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Cooperative and competitive behaviour among passengers during the Costa Concordia disaster

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ABSTRACT

Despite the increase in regulation and codes, there is a relatively small body of scientific literature on maritime disasters management, especially in terms of human factors that affect the success of the evacuation and safety procedures. This paper provides an analysis of passengers’ behaviour during the Costa Concordia disaster of 2012, in which 32 people died. We use 49 passengers’ witness statement made available by the court of Grosseto to understand how the evacuation occurred. We examine whether the main factor in reducing the effectiveness of the evacuation procedure was the lack of effective management or the behaviours among evacuees, or a combination of the two.

Results of the analysis suggest that passengers reacted with solidarity, helped each other and that such spontaneous and pro-social behaviour possibly contributed to reduce the number of casualties. By contrast, competitive behaviours happened only in relation to specific environmental constraints and were limited to the proximity of safety boats.

The deficiencies in command in the Costa Concordia evacuation highlights the need to increase the skills of personnel called to manage an emergency at sea and the need to create ad hoc training programs that consider also unexpected scenarios.

Understanding how people (both staff and public) deal with an emergency and the factors that affect their decision is pivotal to help planners to review their strategy, anticipate similar events, and consider all the factors in future plans and regulations. While human error is always a big factor in maritime disaster, its impact can be considered and mitigated with specific procedures and adaptable plans.

1. Introduction

Since 1980, the cruise ship industry has been one of the fastest growing sectors in the travel sector (Barron and Greenwood, 2006; Brida and Aguirre, 2008) and recent years have been characterised by a significant increase in large-scale cruise ships and passenger ships in terms of numbers and popularity (Kvamme, 2017). As consequence, the number of maritime disasters involving passenger ships has also increased and maritime disasters have caused more injuries and fatalities than road disasters. Many dramatic maritime disasters happened in recent years (e.g. the capsizing of the Princess of Stars in 2008). Some of them have been characterised by the desertion of the ship by the captain before the end of the evacuation process; in 2014 the captain of the Sewol left the ship without issuing an evacuation order, hindering the formal start of the evacuation (Kee et al., 2017). Most of these events were characterised by the captain’s inability to manage the emergency and by ineffective decisions; for example, during the emergency of the Oceanos the cruise director reported that many of the officers left the ship before the emergency was over, leaving the passengers without any information about what to do (Allen, 1994).

The same happened during the Costa Concordia disaster which took place near Tuscany in 2012, when Captain Francesco Schettino...
abandoned the ship before the end of the evacuation resulting in one of the largest number of fatalities in a passenger ship accident in Europe in recent years and which was followed by great public interest (Elnabbawybrizh et al., 2016). As declared in the Judgment of the Court of First Instance of 11 February 2015 no. 115/2015 (Court of Grosseto, 2015), the abandonment of the ship resulted in a lack of management and in organizational improvisation (Court of Grosseto, 2015). What this and the other two emergencies have in common is that passengers did not receive help or information and were left alone, possibly causing injuries and fatalities (Talley et al., 2008; Lu and Yang, 2011).

Although ship abandonment by the crew seems to be a frequent feature of emergency management in case of disasters involving passenger ships, the way people behave in such situation is still not properly investigated. The literature abounds with mathematic models that describe efficient strategies to safely evacuate a sinking ship considering the ship’s architectural design (Kobes et al., 2016; Carattin et al., 2011; Pinto et al., 2012) or the amount of information received by passengers (Ockerby, 2001; Nevalainen et al., 2015). But modelling people’s behaviour is not always sufficient to deeply consider all the elements that lead a person to take a decision, especially during emergencies (Marmot, 2002). Analysing and describing people’s actual behaviour during emergencies is challenging and would ideally require collecting primary data (such as video or interviews) (Kvamme, 2017; Alexander, 2012) while the emergency is still ongoing. Such challenge could be one possible reason of the lack of studies about how passengers react to the absence of command and the consequent lack of information. Secondary data (i.e. data not directly collected by the researcher) are a feasible alternative when contemporaneous primary data are not available. However, such information is not always easy to collect or does not provide enough details for a proper analysis.

The Costa Concordia disaster offers a unique opportunity to investigate the combination of factors that affect the correct execution of the entire emergency procedures, because documents related to the proceedings have been made available by the Court of Grosseto, in charge of the trial. These documents enable us to study the evacuation, the communication, the crisis management and, above all, the behaviour of passengers during the event. Behaviour is especially important given that previous research has shown that in emergencies most lives are typically saved by “ordinary” members of the public - whether bystander or fellow survivors - rather than by professionals (Helsloot and Ruitenberg, 2004). And yet detailed comparisons of different evacuations show that as well as cooperation, under some circumstances there is competition and pushing among evacuees which might jeopardize their safe exit (Chertkoff and Kushigian, 1999).

The present paper complements the attempt of previous researches to describe peoples’ behaviour during the Costa Concordia disaster (Kvamme, 2017; Alexander, 2012) using witnesses’ evidence collected during the hearings held by the Court of Grosseto. The evidence is treated as “indirect interviews” with survivors and the analysis presented in this paper represents one of the rare (if not only) example of the use of such evidence transcripts to investigate passengers’ behaviour during maritime disasters. It also represents the only analysis of the available documents related to the Costa Concordia proceedings in terms of passengers’ witness evidence collected during the hearings held by the Court of Grosseto. It provides a critical investigation of how the lack of the management, due to the abandonment by the captain, affected the behaviours of the passengers during the Costa Concordia disaster with a special focus on risk perception and cooperative versus competitive behaviour. We hypothesised that the lack of management by the captain and ineffective organizational improvisation by the crew resulted in most of the passengers spontaneously, self-organizing themselves and displaying both cooperative and competitive behaviour, instead of following all the crew’s instructions. Furthermore, we also hypothesized that competitive behaviours during the Costa Concordia happened only in situations of physical and environmental constraints (e.g. when approaching and boarding the safety boats).

