be aggressive when they are afraid, and then it is important to give them the confidence that you are there for them and listen to them."	Contextual Figure- Verbal Background	The operator forms multiple interpretations for a single expression. Re-framing is made based on emotional expression but needs to be carefully investigated.	Emotionally cued options for inferences.	E-E-N	Frame modifying Practice

contrast, cardiac patients may often be calm despite the pain of the ongoing myocardial infarction. People who have prior experience of emergency situations might also seem calm. This applies, for example, to drivers who report a traffic accident. Otherwise, in traffic accidents and fires people are usually more upset. They show clear signs of stress and require help 'here and now.' They get angry with the operator because the operator has to ask questions."

Another operator [Male, Experienced] said that "fear and screaming are normal reactions to an emergency and are easier to

manage than anger and apathy." These differences in expressions matter for the sensemaking process. For instance, expressions of fear were more consistent with a frame of emergency while operators inferred that angry callers were less likely to display critical medical conditions since their speaking indicated they had enough air to scream and therefore their breathing was unlikely to have been affected. Besides emotional expressions, the operators attune to material conditions when assessing emergencies (see the previous quote on how silence can be difficult to assess). Operators also report that when emotional and material cues are expressed simultaneously, it is easier to prioritize help.

Operator (Male, Very Experienced): “Emotional expressions contribute to the overall picture you get of the call. You add up all the sounds of the background and then you can create a picture of the event, and it can be everything from the noise in the background to listening to how the injured person is breathing in order to determine the need for help.”

Operators also reported that they continuously reassess the situation by means of material and emotional cues, such as listening to cues indicating that conditions for the caller have changed.

Operator [Male, Very Experienced]: “Our whole mission is based on being able to look with our ears and be sensitive to small variations in voice, but still we are not able to succeed in every instance If you freeze in these situations then you do not have what the company calls special emergency skills [...]”

While non-verbal information (such as honking cars or expressions of anger) emerged as being crucial for assessment, our analysis also unveiled two specific practices in which these cues were critical to making an assessment. These two practices enable the operators to punctuate the frame, modify it, or even switch to a different understanding.

4.1. Frame-confirming practice

The first of the two practices helps operators to contract the sensemaking frame into a decision as expectations of an emergency are met. Operators described calls that have few material and emotional cues as “obvious cases,” and assessment of these calls is based on the verbal rather than non-verbal information the caller provides [see 1, 2, 3 and 4]. These types of calls might still be urgent in terms of the medical conditions, but they require less sensemaking since there is nothing to disconfirm the information that is provided. Such instances emerge when communication is clear, ordered, and characterized by an efficient exchange between the caller and the operator. The following interaction between a female caller and the operator serves as an example³:

Operator (Female, Very Experienced): 112, what has happened?

Caller: Hi, my name is Linda ... [...] ... I have my mother here and she is like ... she is having a heart attack [rather rapid talk to the point, but little distress] ... she has pressure across her chest.

Operator: Yes ... [Caller interrupts]

Caller ... and it radiates out towards the arm ... and she is really bad and is very pale. [The operator interrupts]

Operator: Yeah, OK ... then we will come out and provide help ... what phone number are you calling from?

Despite the emergency, the call was undramatic and had a clear and ordered exchange between the operator and the caller. Speech, rather than non-verbal cues, was the dominant carrier of information, yet the non-verbal information was not completely missing. In other words, there was a convergence of material, emotional, and verbal cues: the non-verbal cues were background expressions and played the role of confirming the overall understanding of the call produced by the verbal statements. The caller

provided information that enabled the operator to efficiently tick off symptoms in the decision support system by confirming the frame in accordance with the pre-scripted and standardized procedure of emergency call taking.

