Speaking up for patient safety: individual and team-related antecedents of voice in healthcare teams

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SPEAKING UP FOR PATIENT SAFETY: INDIVIDUAL AND TEAM-RELATED ANTECEDENTS OF VOICE IN HEALTHCARE TEAMS

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For my mother.

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Abstract

Whenever employees feel that they have potentially valuable information to share within their organization, their team or with their supervisor, they have two choices: they can either remain silent or speak up (i.e., also called voice behavior). In healthcare, speaking up with concerns about a medical procedure, providing suggestions for alternative treatment or simply questioning a current diagnosis can sometimes even make the difference between life and death. Yet, studies found that people are highly reluctant to speak up as they fear negative sanctions from those in positions of authority. Although a large body of research has been devoted to better understand factors leading to voice within organizations, there is only little knowledge about the specific antecedents of voice in healthcare teams. Thus, this cumulative doctoral thesis aims at identifying factors that facilitate speaking up in healthcare teams. Drawing from literatures in the area of organizational psychology, social psychology and healthcare, I developed and tested an integrative theoretical model that combined both individual and team-related antecedents of voice.

Collaborating within an interdisciplinary research team and using high-fidelity medical simulations, I completed three empirical papers involving five simulation studies and a total of 235 healthcare professionals. The results revealed that (1) agentic self-concept traits (i.e., assertiveness, independence, persistence) were a positive and communal self-concept traits (i.e., kindness, helpfulness, were a negative predictor of speaking up in two-person anesthesia teams; (2) within larger team settings, leader communication (use of the word "we") had a positive impact on residents' speaking up intentions—nurses only benefitted from such inclusive communication when they perceived close intergroup relations with physicians; (3) an inter-professional speaking up intervention had a positive effect on nurses' but not on residents' speaking up behavior. On the basis of these findings, I discuss theoretical and practical implications for team processes in healthcare and other professionally diverse teams and provide future research directions for the study of voice in teams and its implications for organizational learning.

Zusammenfassung

Die vorliegende kumulative Dissertation untersucht das Phänomen „Speaking up“ oder „Voice“, das heisst das konstruktive Äussern von Ideen, alternativen Vorschlägen oder Kritik, in medizinischen Teams. In der Medizin kann Speaking up nicht nur die Teamleistung verbessern, sondern in manchen Fällen sogar lebensrettend sein. Im Fokus bisheriger Studien stand vorwiegend die Beschreibung der wahrgenommenen Barrieren für Speaking up und weniger eine konkrete Systematisierung der Faktoren, die Speaking up in medizinischen Teams begünstigen können.

Ziel dieser Dissertation ist die Überprüfung eines theoretischen Modells, welches sowohl individuelle (z.B. Selbstkonzept) als auch teambezogene (z.B. Führungsstil, Intergruppenbeziehungen) Prädiktoren von Voice postuliert. Die empirische Basis dieser Dissertation bilden fünf Studien, an denen 235 Ärzte/innen und Pflegefachpersonen teilnahmen. Hierfür wurden komplexe medizinische Notfälle simuliert, in welchen Speaking up notwendig war. In insgesamt drei wissenschaftlichen Artikeln konnte gezeigt werden, dass: (1) in dyadischen Anästhesieteams agentische Facetten des Selbstkonzepts (z.B. Durchsetzungsfähigkeit, Unabhängigkeit) Speaking up positiv und kommunale Eigenschaften (z.B. Hilfsbereitschaft, Sensibilität) Speaking up negativ vorhersagen; (2) in grösseren notfallmedizinischen Teamsettings ein inkludierender Führungsstil (die Verwendung des Wortes „wir“ durch den leitenden Arzt/die leitende Ärztin) Einstellungen zu Speaking up verbessern kann—für Pflegende aber nur dann, wenn sie positive Intergruppenbeziehungen zu Ärzten/innen wahrnehmen; (3) eine Speaking up Intervention, die im Rahmen eines multi-professionellen Teamsettings evaluiert wurde, erzielte nur bei Pflegenden nicht jedoch bei Assistenzärzten/innen einen positiven Effekt auf Speaking up.

Basierend auf diesen Befunden diskutiere ich theoretische und praktische Implikationen für Teamprozesse und Trainings in der Medizin. Darüberhinaus werden weitere Implikationen für andere Teamkontexte und organisationales Lernen abgeleitet und Anknüpfungspunkte für zukünftige Forschungsarbeiten dargelegt.

Introduction and Overview

What do the Space Shuttle Challenger disaster, General Motors producing faulty ignition switches for almost a decade, or wrong-side amputations have in common? Someone did not speak up. To speak up with novel ideas and potential concerns has always been a fundamental driver of organizational success (Argyris & Schön, 1978; Hirschman, 1970; Morrison & Milliken, 2000). An innovative product, a successful marketing strategy, a safe flight or a safe surgery all depend on people communicating with each other and voicing questions, suggestions and concerns to come to an informed decision. And yet, across all industries and in various contexts people often remain silent even when they know that their input could be highly valuable to solve problems, to increase team effectiveness, and to avoid errors (e.g., Bienefeld & Grote, 2012; Kolbe et al., 2012; Milliken, Morrison, & Hewlin, 2003; Morrison & Milliken, 2000; Weiss et al., 2014). In healthcare, numerous mishaps and tragic adverse events could have been avoided if someone had spoken up (Bromiley, 2008; Cooper, Newbower, Long, & McPeek, 1978; Institute of Medicine, 2000). But the strongly enforced hierarchy prevalent in the medical profession seems to keep people from speaking up as they fear negative sanctions from those in positions of authority (Kobayashi et al., 2006; Milliken et al., 2003; Minehart et al., 2012; Morrison & Rothman, 2009; Morrison, Wheeler-Smith, & Kamdar, 2011). It is therefore crucial to understand when and why people are willing and able to speak up for patient safety.

This dissertation sets out to investigate the specific antecedents of speaking up—also called voice—in healthcare teams. To this point, there is only scant evidence as to what kind of individual and team-related factors enhance individuals' ability to speak up in such a high-risk context. Combining Morrison's (2011) model of employee voice with an action team perspective (Kozlowski & Bell, 2001; Salas, Wilson, Murphy, King, & Salisbury, 2008; Sundstrom, de Meuse, & Futrell, 1990), I looked at individual- and team-level predictors and evaluated the effectiveness of a speaking up training intervention. Adopting a multi-method, multi-level approach and using high-fidelity medical simulations with healthcare professionals from various hierarchical levels, I sought to address questions such as: What are individual factors that promote or inhibit voice in healthcare teams? To what extent can the team leader increase team members' ability to voice concerns? How do intergroup

relations between nurses and physicians influence team members' willingness to speak up? And finally, what kind of training intervention is useful to facilitate nurses' and physicians' speaking up behavior alike? By answering these questions, the results of this dissertation contribute to the literature on speaking up, leadership and intergroup relations in teams. Thereby, the findings inform research and practice by providing new directions for team trainings and learning in healthcare and beyond.

This thesis is organized in five parts. Part One provides the theoretical background of the present research by answering questions such as: What is speaking up and what are related concepts? Why is speaking up crucial for organizational learning and effectiveness? What are the most prevalent barriers of speaking up in general and in healthcare teams specifically? Part Two summarizes the methodological approach (i.e., medical simulations), including the research designs and analytical strategies used in all three papers. In Part Three, I provide a summary of all three First-author papers and manuscripts that have been published to date or are currently under review. In Part Four, I summarize and discuss the main findings and provide an outlook for future research. Part Five contains all three scientific papers in the sequence of their publication status.

// PART ONE

Theoretical Background

If you are aware of a potential problem affecting safety or quality and you don't speak up, you're part of the problem.

Mary Barra, CEO of General Motors

Theoretical Background

In this paragraph, I provide a review on research that has looked at voice or speaking up in organizational settings. This review encompasses major findings from work and organizational psychology with a focus on speaking up in healthcare teams. I start with a short overview of the key terms and definitions within the voice literature, before summarizing barriers and enablers of voice in general. Finally, I will turn to the current aims of this dissertation and the addressed research goals: identifying individual and team-related antecedents of voice in healthcare action teams.

Terms and Definitions

The terms *voice* and *speaking up* are generally used interchangeably and have been defined as "discretionary communication of ideas, suggestions, concerns, or opinions about work-related issues with the intent to improve organizational or unit functioning" (Morrison, 2011, p. 375). Throughout this thesis, I also use voice and speaking up interchangeably and thereby refer to any form of communication that challenges the status quo and is directed at higher or lower status colleagues. It is, however, important to note that speaking up is not just any form of speaking but rather involves a constructive input that provides an opportunity for revising or improving a current practice, or for ending a potentially harmful course of action (Tangirala & Ramanujam, 2008).

Although this link is not frequently established in the organizational behavior literature, several works in the area of social psychology and especially those that have emerged post World War II can be seen as origins of the concept of voice. In the aftermath of the Nazi Germany, researchers began to question how such destructive collective obedience could evolve. The concept of the authoritarian personality (Adorno, Frenckel-Brunswick, Levinson, & Sanford, 1950), reflections on power and disobedience (Fromm, 1963/1981) but also experimental social-psychological paradigms investigating conformity pressures in groups (Asch, 1956), and destructive obedience to authorities (Milgram, 1963), all tapped the question as to why people do not speak up even when they are aware of the negative consequences of their silence.

One of first scholars who introduced the concept of voice to organizational and economic contexts was Albert Hirschman (1970). He investigated how customers and organizational members react to organizational practices and shaped the notions of *voice*, *exit* and *loyalty* as three response options. Hirschman (1970) defined voice as "…any attempt at all to change, rather than to escape from an objectionable state of affairs, whether through individual or collective petition to the manager directly in charge, through appeal to a higher authority with the intention of forcing a change in management…" (p. 30). Highlighting the fact that people might challenge managerial practice was a rather innovative approach at that time as the widespread assumption by economists was that people would be "either dumbly faithful or outright traitorous" (Hirschman, 1970, p. 31).

Conceptually, voice is related to employee proactivity (e.g., Grant & Ashford, 2008), issue-selling (Ashford, Rothbard, Piderit, & Dutton, 2014), whistle-blowing (Miceli, 2004), challenging/promotive extra-role behavior (Van Dyne, Cummings, & McLean Parks, 1995) or a form of organizational citizenship behavior (Organ, Podsakoff, & MacKenzie, 2006). Distinctions have been made between different forms of voice, such as promotive and prohibitive voice: while the former involves proactive suggestions for improvement the ladder involves speaking up with problems or advising others against a certain behavior (Liang, Farh, & Farh, 2012). Similarly, Morrison (2011) distinguishes between speaking up with ideas, suggestions, concerns, or opinions. Differentiating between different forms of voice is important especially when considering the voice target. Not surprisingly, supervisors react more favorably towards more promotive and constructive forms of employee voice while prohibitive voice can impair performance ratings (Detert & Burris, 2007).

Although the term *silence* has been used to refer to the absence of voice, some scholars stress that voice and silence are not exact counterparts. Whereas voice involves a conscious act of speaking up with one's opinion, they argue, this is not necessarily true for silence. People can be silent without having anything to share that could potentially be relevant for a work-related issue or their silence can be an unconscious, habituated withdrawal reaction or simply resignation (Kish-Gephart, Detert, Treviño, & Edmondson, 2009). In the present research context, I use the term silence to refer to the absence of voice in a situation that necessitates speaking up.

Why is Employee Voice Important?

The variety of terms and contexts in which voice has been investigated underlines its relevance for individuals, teams, and organizations. On the individual level, it has been found that people can gain control by actively contributing and shaping their work context (Parker, 1993). Employees who express their opinions are also likely to hold more positive job attitudes (Morrison & Milliken, 2000). Notably, it has also been found that remaining silent when one feels mistreated can result in lowered psychological and physical well-being (Cortina & Magley, 2003). Apart from these crucial individual-level effects, organizations are also affected by employee voice. When employees speak up with suggestions and new ideas this might lead to a change in effective organizational routines, contribute to better decision-making, and trigger innovation (De Dreu & West, 2001; Edmondson, Bohmer, & Pisano, 2001; Wyld, 2010). Morrison and Milliken (2000) have pointed out that organizations can benefit from employee voice and make better decisions. Notably, not all voice may be equally useful or constructive and not all voice is motivated by helping the organization and improving work outcomes (e.g., Van Dyne, Ang, & Botero, 2003). Still, gaining more information about employees' views and their specific problems can enhance managerial decisions as those at the top are unlikely to possess all information they need about work processes and problems (Detert & Burris, 2007). Thus, voice can be seen as an essential premise of organizational learning (Argyris & Schön, 1978).

From a teamwork point of view, voice is even more important as it can help to avoid common traps related to group-based decision-making. Classic social psychological paradigms such as conformity effects (Asch, 1956), hidden profiles (Stasser & Titus, 1985), or escalation of commitment (Staw, 1997) suggest that individuals often withhold personal input in group contexts and are strongly influenced by the majority opinion, leading to biased judgments and even to catastrophic outcomes. Therefore, speaking up and openly sharing one's views, knowledge and ideas lies at the very heart of effective teamwork. Especially within highly dynamic team contexts in which decisions have to be made quickly and yet require high reliability, speaking up can make the difference between a well-informed group-based decision and catastrophic outcomes.

Voice in Healthcare Teams

One context in which speaking up is especially important is healthcare. When patients are delivered to an emergency room, scheduled for a surgery or just admitted for a routine screening, various healthcare providers "team up" to provide the necessary care (Edmondson, 2012). Healthcare teams can be classified as *action teams* as they consist of multiple highly skilled specialists who come together for brief performance cycles that require improvisation in unpredictable environments (Sundstrom, Meuse, & Futrell, 1990). Surgical teams, cockpit crews, military teams or fire fighter teams are examples of action teams in which performance is safety-critical at all times. That is, any misunderstanding and any poor decision might cause disastrous consequences. The fact that their work cannot be revised or accomplished at a later point in time differentiates action teams from other types of teams. Project teams, for example, can revise a piece of work when they feel that it should be improved, a surgical team, a military unit or a fire fighter team does not have this opportunity (Ishak & Ballard, 2012). Adding to this safety-critical task work, action teams are temporally unstable and thus have almost no possibilities for team building, reflection or learning (cf. Vashdi, Bamberger, & Erez, 2013).

Acute care teams (ACTs) are a specific form of an (extreme) action team that consists of surgeons, anesthesiologists, nurses, and potentially other clinicians (cf. Klein, Ziegert, Knight, & Xiao, 2006). From a teamwork point of view, ACTs face complex coordination and communication requirements (e.g., Dieckmann et al., 2007; Kolbe, Burtscher, & Manser, 2013). They are formed ad-hoc when intra-hospital emergencies occur and have to deal with complex and dynamic problems such as a sudden cardiac arrest during surgery, an allergic reaction to drug or a complex trauma. Even though some team members may not even be acquainted to one another or might just have graduated from nursing or medical school, they instantly have to function as one team and provide reliable patient care even in crises situations. For instance, a patient may develop a pneumothorax (i.e., air escaping from lung, leading to tension and causing impairment of breathing) during a surgery. The anesthesia team—usually consisting of a nurse and a physician—is responsible for monitoring the patient's circulation and has to notify the surgeon when key vital parameters such as pulse or oxygen saturation change significantly. The surgical team and the anesthesia team will then team up as an acute care team to deal with the emergency. In such a dynamic team context, speaking up—particularly across

professional and status boundaries—can be challenging (Minehart et al., 2012; Zwarenstein & Reeves, 2002)

A very tragic example of when speaking up could have made the difference between life and death is the case of Elaine Bromiley (Bromiley, 2008). Admitted for a routine procedure (i.e., sinus surgery), 37-year old Elaine Bromiley was prepared for a general anesthesia. However, after applying the muscle relaxant the anesthesia team failed to intubate the patient for more than half an hour. Several senior anesthesiologists were present and tried to intubate the patient with a tube but none of them considered the opportunity of performing a coniotomy (i.e., emergency incision through skin). A nurse implicitly suggested the procedure by assembling the tools necessary for the coniotomy—yet, she did not speak up to the senior anesthesiologist and thus her suggestion remained ignored. Although an airway was established after more than 30 minutes, Elaine Bromiley suffered from severe oxygen deficiency and died 13 days after the failed intubation.

Barriers of Voice in Healthcare Teams

Although it seemed so necessary why did the nurse not speak up with her suggestion to perform a coniotomy? Presumably, because she was afraid to speak up to the senior anesthesiologists. Research has focused on the factors that promote or inhibit voice with hierarchy and asymmetric power relations being suggested as one the most important barriers in various organizational and team settings (e.g., Islam & Zyphur, 2005; Kish-Gephart, Detert, Treviño, & Edmondson, 2009; Milliken, 2003; Morrison & Milliken, 2000). In most team- and organizational contexts power is distributed according to a status hierarchy that defines a certain rank order between individuals in groups (e.g., Magee & Galinsky, 2008). In healthcare teams, high professional status, high social status and high power are conjoined in physicians and surgeons (Bartunek, 2011; Burford, 2012; Calhoun et al. 2013; Campbell-Heider & Pollock, 1987; Cott, 1997; Minehart et al., 2012; Zwarenstein & Reeves, 2002). As a consequence, lower status team members such as nurses and residents, fear to be punished by higher-status physicians when raising their voice against them or when simply pointing out other solutions that might undermine their authority (Kish-Gepart et al., 2009). As Morrison (2011, p. 377) puts it: "Implicit in the definition of voice is the idea that this behavior often entails risk, since offering even a seemingly constructive suggestion implies a challenge to the status quo". As hierarchy is so

pervasive in the medical profession people may perceive more risks than benefits of speaking up (Calhoun, Boone, Miller, & Pian-Smith, 2013; Zwarenstein & Reeves, 2002).

In a cross-cultural study, Kobayashi and colleagues (2006) presented residents with a vignette in which a surgeon made a wrong judgment. More than 70% indicated that they would not speak up to the surgeon because they feared negative repercussions. There is, however, evidence showing that some people do find the courage to speak up against all odds. Specifically, a simulation study with anesthesia nurses and residents in which the necessity for speaking up was manipulated showed that nurses even spoke up more than residents (Kolbe et al., 2012). This counterintuitive finding prompted my interest in better understanding when and why people in healthcare teams speak up.

Aims and Research Gaps Addressed

The overall aim of this cumulative doctoral dissertation is to identify antecedents of speaking up in healthcare teams. To this end, I adopted a multi-level and multi-method approach, by taking into account individual and team-related factors and studying actual speaking up behavior in healthcare teams using high-fidelity medical simulations. With the derived findings, I aim to contribute to a better understanding of voice in (action) teams, to further the study of leadership and intergroup relations in diverse teams, and to provide theoretical and practical implications for team performance, training, and learning.

My theoretical approach (see Figure 1) is based on Morrison's (2011) model of employee voice. The original model conceptualizes voice as a deliberate decision-making process in which people weigh expectancies and values of speaking up before they speak up (cf. Vroom, 1964). I did not look at perceived expectancies and values of speaking up but investigated whether or not people speak up in a situation that requires voice (i.e., speaking up necessity). In all three papers, this was operationalized with a simulated medical problem that necessitates speaking up. With Paper 1, 2, and 3, I cover three moderating factors that may impact this decision: individual, team-related, and contextual (i.e., intervention) factors.

In Paper 1, I looked at how agency and communion as two fundamental self-concept dimensions may affect individuals' ability to speak up in two-person acute care teams. In Paper 2, I adopted a group-level and social identity perspective and looked at the interplay of leader communication, physician-nurse relations and professional status in larger acute care teams. Paper 3 involved a contextual-interventionist approach, in which the effectiveness of an inter-professional speaking up training intervention was tested. The intervention aimed at improving nurses' and

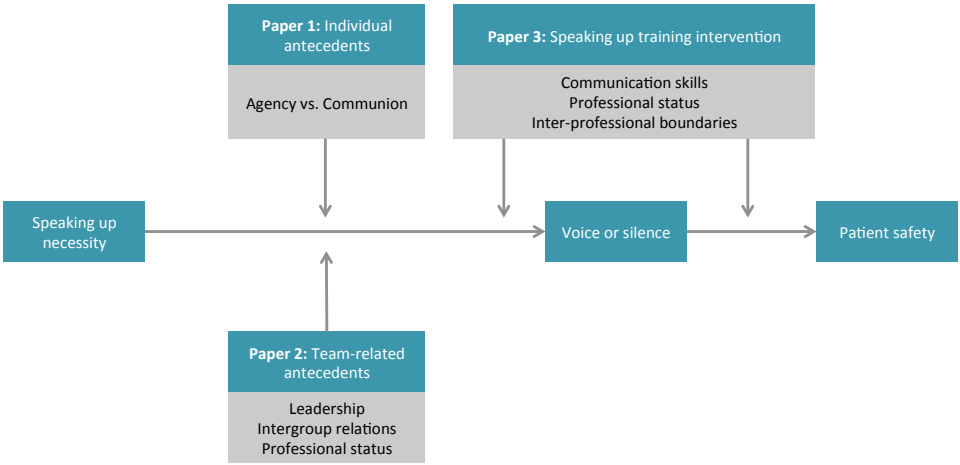

Figure 1. Research model and integration of scientific papers

residents' communication skills to ensure that voice is constructive and relevant for patient safety. In the following paragraphs, I will briefly describe the particular research gaps that provide the basis for the current research model and for all three scientific papers.

