Media Use and Exposure to Graphic Content in the Week Following the Boston Marathon Bombings

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Traditional and new media inform and expose the public to potentially distressing graphic content following disasters, but predictors of media use have received limited attention. We examine media-use patterns after the Boston Marathon bombings (BMB) in a representative national U.S. sample (n = 2888), with representative oversamples from metropolitan Boston (n = 845) and New York City (n = 941). Respondents completed an Internet-based survey 2–4 weeks post-BMB. Use of traditional media was correlated with older age, prior indirect media-based exposure to collective traumas, and direct BMB exposure. New media use was correlated with younger age and prior direct exposure to collective traumas. Increased television and online news viewing were associated with exposure to more graphic content. The relationship between traditional and new media was stronger for young adults than all other age groups. We offer insights about the relationship between prior collective trauma exposures and media use following subsequent disasters and identify media sources likely to expose people to graphic content.

Keywords: media use, disaster, terrorism, news, social media, graphic images

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When disaster strikes, the media often suspends normal programming so that the 24-hour news cycle can focus intensely on the event as it unfolds. An example of this was evident during the Boston Marathon bombings (BMB), the most reported story on network television (ABC, NBC, CBS) in 2013 (Pew Research Center, 2013). News broadcasts and social media sources (e.g., Facebook, Twitter) provided near real-time coverage as the bombs went off near the finish line (Sutton et al., 2014), and spectators, police, and emergency medical staff aided the injured and sought to restore calm. In the days following the bombings, BMB-related images and video clips, appearing in both traditional media (e.g., television, newspapers) and new media (e.g., online news, social media), continued to expose viewers around the globe to potentially disturbing images of human carnage and suffering.

When an event of this type unfolds, the media can be instrumental in the early aftermath in mobilizing the community, providing authoritative communication, and connecting people to needed resources (Hawkins, McIntosh, Silver, & Holman, 2007; Wicke & Silver, 2009). Moreover, people often use media to engage in information seeking to learn about details of the event. Using Uncertainty Reduction Theory (Berger & Calabrese, 1975) as a lens, researchers who have studied media use after a disaster (e.g., 9/11 terrorist attacks) have argued that information seeking is a common response among individuals and serves as a means by which individuals can alleviate anxiety induced by the resulting uncertainty of the disaster context (Heath & Gay, 1997; Lachlan, Spence, & Seeger, 2009; Seeger, Sellnow, & Ulmer, 2003). This tendency is particularly relevant to threatening situations and invites reappraisal of felt uncertainty via active information seeking (Brashers et al., 2000).

Although staying informed is essential during a crisis, exposure to potentially distressing content available through traditional and new media channels may have negative repercussions for those who see it. For example, frequency of exposure to media coverage of a collective trauma, such as the September 11, 2001 (9/11) terrorist attacks, has been associated with acute and post-traumatic stress (PTS) symptoms (Ahern et al., 2002; Schlenger et al., 2002; Silver et al., 2013). Moreover, individuals who reported seeing more frequent depictions of graphic content on television after 9/11 (e.g., planes crashing into the World Trade Center, people falling from the buildings) showed increased odds of meet-

ing Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria for probable post-traumatic stress disorder (PTSD) compared to those who saw fewer graphic images (Ahern et al., 2002). Following the initiation of the Iraq War, Silver et al. (2013) found that viewing two specific war-related images (imprisoned Allied soldiers and dead Iraqi children) was positively associated with war-related acute stress symptoms. High acute stress following 9/11 also predicted increased incidence of new onset cardiovascular ailments over 3 years post-9/11 in a sample predominantly exposed to the attacks through the media (Holman et al., 2008).

Despite the preponderance of evidence suggesting that both frequency and content of post-disaster media exposure are associated with distressing mental and physical responses, little is known about the risk factors associated with post-disaster media use and exposure to distressing content. Questions surrounding who uses various media types and what content they are exposed to linger. Importantly, media use following a disaster presents a paradox: When uncertain, seemingly dangerous situations unfold, people turn to the media to reduce uncertainty and lower anxiety, but are instead presented with disturbing content that potentially increases psychological distress.

