

# Are seafarers fit for exceptional emergency situations on board ship?

Päivi Miilunpalo, Harri Lindholm, Sirpa Lusa, Susanna Visuri, Finnish Institute of Occupational Health  
Correspondence: Päivi Miilunpalo, paivi.miilunpalo@ttl.fi.

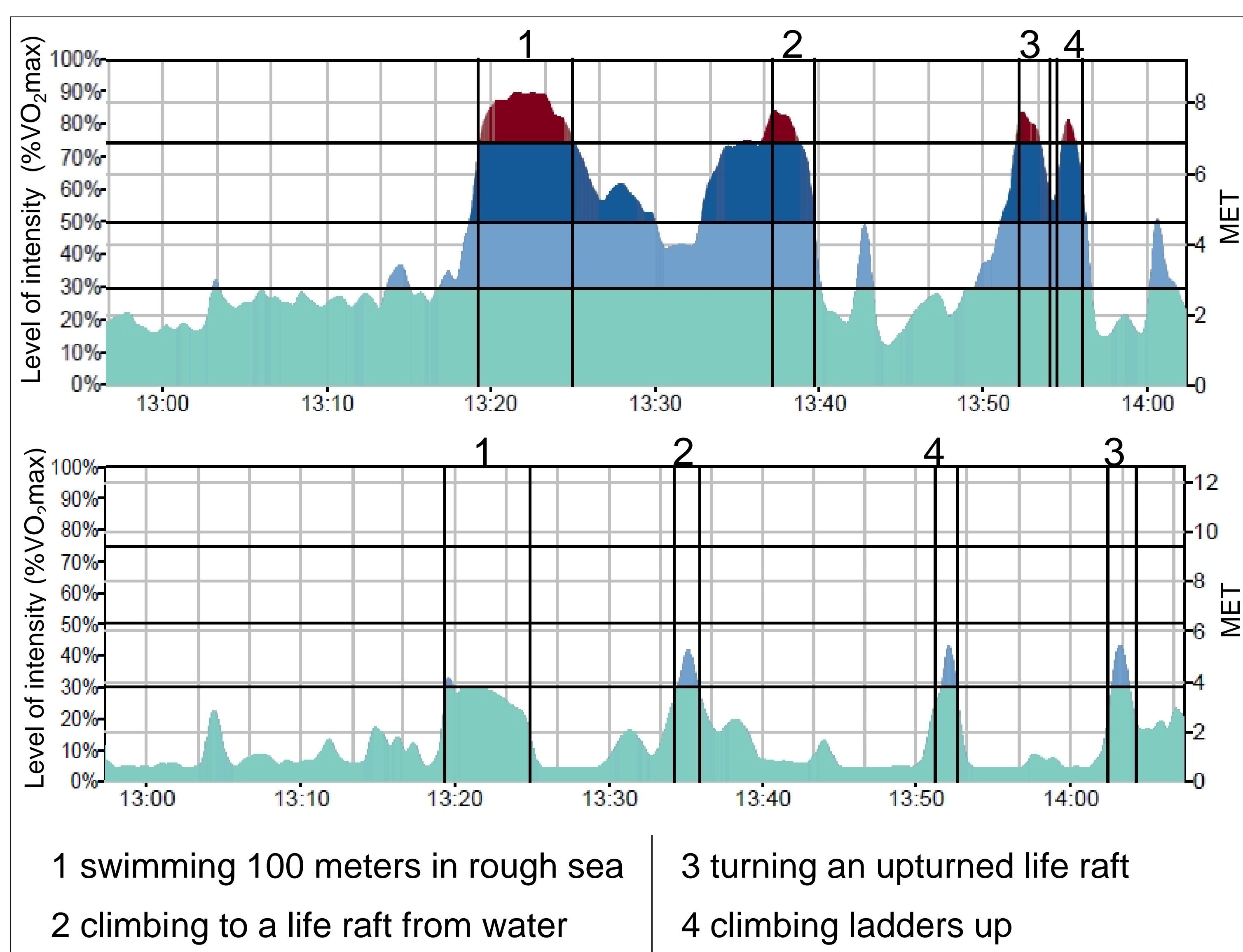
## Introduction

Every seafarer must be able to perform both, normal duties and emergency situations on board ship. Physical fitness of seafarers is often unsatisfactory, obesity and ageing impair it even further.



## Methods

Twenty three seafarers (18 males and 5 females) aged 24-46 (mean 34,3 years) were recruited to study. Ability to perform emergency duties was tested in a maritime safety training center after physical examination and fitness tests. Tasks to be performed were chosen from STCW2010 Basic Safety Training. Energetic strain of these emergency tasks was assessed by estimating oxygen consumption indirectly with heart rate variability method (Firstbeat Technologies, Finland) and perceived exertion by Borg's scale.



**Figure 1.** Physical strain in emergency tasks by level of intensity and metabolic equivalent (MET). Example of two testee with very different physical capacity.

## Results

Of 23 participants, 21 participated in measurements of selected emergency duties. With two participants there was a technical failure in heart rate variability recorder, and their results were excluded from data. Participants had been working aboard ship on average 11 years (min 1,5 – max 22 years). Most of the participants were in good physical condition (table 1).

**Table 1.** Results of participants' fitness tests and body composition (n = 21).

	Mean (min-max)
Body mass index (BMI)	26 (20-36)
Body fat percentage (%)	20 (11-37)
Muscle mass (kg)	42 (31-55)
Sit-ups (reps/60 s)	37 (14-55)
VO <sub>2</sub> max (ml/min/kg)	41 (30-54)
MET max	11,1 (7-13,8)

Of the selected tasks, swimming caused highest energetic strain and highest perceived exertion. (Table 2).

**Table 2.** Energetic strain and perceived exertion of the emergency tasks (n = 19).

Emergency tasks	Mean (min-max)		
	VO <sub>2</sub> max (ml/kg/min)	MET	Borg scale
swimming	26.2 (10.5-39.5)	7.5 (2.9-11.3)	12 (8-19)
climbing to a life raft	23.6 (2-35.1)	6.7 (0.6-10)	10 (6-20)
turning an overturned life raft	22.7 (14.3-32.7)	6.9 (4.1-9.3)	11 (7-20)
climbing ladders up	21.4 (10.1-30.5)	6.1 (2.9-8.7)	11 (8-16)

## Conclusion

There is need to improve evaluation methods of the seafarers' physical capacity required in performing emergency tasks. Result of this study shows that even among seafarers with good physical fitness the tested tasks caused heavy energetic strain. Interestingly the seafarers with similar physical capacity had variation in the measurements of the physical load. One explanation might be, that practicing of these emergency duties augments the efficiency of working.