Individual Predictors of Voice in Healthcare Teams

The first research gap relates to individual predictors of voice. There is accumulated evidence that a variety of individual factors can affect speaking up. For example, a study with telecommunication professionals showed that people who are low in self-monitoring and perceive top management to be open for input are more likely to

speak up (i.e., coworker ratings) than high self-monitorers (Premeaux & Bedeian, 2003). Tangirala and Ramanujam (2008) conducted a survey study with nurses and found a U-shaped relationship between feelings of control and voice such that people are most likely to engage in voice (i.e., supervisor ratings) when they perceive little control (i.e., a dissatisfying state that individuals want to change) and high control (i.e., individuals believe that their voicing is effective). There is also evidence that personality traits may influence speaking up. LePine and Van Dyne (2001) conducted a laboratory study and looked at the Big Five personality dimensions as predictors of change-oriented communication in a computer-mediated team task. They found that extraversion related positively and agreeableness related negatively to constructive change-oriented communication. Yet, change-oriented communication was not operationalized as face-to-face speaking up behavior but as virtual chat comments that participants electronically sent to one another.

To summarize, none of these studies have looked at how individual factors may affect actual speaking up behavior in a team setting. In building on and extending these studies, I sought to address two research questions: First, is there a concept that integrates or relates to the traits and factors presented above? Second, what kind of individual-level factors predict actual voice behavior in healthcare teams? Answering these questions is crucial as identifying the exact attributes that facilitate vs. inhibit voice in healthcare teams might help to design interventions that specifically address and foster these factors. I used the fundamental self-concept dimensions of *agency* and *communion* (e.g., Abele, 2003; Bakan, 1966; Fiske, Cuddy, Glick, & Xu, 2002) to predict actual speaking up behavior during simulated critical events in healthcare teams.

Team-related Predictors of Voice in Healthcare Teams

Apart from identifying individual factors, the second focus of this dissertation is to shed light on team-related predictors of voice in healthcare teams. The extent to which people feel they can state their opinion in their team without being judged is captured in the concept of psychological safety, defined as the "shared belief that the team is safe for interpersonal risk taking" (Edmondson, 1999, p. 354). Team leaders have a special role in establishing (or diminishing) psychological safety. A study with surgical teams showed that teams in which the team leader encouraged the team to speak up with questions were better in adopting to a new surgical technology than those in which the leader did not invite questions (Edmondson, 2003). Inviting and

appreciating team member input has been described as leader inclusiveness and shown to facilitate speaking up particularly among lower-status team members (Nembhard & Edmondson, 2006). But how do leaders convey such an invitation and appreciation of team member input? It seems that beyond formulating an explicit invitation, certain words expressed by the leader might have an impact on the team as well. Research looking at linguistic aspects of leadership in cockpit crews has found that if Captains use the first person plural (e.g., "we") the crew performs better (Sexton & Helmreich, 2000).

In addition to the fact that leaders can have a crucial effect on team members' willingness to voice concerns, within-team group relations seem to matter as well. Nowadays, most teams are highly diverse and healthcare teams are the perfect example of a diverse team that encompasses multiple clinical backgrounds and different levels of professional status. Within such diverse teams, there are various *intergroup relations* such as relationships between surgeons and anesthesiologists or simply between nurses and physicians. With respect to performance, it could be shown that it is necessary that diverse teams establish a superordinate identity and little demarcation between the various groups involved (Hogg, van Knippenberg, & Rast, 2012; van Knippenberg, De Dreu, & Homan, 2004; van Knippenberg & Schippers, 2007). Thus, it is suggested that close intergroup relationships between nurses and physicians might also play a role for voice. However, nurses—as the lower status group—may not feel addressed when team leaders use the word "we". The extent to which inclusive leader communication may affect nurses and physicians may depend on how close or distant intergroup relations between the groups are perceived. So far, there is no study that has looked at this interplay, which is why I endeavored to address it with the second empirical paper. A better understanding of the complexity of leadership, intergroup relations and voice can improve our understanding of how diverse teams function and how these multi-level factors shape team processes (e.g, Kozlowski & Bell, 2001; Kozlowski & Ilgen, 2006).

Can Speaking Up Be Learned?

While the first two aims of this thesis are to identify individual and team-related antecedents of speaking up, the third aim of this dissertation is to provide new directions for team training and learning. More specifically, the goal was to design

and evaluate an integrated speaking up intervention for nurses and residents. As not all voice is constructive to maintain or improve patient safety, trainings and interventions are needed to teach healthcare professionals the appropriate communication skills enabling them to speak up assertively *and* constructively. The impact of message type and perceived constructiveness has been shown to affect whether voice is evaluated positively or negatively (Whiting, Maynes, Podsakoff, & Podsakoff, 2012). Thus, for voice to actually have an impact on team functioning and hence on patient safety, people need to be able to adequately address others. In a healthcare team, people often need to overcome hierarchical barriers in order to voice their concerns. The aviation industry was a predecessor in developing concrete communication rules and policies for speaking up. But can such rules be translated to healthcare given that the professional barriers between nurses and physicians are much more pronounced? What kind of intervention is needed to facilitate nurses' and residents' speaking up behavior alike? In Paper 3, a speaking up intervention was developed and evaluated in a sample of residents anesthesiologists and nurses. The intervention was an adapted version of the *two-challenge rule*, a common policy in aviation that prescribes how crew members are supposed to voice concerns towards one another (Pian-Smith et al., 2009).

// PART TWO

Methodological Approach

Hours of boredom, minutes of thrill, and seconds of terror.

Wisdom of Anesthesia

Methodological Approach

This part provides an overview of the methodological and analytical approach that I adopted across all three studies. I will start by describing the development of simulations in the medical profession before describing the specific simulation and training context in which all three studies were implemented.

What are Medical Simulations?

In the last two decades simulation-based training programs have spread across the medical profession. The need for simulation-based trainings in medicine became salient when critical incident analyses revealed that it was not technical failure leading to critical events or near misses but rather "non-technical" aspects of performance (Cooper et al., 1978; Kohn et al., 2000). The term "non-technical" skills—also described as behavioral or human factors skills—encompasses a variety of cognitive and social abilities such as situational awareness, decision making, leadership, coordination, and communication (Fletcher et al., 2003; Flin & Maran, 2004; Yule, Flin, Paterson-Brown, & Maran, 2006). Ever since the seminal report "To Err is Human" by the Institute of Medicine (1999), it became evident that breakdowns in teamwork and communication accounted for as much as 80% of all reported critical incidents in anesthesia. Therefore, simulation-based team trainings such as Anesthesia Crises Resource Management (ACRM) were designed to improve both technical knowledge and human factors similar to simulations and CRM trainings in aviation (Gaba, Howard, Fish, Smith, & Sowb, 2001).

What is a Simulated Scenario?

A life-size patient mannequin and the simulated operating room environment provided the basis to simulate the medical cases (see Figure 2). The patient simulator can be controlled with a computer from the control room (see Figure 3a and 3b). Just as in reality, the patient simulator can be connected to an anesthetic machine and to a monitor. Key vital parameters such as heart rate, pulse and oxygen saturation can be manipulated. Moreover, the mannequin can display chest movements, its eyes can blink and the pupil width can be altered. It can also "talk" with a speaker connected to the control room. The patient simulator and the simulation

environment are used to design a medical case such as a sudden cardiac arrest during surgery, an allergic reaction to a drug, a complication during pregnancy or a complex trauma resulting from a car crash. Critical incident reporting systems in the study hospital as well as day-to-day work experiences of the senior anesthesiologists in our research team functioned as the starting point of a simulated scenario. In an iterative process, we defined the clinical and behavioral aspects of a case for each phase of the scenario (Schick et al., under review). All scenarios were emergency scenarios, that is, they start off as a routinized procedure such as a general anesthesia but are disrupted by an unexpected event (e.g., cardiac arrest). This corresponds to the day-to-day task requirements of healthcare teams such as anesthesia teams. For example, during intubation a laryngospasm may occur as a result of the highly invasive procedure. This can restrict the trachea in such a way that conventional intubation (i.e., inserting a tube into the trachea) is not possible. In this case the anesthesia team needs to decide whether to apply more muscle relaxant to ease intubation or opt for alternative means of intubation. Both options have some advantages and disadvantages that the team has to weigh and discuss—and this may well require speaking up.

The Present Research Context

My dissertation was part of a two-year interdisciplinary research project between the University Hospital in Zurich (Department of Anesthesiology) and the ETH Zurich (Department of Management, Technology and Economics; Prof. Gudela Grote) and funded by the Swiss National Science Foundation (Grant number: 100014_138545/1). The goal of the project was to design and evaluate a simulation-based team training program that combined clinical and behavioral skills. All studies that form the basis for this doctoral dissertation are the result of an intensive collaboration and would not have been possible without the support of the entire research team.

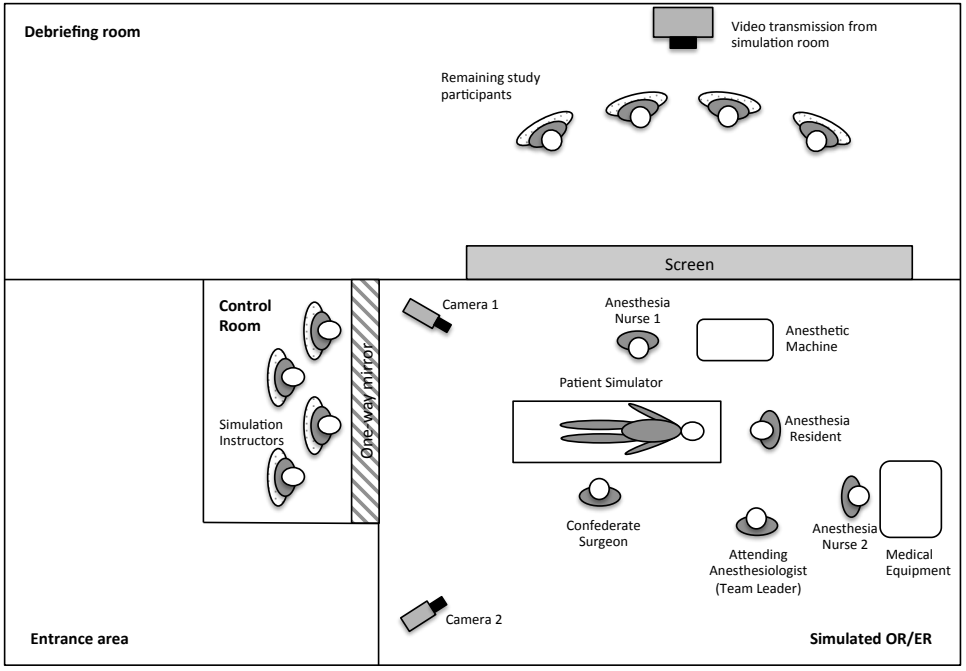

Figure 2. Overview of simulation setting with exemplified positions of the (confederate) surgeon, anesthesia resident, anesthesia nurses and the attending anesthesiologist (team leader).

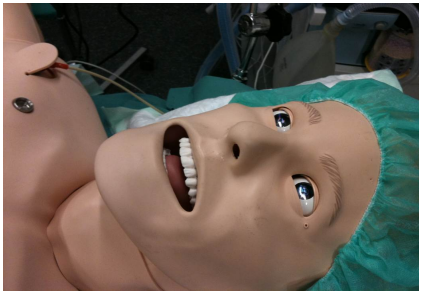

Figure 3b. Patient simulator placed in simulated operating room.

Figure 3a. Patient simulator with realistic anatomic features.

Study Design and Analytical Approach

The data for all three papers were assessed in the course of five training rounds lasting 10 days each. In each round, about 60 participants encompassing both nurses and physicians were trained (overall sample N=235). In each round, a pre-post design was implemented, that is, central individual and team-related aspects were assessed before and after a simulation to account for training effects. For each paper, I used a multi-method approach combining behavioral data from the simulations with questionnaire data gained from participants throughout the training. All simulations were videotaped enabling us to retrospectively code participants' behavior and communication in the simulation. The behavioral data were coded by trained raters and by myself (for a detailed description of the coding process please refer to the method section of Paper 1). In Paper 1 and 3, me and my research team coded team members' speaking up communication and behavior whereas in Paper 2, we coded how many times the team leader expressed the word "we".

With respect to the analytical approach and the unit of analysis, I differentiated between individual-level (Paper 1 and 3) and team-level (Paper 2) predictors. In all three papers, I used multivariate regressions, except for Paper 2 in which I also used a multi-level approach. In the third paper, we used a randomized–control group design and employing ANOVAs to test the effectiveness of two different interventions.

// PART THREE

Summary of Scientific Papers

In order to disobey, one must have the courage to be alone, to err and to sin.

Erich Fromm

Overview of Scientific Papers

The following chapter provides a summary of the three first-author papers that I have completed during my three-year doctoral studies. In all of these papers, I was responsible for the conceptual, empirical, and analytical part of the studies and for crafting each of the three manuscripts. In addition to these first-author papers, I served as a second author in four other papers that are published or currently under review/ in revision (see Table 1).

Table 1. Overview of first and second author papers

No.	Title	Authors	Publication status
1	Agency and Communion Predict Speaking Up in Acute Care Teams	**Weiss, M.**, Kolbe, M., Grote, G., Dambach, M., Marty, A., Spahn, D., & Grande, B.	Published in **Small Group Research**
2	We Can Do It—Can We? How Leader Communication, Professional Status, and Intergroup Relations Affect Voice in Extreme Action Teams	**Weiss, M.**, Kolbe, M., Grote, G., Spahn, D.R., & Grande, B.	Revise and resubmit at **Journal of Applied Psychology**
3	Stop—In the Name of the Patient! Development and Evaluation of an Inter-professional Speaking up Intervention for Nurses and Residents in Anaesthesia Teams	**Weiss, M.**, Kolbe, M., Grote, G., Spahn, D.R., & Grande, B.	Submitted to **British Journal of Anaesthesia**
4	Do we have to talk? Technical vs. combined technical(non-technical) airway training in anesthesia and intensive care medicine.	Grande, B., **Weiss, M**., Biro, P., Grote, G., Steiger, P., Spahn, D. R. & Kolbe, M.	Published in **Anästhesiologie und Intensivmedizin**
5	TeamGAINS: A tool for structured debriefings for simulation-based team trainings	Kolbe, M., **Weiss, M.**, Grote, G., Knauth, A., Dambach, M., Spahn, D. R., & Grande, B.	Published in **BMJ Quality & Safety**

6	Simulation with PARTS (Phase Augmented Research and Training Scenarios): a structure facilitating focused research and assessment for crisis resource management and team training simulation	Schick, C., **Weiss, M.**, Marty, A., Dambach, M., Spahn, D. R., Grote, G., Kolbe, M., & Grande, B.	Revise and resubmit at **Simulation in Healthcare**
7	An anesthesia pre-induction checklist (APIC) to improve information exchange, knowledge of critical information and perceptions of safety and teamwork in anesthesia teams	Tscholl, D., **Weiss, M**., Kolbe, M., Staender, S., Seifert, B., Landert, D., Grande, B., Spahn, D. R., & Noethiger, C. B.	Revise and resubmit at **Anesthesia & Analgesia**

Paper 1

Agency and Communion Predict Speaking Up in Acute Care Teams

Mona Weiss[1], Michaela Kolbe[1], Gudela Grote[1], Micha Dambach[2], Adrian Marty[2]
Donat R. Spahn[2] & Bastian Grande[2]

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[2] University Hospital Zurich, Zurich, Switzerland

Status of Paper: Published

Weiss, M., Kolbe, M., Grote, G., Dambach, M., Marty, A., Spahn, D., & Grande, B. (2014). Agency and communion predict speaking up in acute care teams. *Small Group Research, 45*, 290-313.

In this first paper, I aimed to better understand whether and how nurses and residents speak up by looking at individual predictors. Prior research had identified a link between personality (e.g., Big Five, social dominance orientation, self-monitoring) and speaking up in organizational settings (Islam & Zyphur, 2005; LePine & Van Dyne, 2001), but to that date there was no study looking at the particular individual traits that predict actual speaking up behavior in such extreme action teams. To capture team member traits, I used the fundamental self-concept dimensions of agency and communion. These dimensions are conceptually related to the Big Five but have also been used in the study of social perception and particularly within group settings (e.g., Abele, 2003; Fiske, Cuddy, Glick, & Xu, 2002). Whereas agency relates to traits such as assertiveness, independence, and persistence, communion refers to being sensitive, kind, and helpful in relations with others. Prior research has shown that agentic traits are a positive predictor for assertive behavior in groups (Leaper, 1987). On the contrary, traits pertaining to the agreeableness dimension of the Big Five—that is communal traits—have been found to negatively predict leadership statements in simulated resuscitations in a sample of medical students (Streiff et al., 2011). Thus, we hypothesized that agency is a positive and communion a negative predictor of speaking up in acute care teams.

To study speaking up behavior within acute care teams, we simulated medical emergencies (e.g., a cardiac arrest, a difficult airway, an allergic reaction). Participants were 27 anesthesia nurses and 27 anesthesia residents working together in dyad anesthesia teams. Prior to the simulation, participants' orientation towards agency and communion was assessed. In the simulated scenarios, we had a higher-status confederate (e.g., a surgeon) engaging in potentially harmful behavior for the patient. Thus, speaking up was necessary for team performance and patient safety. Speaking up behavior was coded using videotapes of all simulations and applying a coding manual developed for ACTs (Kolbe et al., 2013). Our hypotheses were confirmed such that team members who generally perceived themselves as highly agentic (e.g., assertive, independent, persistent) were more likely to speak up during a simulated critical event than team members who perceived themselves as highly communal (e.g., friendly, nice, sensitive). Interestingly, those physicians and nurses who spoke up did so in a very powerful way and often stopped the higher-status confederate from a detrimental course of action. This implies that by being highly agentic lower status team members can overcome prevalent hierarchical barriers and firmly state their opinion.

Paper 2

We Can Do It—Can We?
How Leader Communication, Professional Status, and Intergroup Relations Affect Voice in Extreme Action Teams

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Status of Paper: Revise and resubmit at *Journal of Applied Psychology*

This paper focused on identifying team-related antecedents of speaking up in healthcare teams by considering three factors: leadership, professional status and intergroup relations between physicians and nurses. Studies revealed that team leaders can affect team members' ability to speak up by explicitly asking for and appreciating team member input (Edmondson, 2003; Nembhard & Edmondson, 2006). In a similar vein, research on team communication found that teams in which leaders use inclusive first person plurals such as "we" perform better (Sexton & Helmreich, 2000). Thus, it could be suggested that team leader's use of the word "we" may likewise affect team members' intentions to speak up. When team leader use the word "we", team members might feel valued and included in the decision-making process and might be less tentative to speak up.

However, as nurses and residents belong to different professional groups with different tasks, responsibilities, and identities, we argue that it is necessary to account for two intertwined moderating factors: professional status and perceptions of intergroup relations. While professional status simply refers to the fact that nurses and physicians are part of two different professional groups with different responsibilities and executive functions (i.e., nurses are not allowed to perform invasive procedures), intergroup relations refer to individuals' perceptions of being part of the nurses' or physicians' group. Intergroup relations can be perceived as more or less demarcated (i.e. perceived closeness) which indicates that people might

differentiate more or less between their own, the in-group, and other groups, the out-group (Hogg, 2003). In healthcare teams, intergroup relations between nurses and physicians are often highly demarcated and sometimes very conflict-laden (e.g., Bartunek, 2011; Burford, 2012; Campbell-Heider & Pollock, 1987; Zwarenstein & Reeves, 2002). We hypothesized that if team leaders use the word "we", residents might perceive it as inclusive as they are part of the physicians' group. Nurses, on the other hand might only feel included to the extent to which they perceive little demarcation between physicians and nurses. In other words, we predicted a three-way interaction between leader we-statements, professional status (nurse vs. residents) and perceptions of intergroup relations on team members' voice intentions.