Correlates of News Watching

Prior research has examined correlates of general news media use. Specifically, the Pew Research Center has documented shifting demographic patterns of news media use over the past several years; for example, only 34% of adults aged 18–29 said they watched TV news yesterday, down 15% from 2006 (Kohut, Doherty, Dimock, & Keeter, 2012). Similar declines have been seen for this age group with respect to print (newspapers, magazines) and radio news (Kohut et al., 2012). After the BMB, despite the fact that network television was the dominant mode of news dissemination, 56% of respondents aged 18–29 indicated they obtained the majority of their information about the bombings from social media sources (Pew Research Center, 2013). These findings are consistent with research documenting that younger people find the Internet more useful for obtaining information after a disaster than do older people (Spence et al., 2006).

Other demographic factors (e.g., income, education) have also been linked with general news media use. For example, income is negatively correlated with local news television watching (including local TV news, morning news, and daytime talk shows), whereas higher education is positively correlated with obtaining news via new media (Kohut et al., 2012). While these demographic variables appear to be meaningful with respect to the type of news sources (traditional vs. new) people use to get their news, we do not yet know whether they also apply to a post-disaster context. The limited literature that has considered other demographic indicators of media use after disasters (e.g., terrorist attacks, an earthquake) reveals gender differences in the amount and type of media sources consulted in the immediate aftermath (Lachlan et al., 2009; Spence et al., 2006) such that women are more likely to use traditional media sources and men more likely to use the Internet. However, many of these results have been obtained using convenience samples and lack statistical controls for other potentially confounding variables (e.g., employment status). Thus, further research is warranted to determine whether these findings are robust when more representative samples are used and confounds are accounted for.

Beyond demographic factors, several other individual-level factors are likely to be associated with post-disaster news media use. For example, depression is positively associated with increased sedentary television watching among adults aged 25–33 (Sidney et al., 1996). Compared to healthy controls, individuals with major depressive disorder report more hours of daily computer use, while those with panic disorder and agoraphobia report more hours of daily television watching (de Wit, van Straten, Lamers, Cuijpers, & Penninx, 2011). Since individuals with mental health ailments are likely to watch more television or spend more time on the computer, they are at increased risk of exposure to news coverage of a collective trauma, thereby putting them at risk for post-disaster psychological distress.

Direct exposure to a trauma, defined as the physical presence of oneself or a close other during injury or threat of death (American Psychiatric Association, 2013), is another factor that may be associated with increased media use following a disaster. As compared to people not directly exposed to the BMB, individuals who were at or who knew someone at the site of the bombing, or who were affected by the subsequent lockdown during the manhunt for the suspects, may have been more likely to attend to media coverage of the crisis as it unfolded. Media use may also be associated with prior exposure to a collective trauma, either directly or indirectly via the media, independent of proximity to the event. As both direct (Perrin et al., 2007) and indirect media-based exposure (Silver et al., 2013) to collective traumas have been linked with elevated stress responses, residual distress from these prior events might trigger increased information seeking in response to future collective traumas, as anxious individuals tend to be more attentive to stimuli that depict sources of their anxiety (MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985).

Graphic News Media Content

The valence of content transmitted by the media after a disaster may play a vital role in the associations found between media exposure and stress responses. Indeed, there is a robust literature supporting the link between negative imagery and emotion. Negative images exacerbate startle reflexes (Cuthbert, Bradley, & Lang, 1996) and unpleasant pic-

