

A Behavioural Rating Tool for use in Passenger Evacuation

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Sponsors

- **Cranfield university were supported to develop a behavioural rating tool for use in passenger evacuations under the memorandum of co-operation ATA/CA-41 between FAA and UK CAA**

Objective

- **To develop a system for the classification of the range and types of behaviour which may occur during the evacuation of an aircraft**

Development of Behavioural Rating Tool

Background and Methodology

Initial Design:	Inclusion of items on the scale % participants indulging in each behaviour Overall intensity of behaviour Camera views 5 second samples
Second Design:	Amalgamation of behavioural categories Overall average of intensity of behaviour Revision of behavioural anchors

Development of Behavioural Rating Tool (continued)

Third design: **Behavioural anchors and rating sheets**
2 views and overall/average behaviour
5 second sample for each item on scale

Evaluation: **3 independent raters videos from Type III**
exit evacuation with 3 methodologies

- 50% bonus**
- Co-operative bonus system**
- Delayed bonus payment**

- **Potentially many scales and methods of comparison**
- **3 raters asked to rate each behaviour at 5 second intervals. These results were then averaged**

Inside Cabin

Speed	0	No movement at all
	1	Very slow shuffle
	2	Slow walk
	3	Normal walking pace
	4	Fast walking
	5	Moving rapidly/running

Inside Cabin (continued)

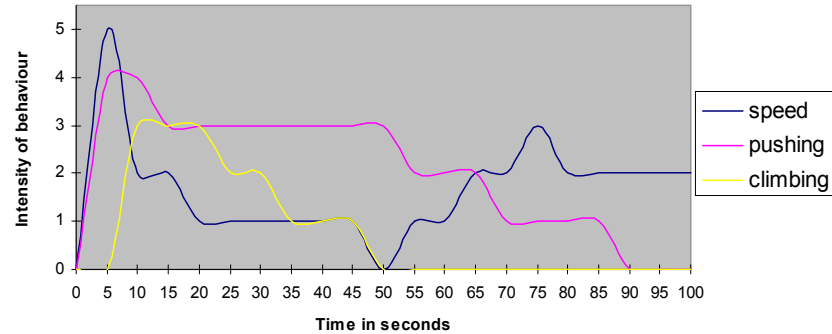
Pushing	0	No contact at all
	1	Light touch (follow my leader)
	2	Light push to hurry person in front
	3	Mild physical bodily contact (non aggressive)
	4	Aggressive physical contact
	5	Intensive aggressive physical contact (no care about injury)

Inside Cabin (continued)

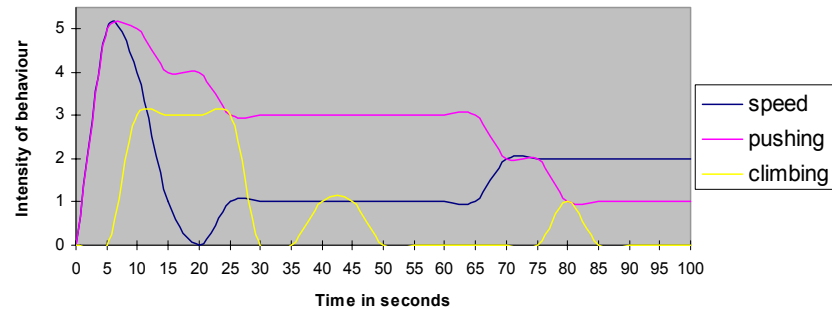
- Climbing**
- 0** No climbing
 - 1** Passengers who amble over seats (no motivation to 'get in front')
 - 2** Passengers with quicker movement over seats **BUT** still no motivation to 'get in front'
 - 3** Passengers who climb quickly instead of queuing
 - 4** 5+ passengers who climb quickly instead of queuing
 - 5** Passengers aggressively climbing/hanging onto lockers, desperate to get out