In this study, the teams were composed of one team leader (i.e. an attending anesthesiologist), 2-3 nurses and 1-2 residents. Overall, we formed 27 acute care teams (n=27 team leaders, n=65 anesthesia residents, n=74 anesthesia/intensive care nurses). Using a multi-method, multi-level approach, I used the amount of "we"'s of a team leader expressed during a simulated critical event to predict residents' and nurses' subsequent self-reported voice intentions. Notably, the amount of "we" served as a team-level variable and team leaders were removed from the data set. Multi-level analysis revealed that residents and nurses were differently affected by the team leaders' endorsement of "we": For physicians, "we" had a direct positive effect on voice intentions—for nurses, however, the effect was moderated by their perceptions of their relationship with physicians. Thus, the hypothesis was confirmed showing that inclusive language by the team leaders is only beneficial for nurses' voice intentions when they perceive close intergroup relations with physicians. As an extension of the hypothesis, "we" even was detrimental for nurses who perceived very distant relationships with physicians: they displayed the lowest voice intention. The results of this study extent the concept of leader inclusiveness by showing the importance of sub-group relations in diverse teams. Team leaders should be careful not to assume that using inclusive language will automatically facilitate team member voice. Instead, it seems advisable to acknowledge and address the different professional groups in a team and to create a second, superordinate identity (Gaertner, Dovidio, & Saguy, 2007; Hornsey & Hogg, 2000).

Paper 3

Stop—In the Name of the Patient! Development and Evaluation of an Inter-Professional Speaking Up Intervention for Nurses and Residents in Anesthesia Teams

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Status of Paper: Submitted to *British Journal of Anaesthesia*

The third paper aimed at covering the latter part of the theoretical model, that is, the link between voice and patient safety. For voice to actually have an impact on patient safety, those in positions of authority, that is, high-status physicians need to be addressed assertively but also convincingly. Yet, research shows that those with lower status (i.e., nurses and residents) feel that they lack the appropriate communication skills to make their voice heard effectively (Kobayashi et al., 2006). Thus, whereas the first two papers were more concerned with the question of whether individuals in healthcare teams would speak up at all, this study aimed at improving speaking up with effective communication skills. Although there is empirical evidence that speaking up interventions for nurses (Sayre, McNeese-Smith, Leach, & Phillips, 2012) and residents (Pian-Smith et al., 2009) are effective, there was no study that implemented and tested a speaking up intervention in an inter-professional team context. This is critical as it is precisely individuals' perception of status and inter-professional boundaries (e.g., between anesthesia and surgery) that diminishes speaking up.

Together with my research team, I developed, implemented and evaluated a speaking up intervention addressing both nurses and physicians in anesthesia teams. The intervention combined two state-of-the-art training techniques. The first technique is a debriefing concept that was recently developed as a structure with which inter-professional healthcare teams can be debriefed after simulated crises situations and trained in crises resource management principles. The approach is

called TeamGAINS and is designed to surface and change trainees' mental models (Kolbe et al., 2013). The second intervention is the *two-challenge rule* originating from aviation (Pian-Smith et al., 2009). The rule involves two consecutive challenges comprising each an advocacy (e.g., "*I see that you are not successful in intubating the patient. I wonder if we should consider an alternative.*") paired with an inquiry (e.g., "*What do you think?*").

We combined TeamGAINS and the two-challenge rule into a speaking up intervention and compared it with a mere TeamGAINS intervention in which basic crises resource management principles such as leadership or situation awareness but not speaking up were trained (Gaba et al., 2001). In accordance with established training evaluation models (Kirkpatrick, 1975; Kraiger, Ford, & Salas, 1993), we evaluated the impact of both approaches on three levels: reactions, self-perceived and actual speaking up behaviour. We hypothesized that the speaking-up intervention (i) is perceived as more useful, (ii) leads to a more positive change in self-perceived speaking up behaviour, and (iii) leads to more actual speaking-up behaviour than the control intervention.

Again, we designed simulated medical emergencies for dyad anesthesia teams (20 nurses, 20 residents). Before participants entered the scenario, they either received an integrated TeamGAINS/two-challenge rule intervention (n=18) or a mere TeamGAINS intervention (n=22). In the simulated scenarios, participants were required to speak up to a higher-status confederate (e.g. a surgeon) whose behavior posed various risks to patient safety. While both interventions were perceived as useful and led to an increase in self-perceived speaking up only the integrated TeamGAINS/two-challenge rule had an impact on trainees' voice behavior. Surprisingly, nurses in the intervention group spoke up more than residents suggesting that residents might face different hurdles there were not sufficiently considered by the intervention. This implies that speaking up can be trained but that the specific hurdles for each professional group need to be adequately addressed.

// PART FOUR

Discussion and Outlook

I see you rushing down
Tell me how to reach you

The National

General Discussion

This dissertation set out to identify individual and team-related antecedents of voice in healthcare teams. Adapting Morrison's (2011) model of employee voice to a dynamic action team context, I conducted three empirical studies with multi-professional healthcare teams. These studies revealed three major findings: First, the fundamental trait dimensions of agency and communion had a converse effect on actual speaking up behavior, and this above and beyond the effect of work experience, gender and professional status. Second, team-related factors such as leadership, intergroup relations and professional status exerted a complex interaction effect on team members' self-reported voice. Third, a speaking up intervention designed for nurses and residents was only effective for nurses but not for residents. In the following, I discuss key themes that emerged from all three papers and point to theoretical and practical implications. Following that, I will position these findings into broader theories of team processes and organizational learning and conclude with an outlook on the study of voice in healthcare teams and beyond.

Individual Predictors of Speaking Up: Being Assertive vs. Being Nice?

In Paper 1, I used the fundamental self-concept dimensions of agency and communion to predict actual voice behavior in two-person anesthesia teams. Whereas agentic attributes (e.g., assertiveness) positively predicted speaking up, communal attributes (e.g., kindness) negatively predicted speaking up. This result may prompt at least two questions: (1) How do different combinations of the two dimensions affect the likelihood of speaking up? (2) How do agency and communion relate to one another? (3) What does this imply for trainings and speaking up interventions?

To start with the first question, the most straightforward combination is given if people are high in agentic traits and low in communal traits: in this case people would frequently speak up across multiple speaking up situations. A converse pattern of agency and communion would then obviously result in a rather low frequency of speaking up. But what if both dimensions are equally strongly pronounced? Given that both dimensions had a similar effect albeit in converse directions, this would result in a medium speaking up frequency. Bluntly speaking,

this implies that across a range of speaking up opportunities people might speak up in half of these cases and remain silent in the other half. Obviously, this theorizing might be rather bold, considering that every situation that necessitates speaking up might be associated with different perceived risks and benefits (cf. Vroom, 1964). Thus, agency and communion are likely to have an impact on the implicit calculus that precedes voice. People who are highly agentic might value the benefits of speaking up more than the risks than people who are high in communal traits. In contrast, people who are highly communal and thus very sensitive of others' feelings, might be concerned to harm their colleagues through speaking up (cf. Detert & Edmondson, 2011). Relating agency and communion to expectancy-value beliefs of speaking up (e.g., will my speaking up be effective? will others be harmed by my speaking up?) could thus be a fruitful extension of the current findings.

The second question pertains to the conceptualization and measurement of agency and communion. Although the two dimensions are theoretically conceptualized as being orthogonal and thus independent of one another, there is empirical evidence that this is not the case. In fact, a significant positive correlation between the two dimensions has also been found in other studies (Abele, 2003; Suitner & Maass, 2008). In Paper 1, agency and communion were also positively correlated. This may either speak for a rejection of the assumption of orthogonality or for social desirability. Particularly communal traits such as being kind, helpful and nice are traits that are highly socially valued. Thus, participants' self-assessment regarding communal traits might have been biased. Especially those who reported high levels of agency might have felt that this rather selfish self-concept orientation should be compensated for. In order to avoid such biases future research should consider the sequence, time, and context of measuring agency and communion to ensure higher validity.

With respect to team trainings, these results have two central implications: The first is quite straightforward: Speaking up interventions should focus on strengthening agentic attributes. Although there are assertiveness interventions (Jentsch & Smith-Jentsch, 2001; Smith-Jentsch, Salas, & Baker, 1996), it is likewise important that other attributes pertaining to agency are trained as well. For instance, being able to be independent of the group's opinion. Even when everyone seems to agree on something that seems wrong, people need to be able to state their opinion. The second implication pertains to the fact that speaking up interventions need to consider the other side of the coin, namely people's communal orientation. The fear

that speaking up means being unkind and insensitive has to likewise be addressed and reduced by such interventions. People who are highly communal and thus sensitive and aware of others' feelings might be concerned with the negative consequences that speaking up might have on their team colleagues (Detert & Edmondson, 2011). Team trainings might be a first step to raise awareness for the importance of speaking up but healthcare teams should also engage in regular after-action reviews (e.g. DeRue et al., 2012) to surface so-called implicit voice theories particularly by those team members who are highly communal (e.g., I don't speak up because I don't want to hurt your feelings).

Nurses vs. Physicians: How Much Does the Difference Matter?

This question is largely debated in medicine and social sciences (Bartunek, 2011; Burford, 2012; Campbell-Heider & Pollock, 1987; Carpenter, 1995; Thomas, Sexton, & Helmreich, 2003; Zwarenstein & Reeves, 2002). When it comes to voice, the results of this dissertation suggest that the answer would be: sometimes a lot, sometimes not so much. Professional role (nurse vs. physician) did not affect speaking up in Paper 1 but in Paper 2 and 3. One explanation for these opposing results could be the team setting. While Paper 1 and 3 involved dyad anesthesia teams consisting of one nurse and one resident, Paper 2 involved larger acute care teams (i.e., 4-7 team members).

A body of research has shown that perceptions of status—perceived competence—and hierarchy—a rank order between individuals according to a certain attribute—influence interpersonal behavior and speaking up (Foldy, Rivard, & Buckley, 2009; Islam & Zyphur, 2005; Magee & Galinsky, 2008; Schmid Mast, 2010; Morrison & Rothman, 2009; Nembhard & Edmondson, 2006). In the dyad team context (Paper 1), nurses' perceived status might have been rather similar compared to the residents, as they were generally older and thus more experienced. Thus, the perceived hierarchical gap between nurses and physicians might have been smaller and individual differences regarding agency and communion might thus have become more meaningful for speaking up. This status perception might have changed within the larger team setting (Paper 2). Not only did the team encompass more members but also the perceived status of nurses might have been different. In these teams, the attending anesthesiologists were the most experienced persons and assumed the highest status, followed by the residents, who closely cooperated with

the attendings, and nurses who were more occupied with task execution. Notably, I assessed agency and communion also in Paper 2 but no significant relationship emerged with any of the assessed constructs (i.e., self-reported speaking up behavior, intergroup relations, team leader "we"-statements, professional role).

Paper 3 revealed that nurses and residents responded differently to an integrated speaking up intervention such that nurses spoke up more than residents. As part of the intervention, we specifically focused on the hierarchical barriers between nurses and physicians and tried to reduce them. Again, this study involved dyad anesthesia teams in which nurses might have felt more confident to speak up. Another explanation might be that residents might either have felt that they—as the higher status group—should leave room for nurses to speak up. Finally, the intervention might have been ineffective for residents as it might not have tackled the specific barriers that residents might perceive when they want to speak up to higher ups.

Taken together, the results suggest that the difference between nurses and physicians matters as soon as it is made salient—either through a more hierarchical team composition (Paper 2) or through an intervention (Paper 3). Future studies should assess self-perceptions of status across different team compositions to better determine when and why professional group membership or individual traits become more or less predictive of speaking up.

Leading to Speak Up: Reducing or Embracing Professional Diversity?

Paper 2 revealed that leader inclusive communication (i.e., operationalized with the word "we") had a different impact on nurses' and residents' self reported voice. For nurses who perceived demarcated intergroup relations with physicians (i.e., this was assessed before the teams were composed), "we" even had a negative impact. Although this seems somewhat counterintuitive at first, it seems plausible when considering that the two groups have two very distinct social identities (cf. Tajfel & Turner, 1979). Being a nurse vs. being a physician is associated with a completely different professional socialization and very different levels of status (Ashforth & Mael, 1989; Campbell-Heider & Pollock, 1987; Zwarenstein & Reeves, 2002). Diversity in terms of professional background and status is not unique to healthcare. In fact, nowadays many teams are highly diverse and this can make leadership challenging (Hogg et al., 2012; Platow, van Knippenberg, Haslam, van Knippenberg,

& Spears, 2006; van Knippenberg et al., 2004; van Knippenberg, van Ginkel, & Homan, 2013; van Knippenberg & Schippers, 2007; Yammarino, Salas, Serban, Shirreffs, & Shuffler, 2012).

How should leaders of diverse teams approach their team particularly in professionally and status-diverse teams? How can they invite and appreciate team member voice? Although it seems important to highlight a superordinate team identity, individuals in larger group settings are often motivated to be loyal to their subgroup (i.e., being a nurse) and might view an externally imposed superordinate identity (i.e., evidenced in "we") as threatening (Hogg & Terry, 2000). Especially minority group members often strive to preserve their identity and are reluctant to identify with the majority (Brewer, 1991). Nurses who felt that the nurse-physician relationship is rather demarcated in general might even have perceived the leaders' "we" as an insincere attempt to integrate them. Thus, I suggest that leaders in multi-professional healthcare teams should acknowledge the various professional groups in a team while persuasively establishing a superordinate team identity. An illustrative example (Paper 2) of such an endeavor was a team leader who approached a nurse during resuscitation: "We are now the cardiac team and have to make sure that the frequency goes up, ok?" That way, the leader clarifies that creating a common identity is not a superficial intervention but meaningful for jointly mastering the task at hand.

Beyond Healthcare: Implications for Other Teams and Organizations

Voice Affecting Team Processes Affecting Voice

Apart from the specific implications for healthcare teams, what do these results imply on a larger scale? Specifically, how could these results be integrated in current models of team effectiveness? The classic Input-Process-Output (IPO) model (Hackman, 1987; McGrath, 1984) would suggest that input factors such as team member characteristics or leadership feed into team processes which in turn lead to team-related output (i.e., performance). More recent models have adopted a dynamic viewpoint, not clearly differentiating between input, process and output factors, but

rather understanding teams from a multi-level, multi-phasic perspective in which adaptation to external and internal factors plays a key role (Baard et al., 2014; Burke, Stagl, Salas, Pierce, & Kendall, 2006; Kozlowski & Bell, 2008; Marks, Mathieu, & Zaccaro, 2001). In this context, a distinction is made between *team processes* and *team emergent states*. Whereas team processes are based on team member interactions, team emergent states are cognitive, affective, and motivational properties of teams based on aggregation from the individual to the team level (Marks et al., 2001).

How can voice be understood from this perspective? I suggest that voice can be likewise conceived of as a team process or team emergent state. It might be a team process, such that when one team member speaks up or when leaders establish a common identity, others might feel safe to speak up as well. This in turn might change perceptions of psychological safety and lower the perceived hurdles to speak up (Edmondson, 1999). On the other hand, the results of Paper 1 suggest that voice could be seen as a team emergent state that follows from the configuration of each team member's agentic and communal attributes. If teams are composed of members who each score high in agency and low in communion, it is more likely that speaking up occurs and thus becomes a characteristic of the team (Morrison et al., 2011). Moreover, speaking up might also influence other central team processes, particularly those related to learning and exploration (cf. March, 1991). A team in which speaking up is a common practice might generate more solutions, develop better strategies, and is more likely to be open for change and experimentation (e.g., Edmondson, Bohmer, & Pisano, 2001; Gurtner, Tschan, Semmer, & Nägele, 2007). Thus, the relationship between voice and team processes can be understood as cyclic, dynamic, and adaptive.

Voice in Organizations: From Uncertainty to Learning

The current argumentation paints a rather rosy picture of speaking up. Yet, throughout my dissertation, I was frequently confronted with the question of whether there could be "too much speaking up", particularly by physicians with higher status. On the one hand, one could argue, there is no such thing as "too much speaking up" and that people with high status are motivated to affirm and maintain their power an thus seek to ward off the potential threat of being challenged (Fast & Chen, 2009). On the other hand, as speaking up induces a challenge to the status quo it might

likewise increase uncertainty. Practices, routines, and decision makers who have previously provided stability and predictability may suddenly become obsolete.

How should organizations deal with the uncertainty that voice might evoke? It has been proposed that organizations that take advantage of uncertainty are more successful in adapting to challenges than those who try to completely avoid it (Grote, 2009). Organizations can adapt to uncertainty by relying not only on stable processes such as rules and routines but in leaving room for flexible adjustment. Although it seems counterintuitive, this argument is even more valid in high-risk or rather high-reliability industries such as aviation, chemical industries, mining, nuclear, and healthcare. This concept of *mindfulness* stresses that HROs need to expect the unexpected in order to discover and manage crisis situations (Weick, Sutcliffe, & Obstfeld, 2008). Among other aspects, mindfulness in organizations involves a "reluctance to simplify interpretations". From my point of view, this is when voice comes into play. Questioning one's own but also others' interpretations and not simply conforming to the majority is a crucial step in recognizing and managing errors. In this regard, it has been stressed that people who speak up should do so in a constructive manner in order to have a positive impact on a given organizational system (Burris, 2012; Liang et al., 2012). I suggest that it is not only the actor who makes voice constructive but the whole organizational system in which voice is enacted. How different stakeholders react and act on voice likewise determines its constructiveness and hence its potential for organizational learning. Rather than framing voice as an individual act it could thus be conceived of as a trigger for collective sense-making between those who voice and those who listen (Weick, 1988). Thus, the question that mindful organizations should ask is not "Is there too much speaking up" but rather "Do we as an organization and as a team provide the conditions that enable people to speak up when they feel that something is not right?".

Limitations

This research has some limitations that need to be pointed out. First of all, the model that I developed was tested consecutively in the course of three empirical studies. A larger sample size would have allowed for testing an integrated model and estimating each of the paths simultaneously. Second, all studies are based on data from

simulations that are subject to a number of biases, particularly social desirability. Participants were aware of being observed by senior anesthesiologists form their own department and videotaped in the simulation. This might have biased their behavior and hence speaking up. Still, the occurrence of speaking up in all five studies was not unexpectedly high. Quite on the contrary, in Paper 1 about one half of the participants remained silent although speaking up was necessary. Still, complementing these results with data from the clinical setting (i.e., conducting live observations and coding for speaking up) would increase external validity. Third, for all three papers, the data were collected in the same hospital and even within the same organizational unit (i.e., Department of Anesthesiology). Thus, certain context effects cannot be ruled out. As the hurdles for speaking up might vary considerable across units and hospitals, future studies investigating speaking up in healthcare teams should include data from different units (e.g., surgery, internal medicine, gynecology) and ideally from various hospitals.

Another limitation pertains to the implementation of the studies. Our research team was responsible for the development, implementation and evaluation of a simulation-based training curriculum. In an ideal training evaluation setting, the functions of instructor and program evaluator should be separated by having independent instructors carrying out the training who are blind to the evaluation criteria (Kirkpatrick, 1975). At the same time, the focus of the studies that build the basis for this dissertation was more on identifying antecedents of speaking up and thus somewhat neglecting the training context for Paper1 and 2. To account for training effects, I controlled for the sequence of the simulated cases as each case was followed by a comprehensive debriefing. Yet, it cannot completely be ruled out that this might have affected participants' attitudes (i.e., assessed before and after the training day) and behavior.

Despite these limitations, the present research also contains a number of strengths. First, each study was conducted with healthcare professionals who were exempted from their daily duties to take part in the studies. This is certainly a very rare opportunity for data access and part of the reason for the fact that there are so few studies that have investigated voice in healthcare teams. Second, for each paper, I adopted a multi-method approach by combining behavioral and self-report data. For Paper 2, I also used a rather large sample size (i.e., based on 1-day simulations with 141 healthcare professionals) allowing me to apply multi-level modeling. Third, despite the possible biases of being immersed in the research setting, I felt that being

a training instructor provided me with a rich understanding of the study context. Being part of the regular training sessions, closely collaborating with senior anesthesiologists, as well as regular visits in the hospital (i.e., operating room, emergency room, intensive care unit) helped to gain a comprehensive picture of voice in healthcare teams.

Conclusion & Outlook

Being able to speak up with a different opinion can be a challenge, particularly in settings in which individuals fear negative sanctions when speaking up to those in power. Promoting voice behavior in high-risk team settings such as healthcare is highly relevant as it can ultimately affect patient safety. The results of this cumulative dissertation provide a first step in better understanding the factors leading to voice in high-risk and ad-hoc team contexts such as healthcare teams. Three empirical papers encompassing five high-fidelity medical simulation studies with healthcare teams revealed that: (1) team members' self-concept orientation towards agency and communion predicted their speaking up behavior in simulated emergencies and that above and beyond the effects of professional status or work experience, (2) team leaders' communication (i.e, use of the word "we") differently affected nurses and residents and this was dependent on their perceptions of intergroup relations between nurses and physicians, (3) a speaking up intervention was effective for nurses but not for residents.

