

Using psychology to improve interoperability: A service evaluation of a novel training tool to support multi-agency working in the UK emergency services

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Abstract

Research has recently highlighted the importance of a psychological understanding of interoperability in multi-agency emergency response to provide insight into why problems in the implementation of interoperability continue to persist, and what can be done to prevent them reoccurring in the future. We developed a training tool on how psychology can be used to improve interoperability and conducted a service evaluation of the tool with members of the Police, Fire and Rescue, and Ambulance Services across the UK. The training was evaluated in two parts: online delivery (survey, N=28; interviews N=7), and in-person delivery (N=37). The training was rated positively by participants and was something participants would recommend to others as being important. The evaluation indicated that responders felt there is a need for further training to improve interoperability and that the training addressed a key gap in their knowledge on interoperability in terms of the psychological underpinnings of interoperability. The evaluation identified several areas for improvement, including more varied graphics, more practical recommendations, and ensuring that the academic content is accessible for a practitioner audience. The research team plans to update the training tool based on the feedback provided and deliver it to emergency responders.

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Introduction

Improving the way in which responders from the UK emergency services work together during emergencies has been a key focus of emergency planners for over a decade. In the UK, emergency response often requires responders from usually separate organizations – the Police, Fire and Rescue Service (FRS), and Ambulance Services – to work together collaboratively to manage risk and coordinate their responses (Bharosa et al., 2010). To support the emergency services in their collaborative efforts, the Joint Emergency Services Interoperability Programme (JESIP) was introduced in 2012, providing standardised principles for joint working (JESIP, 2013; see JESIP, 2021 for recent version). Principles include *communicating* with responders from other services using language, which is clear and free from technical jargon, and *co-locating* with responders from other services as soon as practicably possible at a single, safe, and easily identified location (see Table 1 for an overview). The term 'interoperability' is used by JESIP to describe the joint working between the three services (JESIP, 2013). However, according to Pollock (2017), collaborative working between the emergency services is often hindered because the emergency services are unable to work interoperably with each other.

Table 1. The five JESIP principles for joint working, from JESIP (2021)

Principle	Definition
Co-locate	Co-locate with other responders as soon as practicably possible at a single, safe, and easily identified location.
Communicate	Communicate using language which is clear, and free from technical jargon and abbreviations.
Co-ordinate	Co-ordinate by agreeing the lead organization. Identify priorities, resources, capabilities, and limitations for an effective response, including the timing of further meetings.
Jointly understand risk	Jointly understand risk by sharing information about the likelihood and potential impact of threats and hazards, to agree appropriate control measures.
Shared situational awareness	Establish shared situational awareness by using M/ETHANE (a structured mnemonic model for responders to collate and pass on information, including whether a major incident has been declared [M] and the exact location of an incident [E], and the Joint Decision Model (a model to help responders make decisions together in a response considering the need for immediate action to save lives and reduce harm, including gather information and intelligence, and identify options and contingencies).

Indeed, in a review of 32 major incidents that took place in the UK between 1986 and 2010, including the Hillsborough Stadium Disaster and the London bombings of 2005, persistent problems with interoperability were identified (Pollock, 2013). Problems included inadequate communication between response organizations, a lack of clarity regarding roles and responsibilities of responders, and

a lack of leadership. Yet, problems persist despite the introduction of JESIP to try and combat them, as demonstrated in the recent inquiry into the 2017 Manchester Arena attack (Saunders, 2022a), and the 2017 Grenfell Tower fire (Moore-Bick, 2019). For example, Saunders (2022a) noted that on the night of the Manchester Arena attack there was conflicting communication between the emergency services about a shared meeting point, therefore a multi-agency meeting point where all the emergency services could co-locate was not established. Thus, despite the production of guidance and manuals to train responders on how to work collaboratively with other response organizations, according to Saunders (2022b), “JESIP still failed on 22nd May 2017” (p.135), and responders seemingly worked in organizational silos.

In line with this evidence of interoperability challenges, in a review of 52 local response debrief reports following exercises and incidents across England, Scotland, and Wales, Pollock (2017) found that consistent recommendations regarding the need for more effective joint working were identified. This highlights that similar issues persist across time and during different incidents, and lessons identified from incidents and exercises are typically not being learned (see Coles, 214; Pollock & Coles, 2021, for reviews).

To provide insight into why interoperability challenges persist, it is important to look at the structure of the teams that formulate the response. A key aspect of interoperability is that it requires responders from *different* response organizations to work *together* to deal with complex situations that would otherwise exceed an individual response organization's ability to manage alone (Brown et al., 2021; Curmin et al., 2015); in other words, it requires the formation of a multiteam system (MTS). MTSs are composed of at least two teams that work directly and interdependently to achieve a collective goal (Mathieu et al., 2001; Shuffler et al., 2015). They centre on the dynamics of sub-teams (or component teams) nested within a superordinate team (or MTS). In the context of multi-agency emergency response, the usually separate organizations of the Police, FRS, and Ambulance Services form sub-teams that are nested within the superordinate MTS of the emergency services (see Figure 1). Each of these sub-teams have different individual sub-goals – for example, neutralizing a threat (Police), rescuing casualties (FRS), and treating casualties (Ambulance) – which all contribute to the collective superordinate goal of saving life and reducing harm (Power & Alison, 2017). Sub-teams must align their behaviours and coordinate their actions for an MTS to be effective in achieving their superordinate goal (Brown et al., 2021) – they must act as *one team*. Yet, as suggested in the Manchester Arena inquiry (Saunders et al., 2022b), responders often do not work as one team, instead seemingly working in silos as three separate teams.

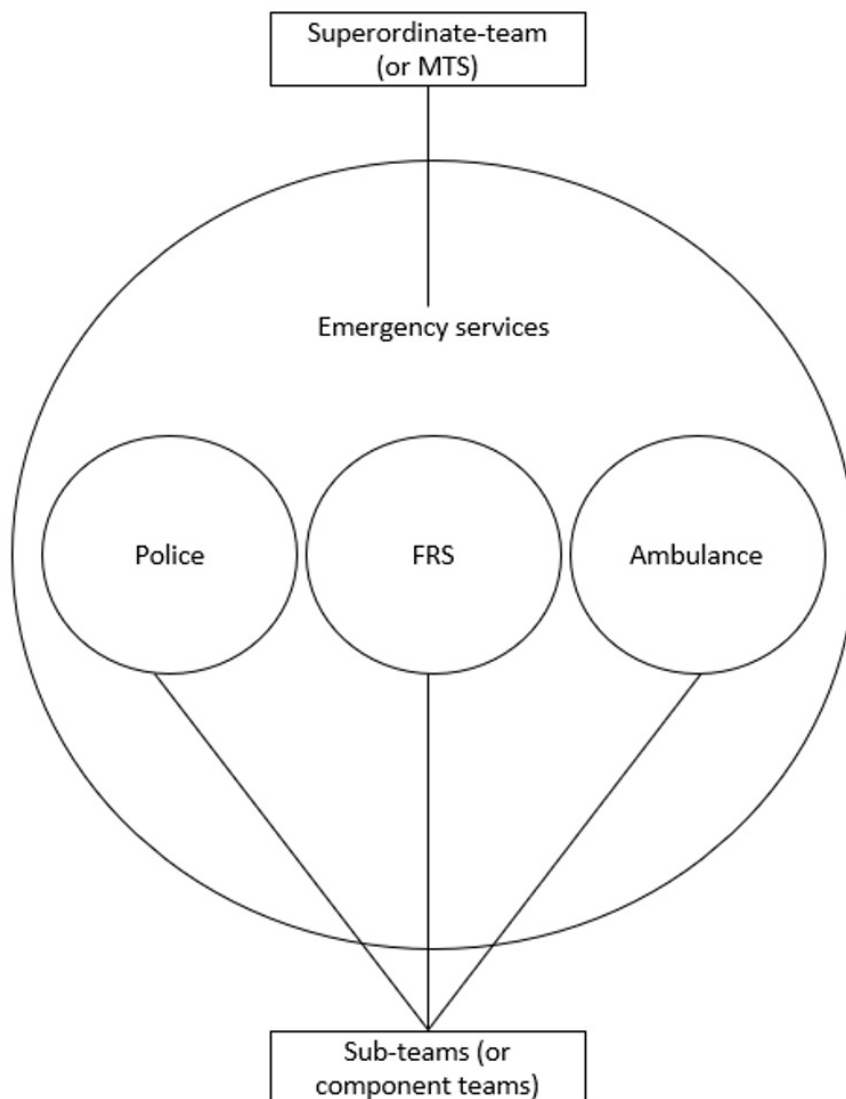


Figure 1. Schematic of emergency response MTS structure, with the sub-teams of Police, FRS, and Ambulance nested within the superordinate team of the emergency services