Competitive 50% - within cabin

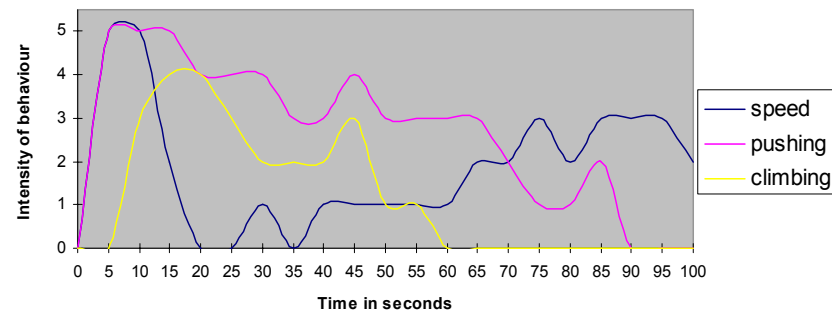
■ Rater 1- cabin



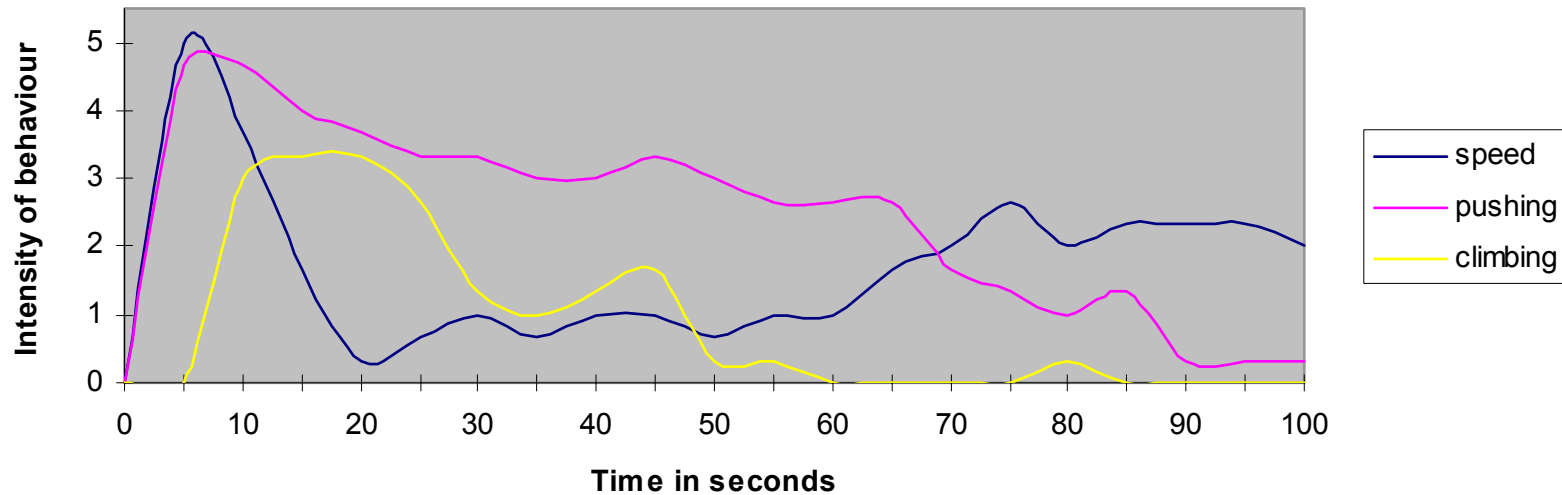
■ Rater 2 – cabin



■ Rater 3 - cabin



Average rating for passenger behaviour within the cabin – 50% competitive trials



At Type III exit

Pressure/	0	No block or pressure
Blocking	1	Mild contact but little if any delay to movement through exit
	2	Mild contact as pax come out, causing slower movement
	3	Multiple pax squeezing out
	4	Several pax stuck in exit managing to extricate themselves with great difficulty (or help of crew/firemen)
	5	Completely blocked (no movement)

At Type III exit (continued)

Speed of	0	No movement at all/blocked
Passage	1	Very slow (1 pax every 5 secs)
	2	Slow flow (1 or 2 pax every 5 secs)
	3	Medium flow / no urgency to escape (3 pax every 5 secs)
	4	Moving quickly no delay / hesitation (4 pax every 5 secs)
	5	Moving rapidly with urgency (4+ pax every 5 secs)

At Type III exit (continued)

Falling	0	No falling
	1	Limited number of pax catching foot on step up and stumbling onto wing
	2	Limited number of pax catching foot on step up and falling onto wing
	3	Large proportion of pax falling to floor as moving through exit
	4	Large proportion of pax falling hard to floor as moving through exit
	5	Pax stuck in exit, majority falling to floor as method of exit

At Type III exit (continued)

