Bringing together knowledge from social psychology and pedestrian modelling: moving towards evidence-based models of collective behaviour

Dr Anne Templeton

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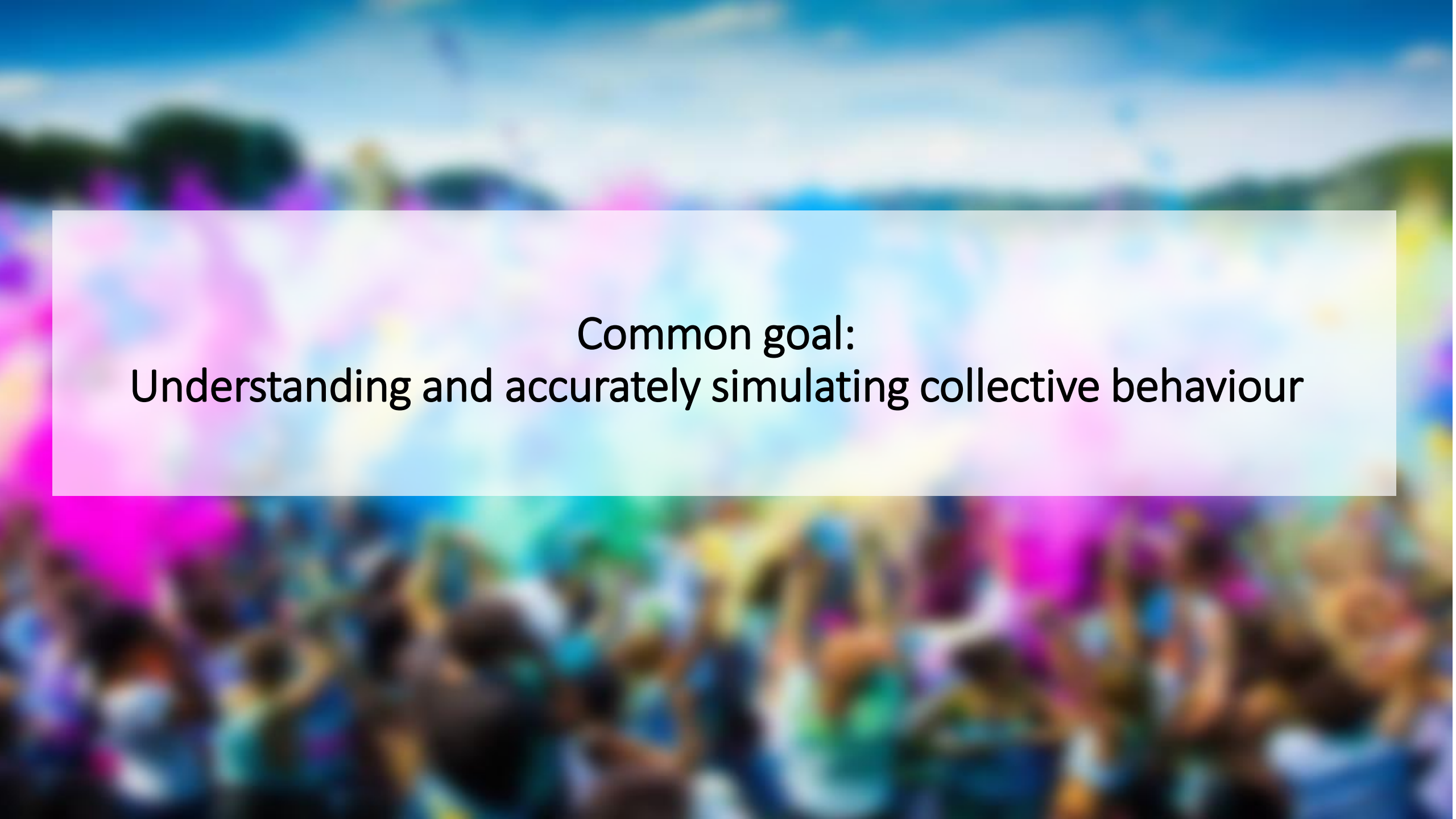
Common goal:
Understanding and accurately simulating collective behaviour

Systematic review

Type	*No. articles* (total 140)	Assumption
Homogeneous mass	52	Everyone is the same
Mass of individuals	31	Everyone is unique
Small groups	57	Large individual; leader-follower; “cognitive” group

Templeton, A., Drury, J., & Philippides, A. (2015). From mindless masses to small groups: Conceptualizing collective behavior in crowd modeling

Social Identity in Agent-Based Models: A Systematic Review

Geeske Scholz, Nanda Wijermans, Rocco Paolillo, Torsten Masson, Martin Neumann, Emile Chappin, Anne Templeton and Geo Kocheril

Social Identity Theory

(Tajfel & Turner, 1979)