To address this need for the three sub-teams within the emergency response MTS to be able to work effectively as one superordinate team and adding to the social identity literature on MTSs in

other domains (e.g., military teams; Wijnmaalen et al., 2019), Davidson and colleagues recently introduced a social identity perspective on interoperability in the emergency services (Davidson et al., 2022a; 2022b). Theoretically speaking, if people *share a social identity* with each other (i.e., a shared sense of *us-ness* - seeing themselves as 'we' and 'us', instead of 'me' and 'I'; Tajfel & Turner, 1979; Turner et al., 1987), they are more likely to be able to coordinate and cooperate with each other due to factors such as an increased sense of interconnection and common purpose (Haslam et al., 2022, 2009), the development of shared understandings of situations and common norms for behaving in those situations (Reicher et al., 2010), and increased trust and respect among group members (Haslam et al., 2012). Of course, in a MTS such as a multi-agency emergency response team, the challenge is not one of Police, FRS, and Ambulance responders seeing themselves as 'I' instead of 'we', but instead seeing themselves in terms of their sub-group of 'us' as Police, FRS, or Ambulance responders, rather than in terms of their superordinate group of 'us' as emergency responders.

With this notion of increased cooperation and coordination between people who share a social identity in mind, Davidson and colleagues conducted two interview studies with responders in the UK working on the COVID-19 response to explore the role of shared identity in multi-agency response (Davidson et al., 2022a; 2022b). Davidson et al. (2022b) found structural barriers (e.g., inequalities in building access, different shift patterns) detracted from the development of a shared identity between responders during multi-agency response and made interoperable working difficult. Despite this, both studies found evidence that social identity processes can arise in multi-agency emergency response. Factors that facilitated the development of a shared identity included context-driven salience processes such as a common purpose created by the shared threat of COVID-19 (Davidson et al., 2022a; 2022b), interaction-driven salience processes such as responders sharing difficult experiences with each other and having the time and space to talk about these shared difficult experiences (Davidson et al., 2022b), and strategic-based communication processes such as leaders emphasising shared goals to group members (Davidson et al., 2022a),

In further research, discussion-based exercises with responders from the Police, FRS, and Ambulance services found evidence of an association between shared social identity and improved interoperability (Davidson et al., 2023). Furthermore, Davidson et al. (2023) provided important evidence of *how* shared identity was associated with improved interoperability during the exercises, such as increased motivation to work with each other, increased confidence in each other, and increased trust and respect for each other.

One thing this research on shared identity and interoperability shows is the importance of understanding the psychological underpinnings of interoperability. This importance is further emphasised in a recent systematic review by Power and colleagues who identified secure team identities, as well as trust and cohesive goal setting, as key psychological underpinnings of interoperability (Power et al., 2023). As such, Power et al. (2023) proposed "a shared system of technology and teamwork built upon trust, identification, goals, communication, and flexibility" (p.13) as an updated definition of interoperability to account for these important psychological underpinnings. Furthermore, this review highlighted that there is little evidence-based describing *how* psychological principles can be put into practice in a multi-agency response. Therefore, whilst research may highlight the importance of psychological processes in understanding and improving interoperability, further evidence is needed to identify how these can be put into practice - this is what we hope to address in the current paper through providing the results of a service evaluation from a newly developed interoperability training tool.

Current UK emergency services interoperability training

JESIP models and principles are the standard for interoperability in the UK emergency services. The JESIP principles are laid out in the Joint Doctrine (JESIP, 2021) which provides a standardised approach to interoperability. Alongside the Joint Doctrine, JESIP offers several training opportunities, including a one-day multi-agency training course, as well as several awareness products (e.g., e-learning, films, mobile applications) that can be used as standalone training, incorporated into the wider training course, and/or refresher material (e.g., the JESIP Awareness e-learning package that can be found on the JESIP website - <https://www.jesip.org.uk/>). Current training includes a wide variety of topics relating to interoperability, including outlining why interoperability is needed, the impacts of declaring a major incident, and the five principles for joint working. The focus of JESIP is on practical actions responders should take to facilitate interoperability (e.g., communicate using language free from technical jargon). However, as discussed above, it is important to consider psychological processes when seeking to enhance interoperability. Indeed, Power et al. (2023) recently argued that considering the psychological processes linked to how interoperability can be better achieved are just as, if not more, important than the current practical focus of JESIP. To address this, in the current paper we: i) describe the development of a new training tool for the emergency services, called 'Using psychology to improve interoperability,' and ii) present findings from an initial evaluation of this training.

Development of the training tool

The development of the training tool consisted of three main stages: (i) selection of content, (ii) feedback from practitioners, and (iii) finalising tool for evaluation.

Selection of content

Selecting the training content involved identifying three key learning outcomes and the relevant information needed to achieve these outcomes. The learning outcomes were chosen based on the overarching intended goal of the training, which was to use psychology to improve interoperability. The information chosen to support the learning outcomes was evidence-based and theoretically-derived from research on emergency response and incident inquiries, group behaviour, and interoperability. The structure of the training was separated by these three outcomes.

The first learning outcome was to understand the challenges in the implementation of interoperability. This section included evidence of the interoperability challenges that have been present in past incidents, including findings from the Pollock (2013) review, a case study example from the 2017 Manchester Arena attack (Saunders 2022a), as well as an overview of the JESIP principles (JESIP, 2021).

The second learning outcome was to understand how group psychology can be used to improve interoperability. The purpose of this section was to introduce responders to the Social Identity Approach and to demonstrate to them its applicability to interoperability. To help the responders recognise the importance of groups in their work, they were presented with a social identity mapping task (Bentley et al., 2019; Cruwys et al., 2016). Participants were asked to think about the different groups present in the last multi-agency incident they attended, how those groups contributed to the situation, and how they interacted with each other. Other domains where social identity processes have been applied were presented to demonstrate the legitimacy of the approach, including other emergency response settings such as emergency decontamination (e.g., Carter et al., 2015) and riot diffusion (e.g., Drury et al., 2019a), but also organizational settings more generally (e.g., Haslam, 2004).

The final learning outcome was to understand what specific actions responders can take to improve interoperability in their work. Three theoretically-derived and evidence-based focus points were developed. Each focus point was presented in three stages: actions responders could take to achieve the focus point, what these actions can provide, and what outcomes they can expect from these

actions. The first focus point was 'build relationships with other services.' This point was derived theoretically from the idea of identity 'impresarioship', which suggests that a shared identity can be embedded within the group through lived experiences, such as attending events which provides a physical reality for the group, as well as opportunities for group members to practise coordinating with each other, and to experience success together (Steffens et al., 2014; Haslam et al., 2020; Haslam & Steffens, 2021). This point was also based on evidence from previous research on identity and interoperability, for example responders who experience positive contact with each other can facilitate a sense of shared identity (e.g., Davidson et al., 2022b).

The second focus point was 'use your shared frame of reference.' This point was derived theoretically from the idea of identity enactment, which suggests that when people view themselves and others in terms of a shared social identity, a cognitive transformation occurs which shapes behavior (Haslam et al., 2012). Individuals who have undergone this cognitive transformation adopt a common frame of reference based on collective norms and the values of the group (Haslam & Reicher, 2012). This adoption of a common frame of reference can explain the variability in behavior across groups who have a different shared identity due to the different norms and values they enact. At the same time, this can also explain the similar behavior in people who share a social identity, and thus enact the same norms and values. Evidence from research on identity and interoperability also contributed to this point, for example responders sharing frames of references (e.g., JESIP; intrinsic motivations) can facilitate the development of a shared identity (e.g., Davidson et al., 2023).