The frame-confirming practice also occurs in calls when material cues are clear and emotional cues are intensely expressed. These expressions guide operators in swiftly converting sensemaking into priorities. These types of calls are initially characterized by uncertainty and ambiguity with regard to the amount of verbal information available in the call, but the richness of material and emotional cues aid the operators in decreasing uncertainty and eventually resolving ambiguity in order to confirm an emergency. Such calls are typically of a critical nature yet easy to prioritize because the non-verbal cues come across as clear signals that indicate an emergency [5, 6, 7, 8 and 9]. In fact, a call might have a verbal content that does not directly indicate a severe medical emergency, yet when there is a match between material and emotional cues, the operators often override the verbal statements and give primacy to the non-verbal content. Such a case is evident in the vignette below:

A hysterical sounding woman calls the emergency center and screams, “It is sinking ... oooh, my mother!” Puzzled, the operator asked probing questions about the mother, what was sinking, and where the caller was calling from. In a follow-up interview, the operator declared, “It took me a while to realize that it was a car that was sinking; one could hear how the water was bubbling around her.” The operator changed voice [illustrating the hysterical woman] and returned to describing the interaction with the caller again. “I am in the car and it is sinking! Ooh, my mother!” The operator goes on to explain that she began to ask about the mother’s car ... “I was thinking what is it about your Mum’s car?” [Illustrates the woman again] “It is sinking!” ... The operator grasped the nature of the emergency and was able to locate the individual by tracking her mobile phone signal.

Initially the operator hesitated typing the call as the verbal information was inconclusive. However, the emotional expressions provided by the caller (hysterical screaming) raised the operator’s awareness that the call might be an actual emergency, and when complemented with material cues such as the bubbling sound of the water entering the car, the pieces fell into place confirming the perception of an emergency. Thus, the sensemaking processes of the two instances above refer to when speech is present, but the non-verbal cues are either in the background (first example) or become the figure (second example). More complicated, however, are the two remaining instances of sensemaking, those in which speech might be present, but one of the non-verbal cues dominates the other. Such dominance can be confusing for the operators and requires a more critical approach to processing the available information.

4.2. Frame-modifying practice

In this practice, the frame of an emergency is not met initially, the non-verbal cues are present, but do not contribute to confirm an emergency [10–13]. Instead, the non-verbal cues point to a mismatch between verbal and non-verbal expressions. Such an instance is described in the interaction between the operator and the caller in the vignette below:

Operator (Male, moderate experience): 112, what has happened?

³ The number in brackets corresponds to the event number in Table 2.

Caller: Yes, hello, my name is Albert Johnsen and I live in Luckville. [An extremely slow onset of speech that develops into a very calm voice]

Operator: Hi ...

Caller: I have my wife, who is 71 ... and for an hour and a half she has had a pressure-like feeling across her chest ... and it does not pass ... she says [his mode of talking is very slow and calm]

Operator: Well ...

Caller: [Interrupts the operator] She seems to be unaffected [still calm, but then comes across as surprised] ... and I have put on some tea right now ... she seems unaffected, but it does not pass, she says.

Operator: Well ... How [sounds surprised ... raises his eyebrows and his pace of speaking] ... Do you think that I would be able to talk to her instead?

Caller: Yes, hold on for a minute [puts down the phone ... walks slowly to get his wife]

The woman who came on the phone and introduced herself explained that she had pressure across the chest and to have affected breathing, which caused the operator to send an ambulance. It is worth noting that the husband provided inconclusive verbal information, sounding calm at the same time as he was saying that his wife had pressure-like symptoms across the chest, which is a verbal cue that according to the decision support system indicates an emergency. The husband, however, seems unaffected, maintaining a calm but surprised tone of voice and then slowly walked off to get his wife. Clearly, the operator is uncertain about the verbal information at first as the emotional expression is incongruent with the verbal statements, yet he let the verbal description be the dominant input that determines the request for more information by the wife who further explained her condition.

