

Barriers to personal protective equipment use among international seafarers: a UK perspective

Abstract

Working at sea remains one of the most dangerous occupations and the workplace is geographically mobile, operating in internationalised, de-nationalised and national waters. This paper explores the barriers associated with the use of personal protective equipment by those who work at sea. One-hundred and six seafarers of various nationalities completed an online questionnaire. The findings revealed that seafarers found various items of personal protective equipment to be ill-fitting, with women seafarers particularly likely to experience equipment which does not fit correctly. Participants also reported issues associated with the availability of well-fitting personal protective equipment, compounded by their geographically remote mobile workplaces. This paper serves as a benchmark, highlighting the experiences of those who work at sea prior to the implementation of the Maritime Labour Convention amendments on personal protective equipment and shows the clear need for such regulation given shipping companies prioritisation of profit over worker safety.

Keywords

Occupational health and safety, seafarers, shipping industry, personal protective equipment

1. Introduction

Various types of personal protective equipment (PPE) are used by workers across numerous industries. The international seafaring industry is no exception. Seafarers utilise PPE items which are widely used across industries on a regular basis, such as overalls, hardhats, safety boots, gloves, and safety glasses. In addition, seafarers also utilise PPE which related to the dangers faced as a result of working in a maritime environment, including immersion suits and lifejackets.

Across all industries the use of PPE has been shown to positively impact on worker health and safety. This is because the correct use of PPE can minimise exposure to hazards which may cause injury or ill-health (OSHA 2022).

Despite the clear benefits of the correct use of PPE for workers' occupational health and safety, research from various industries indicates that this does not always happen and that the reasons for this are wide ranging. Lombardi et al. (2009) identified three categories of factors influencing PPE usage: perceptions of hazards and risk, enforcement, and barriers to usage. In this paper we focus on the barriers associated with PPE usage among those who work at sea, specifically physical barriers and availability. Table 1 indicates the factors Lombardi et al. (2009) associated with these two barriers.

Table 1 Barriers to usage (amended from Lombardi et al. 2009)

Physical	Availability
Not comfortable or poor fit	Not provided by employer
Somatic health effects	Inconvenient

Whilst there is very limited literature regarding PPE usage in the seafaring industry, literature from other industries can help shed light on some of the potential barriers seafarers might face. In a study regarding hospital laundry workers in Ethiopia perceived interference with work performance as a major barrier to PPE use (Tamene et al. 2020). Workers suggested

that the usage of certain items of PPE were an impediment to achieving productivity goals (Tamene et al. 2020). In a similar vein, construction workers reported being disinclined to use PPE when they felt it was not convenient and they could save time and energy by not utilising it (Wong et al. 2020).

In a qualitative study of firefighters PPE experiences, participants reported issues with the sizing and fit of various equipment which resulted in a number of problems (Park et al. 2014). In particular, firefighters reported back pain and soreness as a consequence of wearing self-contained breathing apparatus (Park et al. 2014). They also reported wearing gloves which were of an excessive length and bulkiness which resulted in limited dexterity and grip (Park et al. 2014).

In terms of PPE availability, numerous studies have explored PPE purchasing practices and found various issues. In their study of radiology personnel Cremen and McNulty (2014) found that some PPE was not available in certain sizes in sufficient numbers due to purchasing practices. The importance of the involvement of staff who utilise the PPE in the purchasing practices was highlighted (Cremen and McNulty 2014).

The paper begins by considering the seafaring labour force and the particularities associated with PPE at sea. Following this the methods used to conduct the research are described, before the findings are presented. Finally, we discuss and draw conclusions from this research.

