eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk/

Psychological screening of adults and young people following the Manchester Arena incident

Paul French, Alan Barrett, Kate Allsopp, Richard Williams, Chris R. Brewin, Daniel Hind, Rebecca Sutton, John Stancombe and Prathiba Chitsabesan

Background

Terrorist attacks have increased globally since the late 1990s with clear evidence of psychological distress across both adults and children and young people (CYP). After the Manchester Arena terrorist attack, the Resilience Hub was established to identify people in need of psychological and psychosocial support.

Aims

To examine the severity of symptoms and impact of the programme.

Method

The hub offers outreach, screening, clinical telephone triage and facilitation to access evidenced treatments. People were screened for trauma, depression, generalised anxiety and functioning who registered at 3, 6 and 9 months post-incident. Baseline scores were compared between screening groups (first screen at 3, 6 or 9 months) in each cohort (adult, CYP), and within groups to compare scores at 9 months.

Results

There were significant differences in adults' baseline scores across screening groups on trauma, depression, anxiety and functioning. There were significant differences in the baseline scores of CYP across screening groups on trauma, depression, generalised anxiety and separation anxiety. Paired samples *t*-tests demonstrated significant differences between baseline and follow-up scores on all measures for adults in the 3-month screening group, and only depression and functioning measures for adults in the 6-month screening group. Data about CYP in the 3-month screening group, demonstrated significant differences between baseline and follow-up scores on trauma, generalised anxiety and separation anxiety.

Conclusions

These findings suggest people who register earlier are less symptomatic and demonstrate greater improvement across a range of psychological measures. Further longitudinal research is necessary to understand changes over time.

Mental health impact of terrorist attacks

The number of transnational terrorist attacks resulting in casualties has increased globally since the late 1990s.[1] A summary of the psychosocial and mental health impact and an approach to designing community-oriented responses are provided by recent publications.[2–4] Those people physically present at an attack have a 33–39% chance of developing post-traumatic stress disorder (PTSD) within 1 year, with 17–29% of those close to people killed and injured, 5–6% of emergency and recovery workers and 4% of local communities similarly affected.[5] Children are particularly at risk.[6] In some analyses, the economic burden of mental healthcare almost equals the medical costs,[7] with evidence of considerable unmet need.[8]

The Manchester Arena bombing

On 22 May 2017, a suicide bomber detonated an improvised explosive device in the foyer of the Manchester Arena after a concert, killing 22 people and himself, and physically injuring 239 children and adults. Definitive numbers for those present at the Arena attack are unclear, but with the inclusion of staff (and first responders) it is estimated at 19 500.

The Manchester Resilience Hub ('the hub') was established in the immediate aftermath of the incident to manage the psychosocial impact of the event, including trauma responses shortly after the incident, and those that emerged over time. The hub uses a proactive outreach model,[9] taking a stepped-care approach (universal, targeted and specialist), allowing a flexible response to meet the differing needs of groups and individuals, and adapt personal treatment pathways accordingly.[10,11] Assessment of clinical need or clinical triage[12,13] is made with the help of an online screening tool, supplemented by telephone contact from a hub clinician.

Longitudinal follow-up and trajectories of recovery

A small number of studies has looked at the medium- to long-term trajectories of people's stress levels over time following mass casualty incidents such as terror attacks.[14] However, longer-term studies have been initiated in recent years. A review of these studies examines outcome trajectories following several different stressors, including divorce, death of a loved one and disasters, finding strikingly similar trajectories following each.[15] Based on this review, Bonanno and colleagues[15] outline four of the most common patterns of trajectory, adapted here as follows.

(a) Resilient response: depending on the nature of events, most people are psychosocially resilient. They experience usually mild distress that reduces in severity over time.

(b) Recovery: some people experience distress of moderate or greater severity initially and then recover over time.

(c) Delayed onset: some people experience little distress initially but have a delayed onset of symptoms.

(d) Chronic course: some people may have high levels of stress after events (at above a level that is consistent with a psychiatric diagnosis). The symptoms, signs and dysfunction remain high with only minor evidence of remission.

There are variations in these trajectories across the literature. Bryant and colleagues[16] for example, have conducted a large long-term study of distress over 6 years following traumatic injury, identifying an additional 'worsening/recovery' trajectory, in which patients worsened over time but later recovered. One study compared survivors of natural disaster with survivors of the 9/11 attack in New York City, finding that only the 9/11 survivors showed delayed dysfunction.[14] Another recent study indicated different trajectories for professional groups involved in the 9/11 attack, such as rescue/recovery workers.[17] Nevertheless, consistent across these studies is the high proportion of resilient survivors (up to 75%), as well as the significant dysfunction and long-term impact upon the minority who experience severe and, at times, prolonged distress. Little information is available about the course of disorder in children and young people (CYP).

