

# **Antecedents of Psychological Safety in the Maritime Industry**

Investigating the influence of antecedents on the psychological safety of on- and offshore employees of a maritime shipping and installation company.

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### Abstract

**Introduction.** Open communication and voicing concerns on potential hazards are essential to avoid incidents and accidents in a high-risk industry like the maritime industry. Psychological safety, the shared belief that interpersonal risk-taking is safe in a team, enables employees to speak up without fearing personal consequences or negative consequences for their careers. This research aimed to examine the relationships of cohesion and authentic leadership with psychological safety in the maritime industry. Furthermore, the present study examined if cohesion and authentic leadership can predict the number of reported safety observations, mediated by psychological safety.

**Methods.** For this quantitative research, 228 employees of a maritime shipping and installation company participated by answering a questionnaire in which they indicated the levels of psychological safety, cohesion, and authentic leadership they perceive in their team. Furthermore, the company shared a report including all reported safety observations (positive observations, negative observations, and suggestions) per vessel, reported either in safety audits or proactively by the employees.

**Results.** Quantitative analyses showed that authentic leadership is a significant predictor of psychological safety in the maritime industry. Cohesion significantly predicted psychological safety in both the office and the fleet sample, but not in the total sample. Furthermore, it was found that authentic leadership and cohesion could predict if vessels had a high or low proportion of either positive or negative observations in their reported safety observations. The relationship between authentic leadership and cohesion and the reported safety observations was not mediated by psychological safety.

**Discussion.** This study confirmed previous research and was able to show that psychological safety in the maritime industry derives from high-quality interpersonal relationships and from leadership that actively invites input and feedback and emphasizes open and honest communication. Furthermore, this research showed that those relationships and leadership behaviors could predict the safety communication behavior onboard vessels. The study should be replicated after the global pandemic. The current situation (home office for office sample and prolonged assignments onboard vessels and uncertainty about the beginning of assignments for fleet sample) might have altered with the perceived levels of psychological safety, authentic leadership, and cohesion.

## Introduction

In 2018 there were 1422 casualties and incidents with 1508 cargo ships involved, registered with the European Maritime Safety Agency. Three of these vessels were lost due to the accidents, 258 persons were injured, and there have been 36 fatalities (European Maritime Safety Agency, 2019). Research suggests that between 80% and 90% of all maritime accidents and incidents occur due to human error (Uğurlu et al., 2015). Investigations of such accidents and incidents generally require substantial resources, i.e., time and financial investments. In many cases, the investigation shows that the accident's or incident's causes were visible and apparent before the critical situation took place (International Chamber of Shipping, 2013), for example, if a ladder, that was known to have a deficit, is the cause of an employee falling because it has not been fixed.

To prevent accidents and incidents in the future, it is essential to report and investigate hazardous situations, non-conformities, and near misses. The International Maritime Organization defined a near miss as "A sequence of events and/or conditions that could have resulted in loss. This loss was prevented only by a fortuitous break in the chain of events and/or conditions. The potential loss could be personal injury, environmental damage, or negative business impact (e.g., repair or replacement costs, scheduling delays, contract violations, loss of reputation)." (International Maritime Organization, 2008, p. 3). For employees to report a near miss, the International Chamber of Shipping (2013) suggests that the crew member has to have the confidence that the reporting of that near miss will not have negative consequences.

Research agrees that in order for employees to report concerns, mistakes, feedback, and ideas honestly without having to fear negative consequences to status or career, the employees have to feel that it is safe to speak up without fearing interpersonal consequences (Carmeli et al., 2009; Edmondson, 1999; Kahn, 1990). This shared belief among employees and team members is defined as psychological safety. Psychological safety may be the solution for organizations, not only in the maritime industry, to increase organizational learning and ultimately increase safety performance and decrease accidents and incidents. Psychological safety is shown to be influenced by interpersonal relationships, group and intergroup dynamics, management style and process, and organizational norms (Kahn, 1990).

As leader behavior was found to be an antecedent of psychological safety (Edmondson, 2003; Kahn, 1990) and plays a vital role onboard of vessels, this study tries to examine the leadership's effect onboard the vessels on the psychological safety onboard. To be specific, the perceived authenticity of the company's leaders and its influence on the teams' perceived psychological safety will be examined.

Interpersonal relationships and intergroup dynamics are also found to be influencing psychological safety. As the cohesion onboard vessels is often considered reasonably low due to ethnical differences, educational differences, hierarchical differences, and the regular exchange of crew members (Xiang, 2019), this study also aims to determine the influence of cohesion on the psychological safety of employees working onboard vessels.

This exploratory research aims to determine if leadership and cohesion are antecedents of psychological safety in the maritime industry by quantitatively examining each, the on- and offshore employees of a heavy lift shipping and offshore transportation & installation company. Moreover, this study aims to investigate the relationship between cohesion, authentic leadership, and psychological safety and various safety metrics in the form of reported safety observations and suggestions.

### **Theoretical Framework**

**Psychological Safety.** The most popular definition of psychological safety was established by Edmondson (1999), who defined it as a team construct, namely as “a shared belief held by members of a team that the team is safe for interpersonal risk taking” (Edmondson, 1999, p. 354). Psychological safety is the shared belief of how interpersonal risk-taking is dealt with within the team. Interpersonal risk-taking is meant to “suggest neither a careless sense of permissiveness, nor an unrelentingly positive affect but, rather, a sense of confidence that the team will not embarrass, reject, or punish someone for speaking up. This confidence stems from mutual respect and trust among team members” (Edmondson, 1999, p. 354).

Psychological safety can facilitate innovation, by enabling employees to voice ideas and critical information, speaking up, overcoming disputes and engaging communication between the team members by “suspending judgment, remaining open to other ideas and perspectives, and engaging in active listening” (Gibson & Gibbs, 2006, p. 462). If the shared belief is that interpersonal risk-taking is expected and does not have negative consequences or gets rewarded, then the psychological safety in the team is high, and the team will be more likely to learn.

If the shared belief is that interpersonal risk taking is not appreciated or it will be punished, then the team's psychological safety is low. The team members are less likely to communicate openly, and therefore, they are less likely to adapt to change and learn (Edmondson, 1999; Frazier et al., 2017; Kahn, 1990). In teams that lack psychological safety, members are more likely to withhold information and less likely to seek feedback, learn, and

voice concerns (Edmondson, 1999). If employees do not feel safe enough to voice concerns, it can significantly impact the organization. If, for example, employees onboard vessels observe unsafe conditions and do not report them, it can cause severe costs for the organization, the environment, and in the worst case, even injuries or fatalities.

**Reported Safety Observations.** To prevent accidents and incidents, the present company takes measures to ensure the safety of their employees and assets. One of the measures taken is to do monthly safety audits on their vessels in which the safety onboard the vessels get assessed, and observations are written down by the second officer and second engineer. In addition to the observations made during those audits, the crew reports observations regarding the safety onboard as well, if they observe something worth reporting or if they have a safety suggestion. All those observations are collected and sent to the Health, Safety, and Environment (HSE) department, where employees cluster them into positive observations, negative observations, and suggestions. Furthermore, it is collected on which vessel those observations were made, as well as the date, in order to have a detailed report on the safety onboard the vessels and to have an overview on which observations need to be followed by an investigation or intervention (e.g., correction of unsafe conditions, repair of defective tools)

Positive observations are generally best practices and exemplary safe working behavior of the staff. They get reported when the auditor or an employee observe behavior that proactively increases safety or is just an excellent example of the application of safety measures (e.g., correct and safe execution of working in heights or confined spaces).