In the second type of call, expectations of emergencies are not met as there is a mismatch between verbal and non-verbal cues [14–22]. In turn, the non-verbal cues that are provided are either dominated by the material [14–19] or emotional cues [20–22], and these cues help the operator to re-frame the situation into a decision. Focusing on sounds that are not emotional expressions can lead operators to infer emergencies, but they can also lead them to disregard emergency calls as they become more careful or even hesitant about how to prioritize the call when there is a mismatch of cues. For instance, the honking of a train's horn [14] or the sounds of cars in the background [16] aid in triggering a new understanding of the situation. However, a lack of emotional expressions in callers puzzles operators and initiates probing questions to elicit more details from them [14 and 15]. An example of the frame-modifying practice is when an operator received a call from someone who was mumbling, as described in the vignette below.

The operator was puzzled and rolled his eyes when not able to make sense of the caller's speech. He listened carefully and asked probing questions regarding the caller's concerns and location. In response, he heard scarcely audible mumbling. Procedure dictates that the operator should terminate the call, but before pressing the button, he consulted a colleague. The two operators co-listened to the mumbling caller, muted the line, and discussed the call. They hypothesized that it might be a person speaking Thai and thus engaged another colleague whose wife was Thai and therefore knew a few words. This operator was able to dismiss the hypothesis that the caller was

Thai. The mumbling kept going in response to questions, but it was still incomprehensible. Suddenly, the operator realized it was a deaf person and using a private mobile phone texted the caller.

The operator was clearly puzzled by the call as he summoned colleagues for second opinions. The lack of verbal information and discrepancy between material conditions and emotional expressions caused the operator to hesitate and prompted additional questions in order to make sense of the call and decide whether it was an emergency or not. However, the caller's responses did not provide the operator with sufficient information. It was the indecipherable sounds that eventually caused the operator to weigh the material cues more heavily and modify the frame. Another example of the primacy of material cues is when giggling is interpreted as a cue that invokes frame modifying and moves the situation from a perceived emergency to a non-emergency frame [19].

When the conditions are reversed and emotional expressions dominate calls, [20–22] it may not help the operator because emotional expressions do not necessarily reflect circumstances objectively. However, in contrast to the example of the elderly man described earlier, emotionally dominant expressions can help in assessing the calls by providing a contrast that allows verbal statements to be dismissed. Expressions of sadness are typically disregarded as cues for aiding operators in making assessments of non-emergencies:

Operator (Female, Very Experienced): "We must be professional. They do not get helped if they cry in the call and we also cry. But we have to, we need to, we understand that they are sad, but we must pull together and do our best until the ambulance arrives."

As previously mentioned, anger downplays provision of help by cueing inferences that emotional callers may not have a serious medical problem. However, these emotional cues also assist operators in providing help since emotional expressions cue revision of the situation. One experienced operator expressed this:

Operator (Female, Very Experienced): "Yes, that is ... you have to try to convince yourself that they are angry because they are afraid ... ehh ... if you are able to convince yourself about this you have won [...] but some callers are impossible to talk to ... they are just barking and screaming ... and it's really hard ... it's really hard ..."

5. Discussion

In this article, we have investigated how emergency operators make sense of calls in a sensory deprived setting. Following a recent trend in embodied sensemaking literature (cf. Cornelissen et al., 2014; Whiteman & Cooper, 2011), we find that operators consciously and purposively seek out non-verbal cues to facilitate sensemaking. Our findings reveal that embodied sensemaking is not necessarily a matter of one's own emotions or a result of being physically present in the space in which the events unfold. In the absence of their own sensations of the caller's environment, other than sound, the operators interpreted the material and emotional properties of the situation and made inferences about it. We thus conclude that embodied sensemaking resides in the mis/matching of audio-based emotional and material cues juxtaposed to verbal descriptions and expectations in emergency calls. A key finding is that the configuration of cues also dominate spoken words and allow operators to establish the frame, modify, or even switch frame to prioritize the call. We suggest, in contrast to current theorizing, that such a process require a re-combining on the part of the sensemaker and that non-verbal cues contextualize

discursive elements of the sensemaking process.