Aims of this study

Our aims were to examine the severity of symptoms experienced by CYP and by adults within the first year following the Manchester Arena incident on 22 May 2017, and the potential impact of the proactive outreach screen-and-refer programme implemented by the Manchester Resilience Hub.

Method

Study design

The design is a cohort study of data from screening questionnaires completed online by people who were affected by the Manchester Arena terror attack who registered with the Manchester Resilience Hub before 10 May 2018. Anyone registered with the hub who completed the online screen questionnaires at least once was eligible for inclusion. New people are registering each month; however, at the point of data extraction for this study, at the end of the 9-month screening window, 3150 people were registered with the hub. They included: 380 children between the ages of 8 and 13 years; 386 adolescents between the ages of 14 and 15 years; and 2384 adults aged 16 or over. At the point of data extraction, the hub was supporting around 16.2% of those present at the attack, including people from ages 8 to 75. As a result of the nature of the incident and the innovative response, an evaluation strategy was agreed with the Manchester Health and Social Care Partnership. This paper supports one aspect of that evaluation strategy and as it was conducted as a service evaluation using routinely collected data, ethical approval and patient consent was not sought.

Procedure

This analysis compares data across and within groups of people who registered with the hub within the first year following the attack. Everyone completed the online screening measures at the point of registration with the hub. Following registration, hub clients were sent invitations to re-complete the online screening at 3-month intervals up until 12 months post-incident. For the purposes of this analysis, they were grouped according to the screening window within which they first registered with the hub. The dates of the screening windows are as follows.

(a) 3 months: from 3 months post-incident (9 September 2017) up until 6 months post-incident (20 November 2017).
(b) 6 months: 21 November 2017 to 15 February 2018.
(c) 9 months: 16 February 2018 to 10 May 2018.

For example, any individual who registered with the hub between 21 November 2017 and 15 February 2018 is assigned as 'first screen at 6 months'.

Measures

Screening measures were chosen for sensitivity in adults and CYP, with the age cut-off between the two as 16 years. The Trauma Screening Questionnaire (TSQ)[18] was used with adults, alongside measures of anxiety (Generalised Anxiety Disorder 7, GAD-7[19]), depression (Patient Health Questionnaire, PHQ-9[20]) and functioning (Work and Social Adjustment Scale, WSAS[21]). The Children's Impact of Event scale (CRIES-8[22]) was used with the CYP population alongside specific subscales of the Revised Children's Anxiety and Depression Scale (RCADS),[23] which were chosen for clinical relevance (depression, generalised anxiety disorder and separation anxiety). The parental version of the RCADS (RCADS-P) was used to acquire parental reports of youth's experiences of generalised anxiety and separation anxiety.

Bias

Although proactive outreach was used, there is, nevertheless, risk of bias concerning the self-selection of participants, which may skew data in terms of the characteristics of people who were likely to register with the hub initially, and also of those who choose to take up the invitation to re-complete the screening measures at follow-up.

Statistical analyses

All analyses were performed in SPSS (version 21), with a simple bootstrap on 1000 samples utilising the bias corrected and accelerated bootstrapping method (Bca) to obtain more robust standard errors and confidence intervals.[24] Baseline scores (initial screening scores) were compared across three screening groups (first screen at 3 months, first screen at 6 months, first screen at 9 months) in each cohort (adult, CYP) using one-way independent analysis of variance (ANOVA) to explore group differences. *Post hoc* evaluations of significant ANOVA results were performed using Bonferroni procedure to correct for multiple comparisons and control for type 1 error.[25]

To explore participant-level effects, paired samples *t*-tests were performed to compare baseline data with follow-up data provided 9 months post-incident. As participants who registered within the 9-month screening window had only provided baseline data, it was not possible to explore participant-level changes for this screening group. Therefore, within-participant analyses were performed for the 3-month and 6-month screening groups only. Participants who registered at 3 months had a 6-month duration of follow-up, whereas participants who registered at 6 months had a 3-month duration of follow-up.

Results

The vast majority of people registered with the hub immediately after the incident although there have been new registrants at each follow-up time point over the course of the year after the incident. The proportions of adults and CYP with clinically significant scores in each screening group, at baseline and at 9-month follow-up, are shown in Tables 1 and 2. Very high levels of distress are seen for both adults and CYP following the incident.