Negative observations are findings that suggest non-conformity, refusal of conformity, or failure to comply with governmental safety laws and convention rules, norms, and laws of the International Maritime Organization. Negative observations are defined as findings that are not substantiated with concrete evidence for a requirement breach. If negative observations will be reported multiple times (for example, found in multiple audits or multiple locations) or when evidence of a requirement breach is gathered, negative observations will be reported as non-conformities. They cannot be issued without substantial evidence of a requirement breach. Once reported, the negative observations are classified into the following categories: Insufficient Risk Assessment, Rigging & Lifting, Equipment & Tools, Personal Protective Equipment, Work at Height, Slip – Trip, Housekeeping, Bad Design, Procedure not followed, Emergency Preparedness and Chemical Handling.

Suggestions are the staff's ideas, how conditions and situations can be made more efficient or safer for all parties. They are not observations, but proactive inputs from the employees to improve the safety onboard.

**Authentic Leadership.** Walumbwa et al. (2008) defined authentic leadership as “a pattern of leader behavior that draws upon and promotes both positive psychological capacities and a positive ethical climate, to foster greater *self-awareness*, an *internalized moral perspective*, *balanced processing of information*, and *relational transparency* on the part of leaders working with followers, fostering positive self-development” (p. 94).

The definition is based on four distinct components. *Self-awareness* is being aware of and being confident in one’s motives, emotions, longing, and cognitions. This also includes the self-awareness of strengths and weaknesses and trait characteristics. Besides, it is the understanding of how oneself analyses and makes meaning and how this, in particular, is influencing oneself over time (Kernis, 2003; Walumbwa et al., 2008). *Relational transparency* is showing one’s true self at all times, which manifests by publicly sharing thoughts, values, and emotions while minimizing inappropriate emotions (Kernis, 2003). *Balanced processing* is showing that all relevant data is analyzed before making a decision. It also includes demanding inputs that challenge the leaders’ deeply held positions (Gardner et al., 2005). Walumbwa et al. (2008) refer to *Internalized moral perspective* as “an internalized and integrated form of self-regulation (Ryan & Deci, 2003). This sort of self-regulation is guided by internal moral standards and values versus group, organizational, and societal pressures, and it results in expressed decision making and behavior that is consistent with these internalized values (Avolio & Gardner, 2005; Gardner et al., 2005)“ (pp. 95–96).

Authentic leadership is about the extent to which a leader is aware of his or her openness and clarity in their behavior with team members and outsiders through inviting input, fostering open communication, sharing information, and exposing their own emotions, feelings, and opinions. Team members will perceive an authentic leader as transparent, authentic, and eager to hear their ideas (Neider & Schriesheim, 2011). Not only is this leadership behavior likely to be mirrored by followers, which will have an impact on the entire organization, the customers and stakeholders (Avolio et al., 2004), but higher levels of perceived authenticity are also positively related with higher levels of commitment to objectives and goals (Kernis, 2003; Kernis & Goldman, 2006).

The open communication and the eagerness for the leaders' team members' input enable employees to speak up if they see something unsafe or if they have an idea to improve something onboard or in the office. Suppose the leaders at the company are onboard a vessel. In that case, it is also likely that they are acting by the company's values and goals, including the employees' safety, resulting in a mirroring of their behavior and values by the employees and improving the commitment to objectives and goals. This ultimately leads to the employees

being more observant and working more safely. It can be hypothesized that the leaders' authenticity will positively influence the number of positive observations and negatively influence the number of negative observations as the work will be done more safely and positively influence the number of given suggestions, as employees are more committed to safety.

***Authentic Leadership and Psychological Safety.*** Not only does authentic leadership share significant similarities with psychological safety, but research has shown the influence of leadership on the development of psychological safety in teams. (Edmondson, 1999; Frazier et al., 2017; Kahn, 1990). Edmondson (2003) argued that leaders act as an example of how to behave and that the leader's beliefs are likely to influence the team's psychological safety, and therefore the psychological safety of the organization. The leaders that generally are the most influencing in terms of psychological safety are the ones that interact face-to-face with the team members regularly (e.g., team leaders, middle management, front line supervisors). Three aspects of leader behavior are stated, mainly promoting psychological safety, namely, accessibility, inviting input, and modeling openness and fallibility.

*Accessibility* describes the availability and approachability of the leader. The perceived boundaries can limit discussions and the free exchange of ideas, thoughts, and feedback by seeming isolated and distant. Employees may feel rejected, resulting in the belief that their input is not welcome and valued (Edmondson, 1996). An example of an accessible leader is someone who, despite their full agenda, makes an effort to have contact with their team members.

*Inviting input* involves the leader to ask for constructive feedback from the team members openly. It encourages psychological safety by promoting the belief that team members' opinions are expected, valued, and respected (Edmondson, 2003). Inviting input differentiates itself from accessibility as the leader actively asks for input of his team members instead of just being open to receiving input.

*Modeling openness and fallibility* is concerned with the overall behavior of the leader. Due to the hierarchy and the consequential implication of power, the leader's behavior will set an "implicit model of acceptable behavior in the team" (Edmondson, 2003, p. 16). Suppose the leader makes the team members feel that specific processes or events are better kept hidden or emphasizes they should be profoundly silent about particular conditions. In that case, this behavior will likely be adopted by the team members. In turn, this can be detrimental to the team's psychological safety as it limits the free exchange of thoughts and opinions.

The (perceived) barriers that may hold followers back from starting a dialogue or a discussion, or just approach the leader, can be reduced if the leaders are accessible. By inviting

input, opinions, and feedback from followers, the leader suggests that the team members' opinions are respected and valued. Being an inviting leader can open up dialogues and, consequently, lowers the followers' boundaries to voice their concerns, honest opinions, and constructive feedback to their leader. These characterizations of leader behavior that encourage and promote psychological safety in teams are entirely consistent with authentic leadership characteristics.

If the leader is not authentic and does not value and encourage open communication and objective decision and, in the worst-case, publicly shames or punishes followers, it is doubtful that the team will act in a psychologically safe way. Therefore, it is unlikely that the team will perceive a high degree of psychological safety.

It is important to note that authentic leadership can be considered as a root construct, making it possible for leaders to incorporate any other third type leadership style without compromising the ability to be an authentic leader by building an environment of open communication and appreciation (Avolio et al., 2004; Ilies et al., 2005; May et al., 2003; Price, 2003; Shamir & Eilam, 2005). Authentic leadership being a root construct, concludes that the behavioral style does not necessarily distinguish between the authenticity and inauthenticity of a leader. Therefore, even the leaders of the fleet population can act authentically by being self-aware, having an internalized moral perspective, balanced processing of information, and relational transparency, and still lead in a very hierarchical way, as it is usual and necessary in the maritime industry onboard vessels (Xiang, 2019).

