# Supplementary Material for An Experimental Analysis of the Impact of Thermal Protective Immersion Suit and Angle of Heel on Individual Walking Speeds

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This document presents supplementary material for Azizpour, et., al., [S1] relating to the design and construction of the experimental facility and the experimental methodology employed in the study.

## S1. Experimental set-up

### S1.1. Corridor set-up

The experimental facility consisted of a 36 m long corridor constructed in six sections each 6 m long. The cross-section of each corridor segment was 2.2 m in height and 1.7 m in width. To produce the desired angle of heel the side of each corridor section was raised to the appropriate height using a hydraulic jack and a set of support legs inserted beneath the raised side of the corridor section as shown in Fig. S1. The support legs were designed in order to maintain the desired angle of heel ($10°, 15° and\ 20°$) and to withstand the load of the corridor sections and participants. A stability analysis for the corridor at the maximum angle of heel (20°) demonstrated that the corridor was quite stable. However, as a safety measure, a set of counterweights, placed by the raised side of the corridor were lashed to the corridor to ensure that it would not topple over. The counterweights consisted of 220 litre drums filled with water at the Tromsø site and three 1000 litre tanks filled with water at the Haugesund site. Three persons were required to heel each corridor section to the desired angle, one involved in jacking the corridor and the others involved in positioning the legs (Figs. S2 and S3). It took approximately 4 minutes to jack up and secure each individual section or approximately 30 minutes to prepare the entire facility at the desired heel angle. Conversely, approximately 3 minutes were required to lower and secure each individual section back to 0° of heel, requiring about 20 minutes in total.

The Tromsø test facility was constructed using steel corridor containers. These are used for sheltering sidewalks in construction sites to prevent debris from falling on pedestrians Fig. S2. The interior walls and floor of each section were covered with plywood panels to seal the sides of each unit and to create flat smooth surfaces. The floor of each section was fitted with wall-to-wall carpeting to provide a similar surface to that typically found in passenger ships. Fluorescent lighting was mounted to the side walls to ensure a uniform well-lit illumination throughout the corridor. Luminosity measured one meter above the floor was on average 400 lux, which is four times more than the minimum average (100 lux) recommended by the appropriate standard [S2].

The test facility constructed at the ResQ safety center in Haugesund was essentially identical to the facility in Tromsø. The Haugesund facility was constructed entirely from wood with identical interior dimensions and identical finishes to the walls, floors, and identical interior lighting conditions. The process for heeling the Haugesund corridor was identical to that used in Tromsø (see Fig. S3).

### S1.2. Survival suits

Two different types of TPIS(s) were used in the trials, a lightweight protection suit produced by Hansen Protection (Sea Pass Passenger Suit), identified as Suit-1, and a heavier and bulkier immersion suit produced by Viking (Yousafe Blizzard PS5002) identified as Suit-2 (see Fig. S4). Suit-1 came sealed in vacuum packages (one size fits all), did not have a thermal protection layer and shoes could be worn either inside the suit or on the outside over the suit. Suit-2 was provided in a reusable bag and was also a one-size-fits-all suit, with fully integrated buoyancy and thermal insulation. Suit-2 was worn without shoes.

a. A steel corridor section used in the construction of the Tromsø corridor at 0° of heel.

b. The Haugesund corridor fabricated from wood under construction and at 0° of heel.

c. Support legs for heeling the Tromsø corridor at 10° and 20° of heel.

d. Support legs for heeling the Haugesund corridor at 10° and 20° of heel.

*S1: The Tromsø and Haugesund corridors under construction*

*S2:The Tromsø test facility heeled at* 20°


*S3:The Haugesund test facility heeled at* 20°

*S4:Hansen Protection and Viking Immersion suit*

## S2. Experimental procedure and data collection

The experiment was designed to collect human performance data relating to individuals walking at four different angles of heel, $0°, 10°, 15°, and\ 20°$ while wearing one of two different types of survival suits and normal clothing. The experiment was designed such that each participant walked first at one angle of heel and subsequently at $0°$ of heel (with the same type of clothing). This enabled a comparison of individual walking speeds at $10°, 15°, and\ 20°$ degree of heel with their walking speed at $0°$ of heel while wearing a particular type of clothing. As there were three different clothing states (Suit-0 (normal clothing), Suit-1 and Suit-2) and three angles of heel ($10°, 15°, and\ 20°$), there were a total of 9 combinations of angle and clothing type in addition to the requirement for all participants to walk at $0°$ heel. In order to achieve a balanced number of participants with a similar distribution of age in each cohort, three defined age groups were defined (below 30, 30 to 50 and above 50 years of age) and participants were distributed in all the cohorts randomly and as equally as possible.