The final focus point was 'make your common purpose clear.' This point was derived theoretically from the concept of collective agency which suggests that a shared identity among group members can enable the internalisation of shared goals and enhance shared expectations of support, which can motivate people within a group to work together to achieve a shared goal (Drury et al., 2019b). Findings from research on identity and interoperability also contributed to this point, such as a shared threat can facilitate the development a shared identity between responders (e.g., Davidson et al., 2022a), as well as the importance of having a shared understanding of each other's roles and responsibilities (e.g., Davidson et al., 2022a) and shared goals (e.g., Davidson et al., 2023).

Initial feedback from responders and finalising the training

Responders from the three emergency response organizations were collaboratively involved in the development of the training. Accordingly, eight responders provided feedback on the content of the training before it was finalised for the evaluation. Full details of this process can be found in Table 2. To improve the quality, transparency, and consistency of responder feedback, the GRIPP2 (Guidance for Reporting Involvement of Patients and the Public) reporting checklist is used to describe this information (Staniszewska et al., 2017).

Table 2. Initial feedback from responders, reported as per the GRIPP2 reporting framework (Staniszewska et al. 2017)

Section and topic	Item
1. Aim	To collaboratively engage responders in the initial development stage of the training.
2. Methods	The content of the training was sent in a basic PowerPoint format to eight responders from the Police (N = 2), FRS (N = 3), and Ambulance Service (N = 3). Responders provided either written feedback (N = 2) or face-to-face to the lead researcher (N = 6). Responders were specifically liked and did not like about the content of the training, what areas could be improved, whether they understood what was meant by 'shared identity', and whether there were any areas that they did not understand.
3. Results	Responders who reviewed the training content said they liked it, and it made a valuable contribution to understanding interoperability. However, several suggestions were also made to improve the training, including: more detail on where challenges arose during the Manchester Arena response and the provision of specific examples; emphasising the importance of building relationships before an incident; and making the information presented on the slides more concise. Several responders liked the psychology content and advised on the inclusion of more detail of the psychology elements to make the contribution of psychology clearer. Finally, most responders advised to run the service evaluation of the training with responders across all levels of command (operational, tactical, and strategic) because the elements included in the training are applicable across all levels.
4. Discussion	The content of the training was updated based on the feedback from responders. Specific examples where the training was updated include examples from the Manchester Arena inquiry of the delayed attendance from the FRS, adding additional slides expanding on the psychological elements of <i>how</i> a shared identity can be used to improve group working, and reducing the amount of information on the slides by breaking down sentences into short bullet points. In addition, formatting was added to the presentation, such as animations, transitions, and colour. A similar colour scheme to that used in JESIP documents and training (red, green, and blue) was used to allow for consistency with other training that responders are familiar with. The lead researcher recorded themselves presenting the training, and the PowerPoint was turned into video format. The video was 29 minutes, 27 seconds in length. It was uploaded onto YouTube as an unlisted video: https://www.youtube.com/watch?v=uubrBTzYVWc .
5. Reflection	The feedback received from responders was embedded as far as possible into the training tool. Due to the near equal engagement across the emergency services, feedback from each service was able to be represented. Whilst written feedback was less comprehensive than the verbal feedback, taken together with the verbal feedback from responders several areas for change and improvement were able to be identified and implemented into the finalised training.

The final training tool comprised a presentation using interactive activity and PowerPoint slides that can be delivered either in-person or online and was also turned into a video recording to enable scalability.

Evaluation of the training tool

Current evaluation objectives

Quality of the training was assessed by considering the following:

- Participants' evaluation of the training, either positive or negative.
- How this training can be improved to increase both engagement with the video and learning.
- Do emergency responders see a need for further training.
- Whether interoperability training using psychology can improve participants' knowledge of the importance multi-agency working, and what actions they can take to facilitate it.

Method

Evaluation design

The evaluation used a mixed methods design in which quantitative and qualitative data collection and analysis approaches were used. Quantitative data was collected through a questionnaire survey participants completed before and after taking part in the training. Qualitative data was collected through open-ended questions asked in the post-training survey, and through semi-structured interviews with a subset of participants. The evaluation was carried out in two parts: (i) online video delivery (Part 1), and (ii) in-person delivery (Part 2).

Participants

For Part 1 of the evaluation, a link to the online survey was shared with pre-existing contacts of the research team who disseminated the link within their networks, and on Twitter. Twenty-eight participants from Police (N=8), FRS, (N=12), and Ambulance (N=8) Services took part in the evaluation. Participants were eligible to take part if they were a current or ex operational, tactical, and/or strategic commanders in the UK Police, FRS, or Ambulance Services. All but two participants were current members of the UK emergency services - these two were included in the evaluation due to them reporting being 'very familiar' with JESIP. Participants' years in service in their respective organization ranged from 6 to 35 years ($M=21$, $SD=7.92$). Nearly all participants reported being either 'very' or 'extremely' familiar with JESIP. See Table 3 for participant information. Because the video was available as an unlisted video on YouTube, participants were asked to confirm they had not seen the video before participating in the evaluation. At the end of the survey participants were asked to indicate if they would be willing to participate in a short follow-up interview to discuss the training further, of which seven took part (Police, N=2; FRS, N=3; Ambulance, N=2).

Table 3. Participant information provided in frequency (percentage)

	Part 1	Part 2
Organization		
Police	8 (28.57%)	9 (0%)
FRS	12 (42.86%)	0 (0%)
Ambulance	8 (28.57%)	37 (100%)
Command level		
Operational	6 (21.43%)	1 (2.70%)
Tactical	6 (21.43%)	19 (51.35%)
Strategic	2 (7.14%)	4 (10.81%)
Operational and Tactical	6 (21.43%)	4 (10.81%)
Operational, Tactical, and Strategic	4 (14.29%)	1 (2.70%)
Other		
Change and continuous improvement office	1 (3.57%)	0 (0%)
Tactical operator	1 (3.57%)	0 (0%)
Paramedic	1 (3.57%)	0 (0%)
Emergency planning (tactical)	1 (3.57%)	0 (0%)
Not specified	0 (0%)	4 (10.81%)
Not stated	0 (0%)	4 (10.81%)
Gender		
Male	25 (89.29%)	29 (78.38%)
Female	3 (10.71%)	4 (10.81%)
Not stated	0 (0%)	4 (10.81%)
Years in service		
0 – 5	0 (0%)	2 (5.41%)
6 – 10	5 (17.86%)	2 (5.41%)
11 – 15	3 (10.71%)	9 (24.32%)
16 – 20	5 (17.86%)	8 (21.62%)
21 – 25	8 (28.57%)	7 (18.92%)
26 – 30	4 (14.29%)	4 (10.81%)
31+	3 (10.71%)	1 (2.70%)
Not stated	0 (0%)	4 (10.81%)
Familiarity with JESIP		
Moderately familiar	1 (3.57%)	0 (0%)
Very familiar	10 (35.71%)	12 (32.42%)
Extremely familiar	17 (60.71%)	21 (56.76%)
Not stated	0 (0%)	4 (10.81%)

For Part 2 of the evaluation, the lead author attended an Ambulance Strategic and Tactical Commander Development Day where they presented the training tool in-person to attendees. Thirty-seven ambulance responders took part in this stage of the evaluation. Participants' years in service ranged from 2 to 31 years ($M=18$, $SD=6.83$). All participants reported being either very (N=12) or extremely (N=21) familiar with JESIP (see Table 3).

Materials

Pre-training questionnaire. This questionnaire contained four questions relating to participants' perceptions of multi-agency working (see Supplementary Materials 1 for full pre-training questionnaire). Participants were asked to rate each statement on a 5-point likert scale from 1 (strongly disagree) to 5 (strongly agree). This questionnaire was completed by participants in both Part 1 and Part 2.

Post-training questionnaire. This questionnaire contained the same four questions that were asked in the pre-exercise questionnaire. In addition, nine additional questions were asked relating to the training, including questions about how easy the information was to follow and whether they would recommend the training to others. Participants were asked to rate each statement on a 5-point likert scale from 1 (strongly disagree) to 5 (strongly agree). In addition, participants were also asked four open-ended questions relating to the training (see Supplementary Materials 2 for full post-training questionnaire). This questionnaire was completed by participants in both Part 1 and Part 2 of the training delivery.