The proportion of individuals with clinically significant scores is large compared with estimates that around 30% of adults and CYP will develop PTSD after exposure to life-threatening events.[27,28] However, similarly high TSQ scores have been observed for adults

Table 1 Proportion of adults at baseline and 9-month follow-up with clinically significant questionnaire scores

Adults	% First screen at 3 months	First screen at 6 months	First screen at 9 months
Baseline			
PHQ-9 ≥10	34.50 (n = 1740)	50.00 (n = 256)	49.80 (n = 225)
GAD-7 ≥10	36.60 (n = 1735)	49.80 (n = 255)	55.80 (n = 224)
WSAS ≥11	41.50 (n = 1486)	61.20 (n = 227)	58.40 (n = 202)
TSQ ≥6	51.10 (n = 1697)	67.50 (n = 252)	68.20 (n = 217)
9-month follow-up			
PHQ-9 ≥10	27.80 (n = 623)	44.40 (n = 117)	NA
GAD-7 ≥10	27.50 (n = 618)	43.50 (n = 115)	NA
WSAS ≥11	35.80 (n = 466)	57.10 (n = 105)	NA
TSQ ≥6	40.20 (n = 580)	66.10 (n = 115)	NA

NA, not applicable.
Patient Health Questionnaire (PHQ-9) % with scores of ≥10, indicating moderate to severe depression; Generalised Anxiety Disorder (GAD-7) % with scores of ≥10, indicating moderate to severe anxiety; Work and Social Adjustment Scale (WSAS) % with scores of ≥11, indicating significant to severe functional impairment; Trauma Screening Questionnaire (TSQ) % with scores of ≥6, indicating possible post-traumatic stress disorder.

following other recent events, such as the Grenfell Tower fire (London, 2017), where 67% of adults were found to have clinically significant scores on the TSQ.[29] This figure is comparable with adults in Manchester registering at 6 and 9 months post-incident. The percentage of CYP with clinically significant scores is particularly high for the CRIES trauma scale. The Manchester Arena attack involved unusually high numbers of CYP for an incident of this kind, and as such there is more limited literature available for CYP. Following the Omagh bomb (Northern Ireland, 1998), 47% of young people (aged between 0 and 18 years) were assessed as meeting the criteria for PTSD,[28] with those aged between 8 and 13 years particularly at risk. After the Utøya Island terrorist attack (Norway, 2011), 47% of young people (average age 19.4 years) met criteria for full or partial PTSD, with this figure rising to between 60 and 62% for those who were moderately to severely injured.[29] The statistical analyses of the differences between and within groups is presented in the following sections.

Table 2 Proportion of children and young people (CYP) at baseline and 9-month follow-up with clinically significant questionnaire scores

CYP	% First screen at 3 months	First screen at 6 months	First screen at 9 months
Baseline			
CRIES-8	84.20 (n = 323)	82.90 (n = 105)	92.90 (n = 70)
RCADS Depression	13.00 (n = 323)	21.00 (n = 105)	17.40 (n = 69)
RCADS GAD	19.90 (n = 322)	23.10 (n = 104)	35.30 (n = 68)
RCADS Parent GAD	35.00 (n = 297)	44.10 (n = 102)	50.80 (n = 63)
RCADS Parent separation anxiety	33.70 (n = 303)	52.90 (n = 102)	45.20 (n = 62)
9-month follow-up			
CRIES-8	65.09 (n = 106)	76.92 (n = 39)	NA
RCADS Depression	7.55 (n = 106)	26.32 (n = 38)	NA
RCADS GAD	9.43 (n = 106)	23.68 (n = 38)	NA
RCADS Parent GAD	17.82 (n = 101)	50.00 (n = 63)	NA
RCADS Parent separation anxiety	26.00 (n = 100)	54.29 (n = 61)	NA

GAD, generalised anxiety disorder; NA, not applicable.
Children's Impact of Event scale (CRIES-8) % with scores of 17 or more. Each Revised Children's Anxiety and Depression Scale (RCADS) scale scored according to child's age and gender and converted into standardised T-scores. % with T-scores of 70 or higher, which indicate scores above the clinical threshold.[26]

Primary analyses

Baseline (initial screen) comparisons

Adults. There were significant differences in adults' baseline scores across screening groups on the TSQ, PHQ-9, GAD-7 and WSAS, representing small effect sizes (Table 3). Bonferroni *post hoc* analyses revealed that adults who were first screened 3 months post-incident reported significantly less post-traumatic stress than those first screened 6 months post-incident (s.e. = 0.19, P<0.001, Bca 95% CI −1.36 to −0.63) and 9 months post-incident (s.e. = 0.20, P<0.001, Bca 95% CI −1.63 to −0.84). The severity of depression reported by adults at baseline was significantly milder among those first screened at 3 months than those first screened at 6 months (s.e. = 0.48, P<0.001, BCa 95% CI −3.44 to −1.49) and 9 months (s.e. = 0.52, P<0.001, Bca 95% CI −3.7 to −1.71). Likewise, baseline reports of generalised anxiety were significantly milder among those first screened at 3 months compared with those first screened at 6 months (s.e. = 0.42, P<0.001, Bca 95% CI −2.82 to −1.04) and 9 months (s.e. = 0.48, P<0.001, Bca 95% CI −3.43 to −1.33). There was also significantly less functional impairment at baseline for the 3-month screening group compared with the 6-month screening group (s.e. = 0.69, P<0.001, Bca 95% CI −6.58 to −3.85) and the 9-month screening group (s.e. = 0.74, P<0.001, Bca 95% CI −6.12 to −3.08).