### S2.1. Research ethics approval and recruitment of participants

Data collection required permission from the Norwegian centre for research data (NSD). According to the NSD requirements, it was necessary to conduct a risk analysis associated with the data collection and to adopt appropriate measures for personal data protection. The procedures adopted were documented and submitted to NSD, and when approval was granted (28.03.2018) recruitment of participants commenced. Participants were recruited through various means, including, social media, local newspapers, local TV channels, and leafletting in public places. Participants were also recruited through university networks. Members of the public interested in participating were requested to register online prior to the commencement of the trials. However, a number of volunteers turned up at the test facility on the day of the trials without prior registration. These volunteers were included and were required to complete the registration process at the test facility. In total 210 members of the public were recruited, with 125 people participating in six days of trials at Tromsø from 06/08/2018 to 12/08/2018. An additional series of trials were run at Haugesund for eight days from 05/04/2019 to 23/08/2019 in which 85 members of the public were recruited.

### S2.2. Experimental procedure

Upon arrival, participants received a preamble describing the procedure of the experiment, safety instructions, and a consent form which they needed to sign before partaking in the trial. Those who had not registered online were required to complete the registration form. On completion of the registration formalities, participants wearing one of the survival suits were instructed to don the survival suit (Suit-1 or -2). The survival suit would be checked by a team member to ensure it was correctly donned, and the group would then be taken to the test facility.

When assembled outside beside the facility, participants were instructed that they were required to walk through the heeled corridor one person at a time. They were instructed to walk as fast as they could without running as if they were making their way to lifeboats in an orderly manner. Participants were not permitted to observe others making their way through the heeled corridor. Once participants walked through the heeled corridor ($10°, 15°\ or\ 20°$) they completed the trial questionnaire. While participants were completing the questionnaire, the facility was adjusted to $0^o$ of heel ready for the next trial. On completing the questionnaire, and while still wearing the suit, the participants repeated the process at $0°$ of heel. The instructions were again given to each participant just prior to their second pass through the corridor. Participants then completed a second questionnaire, with an identical set of questions. On completion of the questionnaire, participants were free to leave. Cohorts consisting of 15 participants required approximately 90 minutes to complete the entire process. The performance and behaviour of participants as they walked through the test facility was recorded using four GoPro cameras installed within the facility (see Sec. S2.4). Four categories of data were collected during the experiment. These consisted of; demographical/registration data (see Sec. 2.3), walking speed and behavioural data extracted from the video footage, and personal experience data collected through the post-trial questionnaire (see Sec. S3). Table S1 presents the demography of recruited participants.

*Table S1: Demographics of recruited population*

| Variable | Range |
|---|---|
| Age | 18-72 |
| Height | 154-195 |
| Weight | 48-123 |
| BMI | 18-43 |
| Nationality | Norwegian 90%, European 6%, Rest of the world 4% |
| Level of exercise | Less than one time to 7 times a week |
| Handedness | Right-handed 91%, Left-handed 9% |

## S2.3. Registration data

General demographical data such as gender, age, height, weight, sea experience, level of weekly physical exercise, etc. were collected through participant registration forms. Registration forms were completed up to two months prior to the trial, however, some participants completed the registration forms on the day of the trials. Late completion of the registration form made it difficult to ensure that a sufficient number of participants were recruited in all age and gender categories. During the process of registration, participants had access to the consent form which explained the nature of the experiment they would be engaged in. In addition, participants were instructed to wear a pair of flat walking shoes (e.g., not high heel shoes). As part of the registration process, applicants were asked if they had any temporary or long-term physical conditions that could impair their walking ability or ability to climb stairs. They were provided with examples such as respiratory condition, sporting injury, registered disability, etc. If they responded yes, they were excluded from participation.