The aim of this paper is therefore to investigate public behaviours during the Costa Concordia disaster both in terms of cooperation and competition in relation with the lack of management. It also aims to provide answers to the following research questions: How did people behave and react during the emergency? Are there differences in the behaviour towards familiar people or others? What behaviours are referred to by passengers with the term “panic”? Are such behaviours predominant throughout the entire evacuation or are they prevailing in specific circumstances? Did people receive conflicting information and how they react? Finally, the paper also aims to compare these results to the existing literature: Kvamme (2017), for example, looked at the passengers’ behaviour as a factor that reduced the effectiveness of the evacuation.

1.1. The costa concordia disaster

On 13 January 2012, the Italian cruise ship Costa Concordia hit an underwater rock and capsized off the coast of the Isola del Giglio, Tuscany, Italy. The collision occurred during the so-called “inchino” (salute), an unregulated but accepted manoeuvre that is usually made with the intent to greet and pay homage to the inhabitants of the island and advertise the presence of the ship on land. After the impact, the Costa Concordia gradually listed to the right side, leaping on the seabed and remaining largely above water on the left side. The accident resulted in 32 deaths and 193 further victims with non-fatal injuries. Table 1 shows the timeline of the key events of the disaster according to the reconstruction made during the legal proceedings.

At the beginning of the event, the captain of the Costa Concordia, although the extent of the damage was immediately reported from the outset, decided to minimize the emergency and delay the start of the emergency procedures; furthermore, once the order was heeded, the captain abandoned the ship itself jumping on the roof of a lifeboat before the evacuation was completely over (Court of Grosseto, 2015) going against the Italian Navigational Code (D.R. 30/03/1942n.327) that defines the captain as having a pivotal role in the management of the emergency (Art. 186) and requires him to coordinate all the evacuation procedures. According to the International Maritime Law and the IMO regulations (IMO, 2009), the emergency alarms have to be sounded when the seriousness of the situation is assessed and passengers have to be evacuated within 30 min after the ‘abandon ship’ order is issued. During the Costa Concordia capsizing, the ship abandonment order was decided by the captain and issued by the deputy officer an hour after the impact even though the captain was aware that the ship should have been evacuated after few minutes from the impact (Court of Grosseto, 2015).
influencing in the decision to evacuate, because usually people take they can adapt to it, adding complexity to the process of evacuation people assess the situation and the threat, perceived the risk, and how fort he Heide, 2004; Perry and Lindell, 2003) and in a way that is both orderly and meaningful in the situation. As reported in many studies, people experience fear and uncertainty, but this does not necessarily mean that they will act selfishly or impulsively (Quarantelli, 2008, 1986; Alexander, 2013; Lowe and Fothergill, 2003). After moments of uncertainty and milling, in fact, people often start to evacuate in a self-organised and coordinated (Connell, 2001) manner, usually acting as a group, especially in the presence of familiar people (Riad et al., 1999; Drury et al., 2009). This happens because people act in groups, with familiar persons and relatives, unknown people or both in normal circumstances and in the majority of routine situations. Such groups are maintained also in emergencies, by seeking the proximity of familiar people, or to create a new relationship with strangers. Shared identity, in terms of sharing a sense of ‘we-ness’ with others affected, enhances the expression of social behaviours and solidarity (Drury et al., 2009). Overall, during disasters collaborative behaviours are more common than competitive behaviours (Helsloot and Ruitenberg, 2004; Drury et al., 2009).

The literature suggests that competing instructions may only result in confusing people during their decision-making process in the event of an evacuation (Ploran et al., 2018) and that uncertainty often leads people to depend on others to provide information (Eiser et al., 2012). This led to what is known in sociology as “normalcy bias” (Omer and Alon, 1994). During the Costa Concordia disaster, in fact, many passengers received conflicting instructions and reassuring information from the staff trying to avoid panic and maladaptive behaviours, (Court of Grosseto, 2015) while the literature suggests that usually the result is exactly the opposite (Quarantelli, 2008). This affected the passengers’ assessment of the emergency and the underestimation of the situation probably lead to more deaths and injuries.

By that time the ship was listing heavily and the use of all the lifeboats on the ship was impossible. Some of the passengers had already left the ship and others on the deck were waiting to leave on one of the remaining boats. The Costa Concordia disaster could easily have involved massive loss of life (Alexander, 2012). While listing and turning the ship could have slid into deep water. As reported, fortunately, not all the passengers heeded the order to return to cabins, and people who did were at risk of entrapment and drowning. Unfortunately, most of the people who died did so because of a lack of information.