Personal identity

Social identity


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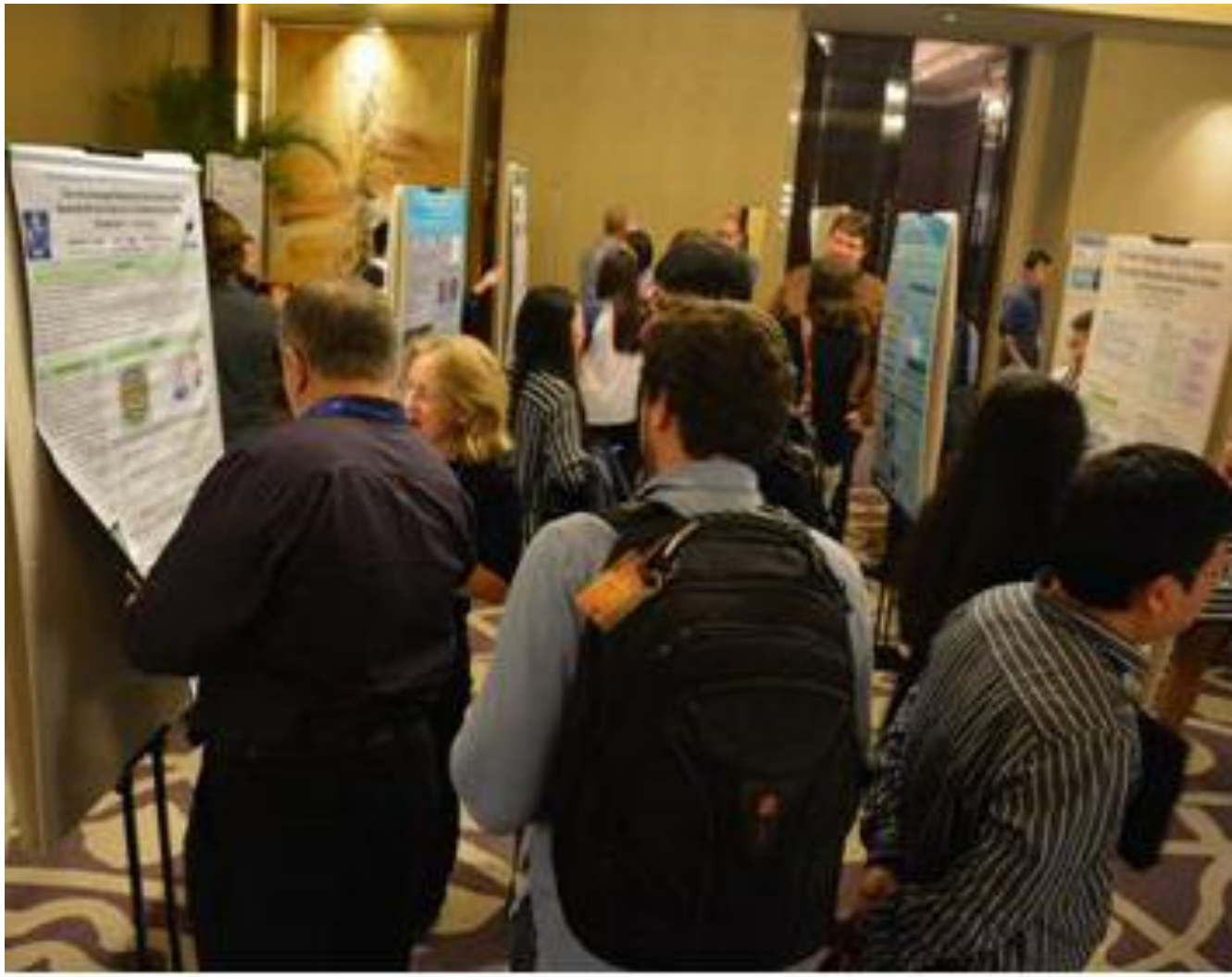