2. Personal protective equipment at sea

There are an estimated 1.6 million workers in the international shipping industry (BIMCO 2021) and an unusual feature of work in this industry is the remote nature of the workplace. Ships by their very nature are geographically mobile and in general, are continuously on the move. This constant mobility causes challenges, one of which is the manner in which provisions and sundries – which are commonly referred to as stores – are received onboard. The difficulty in obtaining stores onboard is pertinent to PPE as, unlike in many shore-based industries where new items can simply be delivered using a commercial next-day delivery service or workers could even shop for items in person, for seafarers such options do not exist. Thus, whilst seafarers' PPE may be ordered in a timely manner, there may be substantial delays in the orders reaching the ship. This is particularly the case for ships which operate on the spot market and have no fixed schedule, instead fulfilling one voyage before being provided with details for the next voyage. Such ships might spend time at anchor waiting for instructions on where to sail and then will load a cargo in whichever port they are instructed to do so. The final destination of the cargo may be unknown, even after it has been loaded, with ships instructed simply to sail towards a geographical location, with final details of the port given at a later date. Operating in such a manner clearly poses substantial difficulties in ensuring items arrive at a ship. Thus, the issue of 'availability' of personal protective equipment takes on a slightly different meaning in comparison to shore-based studies in which availability has tended to focus on cost and accessibility (see, for example, Lombardi et al 2009).

Another distinction regarding the workforce in the international shipping industry is the prevalence of mixed nationality workforces. Onboard a single ship it is likely that workers are from several different nations and likely different continents. This is of relevance to PPE as research indicates that anthropometrical characteristics vary between individuals of different nationalities (see, for example, Nikolova 2013).

The international shipping industry is predominantly comprised of male workers, with women making up just 1.2% of the global seafarer workforce (BIMCO 2021). Women seafarers tend to be more prevalent in certain sectors – such as the cruise industry – however, some shipping companies may employ only a handful of women seafarers in comparison to the hundreds or even thousands of men employed. Maersk Supply Service, for example, employs over one thousand seafarers of which just three percent are female (Maersk 2022, Shipping Watch 2021). The number of female seafarers is of relevance to studies regarding PPE as anatomically there are variations between males and females, with males tending to be larger in stature.

Whilst the number of seafarers onboard each ship varies in relation to ship type and ship gross tonnage, onboard a ship the number of workers is relatively small. Across the industry as a whole the average crew size, in one study was found to be twenty-three (Sampson et al. 2017). These individuals may be permanently employed on a fixed rotation, whereby they return to the same vessel for each subsequent tour of duty. More likely, however, is that they are employed on temporary fixed-term contracts and work onboard a new, unfamiliar ship each time they return to work.

Seafarers may join a ship anywhere in the world and travelling to a ship may involve various modes of transport. Many will travel by commercial flights whilst some may also be transferred to a vessel by helicopter or a small boat. These workers are therefore limited with regards to the luggage they can take with them.

Previous research also indicates that seafarers are sometimes deployed to a ship with very little notice (Devereux and Wadsworth 2021). Consequently, there may be little – if any opportunity – to ensure that PPE appropriate for each individual arrives at a ship prior to them joining.

As a geographically mobile workplace, ships may frequently move to different climates. For example, a cargo may be loaded in North America in freezing conditions and the ship then sails south to the Caribbean area where the weather is considerably warmer. Consequently, seafarers working onboard need access to PPE that is suitable for the climates in which they work and for some ships' trading patterns this may mean PPE is needed which is suitable for all weather types.

These various factors, such as the mixed-nationality make-up of a ship's crew and the related anthropometrical characteristic differences, the predominance of male workers and the various climates for which different types of PPE are required, are all challenges faced by the international shipping industry in regards to PPE. Furthermore, these challenges are compounded by a remote geographically mobile workplace, the need for workers to travel long distances to their workplace – sometimes at short notice – and a workforce that is constantly changing.

3. Methods

In order to address the research question 'What are the barriers to PPE use among seafarers? explore seafarers?' an online questionnaire was designed. The questionnaire was hosted on the JISC platform, as this platform is suitable for access via low-bandwidth internet, and thus for the types of internet speeds generally experienced onboard ships. All participants were first directed to a dedicated webpage which was hosted on the university's domain whereby information regarding the questionnaire was provided, as was the JISC link. The webpage was also designed to be suitable for access by participants with poor internet connections.