Evacuation behaviour in cruises can be similar to evacuation behaviour in buildings (Casareale et al., 2017); in both environments, emergencies and crisis can generate factors that could trigger create competitive behaviours (Fahy et al., 2012). When representing emergency behaviour, the mass media, some people involved in the emergency, and sometimes also experts often use the term “panic” to describe people’s emotion and actions (Fahy et al., 2012). Many authors agree on the definition of specific general key conditions under which collective panic can occur (Perry and Lindell, 2003; Gannt and Gannt, 2012; Fritz and Marks, 1954) but, despite this attempt to find common features, the literature still does not provide an agreed meaning for the concept of panic. More importantly, it cannot easily be determined whether behaviour is rational or irrational in a situation like an emergency (how should people behave?) (Ervingston and Brysiewicz, 2017) Rather than speculating on rational (vs irrational) motivations, It makes more sense to examine the people’s reactions to dangerous or emergency situations in terms of competitive behaviours - which may or may not be linked to feelings such as fear, anxiety and terror – versus cooperative behaviours (Drury et al., 2009).

As usually happens when a disaster strikes, several media source reported “panic” during the emergency of the Costa Concordia (Kvamme, 2017). However, the media often report a distorted and oversimplified description of people’s reactions during disasters (Zarqa, 2013). Some research articles highlighted episodes of competitive
behaviour and chaotic reactions during the evacuation of the Costa Concordia, that were only transient (Alexander, 2012), but in addition to leadership issues, strongly affected the result of the evacuation (Kvamme, 2017). The majority of those studies are based on limited secondary collections of unofficial documents, such as photographs, video sequences, reports by media, post hoc interviews with survivors and scientific reconstructions; examples are the reconstruction of the sequence of events before, during and immediately after the event (Alexander, 2012), the identification of behaviours among the evacuates that may have contributed in reducing the effectiveness of the evacuation procedures (Kvamme, 2017) and the discussion of the circumstances of the accident, the problems encountered during the evacuation and the search and rescue (Elanabawbyahir et al., 2016). These studies may be biased from the necessity of “selling” a story and make it appealing (Kvamme, 2017). Therefore, as suggested by Kvamme (2017), the use of the transcripts of passengers’ statements from the court proceedings would add consistent value to the analysis of human behaviour in the Costa Concordia disaster and widen the understanding of how people behave during maritime disasters.

2. Materials and methods

This research is based on secondary data collection and provides critical analysis of documents related to the Costa Concordia disaster proceedings that have been released only recently. In detail, the documents refer to the passengers’ witness statements registered during the hearings held by the Court of Grosseto that started soon after the accident occurred (from February 2012 to December 2014). Proceedings were collected in compliance with criminal procedural law. Documents were disclosed only after the issuance of the Judgment of the Court of First Instance of 11 February 2015 no. 115/2015 which sentenced the captain of the Costa Concordia to 16 years in prison. Then, the Court of Grosseto ruling was upheld by the Italian Supreme Court (ruling no. 35585/2017 issued on July 19, 2017). All the passengers’ witness statements were in Italian and already officially translated by the court’s offices using professional and registered translators.

A total of 49 passengers’ statements were collected: of those, the majority were females (52%) while passengers were Italians in 93% of the cases. The whole set of statements has been edited and collated in a single document resulting in a total of 19,271 words. In order to assess how and whether the lack of management by the crew affected the passengers’ behaviour, we performed a mixed method content analysis to identify patterns in the passengers’ witness evidence. The mixed method analysis has been chosen for the advantage of being able to account for both narratives and standardized data (Gambrel and Butler Vi, 2013). All the documents collected were analysed, and passengers’ witness evidence was extracted. The contents related to the passengers’ behaviour once landed and information about the compensation were removed. The final analysis was read and re-read to get a sense of the whole and to gain a general understanding of the content of the instructions (Erlingsson and Brysiewicz, 2017).

A qualitative analysis (i.e. coding) was performed in order to find patterns of behaviour and have a preliminary idea of whether competition was a predominant behaviour during the emergency or whether cooperation prevailed. Since the aim of the study is to find practical and useful insights to describe how people behave during an emergency when management is not fully ensured, we analysed the documents from a pragmatic perspective. Using a mixed method, we aimed at emphasizing the nature of people’s experience and how experience and shared beliefs influenced choices and the outcomes of their actions (Patton, 2015). All the relevant documents found in the literature review were read, analyzed and reviewed by the authors to extract content on what to do in relation to a disaster. A special focus was given to the phases of the disaster and on the behaviour of people in relation to other people or themselves. In order to keep their anonymity, passengers have been alphabetically ordered and they have been attributed a number according to the alphabetical order (e.g. Passenger 1 is the first passenger that appears in the list, while Passenger 49 is the last one).

The document then was imported into Nvivo 12® and an exploratory and descriptive analysis was carried out. A word frequency search was used as preliminary analysis to identify and list the most frequently occurring words and to identify possible patterns. Then, a text search was performed to search for the specific words or phrases coming from the word frequency research and from the design of the study; their use in the text was explored to identify possible networks and finally words or phrases were automatically coded.

All the evidence collected from the Court of Grosseto was read, analysed and reviewed by the authors to extract content about behaviours related to the behaviour of people in relation to other people or themselves. All the sets of evidence in the proceedings were transformed into Condensed Meaning Units (CMU). Condensation is the process of shortening the text while still preserving the core meaning to ensure that the core meaning is still retained. All the CMUs were labelled by formulating codes and then grouping these codes into categories and themes.

The coding process followed the phases indicated by Erlingsson and Brysiewicz (2017). A protocol for content-analysing behaviour, consisting of a codebook and a coding form, was developed in order to make the set of codes so complete and unambiguous as to almost eliminate the individual differences among coders (Neuendorf, 2017). A mixed coding, both inductive and deductive (Rivas, 2012), was used in which some codes were known prior to analysis and some of the codes emerged during the reading of the text. A set of five categories (themes), conceptualized as patterns of shared meaning across data that are united by a central concept (Braun and Clarke, 2012), have been used.