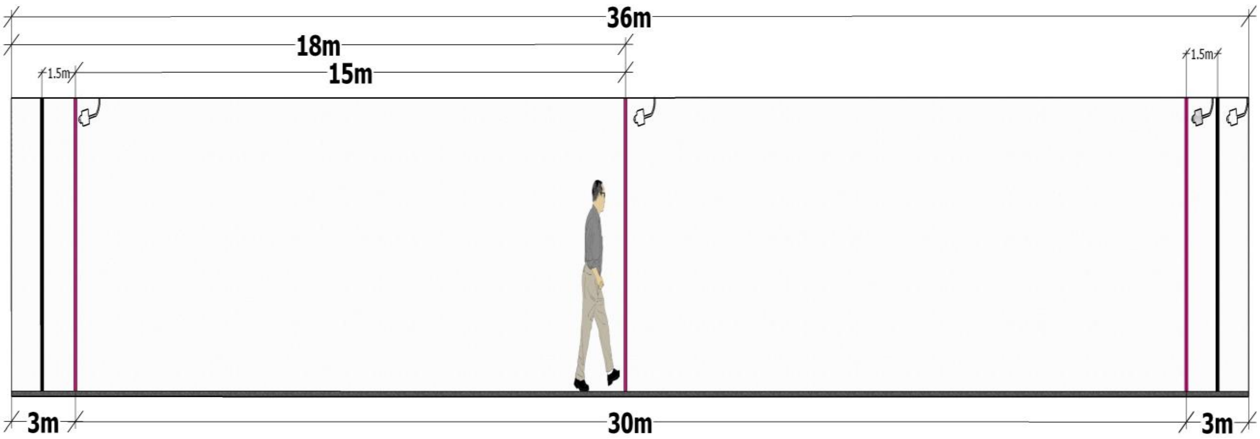
## S2.4. Camera observations (speed & behavioural data)

Four GoPro Hero cameras were used to record the walking performance and behaviour of test participants. Cameras were positioned to capture the participants as they passed the start, middle, and end measuring lines and their movement throughout the corridor. Walking speed was determined over a distance of 30 m, with the start-line being off-set by 3 m from the entrance and the end-line being set-back 3 m from the exit to allow for participant acceleration and deceleration (see Fig. S 5). Acceleration and deceleration regions were split into two regions of 1.5 meters by additional lines marking 'false' start and end lines so that participants would not anticipate the start and end lines and hence modify their initial or final acceleration/deceleration. Participants walked through the corridor (at different angles) in a single direction (as shown in Fig. S 5) with the lower side of the corridor always on their left side. Three cameras were used to determine the walking speed of participants over the first half of the corridor (over 15 m), the second half of the corridor (over 15 m), and the entire length of the corridor (30 m). Cameras were synchronised by noting the time of a whistle blast at the start of each participant's passage through the corridor. Behaviour of participants as they passed through the corridor was also captured to quantify the count of miss-steps, trips, falls, contact with the wall, etc. (see Sec. S4.1). Presented in Fig. S 6 are examples of views from the various cameras. The two start-lines are visible in Fig. S 6-4, with the second yellow line marking the start of the walking speed measurement. Other behavioural performances of participants such as mis-steps and falls were quantified using cameras that captured throughout the corridor (Fig. S 6, insets 4-7).