Movement away from exit	0	No movement at all, exit blocked
	1	Very slow shuffle
	2	Slow walk
	3	Normal walking pace
	4	Fast walking
	5	Moving rapidly/running

At Type III exit (continued)

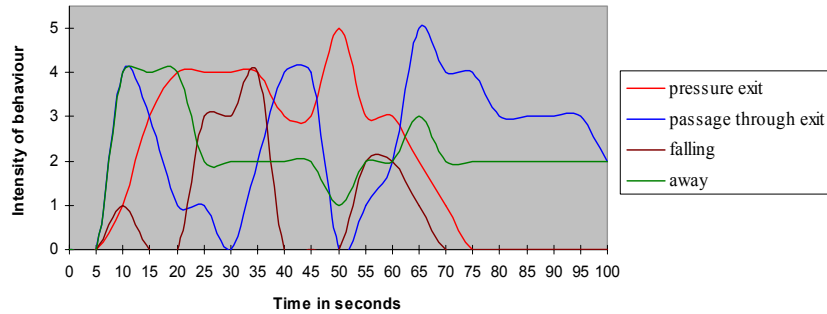
Overall	1	No urgency perceived
Urgency to escape	2	Limited urgency but no aggression
	3	Need to escape quickly but not too urgently (no threat to life perceived)
	4	Urgent and motivated behaviour
	5	Intensely urgent and desperate 'life in exceptional danger'

At Type III exit (continued)

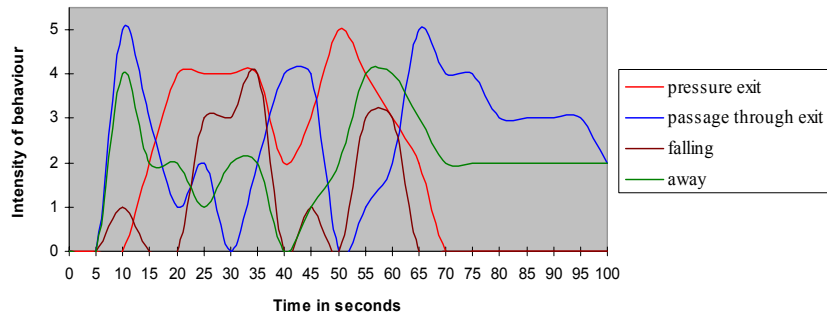
Overall	1	Very mild/slow – no pushing
intensity of	2	Disciplined ordered behaviour
behaviour	3	Urgency but non-aggressive behaviour
	4	Urgent with some aggression
	5	Extreme aggressive behaviour