The first theme was used to define the demographic characteristics of the passengers and to capture the range of variation among person profiles; the respondents were coded by gender (male vs. female) and nationality (Italian vs. foreigners). Nationality was used to understand the issue of language and if there has been a different reaction based on the understanding of the message (most of the messages were in Italian). The second theme labelled as “perception” contains all the passengers’ descriptions related to feelings, perceptions, and whether people were afraid. The third theme represents the types of actions described by passengers in terms of behaviours categorized as: a) behaviours of giving or receiving information; b) behaviour of giving or receiving help; c) imitative behaviour of others; d) competitive behaviour; e) lack of information, instructions or help; f) no reaction; g) opposite behaviour or thought to instruction or information received; and h) “general behaviour”. The code “general behaviour” was assigned to all the actions that did not refer to the above specific categories as suggested in the literature (Neuendorf, 2017), such as moving from a place to another or collecting lifejackets. The fourth theme was used to code all the behaviour based on the person who made/received a specific behaviour. The main nodes were: a) actions towards the passenger him/herself; b) actions towards people belonging to the family nucleus (e.g. wife, husbands, children, etc.) and familiar people (e.g. friends); c) other people or unknown people with who the passenger has no contact or relationship prior to the emergency; and d) Costa Concordia crew members. Finally, behaviours were coded according to the location where the action took place to find out any relation between the description of different types of behaviour (i.e. cooperative vs competitive) and the location of passengers.

A further inductive stage was completed in which the researchers added additional codes based on reading the initial transcripts and identifying unexpected issues and topics that had emerged during data collection. The final code frame consisted of 19 codes located across 5 main thematic or interest areas. Table 2 outlines the codebook and presents the list of the codes and themes, with description and examples, used in the coding process.

To ensure the quality and the reliability of the data coding, an Inter-Coder Reliability (ICR) test using Cohen’s $\kappa$ was performed. The test
allows to estimate the agreement between coders accounting for their chance agreement (MacPhail et al., 2016) and to evaluate the extent to which these coders make similar coding decisions in assessing the characteristics of text (Lombard et al., 2004) in terms of behaviours. A random sample consisting of the 10% (five out of 49) of the total statements (Lombard et al., 2004) was extracted and coded independently for the κ by the principal investigator and by an external second coder who was invited to code the sample. The second external coder, a student form Università Politecnica delle Marche with experience in coding research, underwent a training process consisting of revising the codebook (that contains the definition of the nodes) to get comfortable with the coding scheme (Neuendorf, 2017). Blind coding, in which coders do not know the aim of the research (Knobloch, 2008), was used in order to reduce bias that compromise validity. A criterion of 0.80 or greater for Cohen’s κappa was selected based on the literature indications (Lombard et al., 2004). There was excellent agreement between the two coders, with κ = 0.826 (p < .001).

In order to assess how and whether passengers behaved, both in relation to familiar persons or strangers, we performed a mixed method content analysis to identify core consistency and patterns in the passengers’ witness evidence. Results were then analysed in order to explore the relationship between the codes. In order to explore and show data relationships and patterns we used NVivo software’s matrix coding/crosstab function that provides matrices and show the relationship between different groups of codes within the set of instructions. The relationships described by matrices are mainly focused on which behaviours (coded based on the behaviour) are related to different typology of people. Combinations of codes are presented in tables that provide frequencies expressed as numbers of key categories (Neuendorf, 2017; Krippendorff, 2004).

### 3. Results

Passengers reported fear, confusion, ‘panic’ and competitive behaviour, as well as cooperation. They also reported communication issues and lack of trust in the authorities. Starting from the word count analysis, specific words in the text were searched. Table 3 presents the count of the main words used in the whole document. The word “panic” (panic) with stemmed words, is present in the text 34 times, representing 0.18% of the whole document, 40 times before (0.21%), two times during (0.01%) and eight times after (0.04%).

The 21 codes used in the coding analysis produced 1148 references (number of times when an instruction has been coded): 467 references were found using the theme “people”, 503 using the theme “behaviour”, 50 using the theme feeling, and 30 using the theme “location”. The remaining nodes were for “gender” (49) and “nationality” (49) (Table 4).

According to the count of codes by person: a) 17 (35%) passengers said they provided help to someone; b) 21 (43%) passengers said that they received help; c) 25 (51%) passengers reported competing behaviours and 29 (59%) said they behaved in a different way to what they have been told by the crew members; d) 41 (84%) passengers received information from others; e) 8 (16%) passengers followed other passengers; and f) 36 (73%) passengers reported a lack of information by the crew members.

The NVivo Crosstab function provided a set of 3 relational matrices (contingency tables) for analysis: a behaviour-by-person 4 × 7 matrix, a panic behaviour-by-location 2 × 3 matrix and an opposite behaviour-by-instructions from the crew 3 × 2 matrix. The first matrix describes the relation between the behaviour described and the person with whom the passenger made such behaviour. This matrix is used to analyse if the behaviour of passengers was with familiar people, strangers or individuals. The second matrix is used to define the location of passengers when they describe competitive behaviour such as pushing, trampling and trying to board the safety boat without helping others. The last matrix is used to investigate the relation between the instruction from the crew and the decision the passenger has taken (follow vs not to follow). The variables are all a similar kind or type (case nodes v case nodes).