CYP. There were significant differences among the CYP cohort in baseline scores across screening groups on the CRIES-8, RCADS depression, RCADS GAD, RCADS-P GAD and RCADS-P separation anxiety, which represented small effect sizes (Table 3). Bonferroni *post hoc* analyses revealed those first screened at 3 months reported significantly less post-traumatic stress at baseline than those first screened at 9 months (s.e. = 1.03, P<0.05, Bca 95% CI −5.42 to −1.13), however they did not significantly differ from those first screened at 6 months (P>0.05). Baseline reports of depression were significantly milder for those first screened at 3 months compared with the 6-month screening group (s.e. = 0.78, P<0.01, Bca 95% CI −3.92 to −0.82) and the 9-month screening group (s.e. = 0.75, P<0.01, Bca 95% CI −4.19 to −1.46). Bonferroni *post hoc* analyses revealed no significant differences in CYP who self-reported generalised anxiety at baseline across screening groups (P>0.05). However, baseline parental reports of adolescents' generalised anxiety was significantly milder among the 3-month screening group than the 9-month screening group (s.e. = 0.66, P<0.05, Bca 95% CI −3.06 to −0.38), but did not significantly differ from the 6-month screening group (P>0.05). At baseline, parents in the 3-month screening group also reported significantly less separation anxiety among adolescents compared with those first screened at 6 months (s.e. = 0.63, P<0.01, Bca 95% CI −3.32 to −0.58) but they did not differ significantly from reports from the 9-month screening group (P>0.05).

Participant-level effects

Adults. There were significant differences between baseline and 9-month follow-up scores for adults in the 3-month screening group on the TSQ, PHQ-9, GAD-7 and WSAS, P<0.05 (Table 4). On average, less post-traumatic stress was reported by adults at follow-up compared with baseline. The mean difference −0.76 (Bca 95% CI 0.57–0.94) was significant (P = 0.001) and represented a small effect size d = 0.26. Adults' reports of depression at follow-up were milder compared with baseline reports. This difference 1.2 (Bca 95% CI 0.76–1.66) was significant (P = 0.001), with a small effect size d = 0.18.

There was a reduction in severity of generalised anxiety between baseline and follow-up. The mean difference, 1.32 (Bca 95% CI 0.94–1.68), was significant (P = 0.001) and revealed a small effect

Table 3 Baseline comparisons across screening groups for adults and children and young people (CYP)

Cohort	n	First screen at 3 months, mean (s.d.)	n	First screen at 6 months, mean (s.d.)	n	First screen at 9 months, mean (s.d.)	F (d.f.)	P	r
Adult									
PHQ-9 baseline	1740	7.83 (6.77)	256	10.32 (7.04)	225	10.48 (7.31)	26.37 (2, 2218)	<0.001***	0.15
GAD-7 baseline	1738	8.14 (6.19)	255	10.07 (6.32)	224	10.59 (6.48)	23.21 (2, 2214)	<0.001***	0.14
WSAS baseline	1718	9.52 (8.7)	245	14.75 (10.33)	213	14.12 (10.28)	53.91 (2, 2173)	<0.001***	0.22
TSQ baseline	1697	5.53 (2.86)	252	6.54 (2.73)	217	6.77 (2.71)	28.82 (2, 2163)	<0.001***	0.16
CYP									
CRIES-8 baseline	323	25.71 (9.14)	105	26.25 (9.59)	70	28.91 (7.10)	3.66 (2, 495)	0.03*	0.12
RCADS Depression baseline	323	7.56 (6.06)	104	9.88 (6.60)	69	10.38 (5.66)	9.64 (2, 493)	<0.001***	0.19
RCADS GAD baseline	322	9.21 (4.67)	104	9.92 (4.93)	68	10.71 (4.89)	3.13 (2, 491)	0.05*	0.11
RCADS-P GAD baseline	291	7.58 (4.54)	102	8.69 (4.46)	63	9.32 (4.86)	4.95 (2, 453)	0.01**	0.15
RCADS-P Separation anxiety baseline	299	6.37 (4.88)	98	8.38 (5.55)	60	7.53 (4.69)	6.42 (2, 454)	0.002**	0.17

PHQ, Patient Health Questionnaire; GAD, generalised anxiety disorder; WSAS, Work and Social Adjustment Scale; TSQ, Trauma Screening Questionnaire; CRIES-8, Children's Impact of Event scale 8; RCADS, Revised Children's Anxiety and Depression Scale; RCADS-P, RCADS Parent.
* Significant at P<0.05, **significant at P<0.01, ***significant at P<0.001.

size $d = 0.21$. Likewise, less functional impairment was reported at follow-up compared with baseline. This difference, 0.82 (Bca 95% CI 0.27–1.35) was significant, $P<0.01$, $d = 0.10$.