Self-categorisation theory

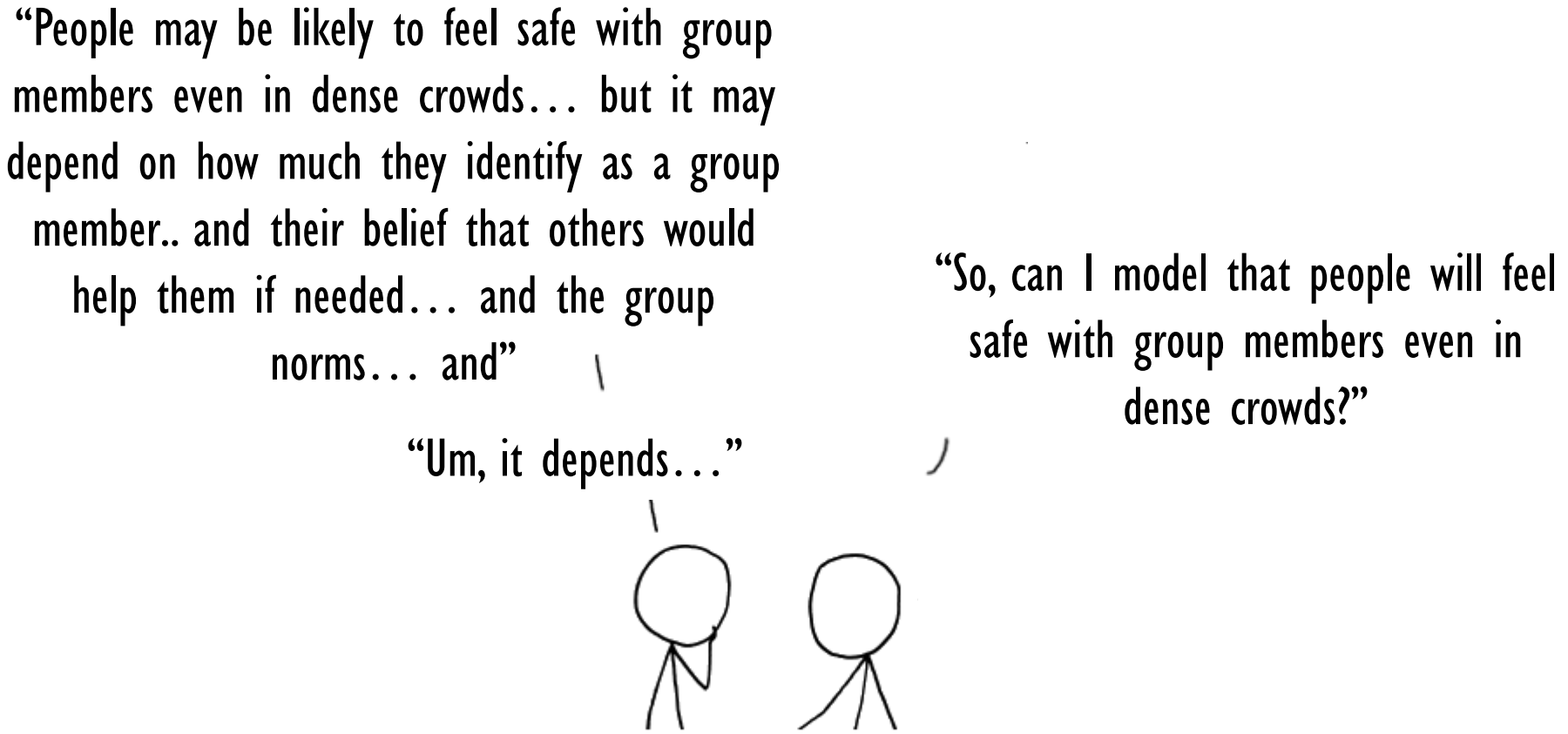
(Turner, Hogg, Oakes, Reicher, & Wetherell, 1987)

- How we categorise ourselves and others into groups, depersonalisation (shift to the ‘we’), self-stereotyping (taking on norms, definitions)
- Common fate can create a shared social identity in emergencies (Drury et al., 2009; Drury et al., 2016, Ntontis et al., 2020)
- Common experience/interest as the basis for ingroup membership (Hopkins & Reicher, 2020)