Competitive 50% - Type III exit

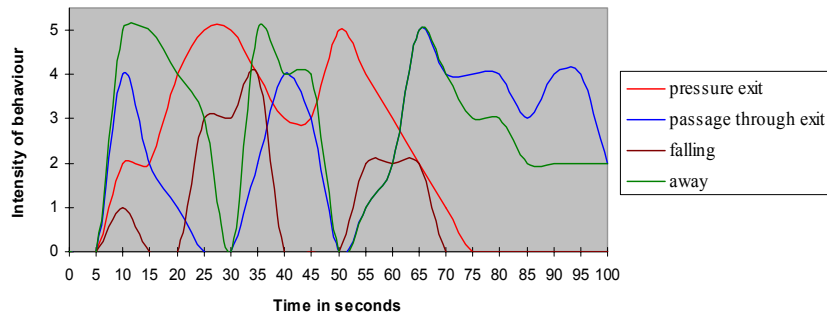
■ Rater 1- exit



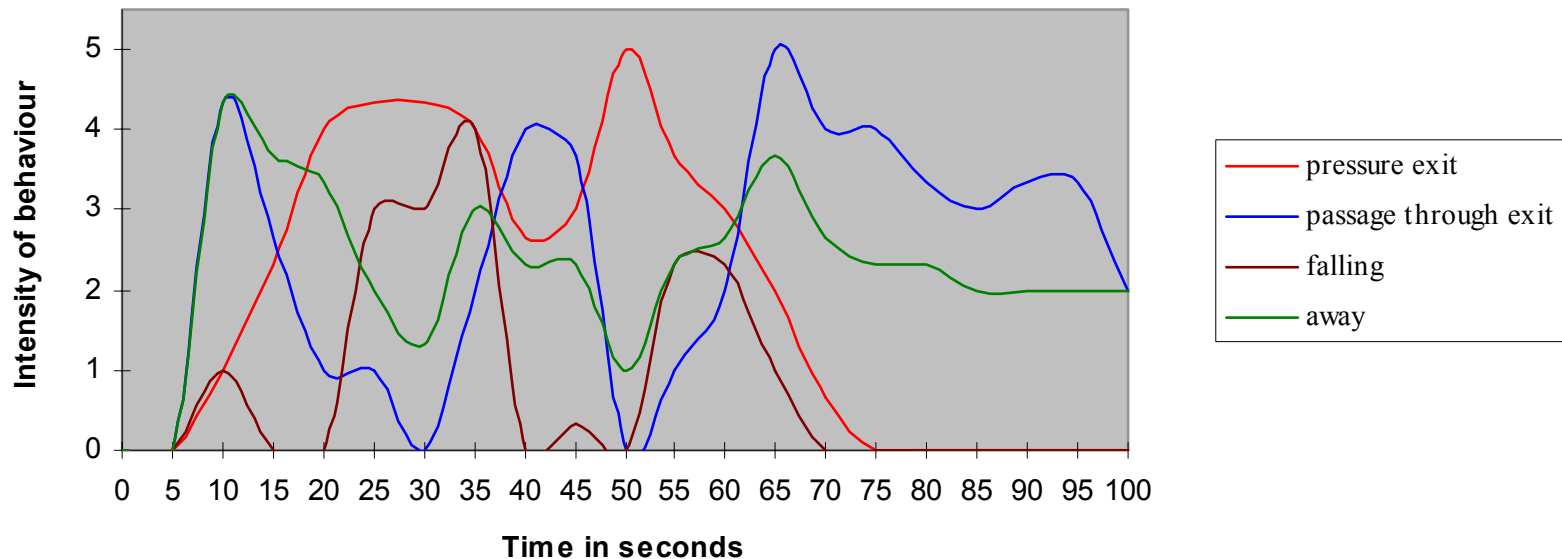
■ Rater 2 – exit



■ Rater 3 - exit

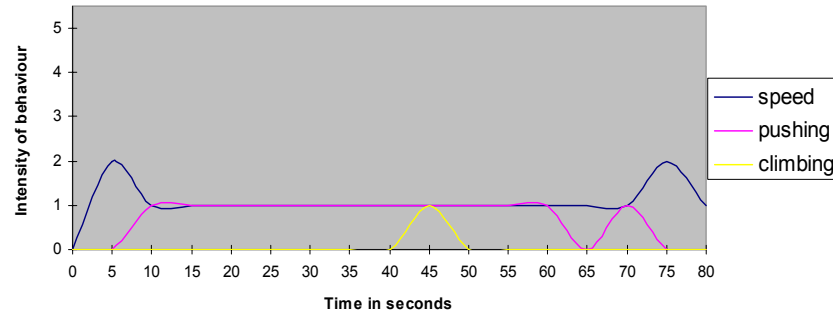


Average rating for passenger behaviour around the overwing exit - 50% competitive trials