Interview guide. The interview guide contained similar questions to the post-training questionnaire (see Supplementary Materials 3).

Training tool. The training was developed as per details outlined in the 'Development of the training tool' section above.

Procedure

Part 1. This part was carried out using the online survey software, Qualtrics, between 25 February 2023 and 06 April 2023. Participants were provided with an online information sheet which explained the purpose of the evaluation and they were asked to consent to take part in the evaluation, before completing the pre-training questionnaire. They were then provided with a link, via Qualtrics, to the training video on YouTube which they were asked to watch before returning to Qualtrics to complete the post-training questionnaire. At the end of the survey, participants were asked to indicate if they would like to take part in a follow-up interview. Interviews were completed by the lead researcher between 23 March 2023 and 12 April 2023. Interviews were carried out via Microsoft Teams and lasted on average 37 minutes. Before the interview, participants were reminded by the researcher of the purpose of the evaluation and were asked to verbally consent to participate and for the interview to be recorded.

Part 2. The in-person delivery of the training was carried out on Thursday 26th May 2023 at an Ambulance Strategic and Tactical Commanders Development Day. Participants were provided with a link to the pre-training survey (containing the information sheet, consent questions, and pre-training questions). The lead researcher then delivered the training to the group, which lasted approximately 45 minutes. After the training delivery participants completed the follow up survey.

Analysis

Questionnaire data. The quantitative questionnaire data was analysed using SPSS 28.0.1. Non-parametric tests were used for analysis due to parametric assumptions being violated. A Repeated-Sample Wilcoxon Signed Rank test was conducted to examine differences between the responses to the pre- and post-training questionnaires. To identify whether participants' responses to the questionnaire items were neutral, positive, or negative, One-Sample Wilcoxon Signed Rank tests were conducted on each of the subsequent post-training questions to compare the average participants score to the midpoint value of 3 on the likert scale. Due to the hard-to-reach sample in this study, an effect-size sensitivity analysis was conducted to explore if we had enough power to detect effects (Giner-Sorolla et al., 2022). Sensitivity analyses were conducted for each statistical test using G*Power (Faul et al., 2007).

The qualitative questionnaire data was analysed using a semi-deductive content analysis to determine the presence of certain categories within the results. As such, the lead researcher read and re-read the qualitative responses from participants, coding each response into a wider category. The categories were pre-determined based on the evaluation objectives and the questions asked in the survey: improvements that can be made to the training, most useful aspects of the training, and comparisons to other training. However, the sub-themes within these categories were determined by the data itself (see Table 4 for coding framework). Questionnaire results from Part 1 and Part 2 were analysed separately and are reported separately below.

Table 4. Coding framework with a breakdown of responses provided in the qualitative survey questions

Category of response	Frequency	Examples from survey
1. How can this training video be improved?		
Provision of training wider than just the blue-light services	2 (O)	"Involve/include other Category 1 responders, not just the blue lights. It is my experience that responders from other non-blue light Cat 1 responders are the ones who are most wary about approaching/interacting with Fire/Police/Amb at incidents" (Operational and Tactical Commander, FRS, online).
Combine with other training on interoperability	2 (O)	"It should be used in conjunction with practical JESIP training" (Tactical Commander, FRS, online).
Increase tempo of presentation	2 (O)	"Faster paced" (Operational Commander, Ambulance, online).
Provide more examples from real incidents	2 (O)	"Possibly use a few more examples of where we (emergency responders) have not worked well together" (Tactical Commander, FRS, online).
Increased interaction opportunities	2 (O)	"Make the training package more interactive" (Tactical Commander, FRS, online).
Provide more practical examples of how advice can be implemented	4 (O)	"Some scene examples - from a control room perspective and from a 'ground' commander perspective. How can these people better work together when chances are they haven't had prior opportunity to meet/build relationships?" (Operational and Tactical Commander, Police, online). "Also adding practical examples of interoperability such as how to hold an operational JESIP meeting at a scene" (Operational Commander, Police, online).
Provide more visual elements	5 (O), 3 (I)	"It would be more engaging with some command videos to emphasise the point" (Strategic Commander, FRS, online). "Could improve the graphics, maybe. For example, the video references use of the JDM, but I don't remember the JDM being shown" (Tactical Commander, Ambulance, online).
Have more knowledge checks	1 (O)	"More interactive & test knowledge" (Operational, Tactical, and Strategic Commander, FRS, online).
Change tone of language	1 (O)	"Refined language when talking about example incidents (people killed in London but died at Hillsbrough [sic], should be same for both, and a degree of judgement with the 2 hours comment re Manchester. Should remain objective" (Tactical Emergency Planning, FRS, online).
Multi-agency audience	1 (I)	"Delivered at a multi agency event" (Strategic Commander, Ambulance, in-person).
Longer session delivery	4 (I)	"I think it needs to be longer, and allow for further discussion, as it really get people talking" (Tactical Advisor, Ambulance, in-person).
Provision of handout	1 (I)	"Providing supportive learning handouts or electronic copies" (Tactical Commander, Ambulance, in-person).
2. What aspects of this training video did you find the most useful?		
Psychological elements	17 (O), 12 (I)	"I liked the brief foray into psychology and wish we had explored that more deeply" (Operational Commander, Ambulance, online). "Providing a robust foundation as to why inter-agency training and working is needed to be capable of building a co-ordinated approach" (Tactical Commander, FRS, online). "Group psychology description really opened up a new aspect that I'd never thought of before" (Tactical Advisor, Ambulance, in-person).
Combination of psychology and practical applications	2 (O)	"The science followed by practical applications to help improve interoperability" (Operational, Tactical, and Strategic Commander, Ambulance, online).
The link to real life examples	3 (O)	"Case study is useful and helps to show the real-life issues with interoperability" (Tactical Commander, FRS, online).
Clear explanations	1 (O)	"Breaking down each focus point and elaborating making a clear and concise point" (Paramedic, Ambulance, online).
3. Compared to other training you have taken part in; how did you find this training video?		
Not as effective	3 (O)	"Not as effective perhaps as other training delivery methods. Perhaps it could be included in a blended training package including an interactive e-learning solution" (Operational and Tactical Commander, FRS, online).
Ambivalent	4 (O)	"I found it a little dry and at times, I found myself having to re-focus my concentration" (Change and Continuous Improvement Officer, Police, online).
Good/great	10 (O), 4 (I)	"When compared to other Incident Command related training this was a good primer for further training on JESIP. Better than previous training I have had on JESIP. I personally like the reference to background research that informed this presentation; however I think this will be lost on many within the intended audience. I think this would need to be delivered more interactively to achieve some form of improved awareness within a practitioner community" (Operational Commander, FRS, online). "I'm keen on psychologically informed education within the service so it's good to see this rolling out to command" (Tactical Commander, Ambulance, in-person).
Useful/clear/interesting	6 (O), 6 (I)	"The information was delivered in a clear and structured way, the 'why does this matter to me' is illustrated clearly throughout making the training captivating. The session was thought provoking and much better than the bog standard EPRR session on something about a rolled over coach and the Lockerbie bombing! There is something I can take away from this to develop on" (Paramedic, Ambulance, online). "Up to date and informative" (Operational and Tactical Commander, Ambulance, in-person).
Improvements needed	1 (I)	"Useful but some polishing needed" (Tactical Commander, Ambulance, in-person).

Note. O = Online delivery (Part 1), I = In-person delivery (Part 2)

Interview data. Interview data was analysed using an inductive thematic analysis whereby the themes identified were driven by the data (Braun & Clarke, 2006). This process involved the lead researcher immersing themselves in the data through transcribing the interviews and reading the transcripts. During the initial read through of the transcripts the researcher noted down any points that were relevant to the wider evaluation objectives (e.g., how the training can be improved). The researcher then used these initial notes to develop a series of codes. Relevant extracts from the data were then separated into these codes before meeting with research team to discuss the codes. Themes were identified after re-reviewing the codes, relevant extracts, and transcripts. Following discussions with the research team, these themes were named, defined, and separated into three topic areas: content (psychological theory and practical recommendations), presentation (format and delivery method), and audience and scope (level of command, responding agencies, and type of incident; see Table 5 for the thematic framework). Using the thematic framework, the lead researcher then re-read the transcripts separating the data into the relevant themes. The final analysis was discussed and agreed with the research team.