There were also significant differences between baseline and follow-up scores among adults first screened 6 months post-incident on the PHQ-9 and WSAS ($P<0.05$). However, analyses of data from the 6-month screening group revealed adult baseline scores did not significantly differ from follow-up scores on the TSQ and GAD-7, $P>0.05$ (Table 4). There was a reduction in

severity of depression between baseline and follow-up among the 6-month screening group. The mean difference, 1.15 (Bca 95% CI 0.36–2.03) was significant ($P<0.01$), and revealed a small effect size, $d = 0.16$. Likewise, there was less functional impairment reported at follow-up than at baseline. This difference, 1.74 (Bca 95% CI 0.39–3.12) was significant ($P<0.05$, $d = 0.17$).

CYP. Among the CYP group first screened at 3 months, analyses revealed significant differences between baseline and follow-up

Table 4 Change over time for adults and children and young people (CYP) from initial screening (registration at either 3 or 6 months) to repeated scores at 9 months[a]

Screening group (time point at which registered)	Baseline score, mean (s.d.)	9-month score, mean (s.d.)	t (d.f.)	P	Mean difference (s.e.)	Bca 95% CI	d
Adult cohort							
PHQ-9							
3 months (n = 623)	7.86 (6.84)	6.65 (6.26)	5.31 (622)	0.001***	1.2 (0.23)	0.76 to 1.66	0.18
6 months (n = 117)	10.38 (7.05)	9.23 (6.92)	2.73 (116)	0.005**	1.15 (0.41)	0.36 to 2.03	0.16
GAD-7							
3 months (n = 618)	8.03 (6.18)	6.71 (5.75)	7.14 (617)	0.001***	1.32 (0.19)	0.94 to 1.68	0.21
6 months (n = 115)	10.37 (6.30)	9.72 (6.16)	1.52 (114)	0.14	0.65 (0.43)	–0.11 to 1.37	0.10
WSAS							
3 months (n = 577)	9.20 (8.42)	8.38 (8.49)	3.03 (576)	0.002**	0.82 (0.27)	0.27 to 1.35	0.10
6 months (n = 113)	15.01 (10.09)	13.27 (9.33)	2.55 (112)	0.02*	1.74 (0.69)	0.39 to 3.12	0.17
TSQ							
3 months (n = 580)	5.48 (2.89)	4.72 (2.77)	8.41 (579)	0.001***	0.76 (0.09)	0.57 to 0.94	0.26
6 months (n = 113)	6.41 (2.78)	6.19 (2.59)	1.24 (112)	0.21	0.21 (0.17)	–0.13 to 0.59	0.08
CYP cohort							
CRIES-8							
3 months (n = 106)	25.29 (8.96)	20.28 (10.85)	5.41 (105)	0.001***	5.01 (0.94)	3.19 to 6.86	0.56
6 months (n = 39)	25.74 (8.79)	24.44 (11.73)	1.02 (38)	0.31	1.31 (1.25)	–0.94 to 3.94	0.15
RCADS Depression							
3 months (n = 106)	6.85 (5.60)	6.42 (5.74)	0.96 (105)	0.35	0.43 (0.45)	–0.50 to 1.32	0.08
6 months (n = 38)	9.34 (6.58)	10.05 (6.97)	–1.18 (37)	0.26	–0.71 (0.60)	–1.95 to 0.42	0.11
RCADS GAD							
3 months (n = 105)	8.36 (4.82)	7.37 (4.53)	2.46 (104)	0.02*	0.99 (0.40)	0.21 to 1.79	0.21
6 months (n = 38)	10.11 (5.06)	10.05 (5.01)	0.09 (37)	0.93	0.05 (0.57)	–1.05 to 1.18	0.01
RCADS-P GAD							
3 months (n = 101)	7.04 (4.43)	5.97 (3.58)	3.13 (100)	0.003**	1.07 (0.34)	0.42 to 1.78	0.24
6 months (n = 36)	9.39 (4.55)	8.97 (4.12)	0.83 (35)	0.41	0.42 (0.50)	–0.56 to 1.58	0.09
RCADS-P Separation Anxiety							
3 months (n = 100)	5.76 (4.74)	5.05 (4.38)	2.18 (99)	0.03*	0.71 (0.34)	0.07 to 1.40	0.15
6 months (n = 34)	10.00 (5.68)	9.00 (5.42)	1.82 (33)	0.08	1.0 (0.55)	0.12 to 2.00	0.18