The re-combining—associating cues with a particular site—is the process by which frame-confirming and frame-modifying practices occur. Initial understanding hinges on the material and emotional conditions that are present in the call. When the cues match the verbal content and confirm the expectation of an emergency, it enables fast decisions to be made [see 1–4 in Table 2]. These calls are mainly driven by speech. They are considered to be easy to manage and covered in the prescribed routines of work. Operators also match non-verbal cues with the verbal content but allow the non-verbal cues to be the basis for prioritization [see 5–9 in Table 2]. Typically, material cues such as breathing problems [5, 8] and expressions of fear [5–9] cue the confirmation of an emergency.

The reduction in non-verbal cues where there is a verbal dominance causes operators to commit to a lengthy and tedious procedure [10–13] to modify their frame. When non-verbal cues, such as laughter in the background, the sound of wheezing when breathing, mumbling by a person believed to be speaking Thai, or a pounding sound in a CPR situation, dominate calls, operators are prompted to consider that their frame might be inadequate for understanding the situation [see 14–19 in Table 2].

Similarly, when expression of emotion becomes the dominant input in a call, it aids in re-framing the situation from an emergency into a non-emergency or vice versa [see 20–22 in Table 2]. The role of emotional expression is key as expressions of anger, fear, and sadness require different management strategies. For instance, while expressions of fear typically aid in confirming emergencies, sadness seems to be a cue that operators try to disregard. By contrast and in line with the previous emergency literature (cf. [Imbens-Bailey & McCabe, 2000](#); [Tracy & Tracy, 1998](#)), anger in emergency calls compromises understanding and results in a switch of a potential emergency into a non-emergency (see example in the introduction and in the findings regarding how operators overlook medical symptoms when displaying anger). On other occasions, however, when anger dominates calls, it causes operators to re-frame, creating a new understanding of the situation resulting from re-interpreting expressions of anger as fear [21]. Thus, the type of cue that initially dominates the call sets off interpretations and search patterns to modify the frame (for example, reframing the caller's emotional status) into a shift in understanding of the situation.

We suggest that re-framing the situation, whether materially or emotionally, and modifying or switching from one frame to another are practices that assist operators to help even the most difficult callers. Consequently, this means that the re-framing is not only a matter of moving from a non-emergency to an emergency (or vice versa) but also a matter of establishing an initial frame in cases of when there is an overall poor understanding of the situation. The idea of re-combining could be illustrated by the example given when the background sound of cars allowed the operator to make assumptions about the nature of a car accident [13]. In this respect, the re-combination puts the operators in the site (the mental and physical representation) of the caller and allows them to make inferences through someone else for the benefit of their own sensemaking in the absence of the sensations associated with a physical presence in the context (see [Schatzki, 2010](#)). Such practices also motivate activities by the operators and provide a structure in which sensemaking can be contracted in a systematic manner based on explicit cues, while at the same time being open to subjective interpretations that are seeking for confirmation. The sensemaking activities that cause oscillation between the two practices in this single-means sensory channel are thus crucial in responding to emergencies.