Brief snapshot

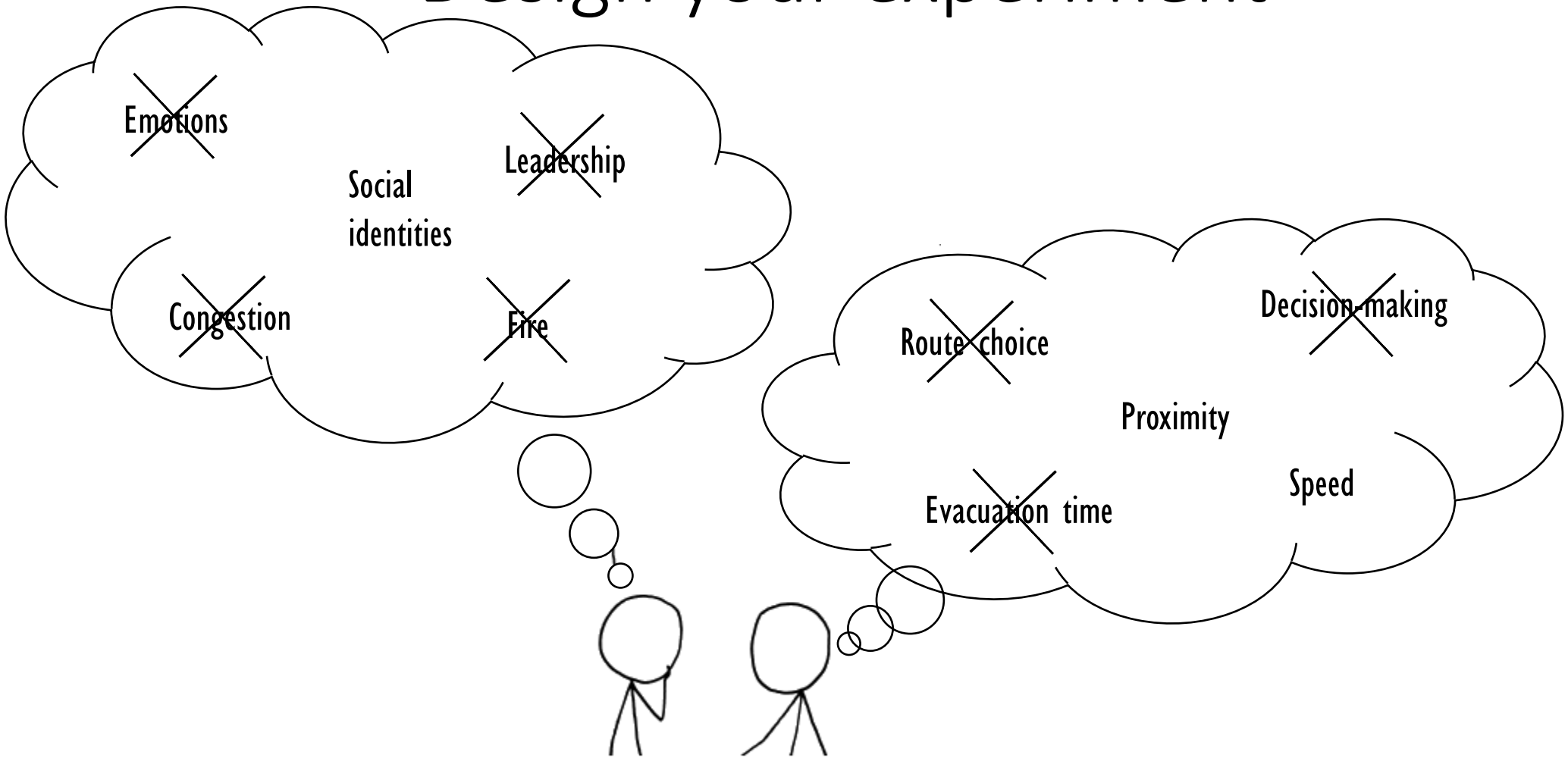
- Groups have shared social norms and values (Hopkins et al., 2019; Stott et al., 2018)
- We have favourable opinions of ingroup members and are more likely to help ingroup members (e.g., Drury et al. 2016; Levine et al., 2005)
- Ingroup members are perceived as less risky/we care less about risks ingroup members pose (e.g,. Cruwys et al., 2020; Khazaie & Khan, 2019)
- Being with ingroup members can have positive emotional effects, e.g., positivity (Neville & Reicher, 2011), joy (Novelli et al., 2013)