Table 5. Thematic framework for analysis

Theme	Description	Illustrative quote
1. Content		
1.1 Psychological theory	Discussions about the Social Identity Approach, psychology, or science more generally. This includes both positive and negative reflections of the psychological content	"Building relationships, go in and sit down with people, sharing your experience and your common goals, that isn't that isn't new to me [...] what I think was new to me, is the understanding, and the academic bit that sits beneath it [...] so the academic understanding reinforced [...] my knowledge, it's a good thing to do, that that all makes common sense. But just understanding some of the, the the research and the academic principles below that" (Ambulance).
1.2 Practical recommendations	Any discussions around any practical elements of the training, such as examples from real life incidents, or practical recommendations based on theory included in the training, as well as examples of how participants may have implemented aspects of the training into their practice.	"It gives us the reason for why we should be doing it, whether it actually leads to tangible benefits or not I don't know because some of the practice some of the practical steps that you can take, I think that was the part which I think was a bit lacking, if I'm honest, in terms of the practical things" (Police).
2. Presentation		
2.1 Format	What participants thought about the format in terms of the video style, colour scheme, layout of the slides, etcetera.	"It's very visual as well. So someone like myself, it was quite good to see. And it wasn't, it wasn't the normal type of training video, I suppose. Because it was quite sort of, like, say, a visual on sort of got your attention and kept your attention" (Fire and Rescue).
2.2 Delivery method	What participants preferred delivery method for this training would be, for example in-person, on-line, or blended.	"It just, it, it depends on, the content will depend on how you choose to, you choose to present it and ultimately, it's always, it's always going to be better if it's presented in person, but if that's not practical, then you just tailor the content to suit by as I say, if it is just a video, then you really have to be conscious of the expected level of understanding and anything that airs on the more academic side, people are going to switch off" (Fire and Rescue).
3. Audience and scope		
3.1 Level of command	Where in the organizations command level should the training be aimed at, for example operational, tactical, or strategic commanders.	"It should be rolled out to everybody who can come into contact and work with anybody from a different organisation or response service, really" (Fire and Rescue).
3.2 Responding agencies	Which response organizations should the training be provided to, for example just the blue-light services, or wider organizations that would typically be involved in emergency response.	"Their experience is completely different as well, especially with multi agency working. So, I suppose it's about how you make it sort of fit all [...] but getting the right information out of them as well, if that makes sense" (Fire and Rescue)

Results

Part 1 - online delivery

This section is separated into three subsections based on the data: quantitative survey data, qualitative survey data, and interview data. Sensitivity analysis suggested that for both parts, the study was sufficiently powered for One-Sample Wilcoxon Signed Rank tests, but partially underpowered for Related-Samples Wilcoxon Signed Rank test (see Supplementary Materials 4).

Quantitative survey data

There was a significant difference in participants' perception of their ability to work effectively in a multi-agency team - participants reported higher agreement scores to the statement 'I am able to work effectively in a multi-agency team' after completing the training ($M=4.43$, $SD=.92$) compared to before the training ($M=4.21$, $SD=.83$), $z=2.12$, $p<.05$, $r=.40$. Further, there was also a significant difference in participants' confidence to be able to effectively work in a multi-agency team with participants' reporting higher agreement scores to the question 'I am confident that I can effectively work in a multi-agency team' after completing the training ($M=4.43$, $SD=.92$) compared to before ($M=4.21$, $SD=.83$), $z=2.12$, $p<.05$, $r=.40$.

No significant difference was found in participants' knowledge of actions they could take to facilitate an effective multi-agency response when expressing agreement to this statement before completing the training ($M=4.46$, $SD=.84$) compared to after ($M=4.57$, $SD=.84$), $z=1.34$, $p=.18$, $r=.25$. There was also no significant difference found in participants' perception of the importance of working with responders from other services before completing the training ($M=4.71$, $SD=.81$), compared to after ($M=4.75$, $SD=.80$), $z=1.00$, $p=.32$, $r=.19$.

All questions in this section were significantly higher than the mid-point value of 3 (see Table 6 for One-Sample Wilcoxon Signed Rank tests). Over 90% of participants agreed or strongly agreed that they were able to easily follow the information provided in the training, that they understood the information provided in the training, and that they would recommend the training to others. Over 80% of participants agreed or strongly agreed that they found the training helpful, they liked the training, and the training is important. Whilst 75% of participants agreed or strongly agreed that the training improved their knowledge on interoperability, fewer (67.9%) agreed or strongly agreed that the training video will improve their skills in implementing an effective multi-agency response. In comparison, 85.7% of participants agreed or strongly agreed that the training will help improve others' ability to work effectively in a multi-agency response.

Table 6. One-Sample Wilcoxon Signed Rank test results from follow up questionnaire items: Part 1, Part 2

Question	z		Mdn		r	
	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2
I was able to easily follow the information provided in this training video.	4.50**	5.37**	5	4	.85	.88
I understood the information provided in this training video.	4.61**	5.44**	5	4	.87	.89
I found this training video helpful.	4.51**	5.08**	4	4	.85	.84
I like this training video.	4.51**	5.00**	4	4	.85	.82
I think that this training video has improved my knowledge on interoperability.	4.16**	4.88**	4	4	.79	.80
I think this training video will improve my skills in implementing an effective multi-agency response.	3.95**	5.15**	4	4	.75	.85
I think this training video will help improve others' ability to work effectively in a multi-agency response.	4.43**	5.48**	4	4	.84	.90
I think this training video is important.	4.51**	5.24**	4	4	.85	.86
I would recommend this training video to others.	4.69**	5.26**	5	4	.89	.86

Note. z = test statistic, Mdn = median, r = effect size ** $p < .01$

Qualitative survey data

This subsection is separated into three further sections: (i) improvements that can be made to the training, (ii) most useful aspects of training, and (iii) comparisons to other training. Twenty-five participants answered the qualitative questions. See Table 4 for an overview of results, plus illustrative quotes.

Improvements that can be made to the training. Five participants suggested that the training should include more visual elements, such as command videos, infographics, icons, and images to help emphasise points being made and make it more engaging. Four participants recommended the inclusion of more practical examples of how the information presented in the training could be implemented in real life. Two participants made suggestions for each of the following: providing the training to other response organizations wider than the blue-light services, making the training faster paced, standardising the training with other current training on interoperability, providing more examples from real-life incidents, and making the training more interactive. Finally, one participant recommended that the training should include more knowledge checks, and another recommended the tone of the language used in the training be changed and made more consistent, such as being more consistent with wording (e.g., "killed" vs. "died") and ensuring objectivity in statements made.

Most useful aspects of training. Seventeen participants said that the aspect of the training that they found the most useful was the inclusion of the psychology elements, with two further participants saying they found the combination of psychology and the practical applications arising from that the most useful. Reasons provided for why participants found the inclusion of psychology most useful included understanding why groups are likely to work together effectively, framing language from an emergency responder point of view rather than a single service point of view, and providing an evidence-based behind why JESIP principles exist and are important. Other aspects that participants found most useful were examples from real incidents (3 participants) and the way each focus point was broken down and elaborated on (1 participant).

Comparisons to other training. When compared to other training participants have taken part in, three participants said that the training provided in the current study was not as effective because the academic content made it hard for participants to stay engaged. One participant recommended that because of the trouble with engagement, the training should be combined with other training and presented as part of a blended training package. Compared to other training, four participants described the training as "okay" and "average," because it covered the same topics as other training. Ten participants described the training as good or very good and a further six described it as "useful", "clear", or "interesting". Accordingly, one participant described the training as "thought-provoking" and said it was much better than other training sessions they have attended because the "why does this matter to me" question was clearly illustrated.