5.1. Sensemaking in a sensory deprived setting

The findings in this article unveil three related theoretical contributions: two for sensemaking and one for embodied sensemaking. The general contribution is related to the process of making sense of violated expectations ([Maitlis & Christianson, 2014](#), p. 67) and helps fill the gaps in understanding of triggers and underpinnings, influences, and outcomes of sensemaking ([Sandberg & Tsoukas, 2015](#)). The implication is that non-verbal cues, although varying in degree, are not passively bracketed from the environment but rather are consciously and purposively perceived and acted upon. This contrasts and extends research on sensemaking that has had a primarily cognitive, discursive, and/or text focus ([Maitlis & Christianson, 2014](#)) and build on later contributions related to how emotions and materiality influence the sensemaking process (e.g., [Ben-Shalon et al., 2012](#); [Cornelissen et al., 2014](#); [Maitlis & Sonenshein, 2010](#); [Whiteman & Cooper, 2011](#)). In contrast to earlier contributions, we suggest that the embodied process is not a result of one's own emotions and their interaction with the material conditions but a re-interpretation of non-verbal inputs into an imagined situation. If the imagined situation corresponds to the verbal cues, the embodied sensemaking process confirms expectations. On the other hand, if the imagined situation does *not* correspond to the verbal utterances, embodied sensemaking demands frame-modifying practices that expand rather than contract the process until the conditions are accurately comprehended. This suggests that there is more to embodied sensemaking than has previously been considered since it is not necessarily about the sensations that are self-experienced (such as being angry) but rather how they are put into action through a filter of previous experiences, active sensory searching, and frame-attribution into a tentative picture of the situation. Hence, our findings confirm the need for a nuanced treatment of how sensory cues, such as expressions of anger, fear, sadness, as well as sounds from the surroundings, such as honking cars, are interpreted.

This could also be compared with [Weick \(1993\)](#) and how the firefighters failed to re-evaluate the situation, presumably not only because they were experiencing fear but also because they failed to broadcast it to others. [Whiteman and Cooper \(2011\)](#) discussion on the role of topography in the same situation is also relevant. Thus, the second theoretical contribution of this paper concerns the finding that perceptions of audio-based non-verbal information profoundly shapes the meaning of the situation and sometimes are crucial for determining a state in the world. Thus, it makes an important contribution to further developing sensemaking research by focusing on how emotions and expressions of materiality jointly provide lenses for understanding.

The third specific implication extends the few studies that have investigated embodied sensemaking from the perspective of a plethora of sensory cues available (e.g., [Cornelissen et al., 2014](#); [Cunliffe & Coupland, 2012](#); [Whiteman & Cooper, 2011](#)). The richness of cues in these studies contributes to in situ personal visceral and/or emotional interpretations. By contrast, in a sensory reduced setting, the embodied sensemaking has to proceed through the use of auditory non-verbal cues. The first contribution to this end is that sensory cues are always present, even when the verbal cues are apparent. When the verbal cues are straightforward, the non-verbal cues are put into the background. However, if the verbal cues are not able to completely fill the meaning of the situation, we find that the non-verbal cues tend to become dominant and trigger additional sensemaking practices, such as asking clarifying questions of the caller, or even involving other operators. The common view of how sensemaking is triggered is that it is influential only when there are ambiguities and uncertainties. Our findings, however, would suggest that the context of the sensemaking is always

present. This insight further complements Whiteman and Cooper (2011) point about the abilities of Inuit hunters to read the context and unconsciously act in accordance with them. Moreover, it extends the Cornelissen et al. (2014) study by unveiling conditions for both how confirmation (contraction) and a modification or a shift in understanding occurs.

5.2. Practical implications

Evidently, operators may spuriously confirm the presence of material and emotional cues that accidentally lead them into a decision with fatal consequences, as happened with the police officers in the study by Cornelissen et al. (2014). However, the risk of confirmation bias is countered by the parallel search for dominant cues (frame-modifying practice). Thus, encouraging operators to listen for emotional expressions and material cues is important in order for the organization to fulfill its mission of providing high quality and equal care to all callers. Even though the standardized procedure of following interview templates grants callers equal attention, such interviewing is a time-consuming activity in a time-critical situation. Therefore, being skilled in decoding emotional expressions and material references is likely to increase efficiency in a high-pressure environment because operators will be able to frame and reach decisions faster than when they rely on purely reason-based skills or pre-scripted procedures.