The descriptive analysis shows that: a) 23 (65.7%) of codes refer to help given to a familiar person; b) 17 (44.7%) of codes refer to people who received help from stranger; c) there was no difference between codes that describe receiving information from familiar or others; d) nine (64.3%) of the codes about following behaviours refers to strangers and three (21.4%) to familiar people, e) 54 (54.5%) of general behaviours codes refer to familiar people, 25 (25.3%) to others. Results are summarised in Table 5 and Fig. 1.

### Table 3

| WORD (ITA) | WORD (ENG) | REFERENCE | COVERAGE |
|----------|-----------|-----------|----------|
| Paura    | Fear      | 12        | 0.05     |
| Figlio   | Son       | 12        | 0.06     |
| Famiglia | Family    | 11        | 0.08     |
| Marito   | Husband   | 32        | 0.17     |
| Moglie   | Wife      | 47        | 0.25     |
| Marito   | Husband   | 32        | 0.17     |
| Figlio   | Son       | 12        | 0.06     |
| Paura    | Fear      | 12        | 0.05     |
| Cosa fare| What to do| 68        | 0.24     |

| CODE | DESCRIPTION | THEME |
|------|-------------|-------|
| Gender | Male/Female | Demographic |
| Nationality | Italian/foreigner | |
| Feeling and perception of the risk | Passengers describe feelings, risk perception, and report people afraid. There is no mention to real behaviour involved | Perception |
| Give info or instructions to | Action of giving information or instructions to someone | Type of action |
| Receive info or instructions from | Action of receiving information or instructions from someone | |
| Give help to | Action of helping or providing support to someone | |
| Receive help from | Action of receiving help or support from someone | |
| Follow who | The act of follow/repeat the behaviour of other people | |
| Competitive behaviour | Competitive behaviour (e.g. pushing, screaming, running, trying to get onboard without helping people). Lack of information on what to do, where to go, how to behave. | |
| Lack of information or instructions or help | Opposite action as results of an official instructions that is perceived as incorrect or not useful | |
| No reaction | Lack of reaction or no action during the emergency | |
| Opposite behaviour or thought | Opposite action of receiving help given to a familiar person; b) 17 (43%) passengers said that they received help; c) 25 (51%) passengers reported competing behaviours and 29 (59%) said they behaved in a different way to what they have been told by the crew members; d) 41 (84%) passengers received information from others; e) 8 (16%) passengers followed other passengers; and f) 36 (73%) passengers reported a lack of information by the crew members. | |
| General behaviour with | Any kind of action not coded in the other codes (e.g. moving from a place to another, collecting lifelengths) performed with someone | |
| Himself or alone | The behaviour/interaction is linked to the passenger himself | People |
| Familiar people | The behaviour/interaction is linked to familiar people (family members, friends, people already known before the emergency happened) | |
| Other people | The behaviour/interaction is linked to unfamiliar people (people meet or known during the emergency) | |
| Crew and staff | The behaviour/interaction is linked to with the crew (costa Concordia crew, waiters, kitchen staff) | |
| Close to the safety boat | Behaviour in the proximity of the safety boat | Location |
| Inside the ship | Any other location not coded in the other codes | |
In total 59 descriptions of behaviours related to competitive behaviours were found deriving from the competitive behaviour-by-location 2 × 3 matrix; of these 17 (13%) are inside the ship, 41 (56%) are related to a location in proximity of the safety boats and 1 (3%) to behaviour inside the safety boat. The following behaviours were grouped under “cooperative behaviours” to make a comparison with competitive behaviours: a) give info or instructions to; b) receive information/instruction from; c) give help to; d) receive help from; and e) follow who.

There was a significant association between the behaviour and the location of the passenger (χ² = 45.7, p < .001). This result is consistent with the odds ratio, which shows that the odds of having competitive behaviour were 9.4 times higher in the proximity of the safety boats than inside the ship (Table 6).

Most of those behaviours called ‘panic’ refer to the description of other people’s behaviours (80%) rather than familiar people (9%) or staff (11%). No one described his own behaviour as ‘panic’, similar to previous findings in the literature (Fahy et al., 2012).

Almost everyone in the sample claimed that they received little information or didn’t receive information at all from staff; in total 58 nodes related to instructions from crew and of these 47 (82%) resulted in opposite behaviours, 9 (15%) in general behaviour and 2 (3%) to a following behaviour (Table 7).

### 4. Discussion

The evacuation during the Costa Concordia disaster was very challenging. The delay in declaring the alarm and the consequent late issue of the evacuation order, in fact, resulted in a less quick and effective abandonment of the ship. Furthermore, the abandonment by the captain before the end of the process resulted in a lack of management with the staff members who had to rely instead on organizational improvisation and their experience and knowledge rather than specific procedures to

#### Table 4
Count of the main nodes used for the analysis.

| THEME   | CODE LABEL                | N OF REFERENCES |
|---------|---------------------------|-----------------|
| People  | Crew and staff            | 202             |
|         | Familiar people           | 108             |
|         | Other people              | 127             |
|         | Himself or alone          | 30              |
| Behaviour| Follow who                | 14              |
|         | General behaviour with    | 98              |
|         | Give help to              | 35              |
|         | Give information or       | 10              |
|         | instructions to            | 10              |
|         | Lack of information or     | 92              |
|         | instructions or help       | 92              |
|         | No reaction               | 4               |
|         | Opposite behaviour or     | 53              |
|         | thought                    | 53              |
|         | Competitive behaviour      | 46              |
|         | Receive help from         | 38              |
|         | Receive info or           | 112             |
|         | instructions from          | 112             |
|         | Feeling and perception of | 50              |
|         | the risk                  | 50              |
| Gender  | Male                      | 26              |
|         | Female                    | 23              |
| Nationality | Italian                 | 43              |
| Location | Inside the ship           | 7               |
|         | Close to the safety boat  | 23              |