Interview data

Within this section, participants' organization is provided alongside any relevant quote (P=Police, F=FRS, A=Ambulance). Overall, all participants said they liked the training, describing it as "good" (1xP, 3xF), "interesting" (1xF), "helpful" (1xA), "useful" (2xP), "relevant" (1xP), "necessary" (1xP), and "informative" (1xF). Yet, participants also provided several constructive comments to be taken into consideration in the development of the training. As such, this section is presented in relation to three key focus areas based on the thematic framework: (i) content, (ii) presentation, and (iii) audience and scope.

Content. This section is separated into two themes: (i) psychological theory and (ii) practical recommendations.

Psychological theory. Most participants (1xP, 2xF, 2xA) explicitly stated that they liked the psychology and science element of the training. Four participants said that they liked the psychological theory because it helped provide them with reasons and evidence of *why* they should follow JESIP and said this evidence-base was previously lacking, for example:

Every programme I've been on tells us the practical, this is what you should do [...] but no one has ever really explained the science [...] but now I understand that there is science behind it (P).

Yet, three participants expressed concern about some elements of the psychological theory that was presented in the training. One participant (F) said this training was more academic than other training they and emphasised the need to make it accessible to all potential receivers in terms of the language used and the content. One example this participant provided was around research terminology, for example "literature review" which assumes a certain level of understanding and knowledge and so should either be explained or removed from the training. Similarly, another participant advised using less academic language in the training to prevent creating "unhelpful barriers" when trying to engage responders. One participant (A) suggested providing links to research that is discussed to signpost recipients to where they can read more.

However, despite this, two participants who raised the concerns regarding the content said they would have liked to have seen more psychology included in the training (1xF, 1xA) because that was what was unique about the training. Similarly, another participant (A) said that the psychology in the training addressed "a gap in the market" in terms of interoperability training and they would have liked to have seen more psychology elements included.

Practical recommendations. The training was praised by participants for including examples from real incidents that demonstrate where interoperability is often challenged. One participant said this "set the scene" and "really highlights the importance of having joined up working" (F). Another participant said they liked the use of case studies to support the training:

You kind of hit both like opposite ends of the continuum in terms of how you justify what you're talking about, you've given the applied procedural case studies [...] the other end of the continuum is that when you talked about academic research (F).

However, five participants (1xP, 3xF, 1xA) described the training as refreshing or reinforcing their knowledge rather than learning any specific new actions for improving interoperability. Two participants (1xP, 1xA) said this was because they are already very familiar with, and immersed in JESIP, but the training would be useful for those who are not as familiar with JESIP (P). Furthermore, three participants critiqued the training for lacking practical recommendations for how they could implement the advice provided into their practice (2xP, 1xF). Yet, despite this, one participant said they had tried implementing some learning from the training into a recent exercise:

I was trying to use the word 'what's the emergency service response' to try and influence that mindset of the responder [...] rather than saying 'what's the police response' [...] which might ingrain the whole sole agency response, to say 'right what's the emergency service response, what's everyone planning on doing' to try and influence the need to speak to folk to get that answer to come back and hopefully by doing that will improve the coordination (P).

When asked if this participant noticed any differences in the response because of this altered terminology, they said that they got a slower response than they would usually get, but this was because people needed to speak to responders from other services to get the requested information:

You could say, in some sense, it kind of works because it forced the movement to co-locate and coordinate and hopefully in the future that will become more standard and natural reaction

rather than me dropping it on him (P).

Presentation. This section is separated into two themes: (i) format and (ii) delivery method.

Format. Four participants (1xP, 2xF, 1xA) said that they liked the format of the training. One participant (F) said that video format is preferable to a format where they must click through themselves. Another participant (A) said that whilst they like the idea of being able to progress through the training at their own pace, having the video format prevented them from moving through the training too quickly and not taking in what was said. Two participants specifically liked the narration of the video. One participant (F) said this facilitated learning through listening to what was being said rather than relying on reading the information, and another participant (P) said the narration was helpful for making the presentation easier to follow and understand.

In terms of the slides that were presented, most participants said that the number of slides was appropriate for the length of the training (1xF, 1xA) and that the right amount of information was provided on the slides (2xP, 1xF, 1xA). However, one participant (F) said that the training was too long for the amount of information that was provided.

There were mixed opinions amongst participants on the visual layout of the slides with some participants liking the visual layout, whereas one participant said that they would have liked more variety in the graphics on the slides and the way that information was presented:

I thought [the graphics] were a bit simplistic in places [...] it was a bit PowerPoint [...] just in terms of like, reveal bullet one, bullet two, or three, or four, just erm if there's another way of livening that up essentially (A).

Finally, two participants (P, F) said they did not like the parts of the training where participants were asked to pause the video and think about how they would respond. Participants said that this made them feel isolated (1xP) and distracted them from the training (1xF). Instead, one participant (F) said they would have preferred to have regular case study examples provided rather than the 'stop and think' exercises.

Delivery method. Nearly all participants agreed that their preferred delivery method for the training would be in-person. Reasons provided for this method ranged from providing networking (1xF), collaboration (1xP, 1xF), and shared learning (1xP) opportunities as well as being better able to maintain training recipient's attention (2xF):

If somebody watching has a question that isn't immediately answered, it's a great opportunity for them to switch off like 'I don't understand this I'm done', which is why it's obviously always better to do it in person (F).

However, one participant (F) caveated the preference for an in-person delivery method by saying that the training must be delivered by someone who is competent and knowledgeable in the area due to the psychological concepts the training introduces. In the absence of a competent presenter, this participant said a robust standalone training video would be preferable. Furthermore, one participant said the online video was valuable to them and therefore is likely to be valuable to others too, describing the e-learning style as a "quick win," therefore did not express a preference in an in-person delivery (A).

Three participants (2xF, 1xA) said ideally the training would be a combination of in-person and online video delivery to ensure learning is consolidated and that people have regular opportunities to engage with it. Two of these participants (2xF) said that the in-person delivery of the training should be first, followed by the online training video. Another participant (F) said that the online training video should be first followed by the opportunity to consolidate the learning in-person.

Yet, regardless of the delivery method, two participants (1xF, 1xA) expressed concern about competing work pressures preventing opportunities to complete the training, even though they recognised the importance of the training:

The roadblock that you will come up against is the same as for everything else, unless it's a statutory requirement, or it's some kind of mandatory requirement placed on them [...] trying to get people to leave their day jobs for 20 minutes to watch a video is a massive challenge [...] so there's competing pressures all the time (A).

Audience and scope. This section is separated into two key areas: (i) level of command, and (ii) response agencies.

Level of command. There was disagreement among participants about what level the training should be aimed at. Two participants (F, A) said that the training should be provided to people as early in their careers as possible to expose them to the psychology processes behind interoperability. Another participant (A) said not providing this information to people at lower levels or earlier in their careers could cause problems:

At what point in somebody's training do we expose them to JESIP principles? My feel is that we, we don't give them enough of it early on er and that sets them up for potential issues sort of later on in their career [...] I think your video will be really positive to show people when they're going through that operational command level er and getting that training with a view to then building them up towards the tactical or even strategic command later on (A).

In comparison, one participant said the training would be more useful at a strategic and tactical level than operational due to the content of the training being more closely aligned with what they would expect to see at those levels (F).

Yet, it was not just command level that was discussed by participants, one participant (F) said that this training should be embedded at the pre-planning stage of an incident:

Understanding and developing the idea of 'us' [...] needs to be considered at the stage [...] where we're writing our standard operating procedures, we're writing our policy, erm and we're developing our training material, because that's where we need to start embedding it, and then that that extends further across [...] informing culture, if we can shift it beforehand [...] then when we get to a response we've already got that there (F).

One participant (P) suggested that the training should also be provided to control room staff. This participant said due to the difficulty achieving co-location with control room staff, it is important to be

able to develop a sense of shared sense of identity in those situations. Due to the role control room staff have in the initial coordination of an incident, this participant said if the benefits of a shared social identity can start happening in the control room, then it can positively influence the operational crews on the ground:

At the moment, it's disjointed [sic], which means your first responders generally are turning up [...] aren't thinking 'I need to think multi-agency', they're turning up as 'I'm a police responder', 'I'm a fire responder' [...] it relies then on me [...] as a tactical commander sitting there screaming on the radio saying for God's sake think JESIP, where are you going, what, where's the command point? Someone talk to each other, please. That could be 10, 20 minutes into it [...] well we may have already missed opportunities, I just think if we'd not just done this far more earlier, got things moving quicker (P).