The research method was chosen as it was a practical manner in which the qualitative experiences of seafarers employed in the international shipping industry could be captured. Seafarers are a population which is widely accepted as being difficult to access and methods which would require either face to face contact, telephone contact or a stable internet connection were deemed inappropriate. Previous studies have successfully utilised the same approach to capture the qualitative experiences of those who work at sea (see, for example, Devereux and Wadsworth 2022; Sliskovic 2020). Furthermore, this method has also successfully used to capture workers experiences of PPE sizing issues, availability and purchasing practices in other industries (see, for example, Cremen and McNulty 2014).

The questionnaire was open for a period of 4 months, early in 2020. Prior to the opening of the questionnaire a pilot study was conducted. The questionnaire was then refined in accordance with the findings from the pilot.

The questionnaire focused on participants’ experiences regarding PPE use onboard, including how they obtained items of PPE, how well items of PPE fit, how useful they considered items of PPE to be, whether they had personally experienced problems with any items of PPE and the procedures for reporting any problems. The questions were predominantly open questions which allowed participants to answer on their own terms. It was not the purpose of the questionnaire to collect data which could be statistically analysed, rather the questionnaire sought to collect the experiences of those who work at sea in their own words. At the end of the questionnaire participants were also given the opportunity to provide any further information regarding PPE that they deemed relevant.

A thematic analysis of the data was conducted using NVivo software. A number of codes were generated from the data and these were grouped based on areas of commonality.

The research was conducted in accordance with the research ethics standards required by Solent University. All participants remained anonymous, and no identifiable data was collected.

Participants

Participants were recruited in a number of ways including through adverts placed on various social media platforms and on the website of the seafarers’ trade union, Nautilus International. An advert was also disseminated by CHIRP Maritime, a charitable trust which works in maritime safety.

In total 106 responses were received to the questionnaire. The respondents were predominantly British but there were also a handful of respondents from the Philippines, India, Mauritius, the Netherlands, Ireland and Belgium. The predominance of British respondents was expected given the fact that both CHIRP Maritime and Nautilus International are UK organisations.

The participants were employed across the various sectors of the international shipping industry and included individuals from across the occupational hierarchy structure, as can be seen in Table 2.

Table 2 Participants’ sex, ship type, occupation onboard, department onboard and type of employment contract

Sex	N (%)
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	Male	89 (83%)
	Female	17 (16%)
	Prefer not to say	1 (1%)
Ship type		
	Passenger ferry	8 (8%)
	High-speed ferry	1 (1%)
	Freight ro-ro	3 (3%)
	Product tanker	4 (4%)
	Crude tanker	3 (3%)
	Chemical tanker	4 (4%)
	Gas tanker	7 (7%)
	Offshore support	12 (11%)
	Supply vessel	4 (4%)
	Standby vessel	4 (4%)
	Dredger	1 (1%)
	Tug	3 (3%)
	Cruise ship	10 (9%)
	Bulker	4 (4%)
	Container ship	7 (7%)
	General cargo ship	3 (3%)
	Other	28 (26%)
Occupation onboard		
	Officer	88 (88%)
	Rating	8 (8%)
	Other	11 (10%)
Department onboard		
	Deck	63 (59%)
	Engineering	40 (37%)
	Hotel/Catering	1 (1%)
	Other	3 (3%)

Type of employment contract	
Permanent	91 (85%)
Temporary	10 (9%)
Other	6 (6%)

The number of female participants is much higher than the estimated number of female seafarers globally, which is around 1.2% (BIMCO 2021).

In terms of type of employment contract, the participants are not representative of the internationally shipping industry on the whole. This is likely to be because the respondents were predominantly British (91%). Previous research has indicated that British seafarers have higher levels of permanent employment than seafarers of other nationalities (Sampson et al. 2016).

In the following section, the themes which emerged from the analysis are explored and in doing so the PPE barriers faced by seafarers – and the impact of these barriers – are also explored. These themes are broadly divided into two groups, with the first group related to physical barriers to personal protective equipment usage. The second group focuses on the impact of these barriers on seafarers’ work and wellbeing.