#### Table 5
Results of the behaviour-by-person 7 × 4 matrix.

| BEHAVIOUR | INSIDE SHIP (N = 96) | PROXIMITY OF SAFETY BOAT (N = 86) |
|-----------|----------------------|-----------------------------------|
| Competitive | 29 (30.2%) | 69 (80.2%) |
| Co-operative | 67 (69.8%) | 17 (19.8%) |

#### Table 6
Analysis of competitive and cooperative behaviour vs. location.

| BEHAVIOUR | INSIDE SHIP (N = 96) | PROXIMITY OF SAFETY BOAT (N = 86) |
|-----------|----------------------|-----------------------------------|
| Competitive | 29 (30.2%) | 69 (80.2%) |
| Co-operative | 67 (69.8%) | 17 (19.8%) |

#### Table 7
Opposite behaviour-by-instructions from the crew 3 × 2 matrix.

| BEHAVIOUR | INSTRUCTIONS FROM CREW |
|-----------|-------------------------|
| Opposite behaviour or thought | 47 |
| General behaviour with | 9 |
| Follow others | 2 |

Fig. 1. Percentages of behaviour-by-person 7×4 matrix.
manage the situation. Such lack of management and the inability of the crew to effectively manage the emergency (they also faced the same uncertainties of passengers) had important consequences for people’s behaviour: according to official documents, after the captain abandoned the ship, passengers realised that the emergency was not just a blackout and quickly lost trust in authorities’ instructions and communications that resulted in spontaneous organisation and behaviours.

The results of this analysis highlight the challenges that passengers experienced in accessing, processing and applying information to make decisions. The qualitative analysis of the passengers’ statements suggests that during the emergency people exhibited different behaviours during different phases of the evacuation. Although it is not possible to make a clear distinction between what happened before the evacuation signals were given, the evidence provides a description of the general trend of the behaviours during the emergency. Passengers described a first phase of disbelief and describe feelings of fear and confusion relating to the moments immediately following the impact.

These results are in line with the results of previous studies (Kvamme, 2017; Alexander, 2012) which conclude that the emergency of the Costa Concordia was mainly characterised by cooperative behaviour and competition occurred only seldomly. A substantial element that emerges from this qualitative analysis and that adds meaning to the results already achieved with previous research is the suggestion that competitive behaviour occurred in correspondence with the specific situation with the lifeboats. Summarising the qualitative results, most people described cooperative behaviour, even between people with no bonds before the emergency. Almost all the passengers declared that they didn’t receive any information or support from the crew; furthermore, when they realised that the emergency was more severe than described by the crew, they decided to behave spontaneously against crew instructions. Passengers witnessed episodes of behaviour they described as ‘panic’ mainly in the proximity of the safety boats and as a behaviour of others, including the staff. These statements are confirmed by the results of the quantitative analysis, as reported below and confirmed existing studies about competitive behaviours (Chertkoff and Kushigian, 1999).

There is almost no evidence of difference between familiar people (family and friends) and strangers when referring to helping people during the emergency. This result is in line with the social identity approach that describes that during emergencies people affected by the incident often come to see themselves as a group through common fate and behave as a group instead of being selfish (Druy, 2018).

The quantitative analysis also showed that lots of passengers referred to lack of support in terms of information, management, evacuation instructions and especially to a critical management of the boarding of the lifeboats that was one of the most crucial phases in the evacuation. The lack of help, information or support, especially from the staff resulted in spontaneous behaviours and decisions in order to deal with a situation characterised by uncertainty, or even they helped the staff to order resulted in conflicting information to the passengers who soon expanded. In addition, those responsible for preparing communities and the same conditions that trigger competitive behaviour can be applied (Chertkoff and Kushigian, 1999): the perception of the danger, the short number of boats (lack of exits), the feeling that the boats were running out (and exit not available anymore) could have triggered competitive behaviour in the proximity of lifeboats and explain why competition did not happen in other places throughout the emergency. These results reinforce the idea that is not useful to talk about “panic” when addressing to peoples’ behaviour during an event, as previous studies did when analysing the Costa Concordia disaster (Alexander, 2012) but it is preferable to talk about competitive behaviours, which can be measured and compared with cooperative behaviours. Moreover, such behaviours need to be contextualised and every situation referred to the environmental conditions.

The deficiencies in command on the Costa Concordia highlight the need to introduce new protocols idealised to increase the skills of the personnel called to manage an emergency at sea. Such protocols should be tested with ad hoc training programs that consider also unexpected scenarios (as a captain leaving his/her ship). The objectives to be achieved in order to allow the staff responsible for managing passengers during an emergency to obtain the relevant certifications must be expanded. In addition, those responsible for preparing communities and organizations for disasters should also plan for improvisation to occur.

This study has some limitations. Firstly, the data presented and analysed in this paper come from secondary sources; all the passengers’ statements were presented during the hearings held by the Court of Grosseto by lawyers of the Grosseto court. The authors requested direct contact with the passengers contacting their lawyers, but this was denied, and questions were not allowed. The legal and official nature of the evidence excludes the types of bias that can be found in the media, which tends to exaggerate the story; and due to the fact of people responding under oath, all the answers could be considered authentic. Secondly, only 49 statements were analysed of the total of 3216 passengers. In order to ensure solid credibility (Bengtsson, A. Bartolucci et al. Safety Science 134 (2021) 105055
2016) of the content analysis, it would have been useful to analyse the totality of the survived passengers’ statement; however, those collected are the only statements available and made public by the court; therefore a deeper analysis of passengers’ behaviour cannot be performed. The design also has some strengths. Passengers’ statements about competitive and cooperative behaviours were not made to the prompts of researchers’ interview questions and therefore can be considered relatively naturalistic.