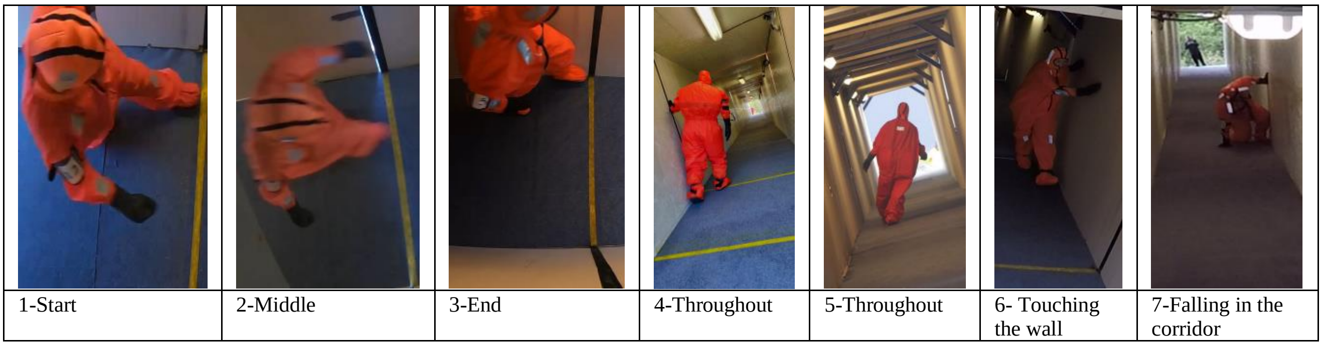
# S3. Participant Questionnaire

## S3.1. Questionnaire data (participants experience)

In addition to recording the performance of participants, a questionnaire was developed to collect qualitative data on participant walking performance (see Fig. S7). The questionnaire was designed to explore participants opinion concerning the difficulty level of walking in the heeled corridor, the reason for stopping (if any), the influence of different corridor features (e.g., wall surface, angle of heel, type of floor, level of lightning, temperature and lack of handrail) on walking performance and the impact of the survival suit (e.g., fit of the suit, weight of the suit, ability to move, see or hear in the suit and comfort of footwear) on walking performance. All questions were presented in the form of multiple choice or Likert scale and there was an opportunity for participants to make additional comments. Once the questionnaire was designed, it was translated from English to Norwegian. The questionnaire was evaluated for intelligibility in both languages in a pilot study. During the pilot study, it was established that the volunteers could read, understand and answer all the questions in under 5 minutes (see Fig. S7).




*S 5: Position of cameras and start and end line in the corridor*



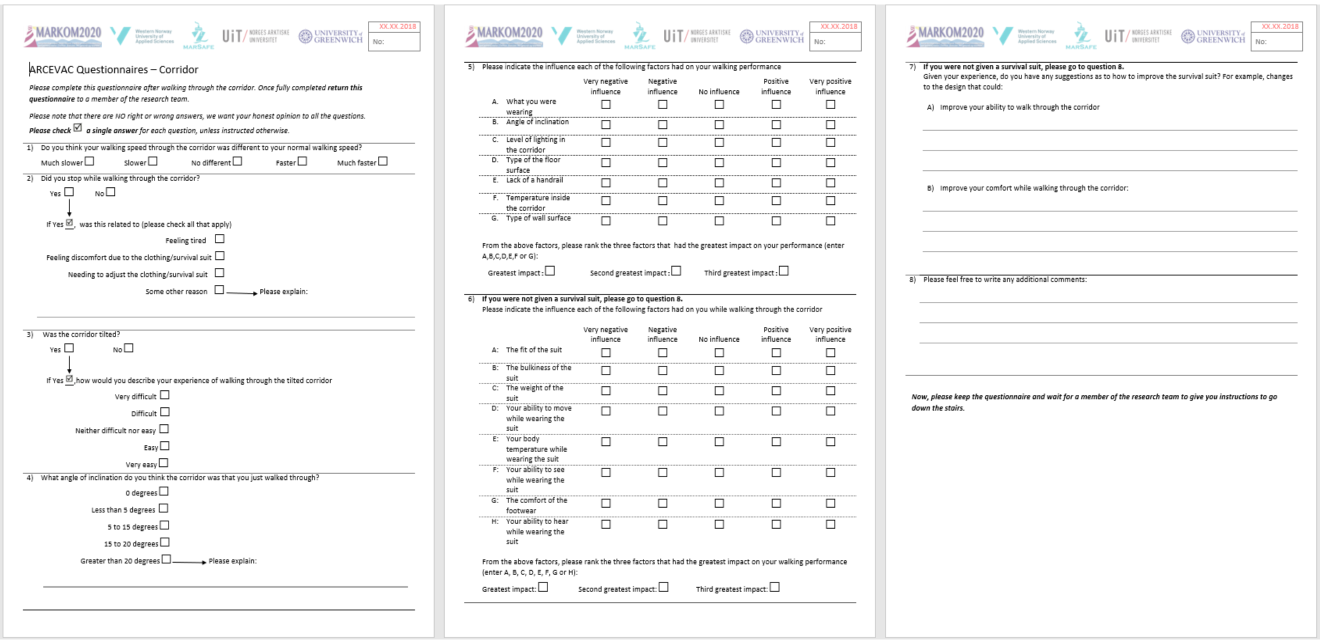

*S 6: Still images captured from trial video footage depicting the progress of participants at different stages of their movement through the heeled corridor*