4. Findings

4.1 Physical barriers to personal protective equipment usage

Poor-fitting PPE was a theme which emerged throughout the data. In particular, female seafarers raised a number of issues with regards to how PPE fitted. For example, a female pilot explained how a piece of equipment designed to keep her afloat should she fall overboard does not fit her:

“[My] Seasafe¹ does not fit properly (made for men with no curves). I have asked for a lightweight one that will fit me better after hearing that a small colleague also asked for one. A new one has been ordered but it is a 12 month wait.” Female Pilot

A female Cadet also stated:

“I don't think the boiler suits are well fitting for women, they are so tight around the hips regardless of how big I go up.” Female Cadet, Crude tanker

Similarly, a female officer working onboard a vessel tending buoys remarked:

“All PPE is Unisex or men's so no always the best for women's body sizes and shapes.” Female Officer, Buoy tender

Whilst the data indicated that women in the seafaring industry more often experienced ill-fitting PPE than their male counterparts, it was apparent that ill-fitting PPE was an issue for a large percentage of the overall workforce. In total, over one-quarter (26%) had experienced poor fitting gloves, 19% stated that they had experienced a poor-fitting boilersuit, 14% had experienced poor fitting protective eyewear, 12% had experienced poor fitting safety

¹ Coat with integrated life jacket

footwear and 9% had experienced poor fitting safety helmets. The following comment made by a male Cadet onboard a cable ship sums up the issue well:

“One size doesn't fit all no matter what your gender. PPE procurement can and should be done in conjunction with individual joiners to a ship and prior to their arrival.” Male Cadet, Cable ship

A similar comment was made by an officer, employed in the container sector:

“If you go on any ship around the world, the PPE fits very few people well. In my place of work we are a mix of Europeans and Asians. You will see Asians in boiler suits with legs that are far too long, or Europeans (generally taller) with the opposite problem. My company decided a few years ago to shorten the legs of their boiler suits as they were too long for “everyone”, now I go around with my ankles exposed all the time.” Female Officer, Container ship

In addition to the issues raised regarding ill-fitting PPE there were numerous responses relating to the quality of the PPE worn by seafarers. In response to a question which asked if they had experienced any issues with PPE an officer onboard a scientific research vessel responded:

*“The usual, no boilersuits in the right size, safety glasses and face shields heavily scratched so you can't see properly. One ship even issued ear defenders that *might* have been suitable for using a lawnmower, certainly not properly adequate for Engine room use.”* Male Officer, Scientific research vessel

In a similar vein a rating working onboard a standby vessel remarked:

“I purchase my own boots as the quality of the ones supplied are poor and uncomfortable.” Male Rating, Standby vessel

The seafarer purchasing and bringing their own safety footwear onboard removes the issue of availability, to which we now turn our attention, but of course also raises other concerns which we also touch on below.

Over one-third of respondents (36%) reported issues regarding PPE on their most recent tour of duty. Issues in relation to the availability of appropriate sizes for individual seafarers were particularly apparent. For example, one female officer onboard a hospital ship stated:

“Most ships don't have my size in stock, so it's easier to take a set that fits.” Female Officer, Hospital ship

A female officer onboard a standby vessel similarly stated:

“PPE not fitting is a common one as most vessels don't stock smaller sizes and often I am the only female on board so small sizes don't seem to be stocked/needed.” Female Officer, Standby vessel

The impact of a lack of availability of suitable sizes meant that in some situations the PPE was unusable for some individuals. For example, one officer onboard a gas tanker stated:

“On a couple of trips, gloves of the right size have not been available. Larger gloves were available but I often had to take them off due to the decreased dexterity.” Male Officer, Gas tanker

Owing to a lack of suitable sizes many of the respondents stated that they simply had to make do with whatever was available. One female officer onboard a container ship stated:

“We just have to make do with what's onboard. Stores can take 3+ months to come. If there's another company ship in the same port we occasionally ask them.” Female Officer, Container ship

Similarly, an officer on a ferry reported borrowing items from seafarers working onboard other ships:

“Ordered correct size took about 4-5 weeks to arrive, borrowed off a sistership” Male Officer, Passenger ferry

The long wait between ordering correct PPE and receiving it onboard was mentioned by several participants. For example, an officer on a gas tanker reported:

“Ordered for next port but had to wear I'll fitting PPE for 6 weeks.” Male Officer, Gas tanker

Some respondents indicated they are able to mitigate for long supply times by borrowing items off seafarers who are leaving the ship:

“Sometimes make do with off signers boilersuits.” Male Officer, Tanker

Worryingly, some individuals indicated that the lack of availability was not due to waits in obtaining the correct size, but rather the employer only supplied particular sizes and as such suitable sizes were never available onboard and were simply not possible to order. A female Cadet onboard a tanker explained:

“This happens all the time. You just have to get a smaller or bigger size. Or in the case of safety boots there were only one of each size. The company don't supply gloves in a size 7, only an 8 and above which is very frustrating when we have to wear them to work in and they're too big.” Female Cadet, Crude tanker

An officer onboard a cruise ship similarly reported a situation whereby appropriate sizes were simply unavailable to order using the company provided ordering system:

“More recently PPE for high voltage work was introduced with only one size being available to order for the ship, XL” Male Officer, Cruise ship

It was particularly worrying to note that several of the respondents commented on restrictions on accessing PPE which were dependent on the individuals place in the occupational hierarchy onboard. For example, a Cadet – who is a trainee – reported a senior officer refusing them an item as this was reserved for the officers:

“One time I had this helmet that was too small for me, having a pronounced forehead and much hair. The chief officer did not want to give me a new one since the new one was for officers. I ended up holding mine each time I was on deck or I borrowed a proper one from a crew member.” Female Cadet, Offshore support vessel

Another Cadet described a similar situation in which they did not have access to appropriate PPE as they were not considered to be onboard for a long enough deployment:

“I've worked as a cadet on three cruise ships with two different companies. Due to deployments being short companies are reluctant to give out PPE - for the first week

of an Icelandic cruise I had no coat or jumper so had to do mooring in my shirt sleeves in freezing temperatures.” Female Officer, Buoy tender

These responses are particularly concerning given the likely difficulties Cadets – who tend to be young and inexperienced individuals – will face in trying to challenge these approaches of more senior colleagues onboard.

Other respondents stated that not only was occupational hierarchy relevant to whether individuals were permitted access to certain items of PPE, but also the department which they worked in onboard. An officer onboard a ferry stated:

“PPE not available to you because you are in the "wrong" department.” Male Officer, Ferry

Seafarers are generally considered to work in either the deck, engine or hotel department onboard, with the areas of work of each department quite separate. Onboard some ships each department will have a separate budget and some ships will divide resources onboard between the departments, similar to what might happen between different teams in an office. Given the difficulties in procuring supplies onboard ships and the importance of PPE, this approach is somewhat worrying.

It was also concerning to see that one respondent’s experience was with an employer who refused to replenish certain items of PPE when they had run out and thus there was simply no availability of that PPE onboard:

“Gloves ran out and company did not replenish stocks to minimise expenditure while prospective buyers were scrutinising company accounts. No actions could be taken. We just had to get on with it or refuse to work.” Male Cadet, Cable Ship

As seen in the previous section, to mitigate for difficulties in accessing appropriate PPE some of the respondents reported purchasing their own PPE whilst on leave and taking this to ships with them. For example, a Cadet said:

“I’ve never come across appropriately fitting PPE in a workplace I therefore pre-empted a situation I knew I would encounter so as to avoid being required to use unsuitable PPE. My decision was vindicated by finding no ships I’ve worked on having had supplies of appropriately fitting PPE on embarkation (Or at any point during the voyage).” Male Cadet, Cable laying vessel

Whilst this approach may be possible for some seafarers, it is unlikely to be a feasible option for all who work at sea. Some shipping companies may insist on their own items of PPE being utilised, for example boilersuits which feature company branding. For some seafarers, particularly those on a low income, the cost of purchasing PPE may be prohibitive. It is not surprising that some seafarers utilise this approach, however, given the impact of these barriers, an area to which we now turn our attention.