Consistent with Edmondson (1999) and Eggers (2011), Maximo et al. (2019) were able to establish that authentic leadership is positively related to psychological safety. Based on the given rationale, it can be hypothesized that authentic leadership can predict psychological safety. Based on the hypothesized relationship of authentic leadership with psychological safety, it can also be hypothesized that psychological safety mediates authentic leadership's influence on the number of reported safety observations.

**Cohesion.** Cohesion can be characterized as “The solidarity or unity of a group resulting from the development of strong and mutual interpersonal bonds among members and group-level forces that unify the group, such as shared commitment to group goals” (Forsyth, 2014, p. 10). Teams with members that foster their high-quality interpersonal relationships with their co-workers are likely to be cohesive teams, as cohesion can reduce anxiety and tension in groups, fosters enjoyment and satisfaction and increases the commitment of the groups' members to the group and increasing the groups' performance (Arriaga & Agnew, 2001;

Forsyth, 2014; Mullen & Copper, 1994; Myers, 1962; Seashore, 1954; Shaw & Shaw, 1962; Wech et al., 1998).

Members of cohesive groups usually feel more satisfaction and enjoyment in their group. They are prone to more favorable responses towards members of their group than members of a non-cohesive group. Being more satisfied in the group results in decreased perceived anxiety, interpersonal problems, and tension in cohesive groups (Myers, 1962; Shaw & Shaw, 1962). This decreased anxiety and nervousness were also shown to be true for cohesive industrial workgroups (Seashore, 1954). Cohesion was also shown to increase members' commitment to their group (Arriaga & Agnew, 2001; Wech et al., 1998).

Employees that experience high-quality relationships feel more engaged to exchange information and inputs that are critical for finding solutions, improving processes, and ultimately can positively influence the outcome (Carmeli et al., 2009).

As shown by Arriaga and Agnew (2001), cohesion can increase members' commitment to their group. Pandit et al. (2018) found that teams with higher cohesion levels demonstrated superior safety communication. Considering both findings, it is likely that high cohesion teams will generally have better safety communication. Since the team members will commit more to their teams, employees' unsafe conditions or actions might be communicated before their colleagues start to engage in an unsafe act, motivated by saving the team members. It can be hypothesized that because the communication of unsafe behavior will be directly before the situation gets unsafe, cohesion will negatively influence the number of reported negative observations.

It can be hypothesized that higher levels of cohesion will lead to an overall improvement in the teams' safety communication, increasing positive observations and suggestions made by the auditors and employees.

***Cohesion and Psychological Safety.*** Interpersonal relationships are included as antecedents of psychological safety in various models (Edmondson, 2003; Kahn, 1990). Kahn (1990) defined interpersonal relationships as “Ongoing relationships that offer more or less support, trust, openness, flexibility and lack of threat” (p. 705). These positive interpersonal relationships promoted psychological safety when they were characterized by being “supportive and trusting” (Kahn, 1990, p. 708) and were shown to encourage learning in and between organizations (Carmeli et al., 2009). Edmondson (2003) concluded that “if relationships within a group are characterized by trust and respect, individuals are likely to believe they will be given the benefit of the doubt—a defining characteristic of psychological safety.” (pp. 17-18).

Kahn (1990) showed that members of a psychologically safe team were likely to share feedback, opinions, and ideas, given it was constructive rather than destructive. Also, Edmondson and Moingeon (1998) argued that team members valued in their team are more likely to share their honest opinions and feedback as members who do not feel valued or whose capabilities are questioned, as they may feel like they are under surveillance. Schulte et al. (2012) were able to show that members of psychologically safe teams were more likely to report friendships with their co-workers, which resulted in them asking more frequently for advice.

High degrees of cohesion in a team fosters the open environment, and communication team members need to build high-quality interpersonal relationships and ultimately develop psychological safety. Therefore, it can be hypothesized that cohesion can predict psychological safety. As cohesion is hypothesized to be an antecedent of psychological safety, psychological safety is likely mediating the influence of cohesion on the safety measures.

### **The current study**

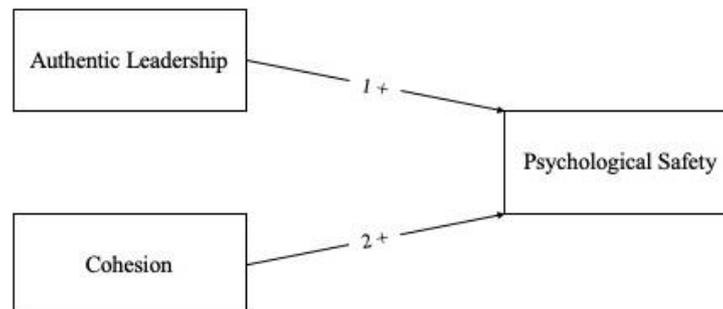
In order to answer the research questions, if authentic leadership and cohesion are antecedents of psychological safety and if authentic leadership, cohesion, and psychological safety can influence the number of reported safety observations in the maritime industry, the on- and offshore employees of a maritime shipping and installation company received a questionnaire measuring the perceived authentic leadership, cohesion and psychological safety in their team. The reported safety observations are collected and categorized by the health, safety, and environment department of the company monthly and were provided to the researchers. The following hypotheses were tested using quantitative analyses. Respective conceptual models are provided to illustrate the hypotheses.

**H1:** Authentic leadership can positively predict psychological safety.

**H2:** Cohesion can positively predict psychological safety.

**Figure 1**

*A suggested conceptual model of hypotheses 1 and 2, hypothesizing authentic leadership and cohesion as antecedents of psychological safety.*



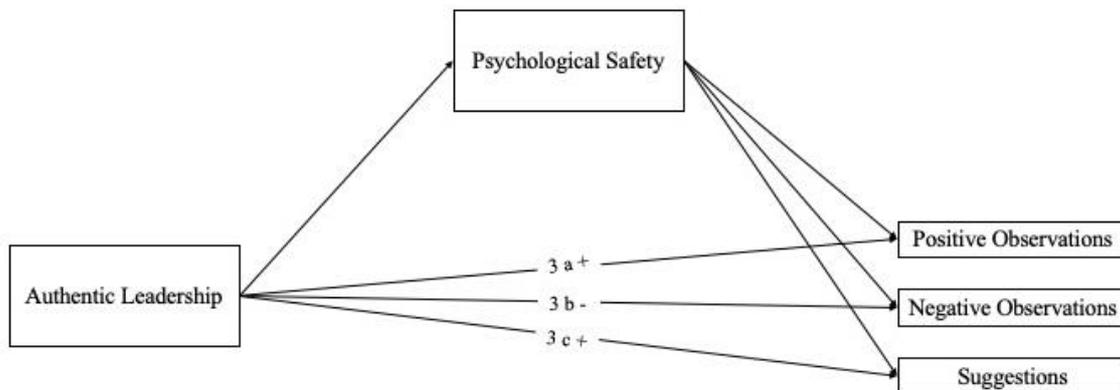
**H3a:** The effect of authentic leadership on reported positive observations is mediated by psychological safety; high levels of perceived authentic leadership cause higher levels of perceived psychological safety than low levels of perceived authentic leadership, which will have a positive influence on the number of reported positive observations.

**H3b:** The effect of authentic leadership on reported negative observations is mediated by psychological safety; high levels of perceived authentic leadership cause higher levels of perceived psychological safety than low levels of perceived authentic leadership, which will have a negative influence on the number of reported negative observations.