Responding agencies. Two participants (2xF) said that whilst the training is valuable, it may be better received by responders if separate tailored training was provided for Police, FRS, and Ambulance Services. One participant (F) acknowledged that the purpose of the training was to widen the sense of 'us' between the emergency services but said that more "generic" training packages tend to be less accepted by responders compared to more bespoke, agency-specific training. Another participant (F) said that service-specific training would be beneficial due to the different experiences and "culture" that each emergency service has.

In addition to discussions on how the training would be presented to the blue-light emergency services, one participant (F) also emphasised the importance of the training being made available to response organizations outside of the three blue-light services. In line with this, another participant (F) said that the training should be rolled out to everybody who might work with somebody from another response organization.

Part 2 - in-person delivery

This section is separated into two subsections: quantitative and qualitative survey data.

Quantitative survey data

There was a significant difference in participants' confidence to be able to effectively work in a multi-agency team, with participants' reporting higher agreement scores to the question 'I am confident that I can effectively work in a multi-agency team' after completing the training ($M=4.16$, $SD=.44$) compared to before ($M=3.97$, $SD=.44$), $z=2.65$, $p<.01$, $r=.44$. A significant difference was also found in participants' knowledge of actions they could take to facilitate an effective multi-agency response when expressing agreement to this statement before completing the training ($M=3.92$, $SD=.55$) compared to after ($M=4.19$, $SD=.52$), $z=3.16$, $p<.01$, $r=.53$.

No significant differences were found in participants' perceived ability to work effectively in a multi-agency team before completing the training ($M=4.03$, $SD=.44$) compared to after ($M=4.08$, $SD=.43$), $z=1.00$, $p=.32$, $r=.32$, or in perceptions of the importance of working with responders from other services before completing the training ($M=4.84$, $SD=.37$), compared to after ($M=4.73$, $SD=.45$), $z=-1.41$, $p=.16$, $r=-.23$.

All questions in this section were significantly higher than the mid-point value of 3 (see Table 6 for One-Sample Wilcoxon Signed Rank tests). Over 90% of participants agreed or strongly agreed that they were able to easily follow the information provided in the training, they understood the information provided in the training, they think this training would help improve others' skills at implementing an effective multi-agency response, the training is important, and they would recommend the training to others. Over 80% of participants agreed or strongly agreed that they found the training helpful, they liked the training, they thought the training improved their knowledge on interoperability, and the training will improve their skills in implementing an effective multi-agency response.

Qualitative survey data

Like Part 1, this subsection is separated into three further sections: (i) improvements that can be made to the training, (ii) most useful aspects of training, and (iii) comparisons to other training. Thirteen participants answered the qualitative questions. See Table 4 for an overview of results, plus illustrative quotes.

Improvements that can be made to the training video. Three participants recommended making the presentation more engaging ("less white-board based"; "quite PowerPoint heavy"). Four participants recommended the length of the training be increased to allow for more information to be discussed and more opportunities for interaction. One participant recommended that the training should be delivered at a multi-agency event to provide interaction opportunities with other services. Finally, one participant recommended the provision of handouts to supplement the information provided during the training.

Most useful aspects of training. Three participants said that the most useful aspect of the training was the psychology, with two participants saying that they found learning about the psychological impact of JESIP most useful. Seven participants specifically mentioned that learning about how groups work together was the most part. Finally, two participants said that the psychological elements of the training provided them with a new perspective to understand interoperability that they had not considered before.

Comparisons to other training. Participants said that in comparison to other training this training was "great" (N=2), "really interesting" (N=2), "useful" (N=2), "beneficial" (N=1), and "relevant" (N=1). One participant said because it was delivered as part of a wider training day, it fitted in with the other topics discussed throughout the day. One participant said that in comparison to other training, they liked this training because they thought it was important to have psychologically informed education included in command training. Although, one participant said that overall the training was useful, but it needed "polishing".

Discussion

In this paper, we presented a service evaluation of a training tool we developed based on the application of the Social Identity Approach to interoperability in the emergency services. The purpose of the training is to facilitate the ability of emergency responders from separate response organizations to work together in a multiteam system (MTS). The purpose of the evaluation was to support in the ongoing development of the training tool by receiving feedback from responders on how it could be improved, but also to understand whether responders think further training on interoperability is needed, and whether specific training on interoperability using psychology could improve responders' ability to work together. The discussion is separated by these three aims.

Participant's perceptions on the training, and how it can be improved

Nearly all participants said that the information provided in the training was easy to follow and understand, both in the online video delivery and in the in-person delivery. Yet, there were still several areas of improvement identified by participants, for example: improved visual graphics, more interactive elements, and provision of collaboration opportunities. The preferred delivery method for the training was in-person. However, the value of having an online video version of the training to supplement the in-person delivery method was recognised by participants.

In terms of the content, participants in both delivery methods liked the psychological elements. However, some participants in the online delivery thought the training was too academic. Feedback on how the academic content could be made more accessible to the practitioner audience included using less academic language (e.g., literature reviews), and the provision of links to academic work to allow for further reading in the area if wanted. Interestingly, this was not mentioned in the in-person delivery, perhaps due to the ability for participants to ask questions throughout the training.

Finally, in terms of audience and scope, participants in the online delivery suggested providing the training to response organizations wider than just the three blue-light services, having separate training for each emergency service, and providing training to control room staff and those involved in pre-planning.

Is further training on interoperability needed?

Most participants both in the online and in-person delivery said the training was important and that they would recommend it to others. This suggests that participants recognised that there is a need for further training on interoperability. This is in line with the findings from multiple incident inquiries and reviews (e.g., Saunders 2022a; Moore-Bick, 2019; Pollock, 2013) that suggest that despite the identification previously of persistent challenges of interoperability, the same challenges persist across incidents. Indeed, Coles (2014) highlighted that there is a clear separation between the lessons that are routinely identified from incidents and exercises, and the conversion of this into learning (see also Pollock & Coles, 2021). As such, Coles (2014) recommended that there needs to be a better understanding of how ad-hoc multi-agency teams interact in an effective way. Therefore, taking together the findings from the current evaluation that participants thought the training was important and they would recommend it to others, alongside the re-occurring challenges with interoperability it is evident that there is a need for further training on interoperability to improve multi-agency working.

Can interoperability training using psychology improve multi-agency working?

After completing the training, participants' confidence working in a multi-agency team increased, both in the online and in-person delivery. Interestingly, in the online delivery participant's perceptions of their ability to work in a multi-agency team increased, but their knowledge of actions they could take to implement an effective multi-agency response did not. When explored further in the interviews, as discussed above, participants said they did not necessarily learn any new skills or actions to improve interoperability. Instead, participants said that the training reinforced skills or actions they already knew. But, what participants learned that they did not already know was the psychology behind interoperability and the reasons *why* certain actions are important and *how* they can facilitate interoperability. Indeed, a recent review by Power and colleagues stated that the consideration of the psychological processes of *how* interoperability can be better embedded into response organizations are just as, if not more, important than the practical arrangements prioritised by JESIP (Power et al., 2023). This is in line with recent research that has highlighted the importance of considering psychological processes, more specifically, social identity processes, to better understand *why* challenges with interoperability continue to persist and *how* social identity processes can help improve interoperability (Davidson et al., 2022a, 2022b, 2023) - the findings of which were incorporated into the current training.

Whilst most participants who took part in the on-line delivery said they thought the training would help improve others' ability to implement an effective multi-agency response, fewer said they thought it would improve their own ability to implement an effective multi-agency response. Exploring this further, nearly all participants reported being 'very' or 'extremely' familiar with JESIP prior to taking part in the evaluation; therefore, the participants were likely to already be familiar with interoperability. However, participants both in the open-ended survey questions and in the interviews said a lack of practical recommendations were included in the training. Therefore, the inclusion of more practical recommendations in the training relating to the psychological elements could potentially increase responders' knowledge of actions they could take to implement an effective multi-agency response. Interestingly, for participants who took part in the in-person delivery, the difference between their perceptions of the training improving their own ability at implementing an effective multi-agency response compared to others' ability was smaller. Whilst the reason for this difference is unable to be discerned, the in-person delivery of the training provided several opportunities for discussions among participants throughout the training, therefore perhaps providing more opportunities for participants to reflect on their own experiences and abilities.