As a further development of this research, I suggest that studying the impact of voice on team dynamics could provide further insight into the changes that voice might bring about. In other words, looking at consequences of voice within teams could be a fruitful extension of this research. Until now, very few studies have looked at outcomes of voice at all. Only some work has investigated how voice impacts group performance (Detert, Burris, Harrison, & Martin, 2013) and individual performance appraisals by supervisors (Burris, 2012; Whiting, Podsakoff, & Pierce, 2008; Whiting, Maynes, Podsakoff, & Podsakoff, 2012). Moreover, teams in which voice is encouraged by supervisors have been shown to better adapt to novel technological challenges (Edmondson, 2003; Edmondson, Bohmer, & Pisano, 2001). This underlines the assumption that voice can profoundly affect team dynamics. Especially processes related to perceptions of status and power might be affected

when individuals speak up. Examining how voice may influence power dynamics in teams, namely perceptions of competence and influence, seems highly valuable. As status hierarchies and hence perceived power distance are the most prevalent barriers to speaking up in healthcare teams, investigating the conditions under which voice can positively impact such perceptions may help to again facilitate speaking up.

There is no doubt that speaking up is not the easiest road to take and certainly involves uncertainty—but in today's business world it is more important than ever that people are willing and able to take responsibility, to seize opportunities, and to make a change: for their organization, for their team, and for themselves.

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// PART FIVE

Scientific Papers

Scientific Papers

This Part includes all three first-author papers (Paper 1-3) that form the basis of this cumulative dissertation. Language, formatting and reference style is adapted to the journal in which the respective paper is published, under review or to which it is submitted.

Paper 1

Agency and Communion Predict Speaking Up in Acute Care Teams

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Abstract

Speaking up with suggestions, problems, or doubts is important—especially in healthcare action teams where each team member's input can be crucial for the treatment of a patient. Implementing a high-fidelity simulation study we investigated individual predictors of speaking up in acute care teams (ACTs). Participants were 27 physicians and 27 nurses from a hospital who completed measures on self-perceived agency (i.e., assertiveness, persistence, independence) and communion (i.e., helpfulness, friendliness, sociability). In two-person teams they managed simulated critical events that required speaking up. In line with our hypotheses, we found that agency positively and communion negatively predicted actual speaking up behavior. We discuss the differential effects of agency and communion on speaking up and thereby highlight theoretical and practical implications.

Key Words: speaking up, agency, communion, action teams, healthcare

Introduction

In various interpersonal, team, and organizational contexts people are faced with the decision of whether they should speak up or remain silent—and a vast body of research shows that far too often they choose the latter (Morrison, 2011). For healthcare professionals, it can be disastrous not to speak up with concerns as this might affect patient safety (e.g., Bromiley, 2008; Sexton, Thomas, & Helmreich, 2000). For example, speaking up can be required when a wrong diagnosis seems to be made, when another team member repeatedly fails to intubate the patient successfully, or when the team does not perform resuscitation despite a significant period of low cardiac output. By combining Morrison's (2011) definition of voice and Edmondson's (1999) definition of speaking up, we use both terms interchangeably and define speaking up as explicit communication of suggestions, problems, opinions, or doubts that challenge the status quo. Challenging the status quo in a group may involve interpersonal risk—especially in hierarchical groups such as healthcare action teams. For example, people fear that they might be punished or lose face when they would voice concerns to those in power and thus refrain from speaking up (e.g., Kobayashi et al., 2006).

Research has identified a variety of contextual factors that influence speaking up such as organizational structure (Morrison & Milliken, 2000), psychological safety (Edmondson, 1999), and supervisor behavior (e.g., Edmondson, 2003; Nembhard & Edmondson, 2006). In addition to these contextual factors, individual factors seem to affect speaking up as well. Even within the same context, people differ in their speaking up behavior (e.g., Premeaux & Bedeian, 2003). By stating that "speaking up is not an automatic result of removing barriers to expression," Islam and Zyphur (2005, p. 101) point to the importance of studying interindividual differences as predictor of speaking up behavior in groups. This raises the question as to what kind of individual factors determine whether people speak up or remain silent. Grasping how individual factors contribute to speaking up is not only important for better understanding the mechanism of voice behavior but also for designing training programs and interventions targeted at enabling team members to speak up.

In this study, we build on and extend prior research in three ways: First, rather than analyzing self-reported speaking up we look at actual speaking up behavior in healthcare teams and thereby extend the theoretical understanding of

voice behavior to real-world action teams in a high-risk context. Second, we use the fundamental trait dimensions of agency (i.e., assertiveness, persistence, independence) and communion (i.e., helpfulness, friendliness, sociability) to identify traits that enable vs. traits that inhibit speaking up. Third, based on our findings we discuss implications for simulation-based team trainings and speaking up interventions. In the following, we will (a) briefly describe the particular characteristics of acute care teams, a special form of healthcare action teams, and the importance of speaking up in this context, (b) introduce agency and communion as two fundamental trait dimensions, and (c) subsequently derive two hypotheses to be tested in a simulation-based setting.

Speaking Up in Acute Care Teams

Acute care teams (ACTs) are composed of nurses and physicians who are put together ad hoc to perform various tasks. For example, they deliver anesthesia during an elective surgery, they provide initial treatment and diagnoses to emergency patients, or they are called to manage acute intra-hospital emergencies such as a cardiac arrest1. ACTs are a typical example of action teams as they engage in brief performance episodes to manage unpredictable events (Ishak & Ballard, 2012; Sundstrom, de Meuse, & Futrell, 1990). Moreover, ACTs are part of a highly diverse multi-team system composed of surgical teams, radiologists, technicians, or recovery room teams (cf. Mathieu, Marks, & Zaccharo, 2001). Engaging in explicit communication and speaking up with ideas can be key for team-based decision-making and for finding the correct diagnosis (cf. Tschan et al., 2009). More importantly, speaking up in ACTs can also help to avoid medical mishaps and severe errors (Edmondson, 2012). Thus, it is crucial that people in ACTs speak up when they think that an alternative dose of medication seems indicated (i.e., suggestion), when a team colleague seems too tired to operate, when they feel that there are differential diagnoses, or when they simply question the appropriateness of a treatment or procedure.

Yet, the steep hierarchy prevalent in ACTs and inherent to the medical profession can pose a barrier to people's speaking up behavior. Particularly people with lower status such as residents and nurses may feel that challenging a person with higher status (e.g., an attending surgeon) could cause negative evaluations or even jeopardize their position (Bisel, Messersmith & Kelley, 2012; Milliken,

Morrison, & Hewlin, 2003). Residents indicated that they would not speak up to a surgeon who causes an intra-surgical complication as their fear penalties or negative repercussions (Kobayashi et al., 2006). However, even though hierarchy is a prevalent barrier to speaking up, there is evidence that some people do speak up. A recent study with anesthesia teams has revealed that nurses even spoke up more than physicians during a simulated critical event and that nurses' amount of speaking up was positively associated with team performance (Kolbe et al., 2012). To better explain such counterintuitive findings, we suggest that it may be fruitful to consider interindividual differences as a predictor of voice behavior. Especially in a highly dynamic action team in which team members have to constantly adapt to changing circumstances, looking at individual differences can be helpful to make predictions across situational contexts and to better understand why people speak up or remain silent (cf. Baard, Rench, & Kozlowski, 2014).

Agency and Communion as Predictors of Speaking up in ACTs

There are two fundamental trait dimensions that are relevant to the understanding of interpersonal behavior, namely agency (also called instrumentality or competence) and communion (also called expressiveness or warmth) (e.g., Abele, 2003; Bakan, 1966; Fiske, Cuddy, Glick, & Xu, 2002). Agency refers to individuals' desire to master the environment, to assert oneself and to experience competence, achievement, and power. Communion, on the other hand, refers to people's desire to closely relate to others and is reflected in being kind, helpful and nice. The two dimensions have been related to gender stereotypes with agency relating to prototypically masculine and communion relating to prototypically feminine traits (e.g., Bem, 1974; Spence & Helmreich, 1978). They are also conceptually related to the Big Five with agreeableness, conscientiousness and emotional stability relating to communion and extraversion and openness relating to agency (Digman, 1997). Thus, agency and communion can be viewed as the Big Two that reflect the duality of human existence: our striving for self-assertion and our desire for belongingness (Bakan, 1966). As voice has been conceptualized as a deliberate decision process in which individuals weigh the pros and cons of speaking up (Morrison, 2011), we propose that agency and communion may likewise affect this decision in ACTs (i.e., being assertive for the patient's wellbeing vs. wanting to be liked by colleagues).

Although research looking at individual predictors of speaking up in teams is rare, some studies have used agency and communion or the Big Five to predict voice behavior or other forms of assertive communication in group contexts. One study has investigated verbal assertiveness in small groups and found that high-agency persons used more direct statements than low-agency persons but that communion was not predictive of assertive behavior (Leaper, 1987). Looking at leadership behavior as a particular form of assertive communication, there is evidence that traits pertaining to the communion dimension can even have a negative effect. Streiff and colleagues (2011) conducted a study with medical students and simulated cardiac arrests. They found that people who scored high in extraversion (i.e., related to agency) and low in agreeableness (i.e., related to communion) were most likely make leadership statements such as making decisions, voicing commands and assigning tasks within the team. A similar pattern of results could be shown for the relationship between the Big Five and voice behavior assessed in laboratory study. LePine and Van Dyne (2001) found that extraversion related positively and that agreeableness related negatively to constructive-change oriented communication. On the basis of these findings, we propose that agency may likewise have a positive effect on speaking up behavior in ACTs. Agentic traits such as being assertive, independent, and persistent may foster people's willingness to voice suggestions, problems, opinions, or doubts. By contrast, communion seems to have a rather negative effect on assertive communication in groups. People for whom being highly communal (i.e., being kind, friendly, and nice) is central to their self-definition may be more likely to be silent. Thus, we hypothesize:

> **Hypothesis 1:** The more agentic team members perceive themselves the more likely they are to speak up during critical events.

> **Hypothesis 2:** The more communal team members perceive themselves the less likely they are to speak up during critical events.

We tested these hypotheses in a high-fidelity simulation setting involving two-person anesthesia teams (i.e., one physician, one nurse) to best reflect the characteristics of ACTs. The teams were required to manage unexpected critical events (e.g.,

treatment of an unexpected difficult airway) during which they were confronted with multiple possibilities to speak up within their own team but also across disciplines (i.e., towards a surgeon). By investigating our hypotheses in a highly realistic simulated environment, we also follow recent calls to use simulation to adequately study processes in action teams (Ishak & Ballard, 2012).

Method

Participants

We implemented this study within one-day simulation-based team training sessions for anesthesia staff members from an university hospital. The entire study period involved 10 training days with up to six participants (e.g., three physicians and three nurses) participating each day. In all, 54 participants (33 female, 21 male, M_{age} = 34.07, SD = 7.61, $M_{work\ exp.}$ = 5.08, SD = 7.46) participated in the study. Of these 54 participants, 27 were anesthesia nurses and 27 were anesthesia physicians (26 residents, 1 attending). On each study day, the nurses and physicians were randomly put together to form a two-person anesthesia team consisting of one nurse and one physician. This resulted in 2 or 3 teams each day and in 27 anesthesia teams across the study period. Prior to the study, all participants were provided with information concerning the procedure and written consent was obtained. All participants participated for training purposes and received advanced education credits.

Simulator

The study was conducted at a simulation center utilizing a full-scale patient simulator (SimMan3G®, Laerdal, Norway) placed in a simulated operating room (OR). The patient simulator has highly realistic anatomic and physiological features and is able to breathe, blink and talk (through a microphone). Chest movements, and heart and lung sounds can be observed and heard with a stethoscope; the pulse can be palpated. Vital parameters such as heart rate, pulse, respiratory rate, body temperature, oxygen saturation, and blood pressure were adjusted by attending anesthesiologists from a control room next door. The simulated OR was equipped with an anesthetic machine, an intravenous pole, and a cart with medical supplies (e.g., drugs, laryngoscope) and provided a highly accurate reflection of participants'

natural work context. Three cameras were placed in the room to enable video recording from different perspectives.

Procedure and Scenarios

Upon arrival all participants were introduced to the simulation facilities and received a comprehensive familiarization with the patient simulator. Following that, they completed a questionnaire including measures of demographics and work experience, as well as agency and communion. Subsequently, all participants were randomly assigned to two-person anesthesia teams involving one physician and one nurse. Depending on the number of teams we could form, we simulated up to three different medical scenarios on one training day. Importantly, each team performed only one scenario lasting approximately 20 minutes. The remaining participants scheduled for that day were able to observe the performing team through live video broadcasting in a room next door. All simulated scenarios were followed by an extensive instructor-led debriefing of which all participants were part. During this debriefing, the medical and teamwork challenges such as leadership, situational awareness and communication were elaborated upon and potential opportunities for speaking up were discussed (Kolbe et al., 2013).

The development of the scenarios was based on critical incidents reports and conducted by three attending anesthesiologists, one resident anesthesiologist, and two psychologists. Each scenario was designed to contain at least one speaking up opportunity—either within the anesthesia team or against a confederate surgeon—that was highly important for successful management of the critical events. Depending on the participants' behavior there could also be more speaking up opportunities if a team member's behavior required unforeseen correction. As limitations in staff availability prevented us from performing each scenario on each study day, we wanted to ensure that the scenarios were evenly distributed with respect to opportunities to speak up within the team as well as across teams. Thus, scenario C, which involved a confederate surgeon to create across-team speaking up opportunities, was performed 26 times over the whole study period. Scenarios A and B were performed 10 and 18 times, respectively. The usability of similar scenarios for investigating speaking up behavior in ACTs has been tested in prior studies (Kolbe et al., 2012; 2013).

Scenario A: Unexpected difficult airway. This scenario was designed to simulate an unexpected difficult airway occurring during the induction phase of a general anesthetic for an elective surgery. In this phase, the patient receives a hypnotic (e.g., Propofol), an analgetic (e.g., Fentanyl), and a muscle relaxant (e.g., Rocuronium) leading to unconsciousness and a total loss of muscle tone and ability to breathe autonomously. Thus, the patient needs to be ventilated with a facemask; as the induction phase progresses intubation with a tube is required (i.e., ventilation tube inserted into the trachea). A difficult airway is defined as the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with mask ventilation, difficulty with tracheal intubation, or both (Apfelbaum, Hagberg, & Caplan, 2013). In this case, the oxygen saturation decreases quickly, which leads to severe brain damage within minutes and eventually to death. The anesthesia team was required to follow an algorithm for unexpected difficult airway involving alternative intubation techniques (e.g., a fiber optic). Several opportunities to speak up emerged concerning the implementation of the difficult airway algorithm (see Table 1).

Scenario B: Difficult airway and cardiac arrest. This scenario was similar to scenario A as it also involved the treatment of the difficult airway. However, in this scenario the difficult airway was to be expected. The team was handed the patient chart that contained critical information about the airway and thus the team could prepare for an alternative intubation and for implementing a difficult airway algortihm (e.g., by assembling special tools for difficult intubation). However, after the patient was successfully intubated with an alternative intubation technique, the heart rate first increased rapidly (i.e., tachycardia) and then decreased over a short period of time (i.e., bradycardia) eventually leading to asystole (i.e., no cardiac electrical activity as evidenced by a flatline on the ECG). This situation requires immediate cardiopulmonary resuscitation through chest compressions and drugs (e.g., Epinephrine). Several opportunities to speak up emerged concerning the procedure of the difficult airway algorithm as well concerning the initiation of the resuscitation (see Table 1).

Scenario C: Tension pneumothorax. This scenario started off as an elective surgical procedure in the OR. In addition to the anesthesia team a surgeon was

present to perform a laparoscopy. A male confederate endorsed the role of a surgeon. He was instructed to act unfriendly and ignorant towards the anesthesia team (e.g., complaining about the high room temperature). The task of the anesthesia team was to monitor the patient during surgery. After the team started to check the status of the patient, the surgeon injured the diaphragm with a needle and inflated the pleural cavity with carbon dioxide, which lead to a tension pneumothorax. A tension pneumothorax results from collection of air between the lungs and the chest wall that deflates the lung and immediately leads to impairment of respiration. In a very short period of time this leads to a significant decrease of arterial oxygen saturation and cardiac output (because of missing cardiac volume preload). The pneumothorax can be a lethal condition within minutes if it remains untreated (Leigh-Smith & Harris, 2005). The task of the anesthesia team was to recognize the lowered oxygen saturation and to treat the pneumothorax by releasing the air with a needle. Among other speaking up opportunities, the key speaking up challenge for the anesthesia team was to stop the surgeon from continuing with the laparoscopy (see Table 1).

Measures

Agency and Communion. In order to assess agency and communion, participants completed a shortened 8-item version of the German Extended Personal Attributes Questionnaire (GEPAQ; Runge, Frey, Gollwitzer, Helmreich, & Spence (1981). In line with previous research we measured agency and communion, respectively, with the positive masculinity and the positive femininity subscale of the GEPAQ (cf. Abele, 2003). The GEPAQ is based on the Personal Attributes Questionnaire (PAQ; Spence, Helmreich, & Stapp, 1974) that was originally designed to measure a person's orientation towards instrumentality/masculinity, expressiveness/femininity and androgyny. The original GEPAQ consists of 40 items, assessing each of the three dimensions as well as differentiating between positive and negative masculine and feminine traits. The positive masculinity scale consists of eight items: (1) independent, (2) stand up well under pressure, (3) never give up easily, (4) self-confident, (5) can make decisions easily, (6) active, (7) competitive, and (8) superior. The positive femininity scale also consists of eight items: (1) helpful to others, (2) able to devote self completely to others, (3) kind, (4) aware of others feelings, (5) understanding of others, (6) warm in relations with others, (7) gentle, and (8) emotional. As this study was part of a larger research project, we selected the first

four items from each scale as a parsimonious measure for agency and communion. Selection of items was based on internal discussions among the research team about which attributes might be relevant in an acute care context. Participants were asked how they would generally describe themselves using a 5-point scale (1 = not at all, 5 = very much). Reliability of both measures was satisfactory (agency: $\alpha = .66$; communion: $\alpha = .71$) and similar to other studies using complete scales (e.g., Abele, 2003; Abele & Wojciszke, 2007). To provide evidence that agency and communion represented distinct constructs, we performed a confirmatory factor analysis using AMOS 22. The fit indices suggest that the two-factorial model provided an acceptable fit to the data ($\chi^2 = 33.74$, df = 19, p = .02; GFI = .88, RMSEA = .12, SRMR = .09).

Opportunities to Speak Up. To specify the number and kind of speaking up situations that emerged within each team, we used the video records of all simulated scenarios. An attending anesthesiologist and a psychologist jointly identified all situations in which speaking up was necessary. A speaking up opportunity was classified as an omission (e.g., anesthesia nurse does not perform chest compressions within 30 sec after beginning of an asystole), a harmful suggestion (e.g., the anesthesia physician suggests to intubate conventionally although the airway is difficult) or a harmful action (e.g., the confederate surgeon harms the patient during surgery). Importantly, speaking up opportunities emerged both from planned, external manipulations (e.g., confederate surgeon) as well as from unplanned, team-internal discrepancies during the treatment of a patient (e.g., how a difficult airway should be treated). We coded all speaking-up opportunities on an individual level, thus taking into account whether the nurse, the physician or both could speak up.

Speaking Up. After having defined opportunities to speak up for each scenario, two further trained raters independently coded each team member's utterances to detect whether or not people spoke up during the predefined speaking up opportunities. To this end, we applied a modified version of a coding manual developed for acute care teams (Kolbe, Burtscher, & Manser, 2013) that differentiates between suggestion-, problem-, opinion-, and doubt-focused voice (cf. Morrison, 2011): Suggestion-focused voice was coded if a team member suggested a different course of action (e.g., "Should we apply another dose of Propofol before we start the

laryngoscopy?"). Problem-solving voice was coded when a team member voiced problems regarding the patient's condition or regarding a certain course of action (e.g., "We have a problem, the oxygen saturation is decreasing!"). It was also coded if a team member voiced a problem and explicitly stopped another person from a detrimental course of action (problem-solving voice with explicit stop; e.g., "Stop! We have a problem and we cannot continue with the surgery!"). Opinion-focused voice was coded if a team member expressed a different opinion (e.g., "No, I think we need to apply more muscle relaxant because she has a laryngospasm."). Doubt-focused voice was coded if a team member questioned assumptions or actions of his or her teammate (e.g., "Could it be possible that you perforated something?"). Using an event-sampling coding approach in Interact (Mangold International, Germany), all utterances were coded with respect to speaking up type (i.e., five types of speaking up vs. no speaking up), actor (i.e., nurse, physician), receiver (i.e., nurse, physician, surgeon), and time. We computed initial agreement among the coders in two steps. The first coder coded one video involving one nurse and one physician. The second coder received a data file with all set events specified by time but no codes and coded the same person. As each of the five speaking up types occurred very infrequently we were not able to compute agreement scores for each of the five speaking up types. Thus, we merged all speaking up types into a dummy-coded speaking up variable and computed Cohen's kappa subsequently. This resulted in a satisfactory agreement score (Cohen's kappa = .76). After computing the initial agreement both coders continued independently with the coding but met on a regular basis to compare their coding, compute Cohen's kappa and to solve potential disagreements through discussions.