tures are often viewed longer than neutral images, suggesting a general attentional bias toward unpleasant content (Lang, Bradley, & Cuthbert, 1998). Importantly, images with human agents in life-threatening circumstances have been found to elicit particularly high physiological arousal (Bradley & Lang, 2007). Such results offer an explanation for Ahern et al. (2002)'s finding that seeing images depicting people jumping or falling from buildings during the 9/11 attacks was associated with depression and probable PTSD, while seeing images of an airplane hitting the World Trade Center was not. While television has been a well-studied mode of transmitting graphic content, few studies have examined graphic content transmitted via new media. Over a 15-month period beginning in 2011, intense visuals of natural disasters (especially the destructive Tohoku, Japan earthquake and tsunami) and political upheaval abroad (Russian elections and unrest in the Middle East) were the top-watched videos on YouTube (Pew Research Center, 2012). As noted above, Americans are increasingly getting their news from online news and social media sites (Pew Research Center, 2012). Given that these sites serve as platforms amenable to rapid information dissemination, post-disaster coverage can be quickly shared across social media, increasing the likelihood of easy exposure to graphic content.

Complementarity of News Media Use in a Post-disaster Context

Taken together, these findings raise an important unanswered question: When disaster strikes, do people use both traditional and new media sources for disaster-related news, and do the correlates of these exposures differ? We know that the landscape of news outlets has changed dramatically over the past two decades, especially with the decline of traditional media and the rise of new media. Some scholars suggest that new media are displacing (or replacing) traditional media (Dimmick, 2002). In this view, individuals are likely to prefer one news medium over another, either by choice or by habit, and have limited time that they allocate to these preferred sources. Yet, others assert that traditional and new media are used complementarily. For example, Dutta-Bergman (2004) argues that a person seeking information about a specific topic (e.g., health news) is likely to consult media sources across the traditional and new media spectrums for information about that topic. While there is some evidence for the displacement hypothesis (De Waal & Schoenbach, 2010), others have found evidence that news media sources are being used complementarily (Diddi & LaRose, 2006). It could be the case that in the context of a disaster, people who are accustomed to accessing a variety of media sources in general (e.g., young adults) might seek disaster-related information from both traditional and new media sources, while others who are accustomed to using traditional media sources (e.g., older adults) may be less likely to stray from their long-standing media consumption patterns (LaRose & Eastin, 2004).

Current Study

After the BMB, images and videos depicting bloodied sidewalks, runners, and bystanders, as well as severely injured individuals with missing limbs, were transmitted via network television and circulated across social media. Given our sensitivity to life-threatening images (Bradley & Lang, 2007), it is likely that graphic images (i.e., those depicting human carnage) are more potent than those containing other disaster-related chaos (i.e., destroyed buildings, rescue efforts). To identify people who may be at greater risk of exposure to graphic images, it is important to understand (a) who is likely to use different media types for disaster-related news, (b) which media sources are associated with transmitting graphic content, and (c) whether people use traditional and new media complementarily in the context of a disaster. With these issues in mind, we formulated the following hypotheses and research questions based on the literature cited above:

H1 Given the evidence that younger adults generally use new media more than older adults, we expected that increasing age would be positively associated with traditional media use and negatively associated with new media use in the post-disaster context.

H2 Given the likelihood of increased media use among those with mental health ailments, we expected to find a positive association between having a history of pre-BMB mental health diagnoses and BMB-related media use.

H3 Given that individuals with prior disaster exposures might exhibit an attentional bias toward media coverage of subsequent disasters, we anticipated that prior disaster exposures (i.e., direct and indirect) would be positively associated with both traditional and new media use.

H4 Given prior research linking television viewing after a collective trauma to exposure to graphic content, coupled with the availability of graphic content online, we expected that television, online news, and social media use would all be associated with graphic content exposure after the BMB.

Lastly, given the conflicting evidence about whether displacement or complementarity of news media sources operates in a post-disaster context, we did not generate specific predictions about patterns of traditional and new media use. Instead, we explored whether respondents used both traditional media and new media complementarily after the BMB, and whether this changed as a function of age.