Furthermore, participants in the interviews said the training lacked specific practical examples of *how* they could implement the psychological knowledge they had learned into practice. This is in line with a recent review that found little evidence-based research that describes *how* to implement psychological principles into training (Power et al., 2023; see also Coles, 2014 who identified a constant focus in training on 'what', rather than 'how' to learn). Therefore, this highlights the need for further developments of the training presented in this paper to include specific practical recommendations on actions responders can take to implement key psychological processes, specifically the embedding of a shared identity into their multi-agency response. Otherwise, the training risks experiencing the same challenges that have been seen previously in terms of failing to provide details on *how* to implement psychological principles into practice.

Yet, participants' knowledge on actions they could take to improve multi-agency working during the in-person delivery did increase after taking part in the training. Whilst the qualitative data does not provide insight into this difference, it could be due to opportunities to discuss potential actions with each other in the in-person delivery.

Whilst further empirical evidence is needed to determine whether interoperability training using psychology can improve multi-agency working in practice, the results from this training evaluation suggests that interoperability training using psychology can improve responders' *perceptions* of multi-agency working. This, this training presents a positive step forward for understanding and improve the inter-organizational collaborations within these emergency response MTSSs.

Next steps

Based on the findings of the current evaluation of the training tool, the research team plans to update the training tool from the feedback received. Two versions of the tool will be created, one for an in-person delivery and one for an online delivery. For both versions, the research team plans to visually update the training by including a greater variety of graphics in the training to make the training more engaging, visual, and eye-catching. In addition, the research team plans to consider the interactive elements of the training. For the in-person version, regular discussion points will be included in the training which will not only help to consolidate the learning but also provide a valuable opportunity for inter-agency discussions. For the online delivery, interactive elements with the training will be developed to ensure participants remain engaged and learning can be consolidated. Specifically, for the online delivery version, the research team will work with the UK Health Security Agency to develop an e-learning package containing the training material. For both versions, the research team will carefully consider the use of language, ensuring any complex academic terms are either withdrawn from the training, or fully explained. To support this, a separate learning aid will be developed that will summarise the information provided in the training, and signpost participants to further reading, should they wish. This learning aid will take the form either as a handout for in-person deliveries, or as a downloadable pdf for online delivery. Finally, the research

team will work to ensure that concrete practical actions for *how* the psychological processes discussed in the training can be delivered in responder's own work.

Strengths and limitations

The training developed and evaluated in this paper incorporates psychological processes, specifically the Social Identity Approach, into interoperability training. Given the recent research focussed on the psychology of interoperability (e.g., Davidson et al., 2022a; 2022b; 2023; Power et al., 2023), the current evaluation is an important step forwards in response to incident inquiries that highlight the persistent interoperability challenges emergency responders face during a multi-agency response (e.g., Saunders 2022a; Moore-Bick, 2019). However, there are several limitations to the evaluation that need to be addressed.

First, only participants from the blue-light services (Police, FRS, and Ambulance) were used to evaluate the training, whereas in a real incident, responders from organizations far wider than the blue light services (e.g., local authorities, the NHS, the Highways Agency) would typically be involved (Cabinet Office, 2013). This lack of inclusion of responders wider than the blue-light services is a gap not just in the current service evaluation, but also in previous research applying social identity processes to interoperability (Davidson et al., 2022a; 2022b; 2023). The exception to this is Radburn and colleagues who conducted a case study analysis of the civil contingency response to COVID-19, seeking to better understand the group processes that took place (Radburn et al., 2022). However, Radburn et al.'s (2022) findings are in line with the findings by Davidson et al. (2022a) who looked at the multi-agency response to COVID-19 from a blue-light perspective. In addition, albeit without a psychological focus, Hill et al. (2021) identified similar challenges to those identified by Davidson et al. (2022a) and Radburn et al. (2022), suggesting the potential applicability of the training to responders wider than the blue-light services. Thus, it would be useful for future developments of the current training video to incorporate other response organizations too, although further research would be valuable to clarify this.

Second, the evaluation overcame some of the challenges experienced in previous research looking at shared identity and interoperability by including a good spread of participants from the Police, FRS, and Ambulance Services. However, nearly all the participants in the current evaluation reported being either 'very' or 'extremely' familiar with JESIP. In addition, results showed that participants' perceptions of the importance of working with responders from other services was very high before participants took part in the training. Therefore, participants already had an in-depth understanding of interoperability and its importance prior to taking part in the evaluation and thus they may be more receptive to this kind of training than those who do not have as much experience or knowledge of interoperability. As such, the findings from the evaluation may not be fully generalisable to the wider responder population. Furthermore, it is well documented that operational commitments can interfere with responders' ability to attend and engage with training, for example, due to high operational demand, ambulance workers often do not have opportunities to engage in multi-agency training and opportunities are limited to more specialist responders (Tovey et al., 2018), which is in line with the sample in the current evaluation. Therefore, it would be useful for future evaluations and research to incorporate responders with a wider range of interoperability knowledge. However, this also highlights the importance of organizations making interoperability training a priority and giving responders the time to engage with it.

Finally, whilst a psychological understanding of interoperability is needed to better understand why challenges in multi-agency working persist, and what can be done to prevent them re-occurring in the future, it is not the only answer to improving interoperability because interoperability encompasses a wide range of factors. One example of other factors that can interfere with interoperability is technical communication systems – in the Manchester Arena attack a multi-agency talk group was available for responders from different services to communicate on; however, it was not used (Saunders et al., 2022a). Technology challenges were also present in the London bombings in July 2005, whereby communication between the emergency services was restricted due to limited coverage of their radio systems in the underground tunnels (Hallett, 2011). Therefore, whilst the current evaluation demonstrates the benefits of training on the psychology of interoperability, psychology should not be seen as the only solution to interoperability and other factors should be considered when seeking to better understand interoperability.

Conclusion

This paper presents a service evaluation of a training tool that was developed by the research team to improve inter-organizational collaborations between emergency response organizations. Specifically, the training aims to use psychology to improve interoperability within multi-agency multiteam systems. Overall, whilst participants liked the training, several areas of improvement were identified that should be considered in the future development of the training, such as making the training more visual, including more practical recommendations of *how* responders can implement social identity processes into their work, and ensuring that the academic content is balanced with accessibility for practitioners. Furthermore, findings from the evaluation indicate that a perception among responders that further training to improve interoperability is needed and that the training presented in this paper addresses a key gap in their knowledge on interoperability in terms of understanding the psychological processes of social identity that can facilitate interoperability. As such, the service evaluation of the training presented in the current paper represents an important step forward in terms of our understanding of the psychology of interoperability and what can be done to improve it. Indeed, this evaluation enables the training to be further developed to ensure it is as useful and effective as possible, something which the authors plan to do in the future.

Practitioner points

- The training evaluated in the current paper was rated positively by participants and was something they said they would recommend to others as being important, albeit with suggestions to improve. Therefore, further developments of this training should be prioritised and incorporated into current interoperability training programmes for UK emergency responders.
- The development of future training for interoperability should emphasise and explicitly outline the practical recommendations for actions responders can take to improve and embed effective interoperability in their multi-agency responses.
- Understanding interoperability through a psychological perspective can improve responders' perceptions of joint working, through allowing them to understand *how* certain actions can facilitate interoperability, thus providing rationale for *why* they should follow those actions.

Ethical considerations

As a training delivery service evaluation, the work was not considered research and therefore did not require research ethics approval. However, ethical considerations were considered by providing participants with an information sheet explaining the purpose of the evaluation and they were asked to consent to take part in the evaluation. All data was stored in compliance with GDPR regulations.

Data availability statement

The data that supports this evaluation are not publicly available due to the paper presenting a service evaluation and not research.

Conflicts of interest

The authors have no conflicts of interest to declare.

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