Bca, bias corrected and accelerated bootstrapping method; PHQ, Patient Health Questionnaire; GAD, generalised anxiety disorder; WSAS, Work and Social Adjustment Scale; TSQ, Trauma Screening Questionnaire; CRIES-8, Children's Impact of Event scale 8; RCADS, Revised Children's Anxiety and Depression Scale; RCADS-P, RCADS Parent.
a. Participants who registered at 3 months had a 6-month duration of follow-up, while participants who registered at 6 months had a 3-month duration of follow-up.
* Significant at P<0.05, **Significant at P<0.01, ***Significant at P<0.001.

scores on the CRIES-8, RCADS GAD, RCADS-P GAD and RCADS-P separation anxiety, P<0.05. However, there were no significant differences between CYP baseline and follow-up scores on the RCADS depression, P>0.05 (Table 4). At follow-up, there was less post-traumatic stress reported by the CYP cohort than at baseline. The mean difference, 5.01 (Bca 95% CI 3.19–6.86) was significant, P = 0.001, and represented a medium effect size, d = 0.56. Self-reports from CYP of generalised anxiety were milder at follow-up compared with baseline. This difference, 0.99 (Bca 95% CI 0.21–1.79) was significant, P<0.05, d = 0.21. There was a reduction in severity of young people's generalised anxiety reported by parents between baseline and follow-up. The mean difference, 1.07 (Bca 95% CI 0.42–1.78) was significant, P<0.01, d = 0.24. Similarly, parental reports of young people's separation anxiety was milder at follow-up compared with baseline. This difference, 0.71 (Bca 95% CI 0.07–1.40) was significant (P<0.05), d = 0.15.

Within-individual analyses for the CYP group first screened at 6 months revealed no significant differences between baseline scores and follow-up scores, P>0.05 (Table 4).

Discussion

These findings indicate that people who register later with an outreach and screening programme following a mass casualty incident are increasingly symptomatic. Baseline (initial screening) analyses revealed significant differences in cohorts defined by initial screening date for both adults and CYP, suggesting that people who registered with the hub earlier (i.e. at 3 months) generally presented with milder symptomatology compared with those who presented later (i.e. at 6 months and 9 months) with moderate severity.

This is consistent with the idea that the likelihood of someone engaging with this type of initiative over time becomes increasingly likely to be driven by the presence of distressing symptomatology. However, the reductions in symptoms over time for people who engage earlier hints at the possibility of a therapeutic effect that could have been beneficial to those who waited to start screening. Further longitudinal data is required to fully test this hypothesis. The effect sizes across the measures are all small but this is only to be expected considering the nature of the intervention.

Participant-level changes for adults and CYP who registered within the 3-month screening window revealed reductions in symptom severity at 9-month follow-up compared with baseline (with the exception of RCADS Depression). Adults who registered at 6 months showed significant participant-level changes on PHQ-9 and WSAS at 9 months, i.e. after only 3 months of intervention from the hub. This also hints at the potential for the hub to support recovery among people who present with more distressing or moderate symptomatology.

Some changes over time at 9-month follow-up were not significant, including the CYP RCADS depression scores for those who had registered at 3 months, all of the CYP measures for those who had registered at 6 months, and adult trauma and anxiety measures for those who had registered at 6 months. It will be interesting to observe the impact of time on these scores, using further longitudinal data. It is also worth considering the different lengths of the follow-up periods analysed (only 3 months' follow-up for the screening group who registered at 6 months, compared with a period of 6 months' follow-up for the screening group who registered at 3 months).

Limitations

As previously highlighted, there is risk of bias concerning the self-selection of participants, which may skew data in terms of the characteristics of people who were likely to register with the hub initially, and also of those who choose to take up the invitation to re-complete the screening measures at follow-up. The sample size for the 6-month cohort is reduced particularly for the sample of CYP, which can inflate type II error rates. It is also important to note the differential time for analysis, as mentioned above; that is the initial baseline scores of both the 3-month screening cohort and the 6-month screening cohort were compared against the data gathered at 9 months. We recognise that this leads to unequal follow-up rates but reflects the nature of the data available at this time. Furthermore, these analyses offer a snapshot of the differences between and within groups, but do not take into account the different type and extent of support received. Again, this reflects the nature of the data available at this time.

Implications

The proactive outreach model appears to offer the opportunity of an early identification strategy for those people affected by large-scale traumatic events with high levels of acceptability; to date, only 1.28% of people have opted out of future screening since their registration. The data presented demonstrate the scale of the psychosocial impact and similarly capture how many people are managing well, recognising that the numbers of people who are likely to take part in ongoing screening is likely to represent a cohort with continuing problems. Analysis of participation in research interviews at 4–5 months and 14–15 months following the attacks in Norway in 2011 showed that survivors who did not participate in the initial interviews were more symptomatic than were other participants.[30] This can be termed selection bias from a research perspective but also represents different help-seeking behaviours. Regardless, this demonstrates the importance of long-term research in order to capture differences in the experiences of survivors who participate across multiple time points.