Identify your common goal

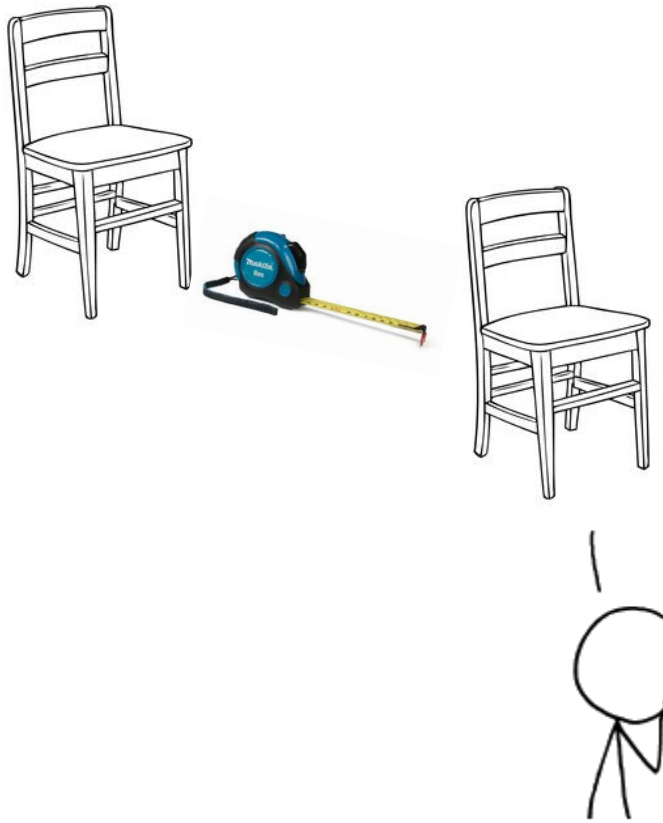


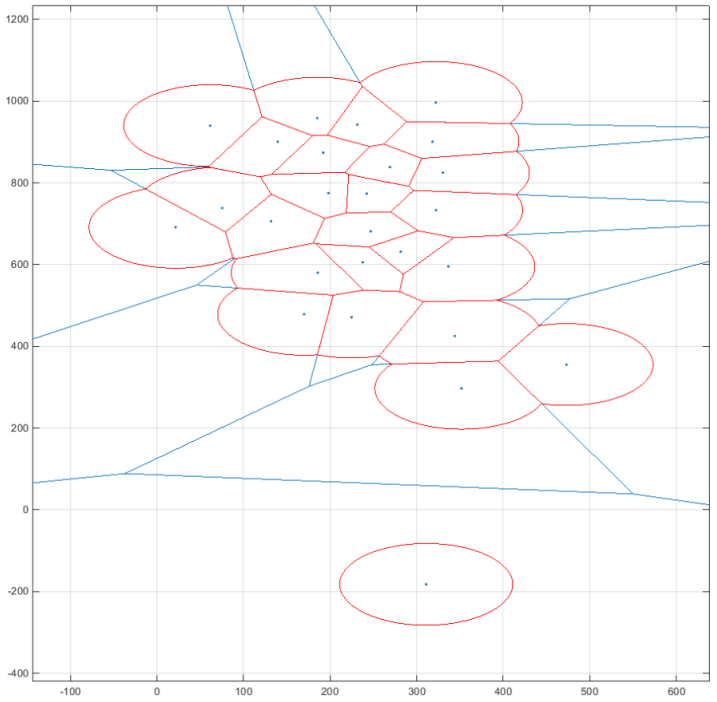
Seitz, M., Templeton, A., Drury, J., Köster, G., & Philippides, A. (2017). Parsimony and reductionism: how can crowd psychology be introduced to computer simulation

Design your experiment



Communicate effectively and share knowledge





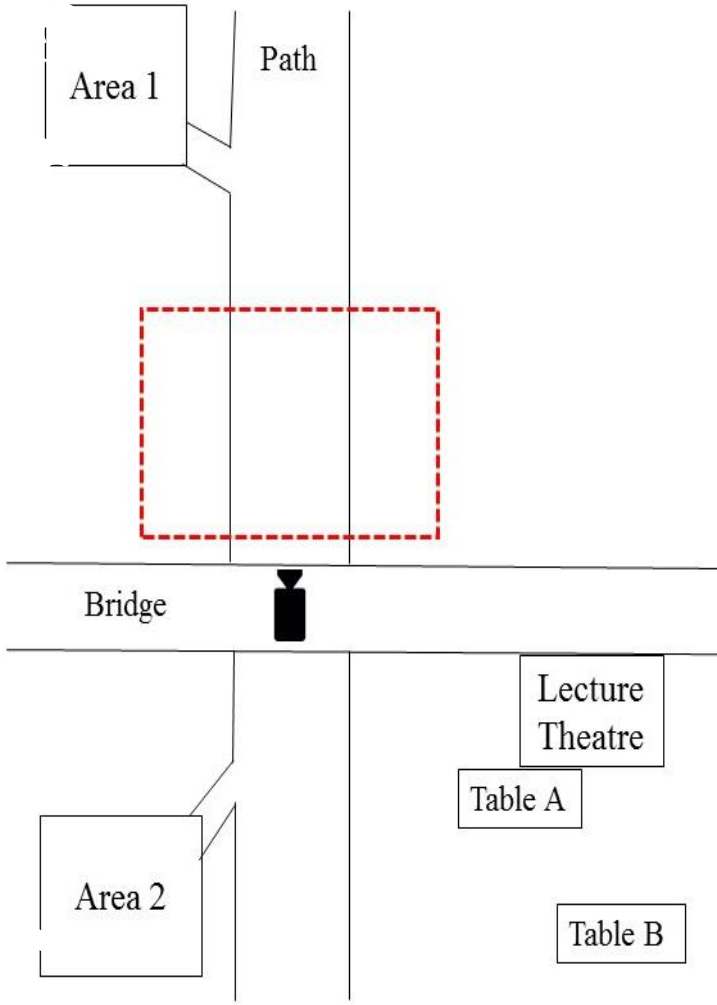
Adrian, J. et al. (2019*).* A glossary for research on human crowd dynamics
Templeton, A., & Neville, F. (2020). Modelling collective behaviour: Insights and applications from crowd psychology

The effects of social identities on pedestrian movement in counterflow

Templeton, A., Drury, J., & Philippides, A. (2020). Placing Large Group Relations into Pedestrian Dynamics: Psychological crowds in counterflow

Method

- Participants selected based on their attendance of a 2nd year Psychology lecture at the University of Sussex, and were randomly allocated into **team A** (*n* = 28) or **team B** (*n* = 26) using an adaption of the minimal groups paradigm
- Given hats as identity primes (and to track participants!)
- Survey measures of social identification
- Given instructions about where to walk
- **Measures:** walking speed, distance between coordinates, proximity to others (tessellation areas), social identification