4.3 Impact of issues with PPE on seafaring workforce

Half of our participants (N=52%) reported ill-effects from PPE. In particular, participants reported ill-effects caused by safety footwear. For example, one officer working onboard a passenger ship reported:

“Poor quality shoes supplied by a previous employer caused discomfort and blisters. Shoes were very heavy.” Male Officer, Passenger ship

Similarly, an officer onboard a cruise ship stated:

“Due to the nature of the cruise industry it is required we wear white safety shoes. These cause terrible issues with my feet, despite changes my socks two or three times daily and washing feet at the same time I still developed athlete’s foot as a result of wearing plastic shoes for extended periods.” Male Officer, Cruise ship

It is apparent from this seafarer’s comment regarding the need for safety shoes to be of a particular colour that the appearance of PPE was of importance – particularly in the cruise sector where workers are viewed by passengers. Nevertheless, one officer suggested that the need for seafarers to ‘look nice’ was more important than PPE which was functional:

“My company has just changed all of its boiler suits to these fancy lightweight ones, none of the Engineers like them, they tear and are damaged easily but they look nice on the Deck Officers in the company promotion brochures, so I guess that’s the most important thing.” Male Officer, Scientific research vessel

In a similar vein, a Cadet explained how they wore ill-fitting shoes as the new shoes they received were the incorrect colour:

“At that time we were at sea for more than 1 month, I had to wear the safety shoes (42 EU) and they were without laces so they felt big for me. Since the new shoes they received were white (for cook), I ended up wearing the given shoes for another 2 months.” Female Cadet, Offshore support vessel

It is concerning that the Cadet wore footwear that was too large rather than the ‘wrong’ colour. In terms of occupational safety, it is difficult to see the logic behind this approach. It is not known, however, if the Cadet was instructed to do this or if they made this decision. Given that an Officer would have ordered the new footwear for the Cadet and known that the footwear had arrived onboard, it is unlikely the Cadet was acting in a way which was unknown by at least one officer onboard.

In addition to the reported ill-effects caused by safety footwear, various negative issues associated with the wearing of poor quality or ill-fitting boilersuits were also apparent. For example, one respondent said:

“In the past, boiler suits have caused sores on shoulders and armpit area, especially in hot climates where you sweat a lot.” Male Officer, General cargo vessel

Another officer working in the cruise sector said:

“Tripping over abnormally long boiler suits.” Male Officer, Cruise ship

Participants in our study also reported negative effects caused by various other items of PPE:

“Hard hats cause headaches and lack of gloves has resulted in contact dermatitis.” Male Officer, Offshore support vessel

One particularly worrying issue was that seafarers indicated that they were not using protective equipment in situations where PPE was required because of the discomfort they experienced. For example, one officer on a cruise ship reported wearing trainers for mooring – a safety critical operation involving machinery and manual labour – as their safety shoes were causing various foot ailments including athlete’s foot.

“Due to issues the white safety shoes have caused to my feet I have found myself on mooring stations with white trainers.” Male Officer, Cruise ship

In addition, some respondents indicated that in some situations they perceived it to be more practical, or even safer, not use a certain item of PPE. For example, an officer onboard a gas tanker reported:

“Manage own risk by removing to complete tasks but this is against company policy.”
Male Officer, Gas tanker

In a similar vein a respondent stated:

“Occasionally [I’ve] not donned boiler suit (as it is poorly fitting) for very quick tasks.” Male, Offshore support vessel

Given their experiences with PPE and the impact that ill-fitting, poor quality or unavailable PPE had on their health and safety, it is perhaps unsurprising that many of the respondents perceived that their employer had little, if any, interest in PPE and instead prioritised cost saving over workers health and safety. One officer onboard a bulker succinctly stated his opinion regarding his employer’s interest in providing suitable PPE:

“They don’t care about the crew only the price.” Male Officer, Bulker

In a similar vein a Cadet on a tanker stated:

“[I] brought up the lack of glove sizing variety with superintendent, he said “noted”. I get the feeling nobody really cares.” Female Cadet, Crude tanker

In particular, women seafarers perceived that as a small minority of the workforce the employer had very limited interest in ensuring that PPE was suitable for them. One female officer onboard a cruise ship explained:

“Being one of a handful of females in the fleet, company don't deem it cost effective to supply limited female PPE.” Female Officer, Cruise ship

It is noteworthy that several of the respondents commented on the lack of understanding regarding issues pertaining to PPE from shore-side employers. Several commented on the lack of consultation with the crew – and thus the actual users of the PPE – by shore side with one officer onboard a scientific research vessel stating:

“I also dislike that no company ever seems to consult with the crew who will be using the PPE.” Male Officer, Scientific research vessel

Similarly, one rating stated:

“Quite often it is decided what we can make do with by people who haven't done the job. An example of this is thermal decksuits on a PSV, our superintendent suggested that we didn't need them as they are an expensive/luxury item and just wear a thermal boilersuit and waterproofs for six hours on deck, very uncomfortable and makes movement a lot harder.” Male Rating, Supply vessel

Finally, as one prudent seafarer remarked:

“It's the seafarer's responsibility to wear it but it's really difficult to do so and work effectively when the company uses cheap, uncomfortable or ineffective PPE suppliers.” Female officer, Buoy tender

5. Discussion and conclusions

The results of this study add to a body of literature which explores PPE usage among workers. Previous research has indicated the significance of barriers on PPE usage (see, for example, Lombardi et al. 2009). Like the findings reported by firefighters (Park et al. 2014), seafarers reported PPE which was ill-fitting and the consequences of this included various issues such as discomfort, blisters and other ailments.

The findings of the study described in this paper indicate many of these barriers are present due to the direct or indirect consequences of prioritisation of profit over safety. Some of the direct consequences include seafarers working without items of PPE because stocks were not replenished, so workers simply had to 'make-do' with whatever was available. This mirrors findings by Cremen McNulty (2014) whereby PPE in certain sizes was not available in sufficient numbers. Workers resorted to sharing PPE items amongst themselves, and even swapped items with crews from other ships. In 'making do' with what was available, seafarers utilised items which were not fit for purpose. Cheap, poor-quality PPE caused a range of issues and discomforts, and these inevitably discouraged the use of PPE. In order to ensure they had suitable PPE that was comfortable and fit for purpose some seafarers resorted to purchasing their own PPE, despite the requirement for shipping companies to provide them with the necessary items.

An indirect consequence of the prioritisation of profit over safety is the importance placed on seafarers' appearance, for example, wearing the 'correct' colour safety shoes which are ill-fitting as opposed to ones which are fit for purpose but are the 'wrong' colour. Like many workers across various industries, seafarers tend to wear a uniform. In many cases this uniform is comprised of items of PPE, for example, a company branded boiler suit worn with epaulets. Unlike in most civilian industries, however, the uniform worn by those who work at sea is more akin to that worn by the military. In fact, in the UK the British Mercantile Marine Uniform Act 1919 makes provisions with respect to British seafarers' uniforms. External stakeholders, particularly passengers, expect seafarers to look a certain way and consequently the appearance of seafarers is of commercial importance and thus of relevance to the shipping company's profits.

Workers in the international seafaring industry have a wide range of anthropometrics yet the PPE supplied by shipping companies focuses on the anthropometrics of the majority crew. This mirrors findings from research from other industries, such as the construction industry, whereby the prevalent attitude is 'one size fits all', with the 'one size' being relevant to male workers, who make up the largest proportion of the workforce (Onyebeke et al. 2016). Clearly, from the point of view of the shipping company the 'one size fits all' approach is a cost-effective way of operating.