Method

Sample and Procedures

Beginning 10 days after the search and capture of the perpetrators of the BMB, we conducted an Internet-based survey of representative samples drawn from the GfK KnowledgePanel from the Boston (n = 846) and New York (n = 941) metropolitan areas, and the remainder of the United States (n = 2,888). To recruit people within households across the United States, GfK uses address-based sampling methods that involve mailing recruitment materials to households that were selected using random sampling-based procedures derived from Census tract information. Households without a computer or Internet connection are given a laptop with Internet service in exchange for the completion of web-based surveys; households that are already web-enabled are compensated with points that can be exchanged for merchandise. The survey was fielded to 6,098 GfK panelists selected via random sampling procedures, stratified by region and other key indicators (e.g., demographics) that adjusted for systematic variability in participation rates (e.g., more men were randomly sampled as they are typically less likely to participate); e-mail and telephone reminders were used to encourage response. A total of 4,822 panelists responded between April 29 and May 13, 2013, resulting in a 79.08% study completion rate. One hundred forty-seven respondents were dropped due to excessive missing outcome data or unreliably short survey completion times (< 3 min), yielding 4,675 (76.66%) cases for analysis. Median survey completion time was 9 min. All procedures for this study were approved by the Institutional Review Board of the University of California, Irvine.

The panel-selection methods provide statistical control of the representativeness of GfK panel samples and ensure samples' comparability to the general population; GfK provided post-stratification weights to adjust for any discrepancies between the obtained samples and U.S. Census benchmarks. The weighted composition of our sample closely matched that of the target population as defined by the benchmarks from the American Community Survey of the U.S. Department of Commerce (2012). (For detailed demographic breakdown and comparisons between our sample, the overall GfK panel, and national estimates from the U.S. Census Bureau, see Holman, Garfin, & Silver, 2014)

Measures

Dependent variables

Traditional and new media use. Respondents indicated the average number of total hours per day during the week following the BMB they were exposed to coverage of the bombings or their aftermath via television, radio, newspapers, online news sites (e.g., CNN, Yahoo, NY Times), or via pictures, videos, and news or text updates on social media (e.g., Facebook, Twitter, YouTube, Reddit). Responses could range from 0 to 11 or more daily hours for each media source. We summed responses across traditional (television, radio, newspapers) and new media sources (online news and social media), respectively. Because participants could report simultaneous exposures (e.g., watching television while reading news online), responses could exceed 24 hours; we therefore standardized responses for each of these variables to make them more interpretable. Responses represented exposure in standard deviation units so as to reflect use relative to others in the sample.

Media content exposure. Participants were asked how frequently they viewed 12 different types of BMB-related content (e.g., bombs exploding, blood at the site of the BMB) on the media sources (listed above) on a 5-point scale (1 = never, 5 = very often). Six items assessed exposure to BMB-related chaos (e.g., bombs exploding, people falling down), three items assessed exposure to coverage with blood (e.g., blood at the site of the BMB), two items assessed exposure to content depicting law enforcement officers or equipment, and one measured exposure to deceased victims when they were alive (Table 1). We factor analyzed the 12 items specifying an oblique rotation and three factor solution.

In the unrotated solution, the chaotic content factor yielded an initial eigenvalue above 1. Factor loadings in the rotated solution were above .45, explaining 92.30% of the variance in content items; the three items hung together well, exhibiting excellent reliability (α = .95). An eigenvalue of .60 was obtained for the second factor (i.e., bloody content), explaining 7.10% of the variance. The three items containing the word "blood" had factor loadings exceeding .50 in the rotated solution. Furthermore, the items hung together well, exhibiting good reliability (α = .85). The third factor explained less than 1% of the variance in exposure and was not included in subsequent analyses.

Independent variables

Demographics. Demographic information for each respondent was collected by GfK and included age, income, gender, ethnicity (White, non-Hispanic; Black, non-Hispanic; other non-Hispanic; or Hispanic), education level (less than high school diploma, high school diploma, some college, or Bachelor's degree or higher), marital status (single/never married, married, or widowed/divorced/separated), employment status (employed, unemployed, or retired/disabled/other), and respondent region (Boston, New York, or national sample).