**H3c:** The effect of authentic leadership on reported suggestions is mediated by psychological safety; high levels of perceived authentic leadership cause higher levels of perceived psychological safety than low levels of perceived authentic leadership, which will have a positive influence on the number of reported suggestions.

**Figure 2**

*A suggested conceptual model of authentic leadership's influence on reported safety observations, mediated by psychological safety.*



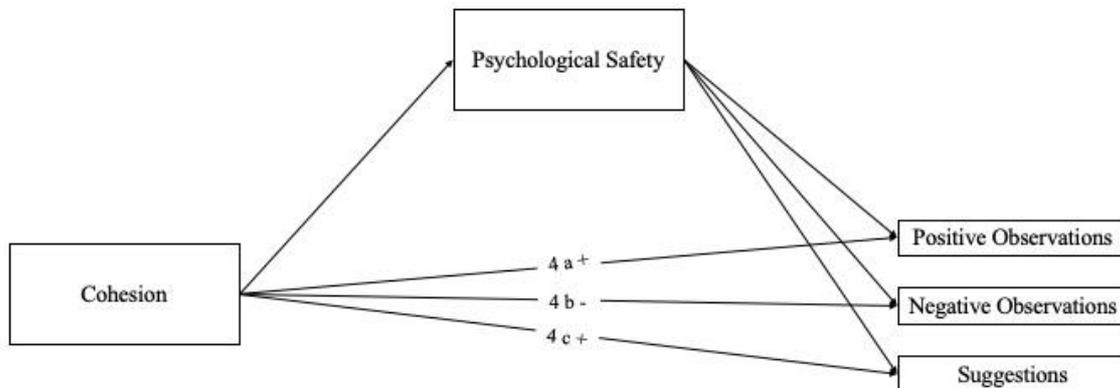
**H4a:** The effect of cohesion on reported positive observations is mediated by psychological safety; high levels of perceived cohesion cause higher levels of perceived psychological safety than low levels of perceived cohesion, and this, in turn, will have a positive influence on the number of reported positive observations.

**H4b:** The effect of cohesion on reported negative observations is mediated by psychological safety; high levels of perceived cohesion cause higher levels of perceived psychological safety than low levels of perceived cohesion, and this, in turn, will have a negative influence on the number of reported negative observations.

**H4c:** The effect of cohesion on reported suggestions is mediated by psychological safety; high levels of perceived cohesion cause higher levels of perceived psychological safety than low levels of perceived cohesion, and this, in turn, will have a positive influence on the number of reported suggestions.

**Figure 3**

*A suggested conceptual model of the influence of cohesion on reported safety observations, mediated by psychological safety.*



## Methods

### Participants

The URL was sent to 442 employees, from which 283 started the survey (64.0%). From those 283 started responses, 228 were valid (valid when at least one scale was answered), resulting in a response rate of 51.2%. The mode for the age categories of the total sample was 3 (41 - 50). In the total sample, 32 (14.1%) respondents were between 20 and 30 years old, 76 (33.5%) were between 31 and 40 years old, 72 (31.7%) were between 41 and 50 years old, 37 (16.3%) were between 51 and 60 years old and 10 (4.4%) were between 61 and 70 years old. The majority of respondents were Dutch (144). There were 14 other nationalities named, including the three most common nationalities, Filipino (58), Russian (4), and German (3). Of the 228 participants, 62 held a managerial position, resulting in 27.2%. Of the participants, 118 (51.8%) work in the offices, and 110 (48.2%) work on the vessels as part of the fleet.

The mode of the age categories for employees from the offices was 2 (31 - 40). In the office sample, 18 (15.3%) respondents were between 20 and 30 years old, 39 (33.1%) were between 31 and 40 years old, 30 (25.4%) were between 41 and 50 years old, 24 (20.3%) were between 51 and 60 years old and 7 (5.9%) were between 61 and 70 years old. Of the employees from the offices, 22.1% held a managerial position. For the employees from the offices, the most common nationality was Dutch (77.1%), followed by Filipino (4.4%) and Singaporean and German (each 1.3%).

The mode of the age categories for employees of the fleet was 3 (41 - 50). In the fleet sample, 14 (12.8%) respondents were between 20 and 30 years old, 37 (33.9%) were between 31 and 40 years old, 42 (38.5%) were between 41 and 50 years old, 13 (11.9%) were between 51 and 60 years old and 3 (2.8%) were between 61 and 70 years old. Of the employees of the fleet, 32.8% held a managerial position. For the employees working on the fleet, the most common nationality was Dutch (48.1%), followed by Filipino (44.4%) and Russian (3.7%).

## **Procedure**

To raise awareness and ensure basic knowledge about psychological safety, the employees have been informed via mail, that they will be asked to participate in this research soon, including an introduction to psychological safety and its benefits for the organization prior to the actual data collection. To maximize participation in the research, the managers have been instructed to ask their employees to participate in the study by bringing it up in team meetings or via mail. They were explicitly instructed to ask their team members to participate and not to make it an obligation to avoid coercion.

All participants received a URL link to participate in the research via an e-mail sent by the office's reception instead of the human resources department to make it even more evident that the company itself did not facilitate this research. The survey started by informing the participants about the research goal, namely, to monitor the psychological safety in their organization and identify factors that might influence psychological safety. The participants were informed that their data will be stored pseudonymized and that no employee of their organization will see the collected raw data. The questionnaire's introduction included a consent form, after which, if agreed, the questionnaire started. The participants were asked if they are working as a seafarer on one of the vessels or if they work in the office and if they are in a managerial position or not (namely if they have employees reporting to them in the organizational structure), assigning the questionnaires to the target groups. After filling out the questionnaire, the participants were thanked for their participation, which, on average, took 105.71 minutes. This lengthy duration can be explained because the employees participated at work and sometimes took several days to revisit and finish the survey.

## **Measures**

All instruments' common characteristics are shown before the stepwise explanation of the various measuring instruments to prevent redundancies. All items are provided to the participants in English to avoid misunderstandings. Due to the organization's multicultural

nature, the operating language is English, which requires a certain level of language comprehension sufficient to answer the questionnaire. In some measurements, some items required reversed scoring. Except for the demographic items and the final two open-ended items, all items were answered with a 5-point Likert scale, which ranged from “Strongly disagree” to “Strongly agree”.

**Psychological Safety.** To measure psychological safety, Edmondson's (1999) scale of psychological safety was utilized. The items addressed beliefs about how it is safe to open up in the participant's work teams. The scale consisted of seven items with a Cronbach's  $\alpha$  of .60. Example items are “If you make a mistake on this team, it is often held against you” and “It is safe to take a risk on this team.”. High scores on the scale of psychological safety indicate firm beliefs that it is safe to take interpersonal risks in a team. Low scores, however, suggest that it is not safe to take interpersonal risks in the team.

**Cohesion.** The Revised scale for Team Cohesiveness (Carless & De Paola, 2000), a shorter work-adapted version of the Group Environment Questionnaire, was utilized to measure cohesion, which resulted in a 10-item scale with a Cronbach's  $\alpha$  of .80. The scale consisted of items related to task cohesion (i.e., “I'm unhappy with my team's level of commitment to the task.” (reverse scored)), social cohesion (i.e., “Members of our team would rather go out on their own than get together as a team.”(reverse scored)) and individual attraction to the group (i.e., “Some of my best friends are in this team.”). High scores on the scale suggest high experienced levels of cohesion, whereas low scores on the scale suggest low experienced levels of cohesion in a work team.