Although the results in this paper provide preliminary insights into the cohorts registered at different time points, further analysis is required once more longitudinal data collection has been completed to (a) explore whether the changes we have found are sustained over time; (b) establish whether cohorts that we reached earlier demonstrate greater recovery than cohorts who register later; and (c) explore the relationship between recovery and the type and extent of support received. Screening invitations will be repeated at 12, 18, 24, and 36 months post-incident to enable us to model the recovery trajectories of the people who have used the hub.

In conclusion, the proactive outreach response to disasters should be evaluated within the context of its long-term impact on people's trajectories of recovery alongside identifying factors that predict or influence differing recovery trajectories in order to improve support. The consistency of approach to follow-up regardless of clients' location is in contrast to many services, in which there may be great geographical variation. In incidents such as this, a uniform screening and follow-up procedure, as opposed to a more random approach adopted across a range of local providers, could minimise dissatisfaction and frustration. The response to the Manchester Arena attack involved complex communication and negotiations across traditional boundaries of care. The lessons that we have highlighted from these organisational hurdles and from identifying successes and challenges have great potential to improve communities' disaster preparedness and the responses of national and international networks. They include the potential for our observation to assist planners to design, develop and test services for future incidents. This includes workforce planning and establishing policies that enable the best possible response to future incidents.

Paul French (ID), PhD, Clinical Researcher, Research and Innovation Department, Pennine Care NHS Foundation Trust, Manchester; and Faculty of Health, Psychology and Social Care, Manchester Metropolitan University, UK; **Alan Barrett**, DClin Psych, Consultant Clinical Psychologist, Clinical Lead Manchester Resilience Hub, Pennine Care NHS Foundation Trust; and School of Health Sciences, University of Salford, UK; **Kate Allsopp**, PhD, Research Associate, Complex Trauma and Resilience Research Unit, Greater Manchester Mental Health NHS Foundation Trust; Manchester Academic Health Science Centre, UK; **Richard Williams** (ID), OBE, TD, FRCPsych, FRCPCH, DMCC, Emeritus Professor of Mental Health Strategy, Welsh Institute for Health and Social Care, University of South Wales, UK; **Chris R. Brewin** (ID), PhD, Professor of Clinical Psychology, University College London, UK; **Daniel Hind**, PhD, Reader in Complex Interventions, School of Health and Related Research, UK; **Rebecca Sutton**, MSc Research Assistant, Greater Manchester Mental Health Care, Greater Manchester Mental Health NHS Foundation Trust, UK; **John Stancombe**, PhD, Clinical Psychologist, Young People's Mental Health Research Unit, Pennine Care NHS Foundation Trust, UK; **Prathiba Chitsabesan**, MD, Child and Adolescent Psychiatrist, Young People's Mental Health Research Unit, Pennine Care NHS Foundation Trust; and Division of Psychology and Mental Health, School of Health Sciences, University of Manchester, Manchester Academic Health Science Centre, UK

Correspondence: Paul French, Faculty of Health, Psychology and Social Care, 53 Bonsall St, Manchester Metropolitan University, Manchester M15 6GX, UK. Email: p.french@mmu.ac.uk

First received 16 Jul 2019, accepted 19 Jul 2019

Funding

Acknowledgements

References

1 Sandler T. The analytical study of terrorism: taking stock. *J Peace Res* 2014; **51**: 257–71.

2 Williams R, Kemp V. Principles for designing and delivering psychosocial and mental healthcare. *J R Army Med Corps* 2018 Mar 8 (Epub ahead of print).

3 Williams R, Bisson JI, Kemp V. Health care planning for community disaster care. In *Textbook of Disaster Psychiatry (2nd edn)* (eds RJ Ursano, CS Fullerton, L Weisaeth, et al.): 244–60. Cambridge University Press, 2017.

4 Department of Health. *NHS Emergency Planning Guidance: Planning for the Psychosocial and Mental Health Care of People Affected by Major Incidents and Disasters: Interim National Strategic Guidance 30-7-2009.DH*. Department of Health, 2009.

5 García-Vera MP, Sanz J, Gutiérrez S. A systematic review of the literature on posttraumatic stress disorder in victims of terrorist attacks. *Psychol Rep* 2016; **119**: 328–59.

6 Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health research. *Psychiatry* 2002; **65**: 240–60.

7 Ellenberg E, Taragin MI, Hoffman JR, Cohen O, Luft-Afik D, Bar-On Z, et al. Lessons from analyzing the medical costs of civilian terror victims: planning resources allocation for a new era of confrontations. *Milbank Q* 2017; **95**: 783–800.