## S3.2. Questionnaire results

Once participants had walked through the corridor, they answered a questionnaire. The questionnaire was designed to survey the opinion of volunteers about the impact of various environmental factors on their walking performance. Over 90% of the participants believed neither of the ambient temperature, wall surface, floor covering, and level of lightning had any appreciable influence on their walking speed. The walls inside the corridor were not equipped with a handrail. About 47% of the participant commented that not having a handrail had a moderate to severe negative impact on their walking speed, while 2% believed that lack of handrail slightly improved their walking performance. The remaining 51% believed that lack of handrail did not impact their walking performance at all.

The questionnaire included a series of questions intended to establish the participant's opinion concerning specific suit features and how these may have impacted their walking performance. Answers to these questions were based on a five-point Likert scale ranging from a 'very negative' impact to a 'very positive' impact (see Table S2). To simplify the analysis of the replies presented here, the 'very negative' and 'negative' responses are collapsed into a general negative response as are the 'very positive' and 'positive' replies.

As both survival suits are intended to be immersion suits, they were equipped with a rubber seal around the face which prevents water ingress into the suit. This feature apparently influenced the hearing ability of individuals with 71.3% of participants wearing Suit-2 claiming that their walking performance was generally negatively impacted due to a reduction of hearing ability (see Table S2). In comparison, less than half (40.3%) of the participants wearing Suit-1 believed that their suit generally negatively their ability to walk due to loss of hearing, with 3.8% even suggesting it had a positive effect (see Table S2). The difference in the ability to hear while wearing the suit is thought to be due to the comparatively lighter weight of Suit-1 compared to Suit-2. Similarly, due to the lightweight nature of Suit-1, body temperature did not seem to be an issue, with only 8.6% of the participants wearing Suit-1 suggesting that it negatively impacted their performance. In contrast, 44.8% of participants wearing Suit-2 claimed that their elevated body temperature while wearing the suit adversely impacted their travel performance (see Table S2). The issue of elevated body temperature can potentially become a serious issue if passengers have to don their survival suit prior to walking to the assembly station, or if they



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ARCEVAC Questionnaires – Corridor

*Please complete this questionnaire after walking through the corridor. Once fully completed* ***return this questionnaire*** *to a member of the research team.*

*Please note that there are NO right or wrong answers, we want your honest opinion to all the questions.*

***Please check*** ☑ ***a single answer*** *for each question, unless instructed otherwise.*

1) Do you think your walking speed through the corridor was different to your normal walking speed?

Much slower ☐ Slower ☐ No different ☐ Faster ☐ Much faster ☐

2) Did you stop while walking through the corridor?

Yes ☐ No ☐

If Yes ☑, was this related to (please check all that apply)

Feeling tired ☐

Feeling discomfort due to the clothing/survival suit ☐

Needing to adjust the clothing/survival suit ☐

Some other reason ☐ → Please explain:

3) Was the corridor tilted?

Yes ☐ No ☐

If Yes ☑,how would you describe your experience of walking through the tilted corridor

Very difficult ☐

Difficult ☐

Neither difficult nor easy ☐

Easy ☐

Very easy ☐

4) What angle of inclination do you think the corridor was that you just walked through?