**Authentic Leadership.** This study relied on the Authentic Leadership Inventory (Neider & Schriesheim, 2011), to measure Authentic Leadership, consisting of a 14-item scale with a Cronbach's  $\alpha$  of .91. The items are related to self-awareness (i.e., “My leader is clearly aware of the impact he/she has on others.”), relational transparency (i.e., “My leader clearly states what he/she means.”), internalized moral perspective (i.e., “My leader uses his/her core beliefs to make decisions.”) and balanced processing (i.e., “My leader encourages others to voice opposing points of view.”). High scores suggest high levels of authenticity in the leadership style of the participant's leader. In contrast, low scores indicate low levels of authenticity in the participant's leader's leadership style.

The scale has been used twice in this study. Once in its original form to measure how the participants rate the authenticity of their leader's leadership style, and additionally, a slightly modified version was used for a self-assessment of the organization's managers to rate how they perceive the authenticity of their leadership style. For the modified version, the items have been

rephrased so that the participants have to rate their leadership style instead of their manager's leadership style. The addressee of the questions was changed to the participant, by changing the personal pronouns of the questions from “my leader” and “his/her” to “I” and adjusting the grammar accordingly. The changed scale had a Cronbach’s  $\alpha$  of .84. Example items for the different dimensions are, “I am clearly aware of the impact I have on others.” (self-awareness), “I clearly state what I mean.” (relational transparency), “I use my core beliefs to make decisions.” (internalized moral perspective), and “I encourage others to voice opposing points of view.” (balanced processing). High scores suggest high levels of authenticity in the personal leadership style, whereas low scores indicate low perceived levels of authenticity in the personal leadership style. The self-evaluation of the managers was used for the analysis in Appendix I.

**Safety Observation Measures.** The positive observations, negative observations, and suggestions used in this research are not collected exclusively for this research. They are regularly reported on the vessels during monthly safety audits. However, the employees are also asked to give their input when they see something worthy of reporting, or a possibility to improve something by suggesting a solution. Once reported, the observations and suggestions get reviewed by the Health, Safety, Environmental, and Quality department of the company, and the responsible safety committee onboard the vessels, namely the second officer and second engineer. Corrective actions are investigated and finally implemented as quickly as possible.

The observation data was gathered by the monthly report on the safety observation counts of the company. This data was only collected for the fleet and not for the office. The data collection for the questionnaire was done in May 2020. Because of the seafarers' rotation scheme, which usually consists of three months onboard, followed by three months on leave, the observation data from December 2019 until May 2020 was utilized. This way, even if crew members filled out the questionnaire and started their working assignment after that, the observation numbers from their last assignment, which they filled out the questionnaire for, will be taken into account. The absolute counts of observations (positive, negative, and suggestions) per month (December 2019 – May 2020) were assigned to the respective vessels, on which they were reported. The absolute counts per month were then added to a total count between December 2019 and May 2020.

## Results

### Antecedents of Psychological Safety

Before the hypotheses from the first conceptual model (Figure 1) were tested, all bivariate correlations were analyzed. Table 1 shows that cohesion, authentic leadership, and the manager's self-evaluation of authentic leadership are all significantly positively correlated. Besides, they are all significantly correlated with psychological safety.

**Table 1**

*Means, medians, standard deviations, and correlations among all variables of the study.*

Variables	<i>M</i>	<i>Mdn</i>	<i>SD</i>	<i>N</i>	PS	Coh.	AL	AL (Mgr.) <sub>1</sub>
Psychological Safety	3.74	3.71	.486	228	-			
Cohesion	3.23	3.25	.601	221	.233**	-		
Authentic Leadership	3.62	3.77	.586	211	.379**	.485**	-	
Authentic Leadership (Mgr.) <sub>1</sub>	3.94	3.90	.379	54	.292*	.585**	.379**	-

\* $p < .05$ ; \*\* $p < .01$

<sub>1</sub>The Manager's Self-Evaluation on the Authentic Leadership Inventory

As shown in Table 1, authentic leadership and cohesion were significantly correlated, which can signify multicollinearity. Nevertheless, a standard multiple regression was chosen as the method of analysis. The hypotheses did not include any hierarchy assumptions for authentic leadership and cohesion, and the collinearity statistics could also be checked.

Psychological safety was chosen as the dependent variable for the multiple regressions. As independent variables, authentic leadership and cohesion were included in the model and entered simultaneously using the ENTER method. As the intercorrelation between authentic leadership and cohesion was below .80, no multiple regression assumptions were harmed (Hutcheson & Sofroniou, 1999). Furthermore, the variance inflation factors were smaller than five, and the Tolerance exceeded the critical value of .20 in all analyses, suggesting that the analyses were not overly biased by multicollinearity (Hutcheson & Sofroniou, 1999). The regression results for all samples can be found in Table 2.

The multiple regression model for the total sample was significant with  $F(2, 208) = 18.118$ ,  $p < .001$ ,  $R_{adj} = .140$ , showing that authentic leadership can significantly predict

psychological safety. Cohesion was shown not to predict psychological safety in the total sample significantly. As seen in Table 2, the results of multiple regressions for the different samples showed that authentic leadership could significantly predict psychological safety in the office sample. In the fleet sample, authentic leadership was shown not to be a significant predictor of psychological safety. Cohesion was able to significantly predict psychological safety in both the office and the fleet sample.

**Table 2**

*Summary of multiple regression analyses for variables predicting psychological safety for different samples.*

Variable	Total Sample			Office Sample			Fleet Sample		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Authentic Leadership	0.285	0.061	.342***	0.422	0.076	.510***	0.064	0.083	.084
Cohesion	0.062	0.059	.077	0.138	0.075	.168*	0.154	0.090	.186*
<i>R</i> <sup>2</sup>		.148			.377			.056	
<i>F</i> ( <i>df</i> )		18.118*** (2; 208)			31.192*** (2; 103)			3.031* (2; 104)	

\* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$

*Note.*  $N_{Total\ Sample} = 211$ ,  $N_{Office} = 106$ ,  $N_{Fleet} = 10$

### **The influence of psychological safety, cohesion and authentic leadership on reported safety observation measures**

To test hypotheses 3a to 3c and 4a to 4c, the PROCESS (v3.5) macro (Hayes, 2018) for SPSS was utilized to calculate the mediation models hypothesized in the hypotheses. For all analyses (hypotheses 3 and 4) with the PROCESS macro, model 4 (simple mediation) was used. The confidence interval (95) and the number of bootstrap samples (5000) have been not changed and will be used in the default setting. Furthermore, in the macro's options menu, the options "Show total effect model" and "Effect size" were selected, whereas everything else was used in the default setting.

To examine the influence of authentic leadership, cohesion, and psychological safety on the safety observation measures, the total number of observations (positive observations, negative observations, and suggestions) have been entered as a covariate into the mediation

models to control for the number of observations recorded per vessel. There might be fluctuations in the counts of recorded observations between the vessels, which could influence the counts of reported observations, due to reasons like inactivity or differences in the reporting cultures onboard the different vessels.