Mental health history. Prior to the BMB, almost 3/4 of the sample completed items modified from the Centers for Disease Control's National Center for Health Statistics Annual National Health Interview Survey (NHIS), which as-

Table 1
Factor loadings based on a factor analysis with oblique rotation for items assessing frequency of exposure to the following types of BMB-related content.

Item	Factor 1	Factor 2
-The bombs exploding	.84	
-Smoke at the Boston Marathon bombing sites	.86	
-People falling down after the explosions	.78	
-People running away from the site of the explosions	.80	
-Rescuers helping injured people	.57	
-People crying or in pain	.46	
-Blood at the site of the Boston Marathon bombings		.79
-Bloody, injured, or maimed victims of the Boston Marathon bombings		.79
-Pictures of the victims who died in the Boston Marathon bombings (taken when they were alive)	–	–
-Law enforcement equipment (police cars, helicopters, etc.)	–	–
-Law enforcement officers searching for the Boston Marathon bombing suspects	–	–
-Bloody or injured Boston Marathon bombing suspects		.52

sessed prior physician-diagnosed depression and anxiety disorders. Missing data for the remaining sample were imputed using sequential Hotdeck imputation (see Holman et al., 2014). This method imputes a missing data point for a respondent using existing data from a similar respondent donor matched on specified demographic variables (Andridge & Little, 2010). For the analyses, responses were coded 0 (none), 1 (either anxiety or depression), or 2 (depression and anxiety).

Pre-BMB television watching. Prior to the BMB, the majority of the sample (n = 4393; 93.96%) provided GfK information on their television watching habits. Respondents reported the frequency with which, in the prior 6 months, they watched each of 117 broadcast and cable television networks (e.g., local morning and evening news, CNN, and other entertainment channels) using a 5-point scale ranging from 1 (never) to 5 (three times a week). A pre-BMB television watching index was created as the mean frequency across all channels.

Direct exposure to the BMB. Respondents reported whether they or someone close to them was at, injured in, or near the site of the Boston Marathon on April 15, 2013 or whether they knew someone who died in the bombings. This variable was coded dichotomously (0 = no exposure, 1 = any direct exposure).

Exposure to the lockdown. Respondents indicated whether they were in the area locked down during the manhunt for the BMB suspects. We conceptualized this variable as another form of direct exposure to the bombings and as a potentially important factor with respect to media use, because being confined to the home may be correlated with watching media coverage for continual BMB-related updates. This variable was coded dichotomously (0 = self or close other not under lockdown, 1 = self or close other under lockdown).

Direct exposure to prior collective trauma. Participants indicated whether they or a close other had been directly exposed (e.g., experienced threat of death or serious injury, or was seriously injured) to three recent collective traumas in the United States: the 9/11 terrorist attacks, Superstorm Sandy, and the Sandy Hook Elementary school shooting. Exposure to each event was dichotomously coded (0 = no exposure; 1 = self and/or close other exposed) and responses were summed (range = 0 – 3).

Indirect media-based exposure to prior collective trauma. Participants also indicated whether they were exposed to the 9/11 attacks, Superstorm Sandy, and/or the Sandy Hook Elementary school shooting via (a) live television and/or (b) live radio or online streaming of the event as it occurred. Given the potential for simultaneous exposure, participants could select more than one method of exposure per event. A count of total indirect prior exposures was generated (range = 0 – 6).

Analytic Strategy

Analyses were conducted in STATA 13.1 (Stata Corp, College Station, TX), a program well suited to handle complex, weighted survey data. All presented results are weighted. To test the first three hypotheses, two multivariate ordinary least squares (OLS) regression analyses were constructed where correlates of traditional and new media use, respectively, were entered into each model including demographic characteristics (including continuous age), pre-BMB mental health, respondent region, pre-BMB television watching, direct exposure to the BMB and lockdown exposure, and prior direct and indirect media-based exposure to collective trauma. Because we were interested in the unique influence of these variables on respondents' use of both media types, in analyses examining correlates of traditional and new media use, we entered new media and traditional media as covariates, respectively.