0 degrees ☐

Less than 5 degrees ☐

5 to 15 degrees ☐

15 to 20 degrees ☐

Greater than 20 degrees ☐ → Please explain:

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5) Please indicate the influence each of the following factors had on your walking performance

| | Very negative influence | Negative influence | No influence | Positive influence | Very positive influence |
|---|---|---|---|---|---|
| A. What you were wearing | ☐ | ☐ | ☐ | ☐ | ☐ |
| B. Angle of inclination | ☐ | ☐ | ☐ | ☐ | ☐ |
| C. Level of lighting in the corridor | ☐ | ☐ | ☐ | ☐ | ☐ |
| D. Type of the floor surface | ☐ | ☐ | ☐ | ☐ | ☐ |
| E. Lack of a handrail | ☐ | ☐ | ☐ | ☐ | ☐ |
| F. Temperature inside the corridor | ☐ | ☐ | ☐ | ☐ | ☐ |
| G. Type of wall surface | ☐ | ☐ | ☐ | ☐ | ☐ |

From the above factors, please rank the three factors that had the greatest impact on your performance (enter A,B,C,D,E,F or G):

Greatest impact : ☐ Second greatest impact : ☐ Third greatest impact : ☐

6) **If you were not given a survival suit, please go to question 8.**
Please indicate the influence each of the following factors had on you while walking through the corridor

| | Very negative influence | Negative influence | No influence | Positive influence | Very positive influence |
|---|---|---|---|---|---|
| A: The fit of the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| B: The bulkiness of the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| C: The weight of the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| D: Your ability to move while wearing the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| E: Your body temperature while wearing the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| F: Your ability to see while wearing the suit | ☐ | ☐ | ☐ | ☐ | ☐ |
| G: The comfort of the footwear | ☐ | ☐ | ☐ | ☐ | ☐ |
| H: Your ability to hear while wearing the suit | ☐ | ☐ | ☐ | ☐ | ☐ |

From the above factors, please rank the three factors that had the greatest impact on your walking performance (enter A, B, C, D, E, F, G or H):

Greatest impact: ☐ Second greatest impact: ☐ Third greatest impact: ☐

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7) **If you were not given a survival suit, please go to question 8.**
Given your experience, do you have any suggestions as to how to improve the survival suit? For example, changes to the design that could:

A) Improve your ability to walk through the corridor

B) Improve your comfort while walking through the corridor:

8) Please feel free to write any additional comments:

***Now, please keep the questionnaire and wait for a member of the research team to give you instructions to go down the stairs.***

*S7: The participant post evacuation questionnaire used in the corridor trials*

must walk a large distance indoors prior to reaching the embarkation station.

Analysis of open comments suggested that the bulkiness of Suit-2 was another factor that negatively influenced walking speed for 73% of male and 70% of female participants. This negative impact is also reflected in the response of participants to the specific question regarding their ability to move while wearing the suit, with 48.9% of the participants wearing Suit-1 and 86.5% of the participants wearing Suit-2 providing a generally negative response concerning their ability to move while wearing the suit (see Table S2).

# S4. Walking Speed Data Extraction

## S4.1. Video analysis

To ensure consistency in the video analysis, a data dictionary was developed containing precise definitions of the various parameters that were to be quantified through the video analysis. Two categories of parameters were defined, categorical and continuous. Continuous parameters were associated with the various time measurements derived from the video footage. These were the time at which a participant crossed one of the three defined lines (start, middle, or end).

*Table S2: Influence of different features on survival suits (Suit-1/2) on the walking performance of individuals*

| Influence of different features of the suit | Suit type | Very negative influence | Negative influence | No influence | Positive influence | Very positive influence |
|---|---|---|---|---|---|---|
| Fit of the suit | 1 | 7.2% | 48.2% | 40.8% | 3.8% | 0.0% |
| | 2 | 30.9% | 58.8% | 10.3% | 0.0% | 0.0% |
| Weight of the suit | 1 | 0.0% | 1.9% | 82.6% | 11.7% | 3.8% |
| | 2 | 3.8% | 32.6% | 61.9% | 1.7% | 0.0% |
| Ability to move with the suit | 1 | 0.0% | 48.9% | 42.7% | 6.5% | 1.9% |
| | 2 | 15.1% | 71.4% | 11.8% | 1.7% | 0.0% |
| Body temperature in the suit | 1 | 0.0% | 8.6% | 86.8% | 4.6% | 0.0% |
| | 2 | 7.5% | 37.3% | 49.7% | 3.6% | 1.9% |
| Ability to see | 1 | 0.0% | 11.3% | 82.1% | 6.6% | 0.0% |
| | 2 | 3.6% | 23.2% | 73.2% | 0.0% | 0.0% |
| Comfort of footwear | 1 | 5.3% | 41.0% | 43.4% | 8.4% | 1.9% |
| | 2 | 68.2% | 28.2% | 1.7% | 1.9% | 0.0% |
| Ability to hear | 1 | 4.6% | 35.7% | 55.9% | 3.8% | 0.0% |
| | 2 | 23.7% | 47.6% | 28.7% | 0.0% | 0.0% |