5. Conclusion

The number of maritime accidents and disasters is growing and, despite the increasing body of regulation and codes, there is a only small body of scientific literature on maritime disasters, discussing emergency management and factors that affect (enhance/reduce) the success of the evacuation and safety procedures; in particular, specific human factors, in terms of human error in management and emergent behaviours, are still not deeply investigated and considered in the creation of guidelines and rules to improve the management of future disasters.

This paper highlighted that the main factor in reducing the effectiveness of the evacuation procedure was the lack of management rather than the behaviours among evacuees. Spontaneous and cooperative behaviour, both among evacuees and the staff, helped people to adapt to the event and possibly contributed to reduce the number of casualties. On the contrary, competitive behaviours happened but only in relation to specific environmental constraints and limited to the proximity of lifeboats, where people described others crushing and pushing.

Even if regulations and laws define the captain as the main authority on the ship and requires him/her to manage emergencies, situations in which the captain did not perform his role can happen and have happened in the past. When such unexpected and unplanned events and contingencies arise, the management of the emergency is often based on organizational improvisation and on the capacity of the people to find a solution by themselves that sometimes, as shown in this paper, strongly affect the effectiveness of the procedures. Therefore, a decision support system (DSS) for the crew could be defined, to accurately predict the procedures to be implemented in the absence of the command figure, to ensure the information exchange among crew members and between the crew and passengers. Understanding how people deal with a situation and which are the factors that affect their decision is pivotal to increase the effectiveness and the efficacy of future plans and regulations. This could help planners to review their strategy, anticipate similar events and consider all the factors.

6. Ethics statement

All the documents used in this research have been formally requested to the Court of Grosseto (Italy) via a formal request to access the public documents according to the Italian Law Art. 116 c.p.p. “Copie, estratti e certificati” (Copy, extracts and certificates).

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Author contributions

The authors’ names are in alphabetical order. All the authors contributed equally to the making of this manuscript.

Data availability

All the passengers’ witness evidence collected, as well as the ruling of the Court of Grosseto no. 115/2015 are publicly available and can be requested to the Court of Grosseto.

Appendix A. List of the behaviours described by passengers

The single behaviour category is indicated in the first column, the second column reports the original comment of the passenger, while the translation of passengers’ comment is reported in the third column.

| BEHAVIOUR | QUOTATION (ITALIAN) | QUOTATION (ENGLISH) |
|-----------|-------------------|-------------------|
| Fear      | “[…] ho visto che stava salendo l’acqua, quindi mi sono spaventata”. (Passenger 1, 12 maggio 2014) | “[…] I saw that the water was rising, so I got scared”. (Passenger 1, May 12, 2014) |
|           | “Erano circa le nove e un quarto quando abbiamo avvertito un forte boato, inizialmente siamo rimasti fermi, poi la gente ha iniziato a gridare ed accalcarsi verso l’uscita, così anche noi, spaventati, ci siamo avviati in quella direzione”. (Passenger 16, 13 maggio 2014) | “It was about a quarter past nine when we heard a loud roar, initially we stood still, then people started shouting and huddling towards the exit, so we too, frightened, moved in that direction”. (Passenger 16, May 13, 2014) |
|           | “Ho sempre avuto paura che la nave si inclinasse a tal punto da ribaltarsi. Questa era la mia preoccupazione più grande, perché sarei finito sotto la nave”. (Passenger 21, 29 aprile 2014). | “I’ve always been afraid that the ship would tilt so much that it would tip over. This was my biggest concern, because I would have ended up under the ship” (Passenger 21, April 29, 2014). |
| Confusion | “[…] siamo scesi dalla scala interna sino al ponte 4 dove vi era la confusione totale”. (Passenger 13, 7 ottobre 2014) | “[…] we went down the internal staircase to deck 4 where there was total confusion”. (Passenger 13, October 7, 2014) |
|           | “Usciti di nostra iniziativa dal teatro abbiamo trovato panico e confusione”. (Passenger 27, 20 maggio 2014) | “We left the theatre on our own initiative and we found panic and confusion”. (Passenger 27, May 20, 2014) |
| Panic     | “[…] subito si è creato il panico anche perché nessuno ci ha fornito informazioni”. (Passenger 3, 7 ottobre 2014) | “[…] panic immediately arose also because nobody gave us information”. (Passenger 3, October 7, 2014) |
|           | “[…] abbiamo notato persone nel panico, qualcuno correva, qualcuno era a terra”. (Passenger 13, 7 ottobre 2014) | “[…] we noticed people in panic, someone was running, someone was on the ground”. (Passenger 13, October 7, 2014) |
|           | “[…] ho cercato di calmare mia moglie che era nel panico, ricordo di averla addirittura presa a schiaffi”. (Passenger 16, 13 maggio 2014) | “[…] I tried to calm my wife who was panicking, I remember even slapping her”. (Passenger 16, May 13, 2014) |

(continued on next page)
“[...] c’era molta fila la gente spingeva e c’erano persone nel panico, ricordo che una ragazza per riuscire a salire [sulla scalinata] si è seduta sulla mia spalla”. (Passeggero 18, 6 ottobre 2014)