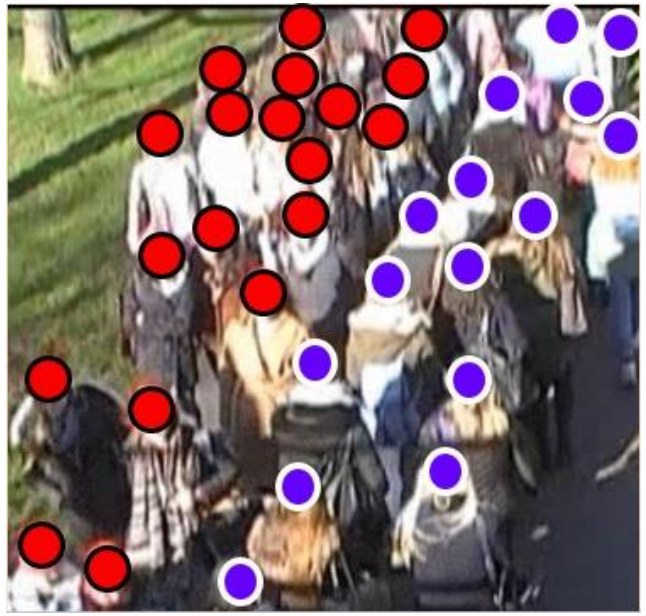


Movement

Manipulation check

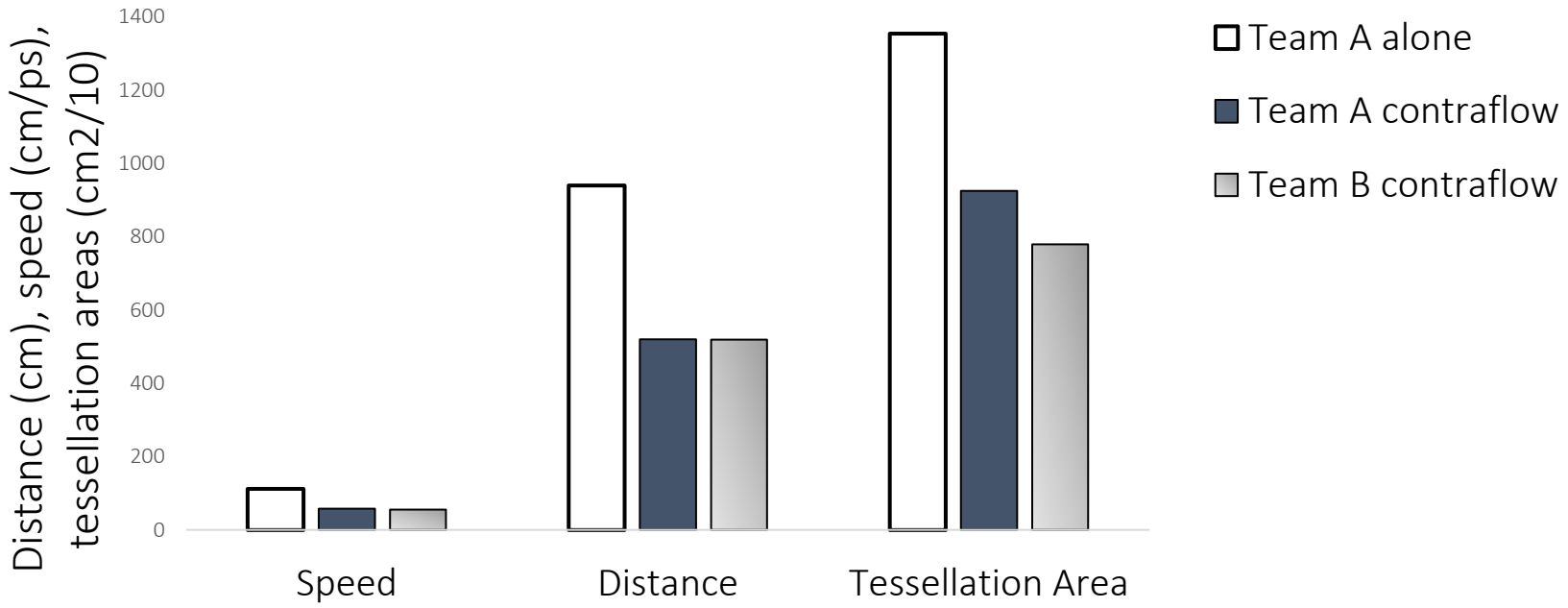
Both groups rated identification with their own group as significantly higher than with the other group

Team A alone



Team A and B in contraflow

Results



The distance, speed, and tessellation areas of each team

Speed: Team A alone **walked faster** (M = 111.94, SE = 1.41) than when in counterflow (M = 57.91, SE = 0.76), 54.03, BCa 95% CI [50.79, 57.27], $t(51) = 33.73$, $p < .001$, $r = .978$.