Control Variables. We used age, sex, professional role (i.e., physician vs. nurse), work experience (i.e., work experience in anesthesia since graduation from medical/nursing school) as control variables as prior research has demonstrated an effect on speaking up (Morrison, 2011). We also used opportunities to speak up as a control variable, as we found that scenario C (M = 4.77, SD = 2.37) involved more speaking-up opportunities than scenario B (M = 1.33, SD = .59) and scenario A (M = 1.30, SD = .95), $F(2, 51) = 26.42$, $p < .001$. Additionally, we investigated whether controlling for the sequence of the simulated scenarios was necessary. As teams participating in the second or third scenario on a given training day were able to observe other teams during the simulation and also participated in their debriefing,

we tested whether they might have benefitted and thus spoke up more. An ANOVA with simulation sequence (i.e., first, second, or third team) as between-subjects factor and speaking up as dependent variable revealed no significant differences, $F(2, 51) = 1.03$, $p = .365$.

Results

Before testing our hypotheses, we provide a descriptive overview on the behavioral data on speaking up. We found that even though all participants were confronted with at least one critical speaking up opportunity, 22 of all 54 participants (41%) did not speak up. To gain a more precise picture of the five different speaking up types we compared physicians and nurses and the frequency of each speaking up type in the two groups. Across all simulated scenarios, 16 of all 27 physicians and 16 of all 27 nurses spoke up at least once (see Table 1). Although physicians ($M = 1.63$, $SD = 1.99$) had slightly more speaking up utterances than nurses ($M = 1.11$, $SD = 1.22$) we did not find a significant difference between the two professional groups regarding their overall speaking up frequency, $t(52) = 1.16$, $p = .253$. By comparing absolute frequencies of the five different speaking up types we found that while nurses engaged mostly in opinion-focused voice, physicians engaged mostly in problem-solving voice with explicit stopping of an action (see Table 2).

We also tested whether physicians and nurses differed with respect to whom they addressed their speaking up behavior. While physicians spoke up more often towards the confederate surgeon, nurses spoke up more often towards physicians within their own team. The proportion of nurses who spoke up towards the confederate surgeon was 0.18 whereas the proportion of physicians who spoke up towards the confederate surgeon was 0.82. This difference in proportions is significant, $\chi^2(1, 25) = 5.31$, $p = .027$.

Table 3 presents the means, standard deviations, and correlations between all assessed variables. To test both hypotheses, we performed a hierarchical regression analysis with speaking up frequency (absolute frequency) as dependent variable2. In the first step, we entered age, gender, professional role, work experience, and opportunities to speak up as control variables. In the second step, we entered agency and communion as main effects. Beta weights for each step as well as $\Delta R2$ for the two models are shown in Table 4. Neither age, gender,

professional status, or work experience significantly predicted speaking up in the first step. However, we found a significant effect of opportunities to speak up (β = .62, p < .001). In line with our first hypothesis, we found that—above and beyond the effect of the number of speaking up opportunities—agency was a significant positive predictor of speaking up (β = .33, p = .011) while communion was a significant negative predictor of speaking up (β = -.29, p = .027). R^2 significantly changed when agency and communion were entered into the model (ΔR^2 = .09, $F(2, 46) = 4.16$, p = .022) . The same direction of effects emerged when the regression analysis was repeated without covariates (for agency β= .33, p = .034 and for communion β = -.38, p = .014, respectively). We also tested for a possible interaction between agency and communion on speaking up but found no significant effect.

Thus, on the basis of these results we find empirical support for Hypothesis 1 and 2. The more agentic team members perceive themselves, the more likely they are to speak up. In contrast, the more communal team members perceive themselves the less likely they are to speak up.

Discussion

The goal of this research was to identify individual antecedents of speaking up in a typical action team, namely an acute care team (ACT). We implemented a high-fidelity simulation study with anesthesia teams and studied the relationship between agency and communion and speaking up. In line with our predictions, we found that agency was a positive and communion was a negative predictor of speaking up. Notably, we found that a high proportion of people remained silent even though this caused a highly critical or even fatal condition for the "patient". Importantly, whether team members chose to speak up or remain silent was not dependent on their age, their work experience, or their professional status but solely on how agentic and how communal they perceived themselves. That is, people who feel that they are highly agentic and rather less communal were most likely to speak up. Conversely, the barriers to voice concerns might have weighed especially high for those individuals for whom being friendly and kind is more relevant to their self-definition than being assertive and independent.

Theoretical Implications

This research contributes both to the literature on voice as well as to a better understanding of the behavioral effects of agency and communion. As has been discussed in the literature, agency is primarily directed at asserting the self and one's interests and communion is primarily directed at other people (Abele & Wojciszke, 2007). The present research shows that agency—but not communion—is also helpful when team members speak up with team- or patient-related concerns. Thus, agency can also be profitable from a team perspective. High levels of communion and low levels of agency, in contrast, hinder team members to voice their concerns as that this might lead people to focus on interpersonal consequences of speaking up. For example, these individuals might have remained silent because they feared to confront their teammates and to jeopardize future work relationships (Detert & Edmondson, 2011; Morrison, 2011). As Bienefeld and Grote (2012) have shown while studying speaking up in airline crews, especially captains and first officers—who are highly trained in CRM (i.e., crew resource management) skills—indicated that the most common reason for their silence is that they fear to damage relationships with their colleagues when they speak up. In light of the present findings it seems that if people define themselves as highly communal and rather less agentic—regardless of professional status—they might believe that speaking up harms the work relationship (Detert & Edmondson, 2011). This corresponds to the finding that highly communal people are strongly motivated by social emotions such as anticipated guilt or gratitude (Grant & Wrzesniewski, 2010). Thus, highly communal team members may decide not to speak up because they fear being blamed as the "troublemaker". As being friendly and agreeable is central to people with a highly communal orientation, they may refrain from speaking up as they might run at risk of being socially rejected. Moreover, as they are so strongly concerned about others' feelings they may also fear that the person they are speaking up to might lose face—especially if that person is a superordinate (Detert & Burris, 2007).

Team members who are highly agentic and less communal might be more willing to take a risk within the team and to challenge others' viewpoints (cf. Edmondson & McLain Smith, 2006). This behavior might be due to the fact that these people have high self-efficacy beliefs and thus are confident to master a situation that requires speaking up (cf. Bandura, 2001). As these people perceive themselves as highly independent, they might be more willing to stand out from the group and defend their opinion. Moreover, although there might be barriers to

speaking up, such as status and power differences (cf. Islam & Zyphur, 2005; Kobayashi et al., 2006), these individuals are less hesitant to express themselves because they might be less concerned about possible interpersonal consequences of speaking up and simply focus on achieving the task at hand. On a related note, we believe that the current results may also have implications for team performance. Although we did not explicitly assess team performance, a failure to speak up in the simulated scenarios implied a threat to patient safety and thus reflects lowered team performance. We therefore suggest that agency and communion are important characteristics to be considered with respect to team composition. The results suggest that when speaking up is required across teams (i.e., against the surgical team) it is least likely when an ACT is composed of team members who are all high in communion and low in agency. ACTs that are composed of members with differential levels of agency and communion can complement each other when across team speaking up is required.

It is also important to highlight the fact that even though agency and communion are related to gender stereotypes (e.g., Abele, 2003), we did not find gender-related differences in agency and communion and subsequent speaking up behavior. Contrary to studies that demonstrated a link between lower professional status and silence (e.g., Morrison & Rothman, 2009), we did not find significant differences between physicians and nurses regarding their speaking up frequency and type of speaking up. However, we found differences between physicians and nurses in whom they addressed their speaking up. Nurses spoke up more often towards the anesthesia physician rather than towards the (confederate) surgeon. Physicians, on the contrary, addressed their speaking up more often towards the surgeon than to the nurses in their team. We suggest two explanations for this difference. One reason may be that physicians are responsible for voicing diagnoses and making decisions and therefore it is more likely that a nurse questions a physician than vice versa. Another explanation may be the relative status of anesthesia physicians within the anesthesia team. As anesthesia physicians have a higher status within their own team than anesthesia nurses they may feel—if they are highly agentic and rather less communal—that they are more powerful and thus speak up against the surgeon (cf. Schmid Mast, 2010). Conversely, nurses may expect their physician teammate to speak up against the surgeon. Drawing on the implications of implicit voice theories—beliefs about when and to whom speaking up is appropriate (Detert & Edmondson, 2011)—nurses might have assumed that the physician should challenge

the surgeon as their lower status might not deem it appropriate to speak up against a high status physician. This corresponds to the findings of Bienefeld & Grote (2013) who showed that perceived status within one's own team (i.e., cabin crew) predicted speaking up across teams (i.e., towards the cockpit crew).

Implications for Team Trainings and Interventions

The central practical implication of this research is to train and empower especially highly communal team members in speaking up. Current simulation-based team trainings such as crisis resource management (CRM) focus on training assertiveness (e.g., Pian-Smith et al., 2009; Salas & Cannon-Bowers, 2001; Smith-Jentsch, Salas, & Baker, 1996). This study suggests that, as part of these trainings, for highly communal individuals it might be more effective to reduce their concerns regarding a potential negative interpersonal impact of speaking up. Thus, it might be fruitful to assess agency and communion within the context of CRM trainings. In this way, interventions and training modules can be designed and implemented according to participants' self-perceptions. Especially highly communal individuals might need other strategies and interventions to engage in speaking up. For them, it might be important to establish a sense of psychological safety in the team (Edmondson, 1999; 2003), thus reducing their fear of negative consequences when they voice concerns. If highly communal team members feel that speaking up is valued, especially by their team leaders, they might be more encouraged to voice suggestions and concerns (cf. Grant & Gino, 2010; Nembhard & Edmondson, 2006). Moreover, highly communal team members could be supported in reflecting on and reframing their conceptions of speaking up. This could be done during the debriefing phase after a simulated scenario where it can be systematically explored what kind of consequences and perceived barriers might hinder highly communal team members from voicing concerns (Kolbe et al., 2013).

Although the results point to a beneficial effect of being highly agentic and rather less communal it is important to discuss potentially negative effects within teams. In the literature this is referred to as unmitigated agency and refers to negative agentic attributes such as being aggressive or egoistic (Helgeson & Fritz, 1999). Such negative facets of agency might then again hinder other team members from speaking up and compromise effective team functioning. In a study of pilots, it was found that crews led by captains with a positive agentic-communal profile (i.e.,

operationalized through high achievement motivation and high interpersonal skill) were more effective than crews led by captains with a negative agentic profile (i.e., operationalized through high levels of competitiveness and irritability) (Chidester, Kanki, Foushee, Dickinson, & Bowles, 1990). Therefore, it is crucial to provide team members with communication strategies that enable them to voice their concerns assertively but not aggressively (Pian-Smith et al., 2009; Minehart et al., 2012).

Limitations and Future Research

We investigated the relationship between agency and communion and speaking up in ACTs in a simulated setting. Thus, some limitations of this research need to be discussed. On the one hand, simulation provides a useful tool as critical events can be created with social and task aspects being held constant. On the other hand, simulation is limited in terms of realism of the context and behavior of the participants (e.g., Gaba, 2007). People may behave differently during simulation than during real clinical performance. In our study, participants were aware of being observed and videotaped during the simulated critical events and might have acted in a socially desirable manner. Moreover, the lack of a "real patient" might have affected those team members with a more communal orientation. It might be plausible that in a real clinical setting they would have spoken up as they would feel empathic towards the patient. To further increase external validity of our findings, we suggest that the relationships between agency and communion and speaking up may also be studied by implementing live observations in the OR.

Another restriction results from the sample. While the anesthesia nurses were representative with respect to work experience, almost all physicians (with the exception of one attending) were anesthesia residents who still undergo specialist training and are supervised by attending physicians. This circumstance and the fact that they might lack medical knowledge and work experience might also account for their relatively low rate of speaking up (cf. Minei & Bisel, 2013). Therefore, future research needs to investigate these results in larger and more diverse samples (e.g., health care professionals from all levels of work experience).

Moreover, the impact of agency and communion on speaking up should also be investigated in other action teams such as cockpit crews, firefighters or air traffic control teams. In each of these action team contexts, task requirements may change

dynamically and safe procedures need to be secured at all times. To voice the slightest doubt and to overcome possible interpersonal hurdles is key to providing high reliability.

Conclusion

This study was conducted to investigate how self-perceptions influence speaking up behavior in acute care teams (ACTs). Our findings highlight that agency (i.e., assertiveness, persistence, independence) and communion (i.e., helpfulness, friendliness, sociability) as two fundamental dimensions of self-perception were significant predictors of actual speaking up behavior during simulated critical events. Specifically, agency positively predicted speaking up and communion negatively predicted speaking up. We conclude from our findings that ACT members need to be highly assertive, independent and self-confident and rather less concerned about their teammate's reactions in order to speak up in critical situations.

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COMPETING INTERESTS

None.

ETHICS APPROVAL

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Footnotes

[1] In the hospital that we studied anesthesia teams are responsible for emergency management. This may differ across hospitals and countries.

[2] We examined whether team members' speaking up behavior was dependent on each other such that speaking up behavior of one team member might have influenced speaking up behavior of the other. As our teams were composed of physician-nurse dyads, we tested for interdependence by following suggestions from Kenny, Kashy, & Cook (2006) for dyadic data analyses. This required restructuring the data into a dyad data set and computing correlations between nurses' and physicians' speaking up behavior. The results indicated no significant relationship (r = .27, p = .167, N = 27), meaning that speaking up behavior was not dependent within teams and that hypothesis testing could be performed at the individual level.

Table 1. Examples for Opportunities to Speak Up and Respective Speaking Up Types Within Each Scenario.

Scenario	Opportunity to Speak Up	Speaking Up Type
A) Unexpected difficult airway	*Omission* AP starts to deliver the first drug without notifying AN who adjusts monitor settings.	*Suggestion-focused voice* AN: "Hang on, I am not ready with the settings yet. I would wait until everything is clear with it."
	Harmful suggestion AP has failed twice to intubate the patient with the tracheal tube and does not proceed with the algorithm for difficult airway that requires alternative intubation techniques. AP: "I'm going to try [intubation with tracheal tube] again."	*No speaking up* AN remains silent and assembles the instruments for a conventional intubation.
	Harmful action AP is inspecting the difficult airway and carefully tries to place the tube into the trachea. AN pushes the tube in a different direction.	*Problem-focused voice (with explicit stopping)* AP takes over control of the tube and says: "No, please don't do anything!"
B) Difficult airway and cardiac arrest	*Omission* AP monitors the patient while AN is answering the phone. Meanwhile, the heart rate drops significantly (i.e., bradycardia) such that immediate resuscitation is necessary.	*Problem-focused voice* AP: "Please go away from the phone and prepare some Epinephrine [for resuscitation]!
	Harmful suggestion AP and AN have decided to use a fiber optic for intubation as the patient chart describes the airway as difficult. They both know that conventional intubation with tube is not possible. AP: "Please hand me the laryngoscope and the tube!"	*Doubt-focused voice* AN: "Don't you want the fiber optic?"
	Harmful action AP is ventilating the patient with a facemask. Although ventilation is rather insufficient (i.e., indicated by decreased thorax movements), AP suggests to starting the anesthetic by applying the first drug.	*No speaking up* AN observes the decreased thorax movements but does not voice this observation and prepares the medication.
C) Tension pneumothorax	*Omission* SRG: "Alright. Now turn off the light (i.e., to better view the monitor for the laparoscopy) and then we get going!"	*Opinion-focused voice* AP: "Actually, we have not finished the checklist (i.e., WHO surgical checklist to be performed by surgeons and anesthesiologists before incision) yet. What kind of surgery is this?"
	Harmful suggestion AP and AN are busy with the treatment of the pneumothorax when phone starts to ring. SRG to AP: "Can you answer the phone, it's my secretary!"	*No speaking up* Although AP is required to help AN, he does not voice concerns and picks up the phone for SRG.
	Harmful action The patient's oxygen saturation decreases rapidly because SRG has injured the diaphragm and thereby caused a pneumothorax. SRG: "What is your problem over there? I need to finish the surgery here."	*Problem-solving voice (explicit stopping)* AN: "No, you need to wait. She [the patient] is getting cyanotic (i.e., blue skin color due to decreased oxygen saturation)."

Note. AN = Anesthesia Nurse, AP = Anesthesia Physician, SRG = (Confederate) Surgeon.

Table 2. Frequencies of Speaking Up Types by Nurses and Physicians.

Speaking up type	Frequencies (percentage) of speaking up types within professional group	
	Nurses *n* = 16	Physicians *n* = 16
(1) Suggestion-focused voice	4 (17%)	5 (16%)
(2a) Problem-solving voice	5 (21%)	1 (3%)
(2b) Problem-solving voice (explicit stopping)	5 (21%)	13 (42%)
(3) Opinion-focused voice	8 (33%)	10 (32%)
(4) Doubt-focused voice	2 (8%)	2 (7%)
Total	24 (100%)	31 (100%)

Note. Total number of frequencies is higher than the number of individuals within each group as people could speak up more than once using different types.

Table 3. Means, Standard Deviations, and Correlations Between Variables.

Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Age (in yrs)	34.07	7.61							
2. Sex[a]	0.39	0.49	–.16						
3. Professional status[b]	0.00	1.01	–.31*	.42**					
4. Work experience (in yrs)	5.08	7.46	.81**	–.23	–.36**				
5. Agency	3.76	0.37	–.06	.05	.04	–.03			
6. Communion	4.12	0.53	–.17	–.06	–.05	–.14	.50**		
7. Opportunities to speak up	2.98	2.44	–.12	.27*	.19	–.10	–.05	–.12	
8. Speaking up	1.09	1.46	.07	.08	.09	.15	.18†	–.22*	.60**

Note. $N = 54$, ** $p < .01$, * $p < .05$, † $p < .10$, [a]0=female, 1=male, [b]0=nurse, 1=physician.

Table 4. Hierarchical Multiple Regression Analysis Predicting Speaking Up Frequency.

	Speaking up		
Model	*B*	*SE B*	*β*
Step 1			
Age (in yrs)	.03	.04	.14
Sex[a]	-.42	.43	-.13
Professional status[b]	.25	.21	.15
Work experience (in yrs)	.01	.04	.05
Opportunities to speak up	.42	.08	.62***
ΔR^2			.40***
Step 2			
Agency	1.45	.54	.33*
Communion	-.89	.39	-.29**
ΔR^2			.09*

Note. $N = 54$; ***$p < .001$, *$p < .05$, [a]0=female, 1=male, [b]0=nurse, 1=physician.

Paper 2

We Can Do It—Can We?
How Leader Communication, Professional Status, and Intergroup Relations Affect Voice in Extreme Action Teams

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Abstract

Voicing concerns to those in power can be crucial—especially in extreme action teams such as acute care teams (ACTs), consisting of physicians and nurses who manage life-threatening events. Combining a linguistic with a social identity approach, we proposed that the team leader's use of the word 'we' differently affects nurses' and physicians' voice intentions depending on their perceptions of intergroup relations. We implemented a high-fidelity simulation study with 27 ACTs (65 physicians and 76 nurses) managing critical events such as a cardiac arrest. Prior to the simulation, we assessed perceptions of intergroup relations, counted the number of 'we's expressed by the leader during the simulation and measured team members' subsequent voice intentions. The results confirmed our hypothesis and showed that 'we' affected nurses and physicians differently: For nurses, 'we' had a positive effect on voice when they perceived close intergroup relations but a negative effect when they perceived distant intergroup relations with physicians. For physicians, a leader's 'we'-statements positively affected their voice intentions independent of their perceptions of intergroup relations. We discuss theoretical and practical implications referring to group processes and hierarchy in extreme action teams and inter-professional teaming in general.