**The influence of authentic leadership on reported safety observation measures.** In hypothesis 3a, it was hypothesized that authentic leadership would positively influence the number of reported positive observations, mediated by psychological safety.

The relationship between authentic leadership and reported positive observations was not mediated by psychological safety. As Figure 4 illustrates, the regression coefficient between authentic leadership and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported positive observations. The indirect effect was = -2.89, and the 95% confidence interval ranged from -197.64 to 259.31. Thus, the indirect effect was not statistically significant.

Hypothesis 3b hypothesized that authentic leadership would negatively influence the number of reported negative observations, mediated by psychological safety. The relationship between authentic leadership and reported negative observations was not mediated by psychological safety. As Figure 5 illustrates, the regression coefficient between authentic leadership and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported negative observations. The indirect effect was = 0.58, and the 95% confidence interval ranged from -236.17 to 156.53. Thus, the indirect effect was not statistically significant.

#### Figure 4

*Regression coefficients for the relationship between authentic leadership and reported positive observations as mediated by psychological safety.*



*Note.* The regression coefficient between authentic leadership and reported positive observations, controlling for psychological safety, is in parentheses. \* $p < .10$ .

Hypothesis 3c stated that authentic leadership would positively influence the number of reported suggestions, mediated by psychological safety. The relationship between authentic leadership and reported suggestions was not mediated by psychological safety. As Figure 6 illustrates, the regression coefficient between authentic leadership and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported suggestions. The indirect effect was = 2.31, and the 95% confidence interval ranged from -20.00 to 74.20. Thus, the indirect effect was not statistically significant.

### Figure 5

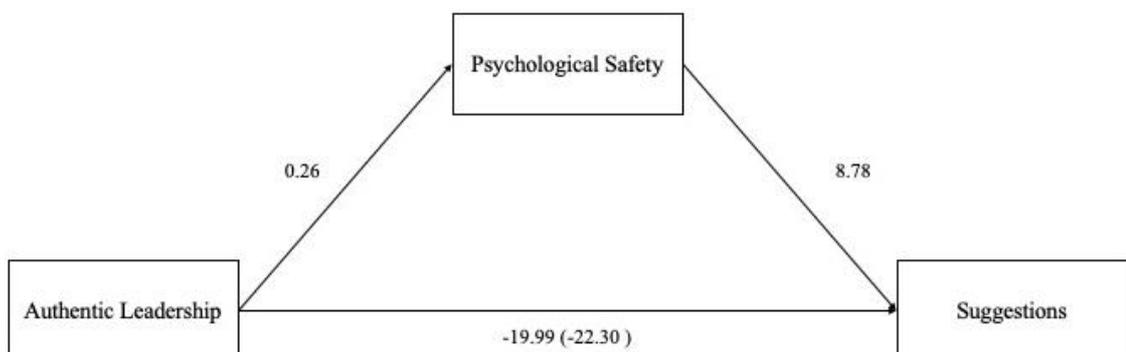
*Regression coefficients for the relationship between authentic leadership and reported negative observations as mediated by psychological safety.*



*Note.* The regression coefficient between authentic leadership and reported negative observations, controlling for psychological safety, is in parentheses. \* $p < .10$ .

### Figure 6

*Regression coefficients for the relationship between authentic leadership and suggestions as mediated by psychological safety.*



*Note.* The regression coefficient between authentic leadership and reported suggestions, controlling for psychological safety, is in parentheses. \* $p < .10$ .

**The influence of cohesion on reported safety observation measures.** In hypothesis 4a, it was hypothesized that cohesion would have a positive influence on the number of reported positive observations, mediated by psychological safety.

The relationship between cohesion and reported positive observations was not mediated by psychological safety. As Figure 7 illustrates, the regression coefficient between cohesion and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported positive observations. The indirect effect was = -1.49, and the 95% confidence interval ranged from -57.20 to 26.70. Thus, the indirect effect was not statistically significant.

Hypothesis 4b hypothesized that cohesion would negatively influence the number of reported negative observations, mediated by psychological safety. The relationship between cohesion and reported negative observations was not mediated by psychological safety. As Figure 8 illustrates, the regression coefficient between cohesion and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported negative observations. The indirect effect was = 1.11, and the 95% confidence interval ranged from -34.11 to 64.96. Thus, the indirect effect was not statistically significant.

**Figure 7**

*Regression coefficients for the relationship between cohesion and reported positive observations as mediated by psychological safety.*



*Note.* The regression coefficient between cohesion and reported positive observations, controlling for psychological safety, is in parentheses. \* $p < .10$ .

**Figure 8**

*Regression coefficients for the relationship between cohesion and reported negative observations as mediated by psychological safety.*

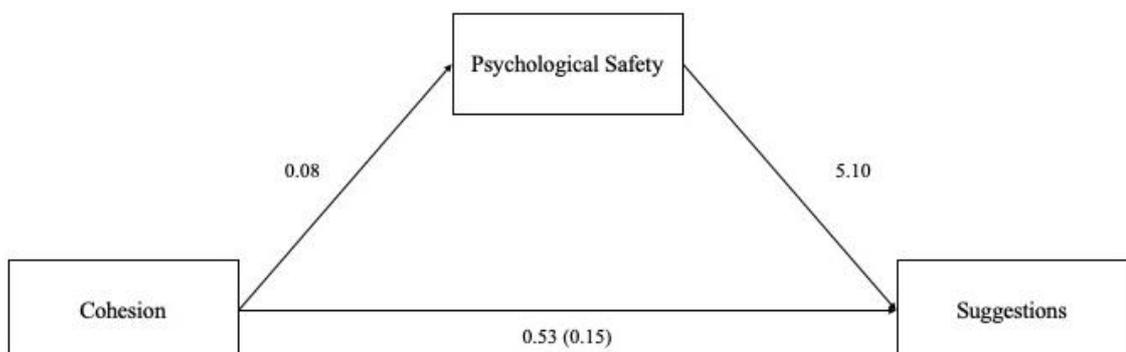


*Note.* The regression coefficient between cohesion and reported negative observations, controlling for psychological safety, is in parentheses.  $*p < .10$ .

Hypothesis 4c stated that cohesion would positively influence the number of reported suggestions, mediated by psychological safety. The relationship between cohesion and reported suggestions was not mediated by psychological safety. As Figure 9 illustrates, the regression coefficient between cohesion and psychological safety was not statistically significant, as was the regression coefficient between psychological safety and reported suggestions. The indirect effect was = 0.39, and the 95% confidence interval ranged from -17.87 to 19.83. Thus, the indirect effect was not statistically significant.

**Figure 9**

*Regression coefficients for the relationship between cohesion and suggestions as mediated by psychological safety.*



*Note.* The regression coefficient between cohesion and reported suggestions, controlling for psychological safety, is in parentheses.  $*p < .10$ .

## Exploratory Analyses

The following part of the results presents the findings of additional exploratory analyses in this study's framework.

**The influence of authentic leadership and cohesion on reported safety observation measures and possible mediation by psychological safety.** The testing of hypotheses 3 and 4 were conducted with only ten observations, as there are only ten vessels in the company's fleet. This small sample size might have resulted in a rather low statistical power, which not only reduces the probability of finding a true effect, but also the likelihood of a statistical significance that reflects those effects (Button et al., 2013). To resolve this issue by making more observations available, the vessels were categorized based on the proportions of positive and negative observations of the total amount of observations per vessel. The categorization based on the proportions has been done to investigate if authentic leadership and cohesion can predict the vessels' categorization. The proportions have been computed to rule out fluctuations in reported observations between the vessels. There might be differences in the number of overall observations due to differences in leadership or overall reporting culture.