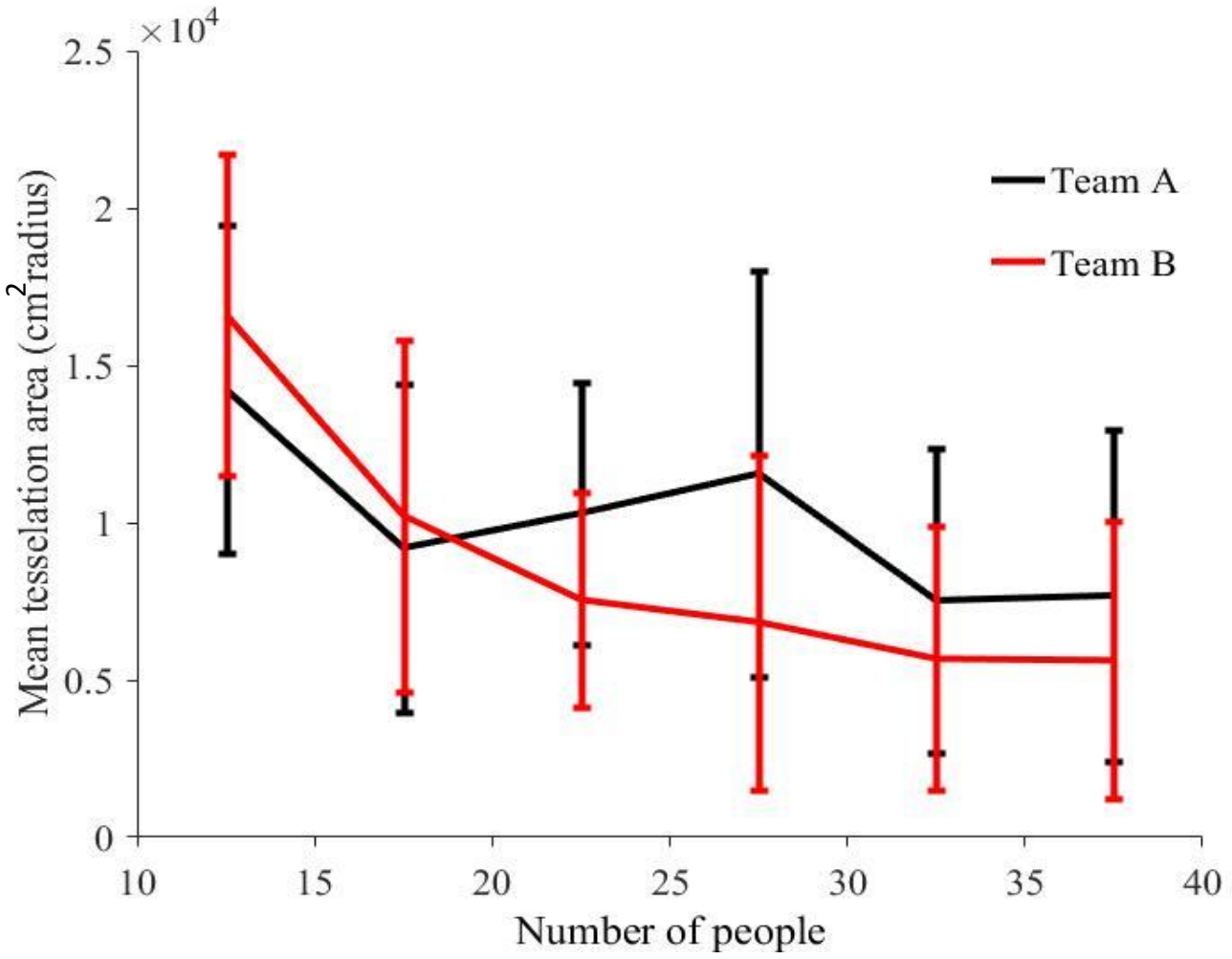
Team A counterflow **walked faster** (M = 57.82, SE = 0.79) vs team B (M = 55.52, SE = 0.81), 2.30, BCa 95% CI [0.031, 4.57], $t(50) = 2.04$, $p = .047$, $r = .276$

Distance: Team A alone **walked less distance** (M = 111.94, SE = 1.41) than when in counterflow (M = 520.52, SE = 4.78), 416.66, BCa 95% CI [403.12, 430.21], $t(51) = 61.77$, $p < .001$, $r = .993$.

Tessellation: Team A alone **maintained more space** around them (M_{rank} = 116) than when in counterflow (M_{rank} = 55.38), $H(1) = 65.67$, $p < .001$

Team A counterflow **maintained more space around them** (M_{rank} = 123.71) vs team B counterflow (M_{rank} =104.55), $H(1)= 4.83$, $p = .028$

Just due to the number of people? No.



Key findings

1. Social identity motivated large groups to self-organise to remain together

2. This was increased by the presence of an outgroup, and that this influenced pedestrian flow when in contraflow with others by decreasing speed, distance, and proximity

Perceived threats and ‘stampedes’:
A relational model of collective fear responses

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Method

		Noise		
		Threating (gunshot)	Non-threating (door slamming)	Control (unknown)
Given interpretation	Ingroup			
	Control (unknown)			

Current DVs: intended response, trust in information about the noise, perceived danger

Later: Movement (direction, time to reach end point), eye-tracking

Pre-registered on the Open Science Framework: https://osf.io/yc35p/

Method

Ingroup condition:
Attending a climate change rally where attendees wear red.
Arrived early and see other attendees wearing red.
List 3 things they share with the crowd as environmentalists

Control condition:
Not given this information

Take home messages

- We have common goals and can **learn from each other**
- We can harness knowledge from each discipline to better understand collective behaviour
- To do this: focus on common aims, identify relevant aspects of theory, select key variables to test, and use the best methodology to test the variables
- Improve our understanding of why collective behaviour occurs and what forms it can take, to improve models of collective behaviour and broader safety planning