However, whether the sensemaking efforts result in accurate prioritizations is still difficult to evaluate since feedback on outcomes of emergency calls is rarely provided. As sensemaking mainly is conceptualized as a retrospective activity, it regards processes where conclusions are drawn about the current situation as based on one's previous experience of similar events. In order to have a true representation of reality on which one can reflect and (mis)match current instances, functional relationships between outcomes and sensemaking efforts need to be established. In other words, operators need to know if their priorities match decisions made by the emergency physician in, for instance, the emergency department. The problem for operators is that they receive little feedback on the accuracy of their decisions. Consequently, it becomes difficult to develop accurate decision-making based on such sensemaking.

Yet, the large base-rates and recording of calls open avenues that facilitate learning in a two-fold manner. First, since all calls are recorded and saved for up to 90 days, operators are able to play back and share calls that are considered to be routine, puzzling, or particularly deviant, providing an opportunity for collective sensemaking among operators. The two outlined practices in this study may be helpful in identifying calls that are aligned with current routines but also in finding calls that are examples of deviation from routines, as well as examples of successful management. Second, when sets of calls are identified, they could more carefully be analyzed with the purpose of finding functional relationships among cues and symptoms. The large base-rates of calls then further help establish these patterns as it is possible to receive structured feedback on outcomes of the patterns on a large number of calls.

5.3. Limitations and future research

Our data collection methods admittedly lack the granularity of conversational analysis that hitherto has characterized empirical studies in the field of emergency operators (cf. Whalen & Zimmerman, 1998). However, what is lost in precision is gained in breadth. Both approaches to sensemaking are well accepted in the literature, and by using multiple sources, we are able to tap into broad sensemaking processes that go beyond what is articulated

during conversations and by extension discourse analysis. Through our research design and data collection, we thus complement the dominant approach to the empirical field and tap into the emotional and material labor of emergency operators—a matter that turned out to be pertinent for understanding sensemaking as a process (cf. Fele, 2012; Greatbatch et al., 2005; Sandberg & Tsoukas, 2015). Our methods offer a way of comparing the same situation from different vantage points and thereby also provide an in-depth understanding of the creation of meaning that underpins the sensemaking practice of emergency operators. Cross-comparisons between data sources allowed us to develop an understanding of the embodied sensemaking procedure based on how our research subjects reasoned and acted. Moreover, using real-time data and retrospective accounts reduces the risk of relying on historical circumstances—which are the default in previous second-order sensemaking studies (Clegg et al., 2015; Corneliessen et al., 201)—and facing the risk of being neither remembered nor recorded correctly.

One could have concerns about how generalizable the findings are beyond the particular setting of emergency operators. Future research should therefore focus on extending our findings into other settings. This should first be where the sensemaking is restricted in sensory-deprived environments under high-pressure situations, such as in military operations; among divers, firefighters, and mountaineers; or by air traffic controllers who mainly rely on a dominant type of cue.

6. Conclusions

In this article, we investigated the role of non-verbal auditory cues in sensemaking while taking emergency calls. Operators consciously and intentionally attend to non-verbal cues, and we outline two practices (frame-confirming and frame-modifying practices), which in turn are underpinned by four processes that facilitate sensemaking. The oscillation between the confirmation and modifying practice helps explain how operators switch and punctuate decision frames and how this may help in even the most difficult cases.

The major contribution is how non-verbal cues affect the sensemaking process. Emotional expressions and material cues are not passively extracted/bracketed from the environment but contextualize discursive elements. The latter finding makes an important theoretical contribution to sensemaking research, which has hitherto been of a predominantly text-based, cognitive, and discursive nature, rarely taking into account expressed (as opposed to experienced) emotions and material aspects of a setting simultaneously (Cornelissen et al., 2014; Sandberg & Tsoukas, 2015). Moreover, the approach allowed us to capture the relation between how operators think and act in accordance with organizationally prescribed routines—a matter that favors the view that operators develop tacit knowledge. The fact that the setting is characterized by difficulties in obtaining feedback about the accuracy of assessments in turn creates unnecessary obstacles to viable organizational learning and the development of expertise. Taken together, these circumstances exacerbate the difficulties in providing high-quality and equal care.

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