None of this is surprising given the well-known issues regarding profit over safety in the international shipping industry. Walters and Bailey (2013, p.1), for example, state that whilst the maritime environment is hazardous "the hazards of work at sea are also a consequence of the way in which the business of maritime transport is conducted." They go on to explain "as long as the global political and economic climate and culture continues to prioritise the pursuit of profit...seafarers will continue to bear the human cost of prioritising profit over safety" (Walters and Bailey, 2013, p.234).

Whilst providing workers with fit for purpose PPE may be seen as a costly burden, literature indicates that it can offer those who control the workforce significant benefits. These include fewer accidents and improved reputation for corporate responsibility among investors and customers (HSE 2022). Thus, despite the challenges faced by shipping companies in ensuring the availability of appropriate PPE for each individual seafarer onboard, there is a clear need

to ensure that such challenges are overcome, and workers have PPE which is individualised and suitable for that individual. Whilst these challenges may be more considerable for various sectors of the international shipping industry, such as those which rely on a workforce which is precariously employed on single-voyage contracts and those which operate on the spot charter market, they are far from insurmountable.

Previous research (see, for example Walters and Bailey 2013) highlights the difficulties in regulating and enforcing occupational health and safety issues in the international seafaring industry. It is the role of the flag state of each ship – rather than the national state of the individual seafarer – to ensure that workers are appropriately protected. Thus, the UK cannot ensure that British seafarers have appropriate PPE, it is up to the flag state of the ships that these seafarers work onboard. One of the ways to mitigate this issue has been through the use of international conventions and when this research was conducted the Maritime Labour Convention (MLC) made limited reference to PPE stating only that:

“The laws and regulations and other measures to be adopted in accordance with Regulation 4.3, paragraph 3, shall include the following subjects reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including measures to reduce and prevent the risk of exposure to harmful levels of ambient factors and chemicals as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships.”

In May 2022 amendments were adopted to the MLC after a proposal was put forward by trade unions regarding PPE. The final report of the meeting states that the proposal “*indicated that its purpose was to ensure that due consideration was given to providing, storing and maintaining a suitable amount of personal protective equipment (PPE) in different sizes to fit different body frames with a view to ensuring a safer environment and contributing to widening job opportunities to a larger spectrum of possible candidates who were seeking employment in the maritime industry (ILO 2022).*” It was agreed that the proposal addressed two important issues: occupational health and safety and the recruitment of women seafarers (ILO 2022). The amendments replaced the above paragraph with the following:

*“The laws and regulations and other measures to be adopted in accordance with Regulation 4.3, paragraph 3, shall include the following subjects reasonable precautions to prevent occupational accidents, injuries and diseases on board ship, including through the provision of all **necessary appropriately-sized personal protective equipment** and measures to reduce and prevent the risk of exposure to harmful levels of ambient factors and chemicals, as well as the risk of injury or disease that may arise from the use of equipment and machinery on board ships.”*

Thus, this study has collected the experiences of seafarers who – in respect of appropriately fitting PPE – were working without the protection of international regulations. It therefore provides an important benchmark against which the impact of this amendment on seafarers’ experiences of PPE use can be measured.

Like all research this study was not without limitations. First, the respondents to the questionnaire were predominantly British and it is generally accepted that British seafarers tend to be employed at the ‘better end’ of the industry. Consequently, the findings may not have fully captured the experiences of seafarers working at the ‘poorer end’ of the industry. Second, as the questionnaires were self-administered online it is likely that a degree of self-selection has occurred. The seafarers who chose to participate may have had a propensity to engage with the study owing to their particular experiences. It is possible that this is why a relatively high number of women seafarers participated in this study as it appears these

individuals were particularly frustrated by their experiences with PPE. Third, it is accepted that there are numerous factors associated with workers' use of PPE and this study has explored just one small area. Finally, in utilising questionnaires the respondents were limited in only answering the questions that were posed and this method did not allow for further probing or respondents to give more details.

The study has nevertheless identified significant concerns with regards to the physical barriers and issues regarding availability experienced by seafarers in relation to personal protective equipment. It has highlighted an area in which those who control the workforce in the international shipping industry prioritise profit over safety.

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