Key words: voice, action teams, intergroup relations

Introduction

> *A 48-year old man has undergone gastric surgery and is now being transferred to the recovery room. A resident anesthesiologist hands over the patient—who has already woken up from the surgery—to one of the nurses. He assures her that there were no complications and that monitoring of vital signs would not be necessary because the patient was already well responsive. After the resident has left, the nurse quickly reads through the patient chart and tries to comprehend the information while another patient calls for her. When checking back on the gastric patient, she realizes that he is not responsive anymore and that there are no visible chest movements. She quickly calls for help and installs the monitoring showing a cardiac flatline. The incoming attending anesthesiologist is terrified: "What happened to the patient, what did you do? Can't you nurses ever do anything right? Start chest compressions, now!"*

This scenario highlights the many challenges that acute care teams (ACTs) face: dynamic, unpredictable patient conditions, ad-hoc team composition (Klein, Ziegert, Knight, Xiao, 2006; Sundstrom, DeMeuse, & Futrell, 1990) as well as the strong group-related differentiation of nurses and physicians (e.g., Bartunek, 2011; Burford, 2012; Campbell-Heider & Pollock, 1987; Thomas, Sexton, & Helmreich, 2003). Why did the nurse not speak up when the resident told her that monitoring of vital signs would not be necessary? Even though this is a routine procedure, she might have thought that he—as a physician—knows better than her. Such absence of voicing concerns has been shown to account for a large amount of medical mishaps and even fatal errors (e.g., Institute of Medicine, 1999; Kobayashi et al., 2006). *Voice* or *speaking up* refers to discretionary communication of ideas, suggestions, or concerns (Morrison, 2011) and team leaders play an important role in fostering or, as the example shows, diminishing voice. Research has shown that if leaders explicitly invite and appreciate team members' input they are more likely to speak up (Nembhard & Edmondson, 2006). Moreover, there is evidence that even mere use of the word 'we' can have positive effects on the team (Sexton & Helmreich, 2000). Although one might expect that a leader's expression of 'we' may have a similar effect on team members' voice intentions in ACTs, we suggest that nurses' and physicians' status and their perceptions of intergroup relations may catalyze such an

effect. Depending on how the two groups—and especially nurses—perceive the nurse-physician relationship, a leader's expression of 'we' may have more or less positive impact on voice intentions. Testing this novel interplay in a high-fidelity simulation setting with real acute care teams, we seek to advance the study of voice, intergroup relations, and leadership in extreme action teams.

How Leader Communication Can Affect Voice in Acute Care Teams

With the notion of acute care teams (ACTs), we refer to multi-professional teams consisting of physicians and nurses who operate in various clinical settings such as anesthesia, intensive care, and emergency medicine. Although most procedures are highly routinized, critical events such as a surgical complication, an allergic reaction or a difficult airway may occur unexpectedly and require immediate action (Edmondson, Bohmer, & Pisano, 2006). ACTs are formed ad-hoc for a limited action cycle such as a general anesthesia during surgery, a shift in the intensive care unit or in the emergency room—and often team members may not even be acquainted to one another (cf. Vashdi, Bamberger, & Erez, 2013). Because of this constant element of uncertainty and improvisation in a high-risk environment, ACTs can be characterized as extreme action teams (Klein, Ziegert, Knight, Xiao, 2006; Sundstrom, De Meuse, & Furtrell, 1990). To enable swift coordination even in critical situations, ACTs have a clear formal hierarchical structure with one senior physician (i.e. an attending) at the top of the hierarchy and several resident physicians (i.e., physicians who receive specialized medical training) and nurses at the subordinate level (e.g., Kolbe et al., 2012). The attending is a key person as he/she decides on relevant actions and diagnoses and often does so in rather directive manner (Tschan et al., 2006). Nevertheless, to be able to identify the correct diagnosis and to apply correct treatment, it is crucial that all team members—nurses and residents—are engaged in the decision-making process, for example, by speaking out loud with questions or concerns—and this is even more important in non-routine and ambiguous situations when symptoms may point to different diagnoses (Tschan et al., 2009). Although it could be shown that ACTs in which nurses speak up with questions or voice concerns outperform those in which nurses remain silent (Kolbe et al., 2012), medical errors are often the result of nurses and residents not daring to speak up against senior physicians (Kobayashi et al., 2006). Moreover, nurses often report that even when they are certain that something is

wrong with a patient they leave it up to the doctors to make decisions and thus disengage from any team-based decision processes (e.g., Campbell-Heider & Pollock, 1987; Thomas, Sexton, & Helmreich, 2003). The reason for such potentially fatal withdrawal and silence is that people may perceive leaders as not approachable and fear to be blamed or punished when they would challenge them (Bienefeld & Grote, 2012; Morrison, Milliken, & Hewlin, 2003; Morrison & Rothman, 2009).

Research shows that leaders who explicitly inquire and value people's opinions can increase willingness to speak up (Detert & Burris, 2007; Edmondson, 2003; Walumbwa & Schaubroeck, 2009). The concept of leader inclusiveness posits that by inviting (e.g., "*What do you think?*") and appreciating (e.g., "*Thank you for this input!*") team member input, people feel more psychologically safe to voice their concerns (Hirak, Peng, Carmeli, & Schaubroeck, 2012; Nemhard & Edmondson, 2006). In addition to such direct invitations, research exploring linguistic patterns in teams suggests that even certain words used by the leader may have an effect on team processes. For example, Sexton and Helmreich (2000) analyzed language patterns of cockpit crews during a flight simulation and found that the captain's use of the word 'we' was associated with better performance and lower error rates. It is suggested that via signaling shared identity, affiliation, and interdependence (Slatcher, Vazire, & Pennebaker, 2008), 'we' may trigger individuals' team orientation, which in turn increases team performance (Salas, Sims, & Burke, 2005). Moreover, leaders who use a more group-oriented rhetoric are perceived as more charismatic (Platow, van Knippenberg, Haslam, van Knippenberg, & Spears, 2006), which in turn facilitates individuals' perception that it is safe to voice concerns (Detert & Burris, 2007; Liu, Zhu, & Yang, 2010). Along this theorizing, we suggest that as it highlights the group as a whole, 'we' may bridge the gap between the team leader and the team members in an ACT and thus positively affect team members' voice intentions.

The Moderating Role of Professional Status and Intergroup Relations

Based on the evidence presented so far, we would expect a direct effect of a leader's amount of expressing the word 'we' for nurses' and residents' voice intentions. Yet, as nurses and residents belong to different professional groups with different tasks, responsibilities, and identities, we argue that it is necessary to account for two intertwined moderating factors when examining the effects of 'we' on voice:

professional status and perceptions of intergroup relations. While professional status simply refers to the fact that nurses and physicians are part of two different professional groups with different responsibilities and executive functions (i.e., nurses are not allowed to perform invasive procedures), intergroup relations refer to their perceptions of being part of the nurses or physicians group. According to the social identity approach, people do not only define themselves and others as individuals but also on the basis of (multiple) group memberships (e.g., Abrams & Hogg, 2012; Hogg & Terry, 2000; Tajfel & Turner, 1979; Tajfel, 1982). This creates an "us" vs. "them" frame in which people differentiate between their own group—the *in*group—and other groups—the *out*group (Tajfel, 1982). Derived from that differentiation is the notion of intergroup relations, that is, "the way in which people in groups perceive, think about, feel about, and act toward people in other groups" (Hogg, 2003, p. 479). When people strongly differentiate between their in-group and a respective out-group, they are more likely to exhibit intergroup bias, that is, they favor their in-group and derogate members from the out-group, which is associated with stereotyping, discrimination and conflict (e.g., Brewer, 1979). Thus, intergroup relations can be perceived as more or less *demarcated*: strong demarcation (or perceived distance) is associated with negative attitudes towards the out-group and a need for distinctiveness whereas weak demarcation (or perceived closeness) is associated with a positive evaluation of the out-group and perceptions of a superordinate identity (Schubert & Otten, 2002). Relating this theorizing to ACTs, team members can either perceive their intergroup relations as highly demarcated or distant, that is, they perceive barriers between nurses and physicians and feel that both groups should clearly be separated. On the contrary, intergroup relations between nurses and physicians can be perceived as little demarcated or close, implying that people make little distinction between the two groups and identify with the superordinate category, that is, an ACT.

As team leaders in ACTs are usually senior physicians, they are out-group members from the perspective of the nurses. Moreover, as teams are composed ad-hoc, the team leader may vary from one action cycle to another. Thus, we suggest that for nurses the impact of the word 'we'—as an expression of a superordinate team identity—may only positively affect their voice intentions if they perceive close intergroup relations between nurses and physicians in their work unit. If they have a distant representation of the relationship between nurses and physicians, such inclusive language by the leading physician is unlikely to positively affect their voice

intentions, as they do not feel included. For residents, we suggest that the effect of team leader 'we' on their voice intentions is independent of their perceptions of intergroup relations with nurses as they are part of the higher-status physician group. Thus, a leader's 'we'-statements should have a direct effect on residents' voice intentions both when they perceive close and distant relationships with nurses (see Figure 1). Put more formally, we hypothesize:

> *H(1): Leader 'we'-statements, professional status, and intergroup relations interact to affect voice intentions: For physicians, the frequency of the team leader's 'we' will have a direct effect on their voice intentions independent of their perceptions of intergroup relations. For nurses, the impact of the team leader's 'we' on voice will be moderated by their perception of the intergroup relations: 'We' only has a positive effect on voice when they perceive close intergroup relations between physicians and nurses but not when they perceive distant intergroup relations.*

Method

Participants

The study was conducted at a hospital's simulation center and implemented within one-day simulation-based training sessions for anesthesia physicians and nurses[1]. The data collection phase encompassed 27 training days spread over six weeks with up to seven different participants participating each day. All participants were provided with information concerning the study and written consent was obtained. In all, 141 participants (90 female, 51 male, M_{age}= 37.07, SD_{age} = 8.64) participated, comprising 48 anesthesia nurses, 17 recovery room nurses, 57 resident anesthesiologists and 19 attending anesthesiologists. On the basis of these participants 27 acute care teams were formed to manage one simulated medical emergency. Depending on staff availability, team size ranged from 4 to 8 persons, that is, one or two anesthesia or recovery room nurses, one or two resident anesthesiologists and one attending anesthesiologist. For 19 teams the leader was an attending anesthesiologist, for 8 teams a resident anesthesiologist in his/her last year of advanced training enacted the leader role. All participants participated for training purposes and received mandatory advanced training credits.

Procedure & Design

On arrival, all participants were introduced to the simulation facilities and completed a questionnaire assessing demographics such as age, gender, and work experience as well as their general perceptions of intergroup relations between physicians and nurses in their work unit. After that, participants formed an ACT and performed a simulated medical scenario (see more detail below) lasting approximately 20 minutes and followed by an instructor-led debriefing. Following that, we assessed participants' voice intentions.

To simulate critical events, we used a high-fidelity patient simulator (SimMan, Laerdal) placed in a fully equipped hospital room. The patient simulator is a full-scale manikin with realistic anatomic and physiological features and is able to "breathe", "blink" and "talk" (through a microphone). There are visible chest movements, heart and lung sounds can be heard with a stethoscope and the pulse can be palpated. Vital parameters such as heart rate, pulse, respiratory rate and oxygen saturation can be controlled from a room next door (see Figure 2). Depending on the participants' interventions, the vital parameters were adjusted by attending anesthesiologists such that participants received a realistic feedback from the 'patient'.

The simulated medical scenarios were designed by three attending anesthesiologists and two psychologists using critical incident reports as a basis. We designed three different but equivalent cases as data collection was spanned over the course of six weeks and we needed to ensure that participants would not talk about the cases in their work unit and thus affect performance of staff participating later in the study period. Importantly, each team performed only one of the simulated scenarios so that we ensured that they were functionally equivalent with respect to medical and teamwork requirements. Each scenario started off as a routine situation in which an unexpected critical event occurred and required management of multiple tasks.

Scenario A. The setting of this scenario was a recovery room where patients receive primary care after surgery. The ACT was composed of two recovery room nurses, one or two anesthesia residents, and one attending anesthesiologist. In addition to the patient simulator there was a human confederate acting as a second patient. The

confederate patient's role was to distract the team's attention by acting annoyingly and repeatedly asking for various services and information. The simulated case was based a 46-year old male who had a port implanted to his stomach to ease access for chemotherapy. After this minimally invasive, routine procedure he was transferred to the recovery room. Soon thereafter he unexpectedly showed symptoms of a post-surgical intra-abdominal bleeding eventually leading to a cardiac arrest. Priority needed to be placed on managing the post-surgical complication even though the confederate patient continued to distract the team.

Scenario B. This scenario was designed as an emergency room scenario. The patient who was delivered to the emergency room was a 35-year old woman suffering from eclamsia (i.e., acute and life-threatening complication during pregnancy involving seizures and unconsciousness). The patient simulator was now equipped with a neonate simulator to allow simulation of a C-section. The ACT was required to assess the woman's and the baby's vital signs and to call a surgeon to carry out the C-section. Soon thereafter, the newborn displayed a very low heart rate and needed to be resuscitated. At the same time, the woman displayed symptoms of a malfunction of blood clotting which required immediate blood transfusions, anti-coagulants, and eventually hysterectomy. Thus, the ACT needed to manage both patients in parallel.

Scenario C. This scenario was also designed as a post-surgical complication in the recovery room. Two nurses were present in the simulated recovery room and were handed over a patient from a resident anesthesiologist (i.e., a male confederate) who had carried out the general anesthesia during the surgery. Soon after the resident had left, the patient started to cough which lead to a rupture of the left bronchus. Consequently, the patient developed a tension pneumothorax (i.e., potentially fatal tension in the chest wall leading to impaired breathing). The nurses needed to call for help and apply primary care until arrival of a resident and the team leader. The team leader was responsible for initiating the right emergency algorithm (i.e., successive treatment of pneumothorax and bronchus rupture) as well as inducing and supervising the resident's intubation of the patient (i.e., tube needed to be placed into the right bronchus).

Measures

Leader 'we'-statements. We videotaped all scenarios and counted the number of *we*'s that the team leader expressed during the scenario. We used an event sampling coding approach and coded all utterances involving the word 'we' from the beginning until the end of the simulation. Overall, we counted 444 'we's for all 27 team leaders. 'We' was counted when the team leader used statements such as "***We*** *need to auscultate* [i.e., examine the lung with a stethoscope]!"; "***We*** *still have a flatline!"*[i.e., no electric cardiac output as indicated by a flatline on the ECG]; "*Let's make a reassessment: A is ok. B,* ***we*** *just checked. C… what's with C?* ***We*** *need to recheck the pressure*". We used the number of we-statements as a between-team variable.

Intergroup relations. We assessed team members' perceived intergroup relations between physicians and nurses with a pictorial measure that uses spatial distances as a proxy for cognitive closeness (Schubert & Otten, 2002). The scale displays seven pictures of two circles labeled "physicians" and "nurses" with increasing closeness and overlap between the two circles (see Figure 3). Respondents were asked which of the seven pictures best represents the relationship between physicians and nurses in their department. The degree of overlap directly assesses perceived closeness between the two groups and thus serves as an indicator of demarcation between physicians and nurses.

Voice intentions. To assess voice intentions, we used the 10-item voice scale by Liang, Farh, and Farh (2012). Sample items are: "*I proactively develop and make suggestions for issues that may influence work",* or, "*Speak up honestly with problems that might cause serious loss to the work unit, even when/though dissenting opinions exist".* Notably, we replaced the term unit with work to enlarge the frame of reference and to account for the ad-hoc team context. The scale achieved good reliability (Cronbach's $\alpha = .82$).

Results

First, we removed the 27 leaders from the data set and assigned the number of 'we's-that a leader expressed to all team members that were part of the respective team. Thus, 'we' served as a team-level variable that differed between teams but not within teams. Table 1 presents means, standard deviations and correlations of all variables. Intergroup relations were significantly positively correlated with sex (r = .22, p = .023) and professional status (r = .21, p = .029) indicating that men and physicians perceived the relationship between physicians and nurses as closer than women and nurses. Notably, professional status was highly negatively correlated with age (r = -.52, p < .001) and work experience (r = -.68, < .001), suggesting that nurses were more experienced and older than physicians.

To test our hypothesis, we first tested whether multilevel modeling would be indicated. Although our data is multilevel in nature, with people nested in teams, we found that the statistical precondition of significant unexplained between-team variance was not met[2]. We therefore computed a moderated regression analysis with voice intentions as dependent variable. Following suggestions from Aiken & West (1991) we mean-centered all predictors before computing the product terms. We entered status, intergroup relations, and the leader's we-statements as main effects (Step 1), all possible two-way interactions (Step 2) and the three-way interaction (Step 3). There was no evidence of a main effect of 'we'-statements (B = .00, SE = .00, t = .30, β = .03, p = *ns*). The interaction between intergroup relations and we-statements was significant (B = .18, SE = .05, t = 3.70, p < .001) and accounted for a significant change in explained variance form step 2 to step 3 (ΔR^2= .17, F(3, 98) = 6.97, p < .001). The proposed three-way interaction between intergroup relations, 'we' and professional status entered in step 3 was also significant (B = -.09, SE = .05, t = -1.98, p = .05) and added significant explained variance to the dependent variable (ΔR^2= .03, F(1, 97) = 3.92, p = .05). Table 2 summarizes the moderated multiple regression results.

As our hypothesis predicted different interaction effects between intergroup relations and leader 'we'-statements for nurses and physicians, we analyzed the conditional effect of the interaction between intergroup relations and 'we' at different values of professional status (Hayes & Matthes, 2009). The results show that the interaction between 'we' and intergroup relations was significant for nurses (B = .02, SE = .00, t = 4.40, p < .001) but not for physicians (B = .00, SE = .00, t = 0.87, p =

.384), thus supporting our hypothesis of a three-way interaction between 'we', intergroup relations and professional status. Only for nurses, a leader's 'we'-statements interacted with their perceptions of intergroup relations. As we predicted a direct effect of leader 'we'-statements on residents' voice intentions, we selected only the residents from the data set and predicted their voice intentions by the leader's we-statements. The results confirmed that for residents, 'we' had a positive impact on their subsequent voice intentions (B = .01, SE = .05, t = 2.34, β = .33, p = .024). To visualize the different effects of intergroup relations for the two professional groups, we plotted the relationship between team leader 'we' and voice intentions at low (-1 *SD*) and high (+1 *SD*) levels of intergroup relations separately for nurses and physicians (see Figure 4a and 4b).

To further determine the effect of distant vs. close perceptions of intergroup relations for nurses, we conducted a simple slopes analysis. The slope for nurses with close perceptions of their intergroup relations (+ 1 *SD*) showed a significant positive gradient from low to high number of we-statements (B = .02, SE = .01, t = 2.52, p = .013). In line with our hypothesis, this implies that for them more 'we' increased their voice intentions. Conversely, and in addition to our predictions, the slope for nurses with more distant perceptions of intergroup relations showed a significant *negative* gradient from low to high frequency of we-statements (B = -.03, SE = .01; t = -4.11, p < .001), suggesting that for those nurses a higher frequency of 'we' even had a negative impact on their subsequent voice intentions.

Discussion

In this study, we investigated the impact of leader communication on voice intentions in extreme action teams while accounting for differences in professional status and perceived intergroup relations. In line with our hypothesis, we found a three-way interaction between 'we'-statements of the team leader, team members' professional status and their perceptions of intergroup relations between physicians and nurses. For nurses, the leaders' use of the word 'we' only positively affected their voice intentions when they perceived little demarcation between physicians and nurses. Most surprisingly and not predicted by our hypothesis, for those nurses who perceived a demarcated or distant relationship with physicians, the leader's we-statements even had a negative impact on their subsequent voice intentions. For

physicians, on the contrary and in line with our predictions, a leader's 'we'-statements had a positive impact on their voice intentions independent of their perceptions of intergroup relations between physicians and nurses.

Implications for Extreme Action Teams in Healthcare

Our findings extend research on voice in extreme action teams by revealing a complex interplay of linguistic markers of group-oriented leadership, professional status, and perceptions of intergroup relations. While residents were directly positively affected by a leader's we-statements, nurses' perceptions of intergroup relations functioned as a catalyzer in the relationship between 'we' and their voice intentions. To disentangle the multiple implications of this interplay, we will start the discussion by first considering implications for residents and for those nurses who perceived close intergroup relations before proceeding to implications for nurses who perceived distant intergroup relations.

For residents, the implications seem quite straightforward. As they belong to the same professional group as the leading attending, a leader's 'we'-statements may highlight their similarities, attenuate the hierarchical differences and put emphasis on a common in-group identity. In light of the fact that team leaders often act as mentors for residents, they may perceive leaders who say 'we' as encouraging role models who appreciate their novice status and support their learning experience (Edmondson, 2003; Minei & Bisel, 2013). This may then intensify their self-confidence—an essential predictor of voice behavior in extreme action teams (Weiss et al., 2014).

Nurses who perceived the relations with physicians as close may have also perceived 'we' as an expression of a common identity, namely that of an ACT (cf. Gaertner & Dovidio, 2000). Thus, they may have likewise felt integrated and encouraged when the team leader linguistically corresponded to their perception of a superordinate identity. This resembles research showing that individuals who strongly identify with a group feel more represented by leaders who use a collective rhetoric style (Hornsey, Blackwood, & O'Brien, 2005). For nurses who see the relations with physicians as close, 'we' may signal common responsibility and common commitment to the task at hand and places emphasis on each team member's importance (Yammarino, Salas, Serban, Shirreffs, & Shuffler, 2012). Yet, 'we' may have detrimental effects for nurses who feel that nurses and physicians are clearly separated. For them, such emphasis on a superordinate team context might

only be ineffective but, and this is most distressing, results in silence. This seems even more staggering when considering the fact that these nurses showed the highest voice intentions when led by leaders who expressed little 'we'. How can this counterintuitive finding be explained?