This was defined as the last video frame before the moment that the participants' foot crosses over the line. Examples can be seen in Fig. S 6:1-3. While the exact moment at which the participant crossed the line is difficult to determine, the measurements are within an accuracy of $\pm 0.04$ s. Categorical variables such as touching the wall with one or both hands were defined in the following way: Never: if they never touched the wall, Occasionally: if they touched the wall less than 5 times throughout the corridor, and Frequently: if they touched the wall more than 5 times (Fig. S 6, insets 4 and 6). Other variables such as the number of mis-steps/stumble were defined as involuntary body movement which is the result of footing that is not normal for walking. Falling was defined as the situation in which any part of the body other than the feet comes into contact with the floor (Fig. S 6-7). Mis-steps/stumbles and falls were quantified by recording their respective frequencies, i.e., counting the occurrence of the event.

To ensure that the analysis was accurate and consistent with the definitions presented in the data dictionary an interrater test was undertaken. A selection of the video footage was used to assess whether raters were applying the definitions within the data dictionary in a consistent manner. The footage was analysed by two raters to quantify walking speed and behavioural variables. Analysis was carried out by two independent raters and the accuracy of measurements produced by the two raters were compared using Interrater analysis methods [S3, S4]. Interclass Correlation coefficient (ICCs) was used for comparing the speed measurement and Kappa statistics was used for comparison quantified of behavioural variables. Results showed excellent agreement between raters with an average Kappa value of 0.84 and ICCs value of 0.98, respectively for speed and behavioural data. The results for the interrater analysis confirmed the clarity of defined variables in the data dictionary and that the raters could accurately extract the required information with the given definition. The process of video analysis required approximately 190 person-hours of effort to complete.

## S4.2. Walking speed analysis

Three walking speeds were determined for each participant, the walking speed over the first half of the corridor, the walking speed over the second half of the corridor, and the average walking speed over the entire length of the corridor. The walking speeds over each half of the corridor (15 m) were determined to investigate if there were any appreciable fatigue effects impacting walking speed. Comparison of the mean walking speed in the first and second half of the corridor showed that at a significant level of 0.05 there was no statistically significant difference in mean walking speed of participants. A two-sample T-test showed that, with P-value of 0.47 and 0.14, respectively, for 20° and 0°, there was no sign of a significant reduction in walking speed throughout the corridor (between the two half). The walking speed of participants in the first and second half of the corridor at 0° and 20° are compared in Table S3. As it was determined that fatigue did not significantly impact walking speed, the average walking speed over the entire corridor length is used in the analysis in Ref. [S1]. The average walking speed through the corridor was determined as follows:

$$speed\left(\frac{m}{s}\right) = \frac{30}{(T_E - T_W) - (T_S - T_W)} \qquad (1)$$

Here, $T_E$ and $T_S$ are the respective measures time for passing the start and end line, and $T_W$ is the time of hearing whistle by each of the cameras.