“La gente ormai era in preda al panico, spingevano per poter entrare nelle scalinate e i corridoi, ecco come si mantenevano ad ogni minuto, io e mia moglie stavamo a fare la protettore con i nostri corpi i bambini e i miei genitori dalle persone che si muovevano alla ricerca di una scalinata”. (Passeggero 26, 29 aprile 2014)

“Nella mia posizione, appoggiato al passamano del corridoio, cercavo di proteggermi dalle persone che in preda al panico cercavano di aggrapparsi a tutto ciò che poteva comprese a me”. (Passeggero 16, 13 maggio 2014)

“Tutti, soprattutto gli addetti ai lavori, sono andati in panico”. (Passeggero 42, 13 maggio 2014)

“Le persone hanno iniziato ad accaparrarsi, io mi sono dovuta reggere ad un palo tenendo stretta la bambina per non venire travolta, un addetto si è rifiutato di darti un passaggio perché non aveva l’autorizzazione allora noi siamo come impazziti e lo abbiamo costretto a farci salire”. (Passeggero 4, 13 maggio 2014).

“Sono arrivati due membri dell’equipaggio ed hanno affermato delle persone tirandole fuori dalla scalinata, la gente continuava a gettarsi dentro la scalinata non è stata completamente sbarchiata nonostante due persone aiutarono spingendo dal ponte”. (Passeggero 4, 13 maggio 2014).

“A quel punto io ho chiesto all’ufficiale e lui mi ha risposto che aveva moglie e figli e ci ha lasciato il ponte”. (Passeggero 15, 26 maggio 2014)

“Al ponte 4, che erano raggiunto faticosamente impiegando oltre 20 minuti, c’era un fiume di gente, tutti spingevano e non si riusciva a fare un passo”. (Passeggero 16, 13 maggio 2014)

“Ho notato scene assurd, tipo un ragazzo alto più di me e quasi nero che era in fila davanti a donne e bambini, senza dare loro la precedenza come invece avrebbe dovuto”. (Passeggero 34, 21 ottobre 2014)

“[…] la nave incombeva sopra di noi così io ho gridato al manovratore di sbarchi e anche lui mi sembrava inespresso, come gli altri, siamo stati lasciati lacciati a noi stessi per oltre due ore”. (Passeggero 3, 7 ottobre 2014)

“Continuavano gli ufficiali a dire di stare tranquilli ma era chiaro che c’erano problemi”. (Passeggero 4, 15 maggio 2014).

“[… ] notavo gli inservienti filippini o comunque stranieri che cercavano di sbarchi la macchina o quando non era in grado di fare le operazioni, fino a che un passeggero ha preso l’iniziativa di rompere la catena che ci impediva il passo”. (Passeggero 7, 12 maggio 2014)

“Una volta sulla scalinata credevamo fono finita invece è stato anche peggio. Era gestita da dei camerieri, dei filippini, che però non sapevano fare nulla, non sapevano chiederla né metterla a mare, l’hanno sganciata di colpo e siamo così caduti in mare, ma anche li non erano in grado di manovrarla e andavamo così verso la nave, semiviste delle botte e la gente urlava continuamente”. (Passeggero 20, 13 maggio 2014)

“[… ] nel tragitto abbiamo incontrato un cameriere che non sapeva darci alcuna indicazione, tant’è che un passeggero lo ha addirittura preso a pugni”. (Passeggero 28, 26 maggio 2014)

“E’ stato detto che era un guasto elettrico ma io e la mia amica abbiamo pensato che non era possibile che fosse solo questo, il personale con la giacca rossa, l’unico che avessimo avvistato, ci invitava a tornare nelle cabine ma noi non eravamo convinti perché l’impatto era stato troppo forte, così abbiamo deciso di recarci alle lance e questo ci ha salvato la vita”. (Passeggero 25, 12 maggio 2014)

“Una donna continuava ad invitare noi tutti a tornare alle cabine perché non c’era nulla di grave e saremmo ripariti al più presto ma nessuno di noi le ha dato ascolto e siamo rimasti sul ponte”. (Passeggero 41, 6 ottobre 2014)

“Per tutto il percorso in cui ci siamo trasferiti dal lato sinistro al lato destro siamo rimasti da soli e nessuno ci ha mai prestato attenzione o ci ha fornito indicazioni”. (Passeggero 3, 7 ottobre 2014)

“[… ] nessuno ci dava indicazioni, continuavano a dire che si trattava di un guasto elettrico ma nessuno ci diceva dove andare” (Passeggero 12, 12 maggio 2014)

“[…] siamo rimasti ad attendere il nulla, intendo dire che sono trascorsi parecchi minuti senza che avessimo disposizioni da parte dell’equipaggio di qualsiasi grado. Dopo tanto tempo, non riesco a dare un orario preciso, personalmente l’equipaggio ci ha detto di fare una corsa e ci hanno detto di perdere il corridoio di comunicazione tra il lato sinistro e quello del lato destro della nave”. (Passeggero 26, 29 aprile 2014)

“Abbiamo avuto difficoltà a raccontarci con il personale, molti infatti, come i camerieri, non parlavamo italiano e quindi non era possibile la necessaria comunicazione”. (Passeggero 34, 21 ottobre 2014)

“[…] i camerieri non parlavano italiano. Non ci davano notizie ed a gesti ci impedivano di salire sulle lance, facendo il gesto di aspettare”. (Passeggero 35, 12 maggio 2014)
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