To answer this question, we need to consider the lack of temporal stability of ACTs and common for many other action teams (Vashdi, Bamberger, & Erez, 2013). As team composition varies from one interaction cycle to another, leader communication differs and so do the expressions of 'we'. Hence, nurses' perceptions of intergroup relations are influenced by accumulated experiences with many physicians as representative of the out-group. If nurses perceive demarcated intergroup relations, it is likely that they have had negative experiences with physicians in the past and may feel devalued or threatened as a group. Studies revealed that interventions designed to create a common identity are likely to result in resistance and to even increase in-group bias for lower status groups as they often feel a need to be distinct from higher status out-groups (e.g., Brewer, 1991; Hornsey & Hogg, 2000). If a leader frequently expresses 'we', they might perceive it as pretending as they might have encountered team leaders who have neither addressed, nor integrated, nor appreciated them at all. Possibly, they may not even feel addressed by a team leader's 'we'-statements and think it is exclusively directed at residents—which then again pronounces group barriers, highlights status differences and thus exacerbates barriers to voice concerns.

General Implications for 'Teaming'

Nowadays, teams in various contexts are increasingly required to instantly "team up" with limited possibilities for proceeding through the classic consecutive steps of team building (Tannenbaum, Mathieu, Salas, & Cohen, 2012). To better adapt to constant societal, environmental, and technological changes, Edmondson (2012) has highlighted the notion of *teaming*, referring to how teams form, interact, and learn in dynamic contexts. We believe that the current findings may add to these considerations as teams are frequently composed of various professional groups that differ in status, intergroup relations, and leader behavior. Whenever such different social identities collide, leaders face an undeniable challenge: how can they quickly establish a common team identity and secure that people speak up without alienating team members from lower status groups?

Recent works suggest that leaders should create a common, superordinate identity in diverse teams to minimize intergroup conflict and to maximize the potential of diversity (Hogg, Van Knippenberg and Rast (2012). Based on the current findings, we suggest that because existing perceptions of intergroup relations may compromise such efforts team leaders are well advised to explicitly invite and appreciate those team members with lower status (Nembhard & Edmondson, 2006). Instead of trying to minimize group-related differences team leaders should acknowledge and embrace different professional group identities while establishing a second, common in-group identity (Dovidio, Gaertner, & Saguy, 2007; Wu, Tsui, Kinicki, 2010). Even though it might be a long-term process, perceptions of intergroup relations might change as individuals from lower status groups make positive experiences with those from higher status groups. Based on the principles of the contact hypothesis, intergroup conflict tends to decrease when people from different groups interact and jointly work on a task (Allport, 1954; Pettigrew, 1998). One way of achieving such contact is inter-professional training. Research shows that such interventions can improve attitudes towards the other profession and decrease barriers to speak up (Carpenter, 1995; Minehart et al., 2012). Another way of aligning and altering group-related perceptions are debriefings or after-event reviews (AER). Originating from the military, debriefings aim at exploring antecedents and consequences of actions, uncovering mental models and thus facilitate team learning. They are increasingly applied in healthcare (e.g., Kolbe, Weiss, Grote et al., 2013; Salas et al., 2008; Tannenbaum & Cerasoli, 2013; Vashdi, Bamberger, & Erez, 2013) but also in other organizational settings (DeRue, Nahrgang, Hollenbeck, & Workman, 2012; Ellis & Davidi, 2005). Key to using the potential of AERs is to adopt a learning-rather than an execution imperative. This in turn can be achieved through the leader who may guide reflections on intergroup relations, individuals' mental models and thus instigate team learning. Saying 'we' might be a first step to creating a superordinate identity, yet leaders should be aware that teaming requires constant integration of team members' different perspectives, identities and needs.

Limitations, Future Research & Conclusion

To increase external validity of the current findings, we suggest that future research should look at the effects of leaders' 'we'-statements on speaking up behavior in actual work settings. Simulation allows for standardization in a risk-free environment, yet potential drawbacks such as social desirability, lack of realism, and limited transferability may not be completely ruled out (Beaubien & Baker, 2004; Salas, Paige, & Rosen, 2013). Although our sample was quite representative of extreme action teams in healthcare, professional status, age and work experience were confounded such that nurses tended to be female, older and more experienced than physicians. To further increase generalizability of our findings it may also be fruitful to investigate these effects in other team contexts as intergroup relations may vary strongly across contexts and even within organizations, departments, and units. We also believe that as a fruitful extension and to uncover conveying mechanisms, it may be examined whether 'we' may trigger automatic processes related to social cognition. To conclude, our results extend current knowledge on the effects of leadership on voice by showing how one word can powerfully alter people's willingness to voice concerns if they feel that hierarchical barriers can be overcome and be what makes successful: one team.

Footnotes

[1] This study was approved by the local ethics committee.

[2] A necessary precondition for applying multilevel modeling is that the null model is significant meaning that the dependent variable shows significant unexplained variation between teams and a significant intra class correlation within teams. The ICC was rather low ($\rho = .02$) thus violating statistical preconditions for multilevel modeling. We attribute the low ICC to the fact that ACTs are ad-hoc teams, thus making within-team similarities less likely. We did, however, compute a multilevel model with professional status and intergroup attitudes as individual-level variables (step 1), leader 'we'-statements as team-level variable (step 2), all two-way interactions (step 3), and the three-way cross-level interaction of 'we', status, and intergroup relations (step 4). In line with our hypothesis, we found a significant cross-level three-way interaction between 'we', professional status and intergroup relations ($\gamma = .01$, $t = 4.11$, $p = .042$).

Table 1. Means, Standard Deviations and Correlations.

Variables	*M*	*SD*	1	2	3	4	5	6
1. Age (in yrs)	37.07	8.67						
2. Sex[a]	0.36	0.48	-.31**					
3. Work experience (in yrs)	11.47	9.57	.85***	-.31**				
4. Professional status[b]	0.54	0.50	-.52***	.31**	-.68***			
5. Intergroup relations	4.60	1.28	-.18	.22*	-.19*	.21*		
6. Leader 'we'-statements	15.77	10.28	.02	.10	.03	-.06	.08	
7. Voice intentions	3.63	0.43	.22*	-.03	.18	-.12	.05	.05

Note. N =141 (incl. team leaders) for descriptives of variables 1-4, N = 107 (no team leaders) for descriptives of variables 5-7 and all inter-correlations, [a]0=female,1=male, [b]0=nurse,1=physician,**p<.01,*p<.05.

Table 2. Moderated Multiple Regression Analysis Predicting Team Members' Voice Intentions.

	Voice intentions			
Model	***B***	***SE B***	***t***	***β***
Step 1				
Professional status[a] (PS)	-.12	.09	-1.45	-.15
Intergroup relations (IR)	.03	.03	.79	.08
Leader 'we'-statements (WE)	.00	.00	.30	.03
R^2		.03		
Step 2				
WE × IR	.18	.05	3.97***	.37
WE × PS	.06	.04	1.62	.15
IR × PS	.03	.04	.78	.07
R^2		.20*		
Step 3				
WE × IR × PS	-.09	.05	-1.98*	-.19
R^2		.23*		

Note. $N = 107$, [a]0 = nurse, 1 = physician, *** $p < .001$, ** $p < .01$, * $p < .05$.

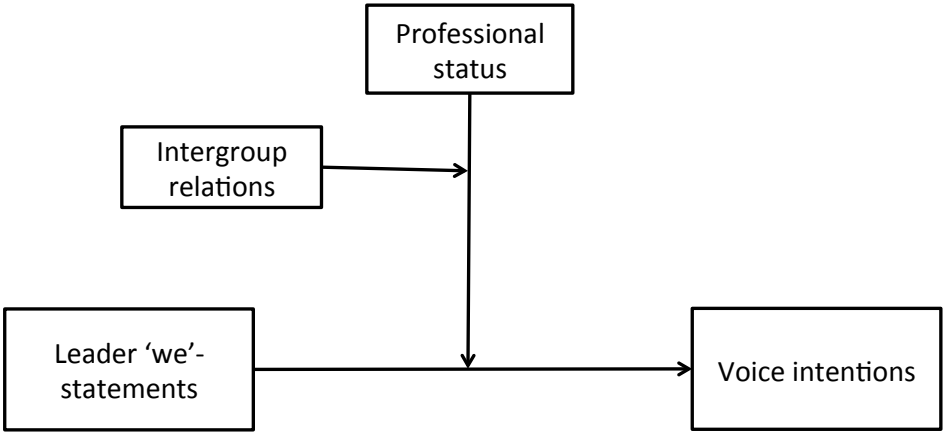

Figure 1. Hypothesized three-way interaction model between leader 'we'-statements, professional status, intergroup relations and voice intentions.

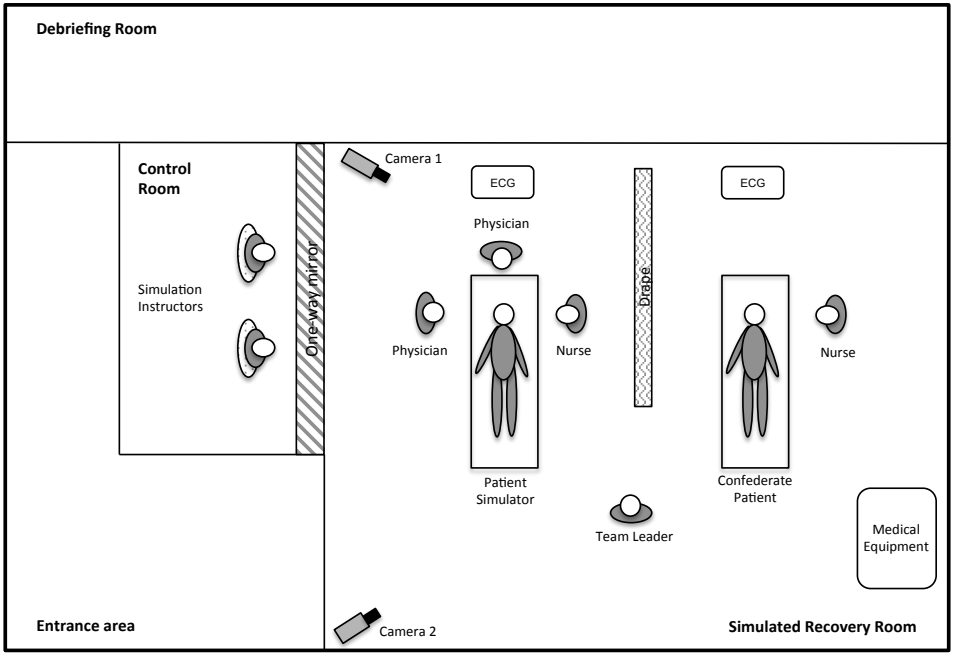

Figure 2. Overview of simulation setting with exemplified positions of team leader and team members.

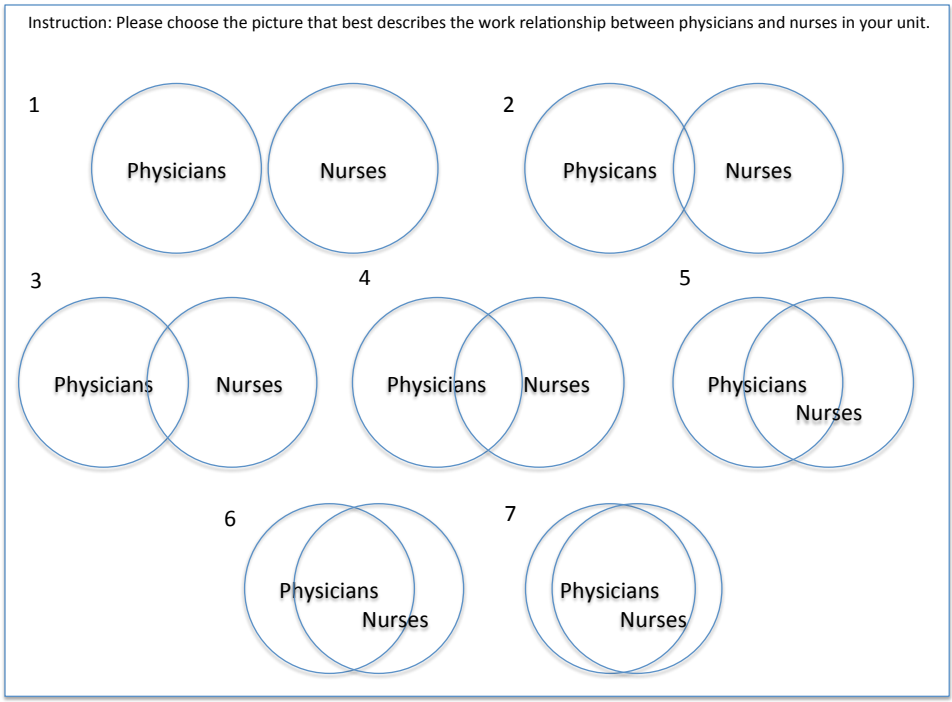

Figure 3. Pictorial measure of intergroup relations between physicians and nurses.

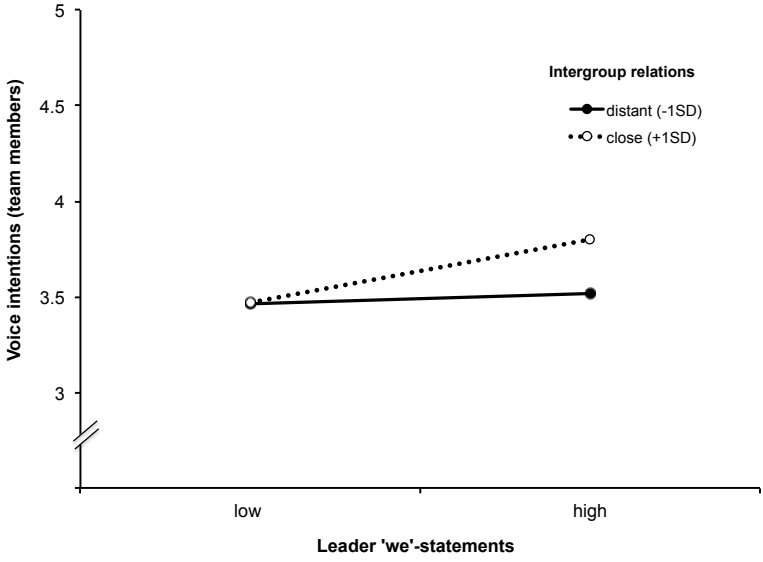

Figure 4a. Effect of leader 'we'-statements (low vs. high frequency) on physicians' voice intentions under distant and close perceptions of intergroup relations (±1SD).

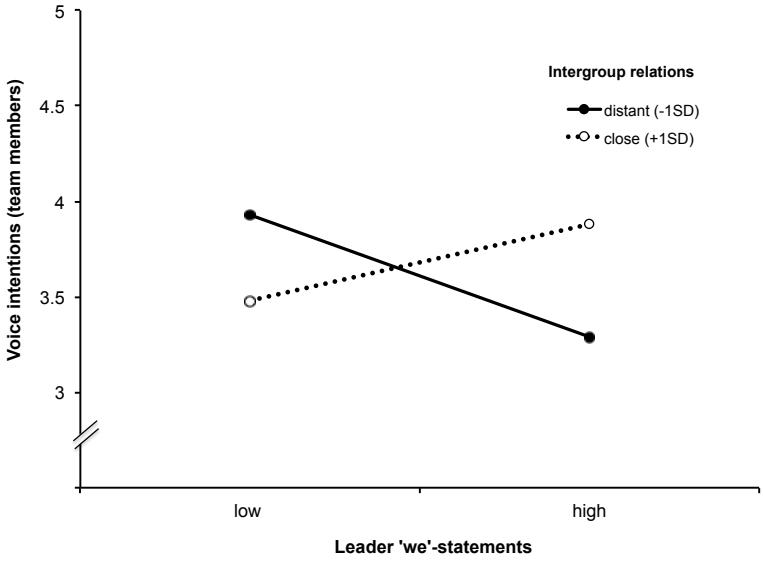

Figure 4b. Effect of leader 'we'-statements (low vs. high frequency) on nurses' voice intentions under distant and close perceptions of intergroup relations (±1SD).

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Paper 3

Stop—In the Name of the Patient!
Development and Evaluation of an Inter-Professional Speaking Up Intervention for Nurses and Residents in Anesthesia Teams

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Summary

Background

Research has shown that residents and nurses are often hesitant to speak up with concerns to higher-status physicians. This may compromise patient safety especially in multi-professional healthcare teams. We integrated two interventions to improve speaking-up behaviour among anaesthesia nurses and residents: The two-challenge rule and TeamGAINS, a combined clinical and behavioural debriefing approach for healthcare teams.

Methods

We implemented a non-randomized control group design using high-fidelity simulations with 20 dyad anaesthesia teams (i.e., 20 nurses, 20 residents). Prior to the simulation, trainees in the intervention group (n=18) received an integrated speaking up intervention while trainees in the control group (n=22) did not. Speaking-up necessity was manipulated by having higher-status team members such as surgeons or senior anaesthetists (all confederates) engage in behaviour potentially unsafe for the patient. Using a multi-method approach, we evaluated the effects of the intervention in terms of subsequent speaking-up behaviour, self-reported speaking up as well as perceived utility of the training.

Results

Both interventions were perceived as useful and had a positive impact on trainees' self-reported speaking-up behaviour. Regarding actual speaking-up behaviour the integrated speaking-up intervention yielded converse effects: nurses spoke up significantly more in the intervention than in the control group and residents spoke up more in the control as compared to the intervention group.

Conclusion

An inter-professional speaking-up intervention that integrated a team-reflection approach with a policy from aviation affected nurses and residents differently.

Introduction

Speaking up, that is, discretionary communication of ideas, concerns or problems[1] can prevent potential harm for patients. Dismayingly, especially in healthcare, people rarely speak up and studies have shown that this has contributed to mishaps and severe errors.[2–4] One of the most prevalent barriers of speaking up is the hierarchical and inter-professional structure of healthcare teams.[5] For example, an operating room team includes nursing, surgery, anaesthesia and potentially more professions as well as multiple levels of status. Particularly those with lower status, namely residents and nurses, fear negative sanctions when they would speak up to higher-status physicians.[5–7] To date, there are very few interventions specifically targeting speaking up and if they do, they are either directed at physicians[6,8,9] or nurses[7] but not at both groups in a multi-professional team setting. The goal of this study was to improve speaking up among resident anaesthetists *and* anaesthesia nurses as they often have to speak up to higher-status physicians such as surgeons, particularly when unexpected events occur.[6,15–17] Thus, we designed and evaluated a speaking-up intervention that integrates state-of-the-art training approaches and considers the multi-professional nature of healthcare teams.

Very recently, a debriefing concept has been developed that aims at fostering team-based reflection within post-simulation debriefings. The approach is called TeamGAINS[10] and combines three state-of-the-art debriefing techniques: (1) *G*uided team self-correction, (2) *A*dvocacy-*In*quiry, and (3) *S*ystemic-constructivist techniques. Similar to Anaesthesia Crisis Resource Management (ACRM) programmes, TeamGAINS aims at conveying principles such as situational awareness, leadership, and closed-loop communication.[11–14] In addition to most ACRM approaches, TeamGAINS seeks to facilitate team learning by surfacing, contrasting and reflecting on team members' mental models. The facilitators would for example inquire a physician about his/her perceptions of a nurse's mental model: "*What do you think might have hindered her from applying the correct dose of adrenaline?*" Yet, TeamGAINS does not provide a concrete speaking up intervention. We thus complemented the TeamGAINS approach with the two-challenge rule—a common policy in aviation that provides a clear structure for speaking up (i.e., twice pairing an advocacy with an inquiry). The two-challenge rule has been adapted to healthcare and was proven as effective for resident anaesthetists.[9] We compared the effectiveness of an integrated TeamGAINS/two-challenge rule intervention

(intervention group) with a TeamGAINS intervention focusing on various crises resource management skills but not on speaking up (control group). In line with established training evaluation models[18,19], we evaluated the impact of both approaches on three levels: reactions, self-perceived and actual speaking up behaviour. We hypothesized that the speaking-up intervention (i) is perceived as more useful, (ii) leads to a more positive change in self-perceived speaking up behaviour, and (iii) leads to more actual speaking-up behaviour than the control intervention.

Methods

Participants

This study was approved by the Ethics Committee of the Canton Zurich, Switzerland (KEK-No: 2010-0405/0) and registered at clinicaltrial.gov (NCT01609829). Written consent was obtained from all study participants. All staff members participated for training purposes and were compensated with credits for mandatory clinical training. We implemented this study as a one-day training program for anaesthesia staff from a teaching hospital. On each training day, up to three anaesthesia nurses and up to three resident anaesthetists participated—allowing us to form up to three anaesthesia teams (i.e., one nurse and one resident). In all, 20 anaesthesia teams (i.e., 20 resident anaesthetists, 20 anaesthesia nurses) participated over a period of ten training days. On five training days, we implemented the integrated TeamGAINS/two-challenge rule intervention (n=18) while on the other five training days we implemented the TeamGAINS intervention only (n=22).