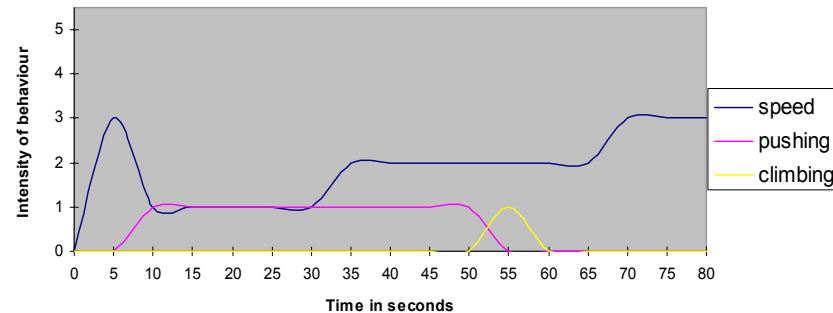


Co-operative 50% - Type III exit

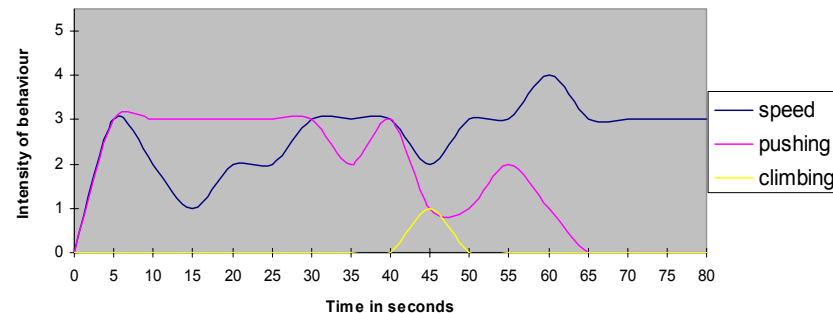
■ Rater 1- cabin



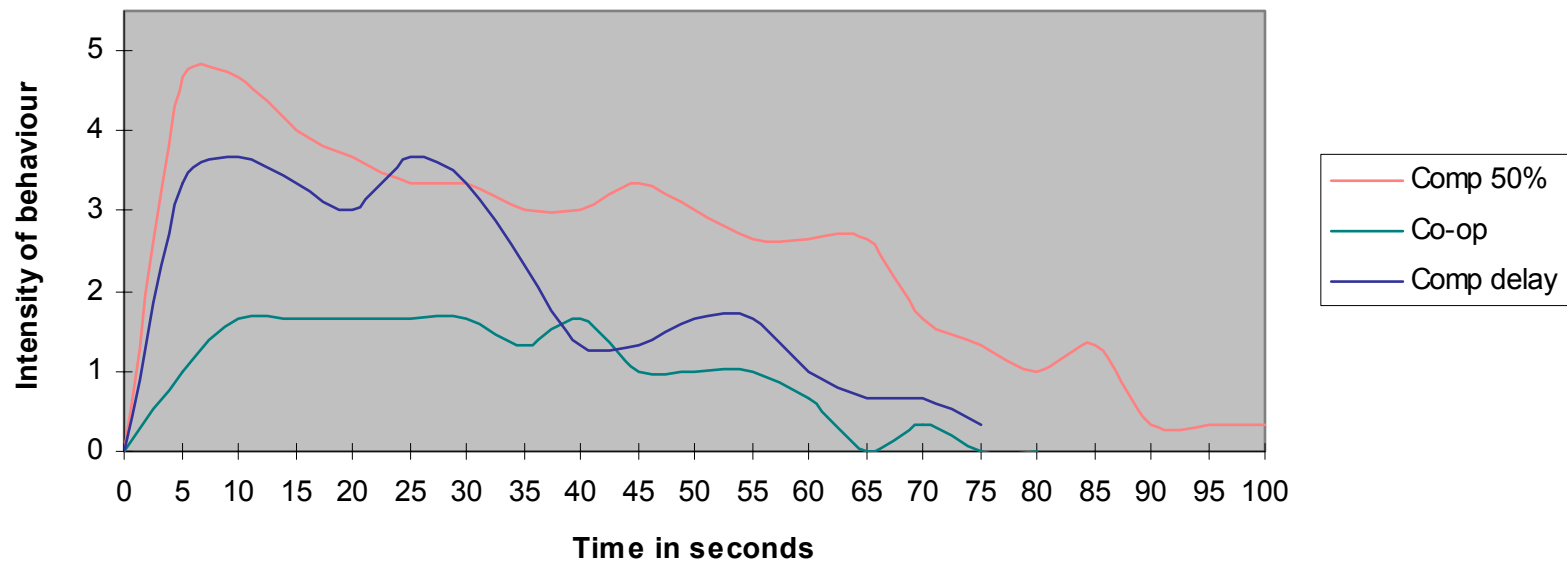
■ Rater 2 – cabin



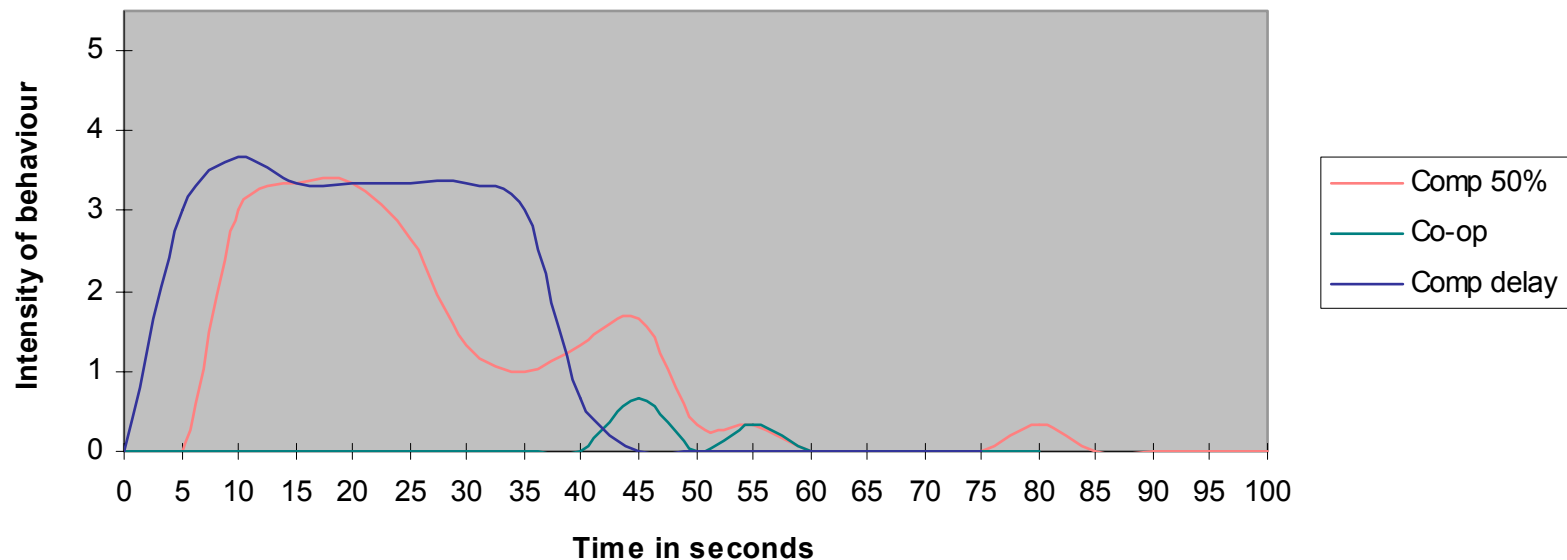
■ Rater 3 - cabin



Amount of pushing with the cabin - all motivation types



Amount of climbing within the cabin – all motivation types



Bulkhead

Pressure/	0	No block/pressure
Blocking	1	Mild contact but little if any delay to movement through bulkhead
	2	Mild contact with other pax, causing slower movement through bulkhead
	3	Multiple pax squeezing through
	4	Several pax stuck in bulkhead extricating themselves with great difficulty (or help of crew)
	5	Completely blocked (no movement)

Bulkhead (continued)

Speed of passage	0	No movement at all/blocked
	1	Very slow (pax being prised out by crew)
	2	Slow flow pax shuffling
	3	Medium flow (3 pax every 5 secs)
	4	Moving quickly (fast walk) no delay/hesitation
	5	Moving rapidly/running

Bulkhead (continued)

- | | |
|---------------------|--|
| Hesitation 0 | No hesitation jumping onto slide as soon as reaching exit |
| 1 | Momentary hesitation (tenths of a second) |
| 2 | Pausing before jumping |
| 3 | Short delay before jumping |
| 4 | Long hesitation possibly waiting for slide to clear |
| 5 | Complete refusal to jump |

Bulkhead (continued)

Falling	0	No falling
	1	Limited number of pax stumbling off slide
	2	Limited number of pax falling to floor
	3	Majority of pax stumbling off slide
	4	Majority of pax falling to floor
	5	Slide blocked due to pax pile up

Bulkhead (continued)

Movement away from exit	0	No movement at all
	1	Very slow shuffle
	2	Slow walk
	3	Normal walking pace
	4	Fast walking
	5	Moving rapidly/running

Bulkhead (continued)

Overall	1	No urgency perceived
Urgency to escape	2	Limited urgency but no aggression
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Bulkhead (continued)

Overall	1	Very mild/slow – no pushing
intensity of	2	Disciplined ordered behaviour
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Conclusions

- 1. A Behavioural Evaluation Tool for passenger behaviour in the cabin has been produced**
- 2. The tool can be used to allow comparisons between facilities and methodologies to be systematically quantified**
- 3. The tool can also be used for the evaluation of the influence of group composition and numbers of participants on evacuation performance (e.g. age, personality, mobility)**

Conclusions

- 4. The use of the tool has shown the requirement for changes to the camera lighting and camera positions used in future research**
- 5. The tool can be used by an intelligent lay person who has been given suitable training**