Due to the small number of positive observations and suggestions, and the fact that both kinds of observations can be classified as positive, due to the intent to improve certain aspects of the work with suggestions and the appreciation of best practices and safe work with positive observations, the two kinds of observations have been added together. Also, all observations have been added together to a total amount of observations per vessel, so that the proportions of positive and negative observations of the total observations per vessel could be computed. To categorize the vessels based on the proportions of the observations, Table 3 shows the absolute counts and the medians for each observation category per vessel and the proportions of positive and negative observations of the total amount of observations per vessel and the medians of those proportions. The median of those proportions was utilized as guidance on how to divide the vessels into categories. The categories were "low", meaning a low proportion of the respective observation category, and "high", meaning a high proportion of the respective observation category. Those categorizations were assigned to the individuals working onboard the vessels. Using these categorizations, linear regressions have been conducted to examine if authentic leadership and cohesion can predict the categorization of the vessels into low or high proportions of observations.

**Table 3***Absolute counts, proportions, and medians for each observation category per vessel.*

Vessel	Positive Obs. Suggestions	Proportion of Pos. Obs. and Suggestions of Total Obs.	Negative Observations	Proportion of Negative Obs. of Total Obs.	Total Obs.
1	46	0,42	64	0,58	110
2	29	0,36	52	0,64	81
3	19	0,22	68	0,78	87
4	34	0,29	82	0,71	116
5	32	0,29	80	0,71	112
6	34	0,18	158	0,82	192
7	26	0,15	147	0,85	173
8	36	0,40	54	0,60	90
9	13	0,10	117	0,90	130
10	10	0,19	42	0,81	52
Median	30,50	0,25	74,00	0,75	111,00

To categorize the vessels based on the proportion of positive observations and suggestions, a median split was conducted at 0,25 to categorize the vessels only into “low” and “high”. Therefore, vessels 1, 2, 4, 5, and 8 were categorized as “high” in counts of positive observations and suggestions, and vessels 3, 6, 7, 9, and 10 were categorized as “low” in proportions of positive observations and suggestions. The categorization of the vessels based on the proportion of negative observations was conducted using a median split at 0,75 to categorize the vessels into “low” and “high”. Therefore, vessels 3, 6, 7, 9, and 10 were categorized as “high” in the proportion of negative observations, and vessels 1, 2, 4, 5, and 8 were categorized as “low” in the proportion of negative observations.

The first regression model included the categorization based on the proportions of positive observations and suggestions of the total number of observations as the dependent variable and authentic leadership and cohesion as the independent variables. The independent variables were entered simultaneously using the ENTER method. The regression results can be found in Table 4. The second regression model included the categorization based on the proportions of negative observations of the total number of observations as the dependent variable and authentic leadership and cohesion as the independent variables. The independent

variables were entered simultaneously using the ENTER method. The regression results can be found in Table 4.

**Table 4**

*Summary of multiple regression analyses for authentic leadership and cohesion predicting the categorization of vessels based on the proportions of the number of different observation categories of the total number of observations.*

Variable	Categorization based on the proportion of Positive Observations and Suggestions			Categorization based on the proportion of Negative Observations		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Authentic Leadership	-0.212	0.107	-.222*	0.212	0.107	.222*
Cohesion	0.225	0.106	.238**	-0.225	0.106	-.238**
<i>R</i> <sup>2</sup>		.055			.055	
<i>F(df)</i>		2.839* (2; 98)			2.839* (2; 98)	

\* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .01$

*Note.*  $N = 101$ , categorizations: 1 = “low” and 2 “high”.

The results show that authentic leadership can negatively predict vessels' categorization into low and high proportions of positive observations and suggestions of the total number of observations and positively predict the categorization of vessels into low and high proportions of negative observations of the total number of observations.

Furthermore, the results showed that cohesion can positively predict the categorization of vessels into low and high proportions of positive observations and suggestions of the total number of observations and negatively predict the categorization of vessels into low and high proportions of negative observations of the total number of observations.

**Differences between the office and fleet employees.** As authentic leadership was only found to be predicting psychological safety in the office sample, an independent t-test was conducted to check for differences in cohesion and psychological safety between the office and fleet employees. The distinction between employees from the fleet and the office is vital, as the employees work in severely different working conditions. Office employees work in a low-risk environment, with teams that stay the same over time, flat hierarchies, and a regular working schedule from Monday till Friday. On the other hand, the fleet personnel works in a high-risk

environment on the vessels, with an alternating working schedule that consists of three months onboard and three months on leave, which results in a change in the crew and, therefore, in the working teams. Besides, the leadership structure onboard is very hierarchical.

Using an independent t-test, both groups were checked for differences. The results of the analyses can be found in Table 6.

The first independent sample t-test showed that employees from the office perceive psychological safety significantly higher than the fleet employees. The second independent sample t-test showed that employees from the fleet perceived cohesion significantly higher than the office employees. The third independent t-test showed no significant differences in the perceived authentic leadership between the office and the fleet employees.

**Table 5**

*Results of the independent t-test comparing the perceived psychological safety and cohesion between office and fleet employees.*

Variable	Office		Fleet		<i>t</i> ( <i>df</i> )	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Psychological Safety	3.86	.501	3.61	.463	4.002 (226)	< .001
Authentic Leadership	3.59	.604	3.65	.569	-.747 (209)	.456
Cohesion	3.05	.608	3.44	.525	-5.129 (219)	< .001

## Discussion

This research aimed to examine the relationships of cohesion and authentic leadership with psychological safety in the maritime industry. Moreover, it aimed to differentiate those relationships between the office and fleet personnel, which are fundamentally different in several ways (e.g., leadership style, location of work, duration of work, risk level). Furthermore, it was researched if cohesion, authentic leadership, and psychological safety can predict the number of reported safety observations (positive observations, negative observations, and suggestions) onboard the company's vessels. The following section will discuss the five main findings of this research.

Firstly, the results showed that authentic leadership could significantly predict psychological safety in the total sample, confirming hypothesis 1 and recreating Maximo et al. (2019) findings. The distinction between office and fleet employees showed that authentic

leadership could only significantly predict authentic leadership in the office sample, but not in the fleet sample. Those results indicate that high levels of perceived psychological safety in the maritime industry might derive from a working environment, created by a leader that invites and insists on a free exchange of ideas, feedback, and opinions, that is accessible for their subordinates and that acts upon their values and statements (Neider & Schriesheim, 2011; Walumbwa et al., 2008).

The difference in authentic leadership's effect on psychological safety between the office and fleet sample might derive from the fact that the leadership onboard vessels is generally very hierarchical (Xiang, 2019). In addition to the power distance due to the hierarchy, there is a social distance between higher-ranking personnel and regular crew members, deriving from different arrangements and qualities of cabins and a social separation with different decks and brake rooms (Xiang, 2019). Without the leaders' genuine effort to increase the exchange of ideas, feedback, and opinions between the crew and the higher-ranking personnel, the leaders' authenticity will decrease. Consequential, the leaders' accessibility, inviting input, and modeling openness and fallibility will decrease, the three factors Edmondson (2003) showed to be characteristics of leadership behavior that promotes psychological safety.