*Table S3: Average walking speed of participants in first and second half of corridor at 0° and 20°*

| Suit type | Age group | 1st half on 20° | 2nd half on 20° | 1st half on 0° | 2nd half on 0° |
|---|---|---|---|---|---|
| Suit-0 | AG1 (18-29) | 2.20 | 2.18 | 2.31 | 2.22 |
| | AG2 (30-50) | 2.02 | 2.04 | 2.39 | 2.07 |
| | AG3 (51-72) | 1.89 | 1.88 | 2.25 | 2.24 |
| Suit-1 | AG1 (18-29) | 1.51 | 1.58 | 2.24 | 2.21 |
| | AG2 (30-50) | 1.85 | 1.80 | 2.17 | 2.14 |
| | AG3 (51-72) | 1.63 | 1.72 | 2.11 | 2.07 |
| Suit-2 | AG1 (18-29) | 1.77 | 1.77 | 2.21 | 2.18 |
| | AG2 (30-50) | 1.56 | 1.57 | 2.20 | 2.12 |
| | AG3 (51-72) | 1.53 | 1.52 | 2.00 | 1.97 |

### S4.3. Identification of disqualified participants

The data produced by some participants was considered to be inappropriate for analysis and was removed from the overall data set. The process by which certain data was excluded from the analysis is described in this section.

According to the IMO International guidelines for advanced evacuation analysis for passenger ships, unhindered walking speeds of individuals at 0° of heel is dependent on age and gender and varies from 0.56 m/s to 1.85 m/s [S6]. This range for walking speeds was derived from data concerning individual walking speeds within rail station environments [S5, S6]. In the experimental trials considered in this paper, the mean travel speed is greater than the maximum travel speed cited in the guideline [S6].

Prior to the start of each trial, participants were instructed to walk as fast as they could, but not to run. Even though participants were instructed not to run, some ignored the instruction and adopted a 'jogging' performance. A literature review [S7-S9] suggested that walking speeds greater than 3 $m/s$ represent the start of the jogging/running phase of motion. Thus, those participants who walked at greater than 3 $m/s$ were considered to be running and so were disqualified and their data excluded from analysis.

Another issue impacted the suitability of the data produced by some participants. Studies have shown walking over heeled surfaces can negatively impact walking speed, or at the very least, not enhance walking speed [S7, S10-S12]. It was thus assumed that if participants were equally motivated, their speed on a heeled surface would be equivalent to or slower than their speed on a flat surface. However, some participants when walking at 0° heel, after having first traversed the corridor at a greater angle of heel, travelled at a considerably slower speed. Slower walking speed during the second pass through the corridor, while at 0° heel, suggests that the participant might not have had the same level of motivation as they did during the first pass through the corridor. Thus, participants that had a walking speed at 0° heel that was less than 90% of their walking speed at heel were considered not to be engaging appropriately in the trial and so were disqualified and their data excluded from analysis.

Data collected from participants during the registration process, video analysis, and questionnaires resulted in a total of 18480 data points. After the various participants were excluded this reduced to 16192 data points. The breakdown of data points, pre- and post-exclusion, according to the angle of heel, gender, and suit type is presented in Table S4.

*Table S4: Number of collected data points as a function of angle of heel, gender, and suit type pre- and post- exclusion*

| Suit type | Gender | 0° Heel | | 10° Heel | | 15° Heel | | 20° Heel | |
|---|---|---|---|---|---|---|---|---|---|
| Disqualified participants | | Pre exclusion | Post exclusion | Pre exclusion | Post exclusion | Pre exclusion | Post exclusion | Pre exclusion | Post exclusion |
| Suit-0 | Male | 3168 | 2508 | 880 | 528 | 748 | 572 | 1540 | 1408 |
| | Female | 1188 | 1100 | 176 | 176 | 352 | 308 | 660 | 616 |
| Suit-1 | Male | 1232 | 1144 | 528 | 484 | 0 | 0 | 704 | 660 |
| | Female | 836 | 836 | 308 | 308 | 0 | 0 | 528 | 528 |
| Suit-2 | Male | 1628 | 1364 | 528 | 484 | 0 | 0 | 1100 | 880 |
| | Female | 1188 | 1144 | 396 | 396 | 0 | 0 | 792 | 748 |
| Total number of datapoints per category | | 9240 | 8096 | 2816 | 2376 | 1100 | 880 | 5324 | 4840 |

## References

[S1] Hooshyar Azizpour, Edwin R. Galea, Sveinung Erland, Bjørn-Morten Batalden, Helle Oltedal "An experimental analysis of the impact of arctic survival suits and angle of heel on individual walking speeds, 105621 " *Safety science*, Accepted for publication 27 November 2021. https://doi.org/10.1016/j.ssci.2021.105621

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