8 Whalley MG, Brewin CR. Mental health following terrorist attacks. *Br J Psychiatry* 2007; **190**: 94–6.

9 Houston JB, First J, Spialek ML, Sorenson ME, Koch M. Public disaster communication and child and family disaster mental health: a review of theoretical frameworks and empirical evidence. *Curr Psychiatry Rep* 2016; **18**: 54.

10 Ruzek JI. Models of early intervention following mass violence and other trauma. In *Interventions Following Mass Violence and Disasters* (eds E Ritchie, PJ Watson, MJ Friedman): 16–36. The Guilford Press, 2006.

11 Bisson JI, Tavakoly B, Witteveen AB, Ajdukovic D, Jehel L, Johansen VJ, et al. TENTS guidelines: development of post-disaster psychosocial care guidelines through a Delphi process. *Br J Psychiatry* 2010; **196**: 69–74.

12 Interagency Standing Committee (IASC). *IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings*. IASC, 2007.

13 Williams R, Bisson J, Kemp V. *Principles for Responding to People's Psychosocial and Mental Health Needs after Disasters. Occasional Paper 94.* Royal College of Psychiatrists, 2014.

14 Norris FH, Tracy M, Galea S. Looking for resilience: understanding the longitudinal trajectories of responses to stress. *Soc Sci Med* 2009; **68**: 2190–8.

15 Bonanno GA, Brewin CR, Kaniasty K, Greca AM. Weighing the costs of disaster: consequences, risks, and resilience in individuals, families, and communities. *Psychol Sci Public Interes Suppl* 2010; **11**: 1–49.

16 Bryant RA, Nickerson A, Creamer M, O'Donnell M, Forbes D, Galatzer-Levy I, et al. Trajectory of post-traumatic stress following traumatic injury: 6-year follow-up. *Br J Psychiatry* 2015; **206**: 417–23.

17 Lowell A, Suarez-Jimenez B, Helpman L, Zhu X, Durosky A, Hilburn A, et al. 9/11-related PTSD among highly exposed populations: a systematic review 15 years after the attack. *Psychol Med* 2017: 1–17.

18 Brewin CR, Rose S, Andrews B, Green J, Tata P, McEvedy C, et al. Brief screening instrument for post-traumatic stress disorder. *Br J Psychiatry* 2002; **181**: 158–62.

19 Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006; **166**: 1092–7.

20 Kroenke K, Spitzer RL. The PHQ-9: a new depression diagnostic and severity measure. *Psychiatr Ann* 2002; **32**: 509–15.

21 Mundt JC, Marks IM, Shear MK, Greist JM. The Work and Social Adjustment Scale: a simple measure of impairment in functioning. *Br J Psychiatry* 2002; **180**: 461–4.

22 Perrin S, Meiser-Stedman R, Smith P. The Children's Revised Impact of Event Scale (CRIES): validity as a screening instrument for PTSD. *Behav Cogn Psychother* 2005; **33**: 487.

23 Chorpita BF, Yim L, Moffitt C, Umemoto LA, Francis SE. Assessment of symptoms of DSM-IV anxiety and depression in children: a revised child anxiety and depression scale. *Behav Res Ther* 2000; **38**: 835–55.

24 Efron B, Tibshirani R. *An Introduction to the Bootstrap*. Chapman & Hall, 1993.

25 Field A. *Discovering Statistics Using IBM SPSS Statistics*. Sage, 2013.

26 Chorpita BF, Ebesutani C, Spence SH. *Revised Children's Anxiety and Depression Scale User's Guide*. 2015 (https://www.childfirst.ucla.edu/wp-content/uploads/sites/163/2018/03/RCADSUsersGuide20150701.pdf).

27 Strelitz J, Lawrence C, Lyons-Amos C, Macey T. *A Journey of Recovery Supporting Health & Wellbeing for the Communities Impacted by the Grenfell Tower Fire Disaster*. The Bi-Borough Public Health Department, 2018 (https://www.jsna.info/grenfell-tower-fire-disaster).

28 McDermott M, Duffy M, McGuinness D. Addressing the psychological needs of children and young people in the aftermath of the Omagh bomb. *Child Care Pract* 2004; **10**: 141–54.

29 Bugge I, Dyb G, Stensland SØ, Ekeberg Ø, Wentzel-Larsen T, Diseth TH. Physical injury and posttraumatic stress reactions. A study of the survivors of the 2011 shooting massacre on Utøya Island, Norway. *J Psychosom Res* 2015; **79**: 384–90.

30 Stene LE, Dyb G. Research participation after terrorism: an open cohort study of survivors and parents after the 2011 Utøya attack in Norway Public Health. *BMC Res Notes* 2016; **9**: 1–10.