Secondly, it was found that cohesion was not able to predict psychological safety for the total sample. Hence hypothesis 2 was not confirmed. However, cohesion was able to predict psychological safety in the office and fleet sample, confirming the existing theory that high-quality interpersonal relationships can foster psychological safety through an open environment and communication and mutual appreciation and trust (Edmondson, 2003; Kahn, 1990).

The third finding of this study showed that neither authentic leadership nor cohesion could predict the number of observations and suggestions reported in the organization. Furthermore, this relationship was not mediated by psychological safety. Thus, hypotheses 3 (a-c) and 4 (a-c) were not confirmed.

Previous research showed that authentic leadership is negatively related to risk perception and open communication between managers and employees. Furthermore, transmission about the risks employees face, as done in audits, has a positive effect on safety behavior, which also includes communicating risks (Birkeland Nielsen et al., 2013; Fernández-Muñiz et al., 2012). Besides, research showed that teams that show higher levels of cohesion were demonstrating superior safety communication than teams with a low perceived cohesion (Pandit et al., 2018). Contrary to this research, the present results did not indicate an effect of authentic leadership or cohesion on the reports of positive and negative observations and suggestions. However, the low number of observations, namely ten based on the number of

vessels in the company's fleet, cast doubt on these analyses' statistical power, which might have led to a reduced chance of detecting an effect. Therefore, it is advised to replicate this study with similar organizations to increase the number of observations by increasing the number of inspected vessels, increasing the chance of finding a true effect between authentic leadership, cohesion, psychological safety, and the reported safety observations.

Due to the prior analysis's low statistical power, the vessels were divided into two categories, based on the proportion of positive observations and suggestions and negative observations of the total number of observations recorded per vessel. The results showed that authentic leadership can positively predict the categorization of vessels based on the proportions of negative observations and negatively predict the categorization of vessels based on the proportion of positive observations and suggestions.

The relationship of authentic leadership on the vessels' categorization is contrary to what was hypothesized in this research. It appears that with an increase in authentic leadership, more negative observations, and less positive observations and suggestions get reported. As authentic leadership is characterized by a leader that invites input and feedback (Neider & Schriesheim, 2011), more negative observations might be reported as the leaders actively demand input from their team members, including negative safety observations that they have witnessed.

The influence of cohesion on the vessels' categorization based on the proportion of the observations was found to be the same as it was hypothesized, confirming the influence of cohesion on the employees' safety communication.

By comparing the means of authentic leadership, cohesion, and psychological safety between the office and fleet personnel, it was shown that office employees perceive psychological safety to be significantly higher than employees working onboard one of the company's vessels. There are no significant differences between the levels of perceived authentic leadership between the office and fleet personnel. However, the fleet personnel reported significantly higher levels of cohesion than the office personnel. Interestingly, cohesion on vessels is generally considered to be quite low due to various factors (Xiang, 2019). The significant differences in cohesion might derive from this research's most significant limitation. The data collection took place during the global lockdown following the COVID-19 pandemic. As a result, the office staff had to work remotely and not as usual with all office colleagues on site. The precautions taken in preparing for the pandemic might have influenced the perception of the office personnel's cohesion, as Furumo and Pearson (2006) showed that members of virtual teams generally report lower levels of cohesion than members of physical teams on site. The effects of the global lockdown on fleet employees were of the opposite

nature. Many seafarers were unable to leave the ships due to local security measures, which meant that the seafarers' teams were onboard for longer than usual. As interpersonal relationships in teams grow over time (Forsyth, 2014), the longer period may well have contributed to the seafarers' perception of increased cohesion. Added to this might be the shared uncertainty about when they can leave the ship and complete their assignment, as well as the probability of an effect of the ingroup-outgroup bias (Forsyth, 2014), as the crew members onboard may have built a sense of unity because the office personnel could not give accurate information as to when they may be able to leave the vessel and complete their assignment, resulting in an increase in cohesion due to ingroup favoritism.

Another limitation of this research might be the language ability of the participants. Due to the company's widespread nationalities, the questionnaire was created in the company's first language English. Even though every employee speaks English, the skill level may vary. It might have been interesting to test the English level throughout the organization prior to conducting the research. An E-Mail address for possible questions was provided at the beginning and end of the questionnaire, but no questions regarding the understanding of the items have been received.

As the reported safety observations are quite prone to subjectivity due to the categorization of the observations by the company's respective department, it can be suggested to take additional, more objective safety measures into account. Those may include the lost time injury frequency rate, the lost time injury incidence rate, and the number of reported accidents and incidents. Integrating more objective safety performance measures will enable the researchers to investigate the influences psychological safety, authentic leadership, and cohesion have on organizations' safety performance in the maritime industry. The results will add to this study's findings, which was concerned with communication-based safety measures (reported safety observations). A long-term study is recommended in which seafarers regularly take part in a survey over a period of time to investigate this as accurately as possible. It may be advisable to have a questionnaire at the beginning of their time onboard, a questionnaire in the middle of their assignment onboard, and at the end of their assignment, when they sign off the vessel. Measuring at different points in time ensures that changes in psychological safety, authentic leadership, and cohesion could be measured, resulting from the constant changes in the crew and the higher-ranking personnel.

To conclude, this research proved that authentic leadership could predict the perceived psychological safety of on- and offshore employees' in the maritime industry. Furthermore, it was found that authentic leadership and cohesion can predict if a high or a low number of

positive and negative safety observations were reported on an organization's vessels in the maritime industry. Additional research is required to investigate the influences of psychological safety, authentic leadership, and cohesion on the safety performance and their importance in the industry's efforts to ensure all parties and employees' safety and health.

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## Appendix I

Authentic leadership was measured twice during this research. Employees only answered the general authentic leadership part of the questionnaire, rating the authentic leadership that they perceive from their immediate manager. On the other hand, managers had to fill out the general authentic leadership part of the questionnaire, also rating their immediate manager, but besides, they filled out a self-evaluation on the perception of their authentic leadership.

Using a paired samples t-test, it was shown that the manager's evaluation of their immediate manager ( $M = 3.60, SD = .627$ ) and their self-evaluation ( $M = 3.94, SD = .379$ ) were significantly different,  $t(53) = -4.197, p < .001$ . Using a one-sample t-test, that the ratings of perceived authentic leadership from their immediate manager ( $M = 3.62, SD = .586$ ) was significantly different, from the managers self-evaluation on authentic leadership ( $M = 3.94, SD = .379$ ),  $t(210) = -7.950, p < .001$ .

The results indicate a discrepancy in how the employees perceive their managers and how the managers perceive themselves. Due to the significant difference between the managers' self-evaluation of authentic leadership and the employees' perception, it is recommended to encourage an exchange between managers and employees to identify the discrepancies and determine the necessary steps to bring both sides closer together. Most importantly, about this is that the managers are open for input and feedback and are encouraging that conversation (Avolio et al., 2004; Neider & Schriesheim, 2011). This exchange might be necessary for the psychological safety of the teams present, as this research, as well as previous research, suggest an influence of authentic leadership on the psychological safety of employees.