Procedure & Design

On arrival, trainees received a familiarisation with the simulation facilities and completed a pre-measure questionnaire involving demographics and their self-perceived speaking up behaviour. All trainees then completed a first simulated medical scenario. This scenario depicted the case of an intra-hospital emergency (i.e., difficult airway with consequent cardiac arrest requiring cardiopulmonary resuscitation) and required participation of all trainees. The defreeze-scenario served

as a basis for implementing one of the two intervention types in the post-simulation debriefings.

In the speaking up intervention group, speaking up was highlighted as a key problem in the scenario. As part of the TeamGAINS approach, we asked questions such as "*In the scenario, I did not hear you speaking up to the surgeon about the timing of the CT scan. I think that speaking up would have given you more time to save the airway before going to radiology, but I imagine that speaking up to a surgeon may not be easy. What was on your mind at that time?*" That way, the conversation surfaced trainees' mental models of speaking up (e.g., *hierarchy does not allow challenges, speaking up is futile, I fell insecure when I speak up*) which were thoroughly discussed. Following that, we introduced the two-challenge rule as a means to speak up assertively and convincingly. We asked trainees to engage in a role-play with one person enacting the role of a higher status physician and the other one speaking up using an adapted example from Pian-Smith and colleagues. [9] The advocacy involved a neutral observation (*"I see that you plan to administer a spinal anaesthetic to this patient. She has a platelet count of 15'000."*) combined with a personal assessment (*"I learned that we shouldn't do a spinal unless the count was at least 100'000."*). The inquiry was an open-ended question (*"Can you clarify your view?"*) that allows for the person being challenged to respond.

In the control group, we discussed different human factors skills such as situational awareness and leadership but did not explicitly point to the importance of speaking up. After that, all participants performed one more scenario as a dyad team (one resident, one nurse) and we coded their subsequent speaking up behaviour.

Scenarios

We used a high-fidelity patient simulator (Laerdal, Stavanger, Norway) placed in a simulated operating room. To be able to train three teams on one training day, we created three different scenarios in which we included multiple speaking up opportunities (see Table 1). Each scenario involved a higher-status confederate (e.g., a surgeon) who proposed or actually engaged in a potentially harmful course of action (i.e. standardized behaviour). From a medical point of view, the speaking up challenges were designed such that both residents and nurses were able to speak up (see Table 2).

Measures

Speaking-up behaviour. Based on the video records of the simulations, we identified speaking up in the communication stream of each study participant with an event-based coding approach. That is, every person's utterance was coded either as a speaking up utterance or as other communication or behaviour. We used the speaking up coding scheme of Co-ACT, a validated coding manual developed for ACTs.[20] Co-ACT involves five speaking up codes: (1) suggestion (e.g., "*I think we should get the difficult airway cart.*"), (2a) problem (e.g., "*The patient is not stable yet, you have to wait!*"), (2b) problem with explicit stop (e.g., "*Stop! Don't lift the leg, he will vomit again!*"), (3) doubt (e.g., "*I don't think that this is working.*") and (4) opinion (e.g., "*Right, it's the methergine, I'm sure!*"). To establish inter-rater reliability, two trained raters independently coded one video that involved a nurse and a resident. Disagreements were resolved by discussions or by consulting a third trained rater. We computed Cohen's Kappa across all speaking up types resulting in satisfactory agreement (κ=0.76).

Self-reported speaking-up behaviour. We assessed trainees' self-perceptions of their speaking-up behaviour using the 10-item voice scale by Liang *et al*[21] before the first (t1) and after the last simulation (t2) on a training day. The scale differentiates between two types of speaking-up behaviour, namely promotive (e.g. "*I proactively develop and make suggestions for issues that may influence work*") and prohibitive voice (e.g., "*I speak up honestly with problems that might cause serious loss to the work unit, even when/though dissenting opinions exist*"). Each item was rated with a Likert-scale from 1 (strongly disagree) to 5 (strongly agree) and both subscales achieved acceptable reliabilities (α = .89 for promotive voice, α = .65 for prohibitive voice).

Trainee reactions. Trainees evaluated both interventions using the 9-item trainee reaction scale.[22] This measure incorporates nine items capturing the extent to which trainees perceived the training as well-organized, useful for their job, and as contributing to patient safety. Sample items are "*The training prepared me to work effectively on my job* ", or "*The training was an effective use of my time*". Again, each item was rated with a Likert-scale from 1 (strongly disagree) to 6 (strongly agree). Reliability of the scale was high (α = 0.88).

Results

Table 3 provides an overview of trainees' demographics. The means, standard deviations and correlations of all assessed variables are presented in Table 4. First, to test how trainees evaluated the two different interventions, we compared the trainee reaction scores of the two groups. We computed a *t*-test with intervention type as between-subjects factor. The results revealed no significant differences between the intervention (M=5.14, SD=0.57) and the control group [(M=5.25, SD=0.47), t(38)=0.63, p=0.533, 95% CI -0.44, 0.23]. This indicates that trainees perceived both intervention types as useful (i.e., no differences between nurses and residents).

Second, we tested whether there was a positive change in trainees' self-perceived speaking-up behaviour by computing two repeated measures ANOVAs comparing the pre- and post measures of promotive and prohibitive voice, respectively, and using intervention type as between-subjects factor. For promotive voice, the results showed a main effect for measurement time, that is, all trainees reported higher levels of promotive voice after the training (post) than before the training (pre), [F(1, 38)=7.58, p=0.009, $\Delta_{post\text{-}pre}$=0.20, 95% CI 0.05, 0.36]. There was no interaction effect between measurement time and intervention type, F(1, 38)=0.76, p=0.785, indicating that a positive change occurred in both training groups. For prohibitive voice, there was no significant main effect of measurement time, F(1, 38)=0.59, p=0.809, and no interaction effect between measurement time and intervention type F(1, 38)=0.61, p=0.440. This indicates that trainees in either intervention group perceived no change in their prohibitive voice behaviour. We also tested whether nurses and residents differed with respect to changes in promotive and prohibitive voice, but this was not the case.

To investigate whether the speaking-up intervention led to more subsequent speaking-up behaviour for nurses and residents than the control intervention we performed a two-factorial ANOVA testing for main effects of professional role (i.e., nurse vs. physician) and training group (speaking up intervention vs. control) as well as for an interaction effect. The results showed a significant interaction effect between professional role and training group on speaking up behaviour, F(1, 47)=3.73, p = .05. Specifically, nurses in the intervention group spoke up more frequently (M=1.33, SD=1.32, 95% CI 0.33, 2.33) than nurses in the control group (M=0.36, SD=0.51, 95% CI -0.54, 1.27). Physicians, on the contrary, spoke up more in the control (M=2.64, SD=1.86, 95% CI 1.73, 3.54) than in the intervention group

(M=1.78, SD=1.86, 95% CI 0.78, 2.78). Figure 1 shows the slopes of nurses' and physicians' speaking up behaviour in both training groups. Across both training groups, the most frequent speaking up type was expressing doubts (42,5 %), problem (22,5 %), problem with explicit stop (17,5 %), opinions (10%), and suggestions (7,5 %).

Discussion

Given the importance of speaking up in multi-professional healthcare action teams, we developed and evaluated an integrated speaking-up intervention for nurses and residents. We combined two recently developed training interventions: the two-challenge rule and TeamGAINS. We adopted a non-randomized control-group design and compared the effects of the integrated speaking-up intervention with a mere TeamGAINS intervention focusing on ACRM principles[14]. Our results revealed that in both intervention groups, trainees evaluated the training as highly useful and reported higher levels of promotive but not of prohibitive voice after the training. Yet, only the integrated TeamGAINS/two-challenge rule intervention yielded a greater impact on actual speaking up behaviour than the mere TeamGAINS debriefing approach, albeit only for nurses. This suggests that our intervention was effective in the sense that it reduced the difference between nurses' and residents' speaking up behaviour.

Reverse Effects on Nurses' and Residents' Speaking Up Behaviour

One possible explanation for the reverse effects on nurses' and residents' speaking up behaviour might be the speaking-up intervention as such. During this intervention, we discussed the hierarchical structure within multi-professional acute care teams and resulting status differences as one of the main barriers to speaking up.[23] One could argue that status differences are a bigger barrier for nurses than for residents. Recent research from aviation has shown that for cabin crew members (but not for pilots) status differences were a considerable reason for silence, whereas for pilots fear of damaging relationships and, among further factors, the lack of experience in the current job position or on aircraft type contributed to silence.[24] In healthcare, due

to their different status positions and roles, nurses and physicians might develop different implicit voice theories that affect their speaking up behaviour.[25] For nurses, challenging physicians' authority might be a highly salient factor in their voicing decisions, whereas for residents factors such as knowledge about the medical issue might be more important.[5,23,26] If our speaking-up intervention had addressed different barriers for both professional groups, it might have yielded positive effects on residents' speaking-up behaviour as well.

Another reason for the reverse effects of the speaking-up intervention on nurses' and physicians' speaking-up behaviour could be that the residents tried to reduce their speaking-up in favour of the nurses. The residents might have felt that they—as the higher status group—should behave more unobtrusively in the scenario to provide nurses with the opportunity to speak up against the confederate. We propose that such biases could be avoided by emphasizing that hurdles for speaking up are evident in all hierarchical levels and by stressing the fact that nurses and residents may complement their speaking-up behaviour and thereby increase its effectiveness. That way, speaking up may not be perceived as an individual, competitive act but as a joint team task by which safer decisions can be reached.

Effects on Self-Reported Speaking-up Behaviour

Regarding trainees' self-reported speaking-up behaviour, the results revealed that both training interventions yielded a positive effect. We attribute this change to the inter-professional training context. Even though speaking up was not a focus in the control group, the inter-professional training setting might have increased trainees' confidence to speak up.[27]

Notably, there was no positive change of self-reported prohibitive speaking-up behaviour after either intervention. This finding resembles research showing that prohibitive voice behaviour is associated with higher perceived risk as it implies a stronger challenge to the status quo.[21] Trainees' reluctance to actually intervene and stop others from potentially detrimental courses of action is also reflected in their actual voice behaviour: Most trainees spoke up with a different opinion rather than stopping the confederates from harmful actions.

Overall, the results suggest that inter-professional trainings provide high value. Yet, profession-specific speaking up hurdles need to be identified and incorporated in the design and implementation of such trainings in order to change nurses' and residents' attitudes *and* behaviour.

Limitations and Future Research

Notably, our study has limitations. The current findings are based on a relatively small sample of residents and nurses in one specific department in one teaching hospital. It is therefore desirable to implement evaluation studies with larger samples and in different clinical settings and hospitals. As organizational culture and particularly safety climate may vary strongly across clinics and units even within the same hospital[28], barriers and enablers of speaking up may need to be addressed in a different manner.

The second limitation pertains to the simulation-based context in which the speaking up intervention was evaluated. To what extent behaviour in the simulator can be generalized to the real world is an on-going debate in the literature.[29–32] We suggest that in order to assess the impact of simulation-based trainings on real-world behaviour, it could be fruitful to observe trainees in their work environment shortly after they had participated in a simulation-based team training. That way, it could be determined how sustainable speaking-up interventions are and how often speaking up needs be trained in the simulator. Future research might also test the applicability of TeamGAINS and the two-challenge rule for after-action reviews. After-action (also called after-event) reviews are increasingly used in medicine and other high-risk industries to foster team learning after critical events.[33,34] By integrating such team-based debriefings into everyday working routines, this may not only help to reduce barriers for speaking up but may also help to develop as a team.

Conclusion

Implementing a speaking up intervention directed at nurses and residents, we found that the intervention improved nurses' but not residents' speaking up behaviour. Nurses' and residents' reactions towards the inter-professional setting as well as their self-perceived speaking up behaviour nevertheless suggest that inter-professional speaking-up interventions are highly beneficial. Thus, understanding barriers to speaking up not only within different professional groups but also across these groups

is important and could help developing intervention programmes targeting specific professional needs more accurately.

AUTHORS' CONTRIBUTIONS

MW was responsible for data analysis and for drafting the manuscript. MK, MW, GG and BG developed the design of the study. BG developed the simulated scenarios and organised the trainings. MW and BG conducted the debriefings and collected the data. All authors contributed to revisions of the manuscript. GG and DRS were the principle investigator and co-investigator, respectively.

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ETHICS APPROVAL

Ethics Committee of the Canton Zurich, Switzerland (KEK-No: 2010-0405/0).

COMPETING INTERESTS

None.

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Table 1. Overview of Simulated Medical Cases.

Case	Description
A	**Pre-simulation briefing:** Elective laryngopharyngectomy (i.e., removal of the larynx due to a tumour); difficult intubation cart available **Task of anaesthesia team:** Anaesthesia induction with expected difficult airway **Confederate posing speaking up opportunities:** Consultant anaesthetist claiming that conventional (i.e., endotracheal) intubation is possible and repeatedly deemphasising the severity of the situation (even tough the oxygen saturation decreased constantly)
B	**Pre-simulation briefing:** 20-year old male involved in a car accident, suffering from fracture of lower leg, multiple lesions, and a whiplash injury and admitted to the emergency room **Task of anaesthesia team:** Initial assessment (i.e., airway, breathing, circulation) and stabilisation of airway **Confederate posing speaking up opportunities:** Consultant trauma surgeon performing rough body check leading patient to vomit and repeatedly urging the anaesthesia team to transfer the patient to the radiology
C	**Pre-simulation briefing:** 34-year old woman (pregnancy week 29) found unconscious and admitted to emergency room; evidence of prior cocaine abuse **Task of anaesthesia team:** Preparation for general anaesthesia for emergency Caesarean section (i.e., C-section) **Confederate:** Consultant gynaecologist applying methergine (i.e., a drug increasing the tone of the uterus) to stop post-natal bleeding resulting in a hypertensive emergency (i.e., due to cocaine abuse)

Table 2. Examples of Speaking Up Challenges and Respective Responses by Residents and Nurses.

Case	Training group	Time	Speaking up challenge	Response of AR	Speaking up type	Response of AN	Speaking up type
A	control	00:55	AN and AR discuss the airway. AA claims: „I intubated her before and that went well.“	"I would like to get the difficult airway cart."	*Suggestion*	none	-
		07:02	AR cannot ventilate the patient sufficiently with the mask. CA: „It's easier with this one, it's always difficult in the beginning you know. Give her some more Succi!“ (i.e. Succinylcholin, muscle relaxant)	Administers more muscle relaxant	-	none	-
		09:10	CA takes over head position and instructs AR to mute the alarm (i.e., due to severely decreased oxygen saturation)	mutes alarms	-	none	-
		10:50	CA to AN: „Can you prepare a laryngeal mask?“ (i.e., this mask is not effective in a CVCI situation)	none	-	hands laryngeal mask to CA	-
		11:30	Again the alarm goes on due to strongly decreased oxygen saturation. CA to AR: „Shut down the alarms!“	mutes alarms	-	none	-
B	intervention	01:59	The patient is handed over to AR and AN by an emergency physician. SRG claims: „I think we should take a CT scan right now.“	none		none	-
		02:07	After handover SRG repeats: „Ok, then let's go and take the scan!“	„I have to check the airway!“	*suggestion*	none	-
		02:20	SRG: „C is ok for me.“(i.e., ABCD algorithm).“	„But we are checking B right now!“	*opinion*	none	-
		04:00	SRG: „The normal procedure is to take a CT scan.“	„Yes, but he has no secure airway!“	*problem 2a*	none	-
		04:58	SRG: „Everything's ok, now let's go¨“	„We still only have 3 on GCS!“ (i.e., Glasgow Coma Scale to assess a patient's conscious state)	*problem 2a*	none	-
		06:25	SRG roughly touches the broken leg and instructs AN: „Can you lift the foot?“	„No! That's a pain stimuli and will cause him to vomit again. Do not touch it right now!“	*problem 2b*	„No!“	*problem 2b*
C	intervention	08:55	AR and AN prepare for an emergency C-Section. CA is present, SRG urges to start with the anaesthesia induction	none	-	„We don't have the ECG!“	*suggestion*
		12:10	The patient becomes unstable during the intubation but SRG wants to start with the C-section.	„No, don't start right now, she is not stable, we have to resuscitate her!“	*problem 2a*	none	-
		13:30	After the patient was shocked with the defibrillator, AR and AN monitor the vital signs while CA responds to SRG: „Ok, now you can start!“	„She is still not stable.“	*Opinion*	„One moment please, she doesn't sleep deeply enough!“	*problem 2a*
		16:00	After the baby was delivered, the patient is bleeding strongly. SRG administers methergine to stop the bleeding but which then negatively reacts with the cocaine abuse and causes severe destabilization.	none	-	none	-
		17:20	While the patient is still unstable CA says: "I have to leave, there's another emergency, you can call me!“	none	-	„No! No! Stay here!“ (firmly grabs CA by his arm)	*problem 2b*
		17:40	The patient displays symptoms of a hypertensive emergency (i.e., acute impairment of one or more organ systems)	to SRG: „Are you sure with the methergine? She reacts quite strongly!“	*doubt*	„Right! That's it, I'm really sure! Stop it, stop it!“ (stops the infusion)	*opinion & problem 2b*

Note. CA=(confederate) anaesthesia consultant, AN=anaesthesia nurse, AR=anaesthesia resident, DIC=difficult intubation cart, OR=operating room, SRG=(confederate) surgeon.

Table 3. Overview of trainees' demographics within each training group.

Training group	Professional function		Sex		Age Mean (SD)	Work experience (yrs) Mean (SD)
	Nurses	Residents	Male	Female		
Intervention	9	9	6	12	38.56 (11.87)	5.53 (6.76)
Control	11	11	7	15	39.36 (10.02)	6.58 (9.68)

Table 4. Means, Standard Deviations and Correlations of all Variables.

	M	SD	1	2	3	4	5	6	7	8	9
1. Age (yrs)	39.00	10.75	_								
2. Gender[a]	1.67	0.47	0.25	_							
3. Work exp. (yrs)	6.11	8.41	0.68**	0.26	_						
4. Professional status[b]	0.00	1.01	-0.67	-0.16	-0.44**	_					
5. Speaking up behavior	1.53	1.66	-0.21	0.19	-0.20	0.44**	_				
6. Self-reported promotive voice (t1)	3.46	0.70	0.50**	0.06	0.37*	-0.39*	-0.11	_			
7. Self-reported promotive voice (t2)	3.67	0.55	0.45**	0.01	0.39*	-0.28	0.03	0.73**	_		
8. Self-reported prohibitive voice (t1)	3.61	0.47	0.46**	-0.10	0.45**	-0.30	-0.33*	0.71**	0.67**	_	
9. Self-reported prohibitive voice (t2)	3.59	0.53	0.40**	-0.01	0.45**	-0.27	-0.19	0.51**	0.68**	0.70**	_
10. Trainee reactions	5.20	0.52	0.02	-0.01	0.15	-0.13	-0.02	0.17	0.21	0.00	0.18

Note. N=40, **p<0.010, *p<0.050, [a]0=female, 1=male, [b] -1=nurses, 1=physicians.

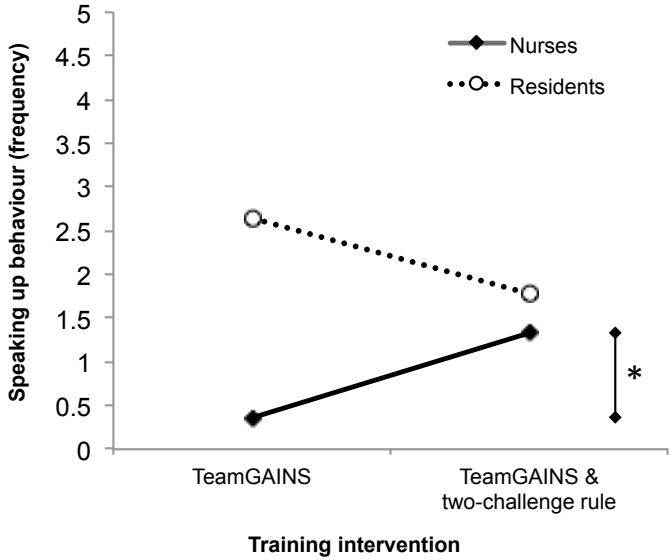

Figure 1. Interaction Effect of Professional Role (i.e., nurses vs. residents) and Training Intervention on Speaking Up Behaviour, *p = 0.05.

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Q-Award University Hospital Zurich, Switzerland (June, 2013). TeamGAINS: A more effective approach to the use of a medical team's potential in crises situations.

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**shared first-authorship*

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