Next up

- UKRI Future Leaders Fellowship, ‘Simulating the impact of first responder communication strategies on citizen compliance in emergencies’
- SIAM network https://www.siam-network.online/home
- PhD students research group processes
  - Luna Dabinovic - Incorporating decision-making in environmental emergencies into behavioural computational models for crisis planning
  - Waleed Alhajri – the role of group processes in risk-taking at mass gatherings
  - Sayaka Hinata – intergroup relations between emergency services and the public in emergencies
  - Sam Vo – public support for protest actions

Prof John Drury

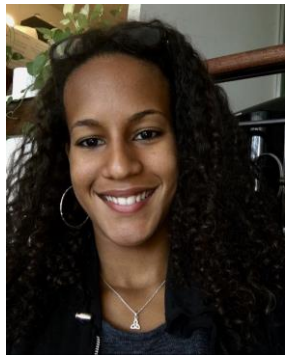
Prof Dr Gerta Köster

Prof Andrew Philippides

Dr Nanda Wijermans

Dr Natalie van der Wal

Dr Fergus Neville



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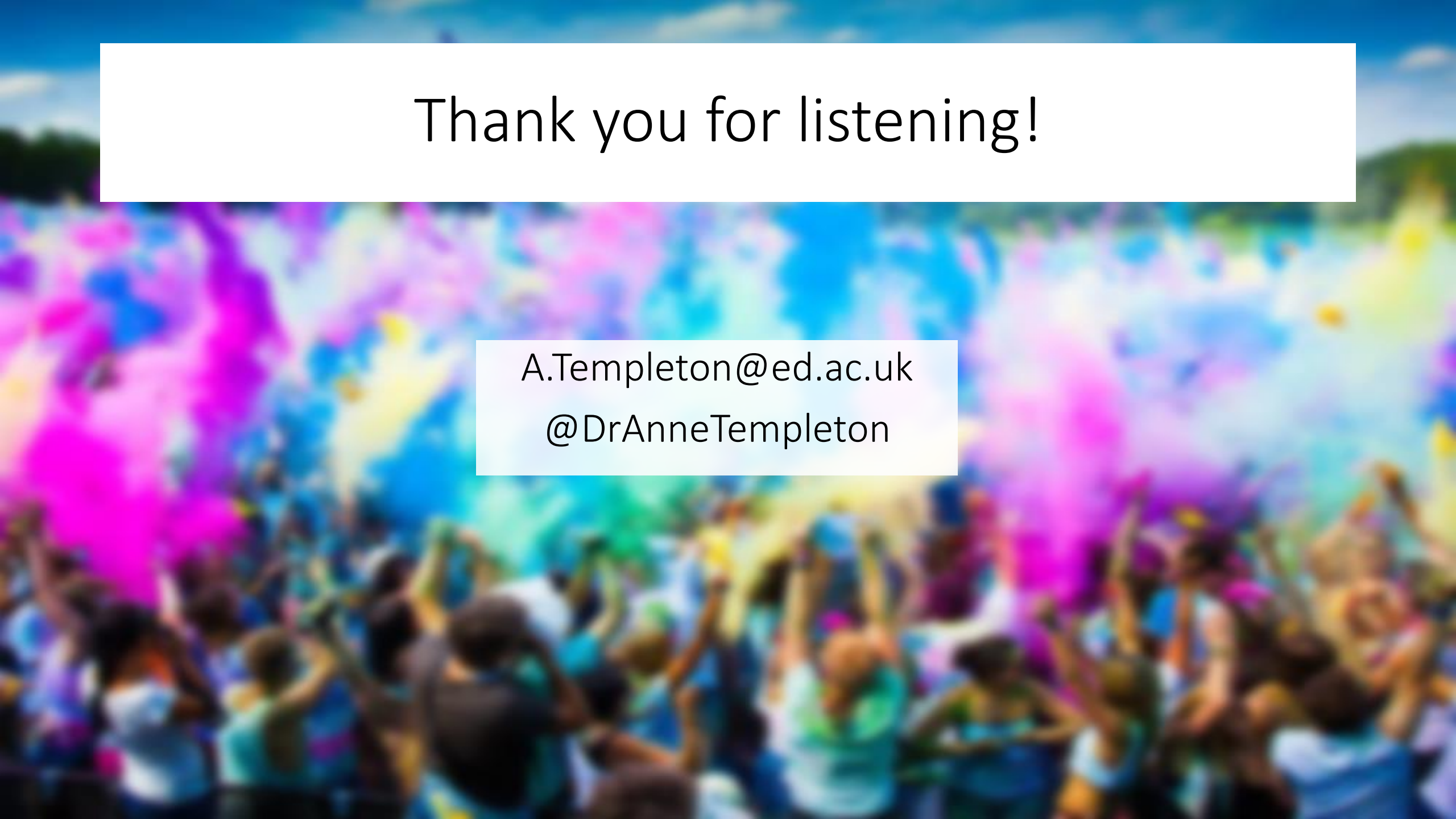
Thank you for listening!



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