To test hypothesis four, two multivariate OLS regression

Table 2
Weighted average daily hours of Boston Marathon bombing media use and average frequency of exposure to chaotic and bloody content by region

	Total sample (N = 4,648)$_a$		Boston metro (n = 839)		New York City metro (n = 933)		Remainder of U.S. (n = 2,876)	
Media/Content Type	*M*	SE	*M*	SE	*M*	SE	*M*	SE
Traditional media								
Television	2.46	.05	3.41	.14	2.44	.11	2.19	.05
Radio	.84	.03	1.27	.08	.87	.07	.70	.03
Print	.79	.03	.97	.09	.93	.06	.68	.03
Total	3.75	.06	5.14	.17	3.99	.16	3.27	.07
New media								
Online news sites	1.11	.04	1.25	.09	1.15	.08	1.06	.04
News on Social media sites	.43	.03	.63	.10	.44	.06	.36	.03
Pictures on social media	.64	.03	1.02	.12	.64	.07	.52	.03
Videos on social media	.36	.03	.42	.07	.40	.05	.32	.03
Total	2.07	.06	2.63	.18	2.27	.15	1.84	.06
Content type$_b$								
Chaotic	3.40	.02	3.86	.05	3.46	.05	3.26	.02
Bloody	2.68	.02	3.08	.06	2.79	.04	2.53	.02

[a]Sample size varied across media sources slightly, due to missing data from 27 respondents (<1% of total sample); [b]The full sample was used for content type mean calculations

analyses examined correlates of exposure to chaotic and bloody content; the variables entered into the models included hours spent attending to BMB-related coverage on television, radio, newspaper, social media news, social media pictures and videos, and online news, demographic characteristics (including continuous age), pre-BMB mental health, respondent region, pre-BMB television watching, and exposure to the BMB and lockdown experience.

To explore our research question about complementarity of media use after the BMB, the correlation between traditional and new media use was examined for the entire sample. We then divided our continuous age variable into four categories (i.e., 18–29, 30–44, 45–59, 60+) in order to calculate the correlation between traditional and media use for each group and directly compare those correlations using a Fisher's r-to-z transformation.

Results

Sample characteristics

Demographics. The final weighted sample was approximately 52.40% female, ranged in age from 18 to 93 (M = 47.18, SE = .31), 78.50% White and 13.30% Hispanic. Just over 52% were married, 58.10% had at least some college education, 57.10% employed, and 57.90% had an annual income of $50,000 or more.

Media use. Average total media use by the sample is presented in Table 2. The average for the index for pre-BMB television watching across the sample was 2.90 (SE = .01). Mental Health Ailments. A history of prior mental health ailments was reported by 18.35% (weighted n = 858) of the respondents. Of these, 77.60% reported one ailment (either depression or anxiety) and the remainder reported having both anxiety and depression.

Direct BMB and lockdown exposure. Nearly 10% (weighted n = 449) of the sample reported being directly (i.e., self or close other) exposed to the BMB. Almost 9% (weighted n = 420) reported being directly exposed (themselves or through a close relationship) to the Boston-area lockdown that occurred shortly after the bombings.

Direct/indirect prior collective trauma exposures. Direct exposure to at least one prior collective trauma was reported by 26.54% (weighted n = 1231); 14.86% (weighted n = 689) reported exposure to one trauma, 10.25% (weighted n = 476) reported exposure to two prior collective traumas, and 1.43% (weighted n = 66) reported exposure to three prior collective traumas. Across the sample, the average number of direct exposures to prior collective traumas was

Table 3. *Predictors of average daily BMB-related media exposure via traditional and new media (N = 4,646)*$_a$

	Traditional media				New media			
Variables	*B*	(95% CI)	SE_b	*t*	*B*	(95% CI)	SE_b	*t*
Demographics								
Gender								
Male = 0	-							
Female	.02	(-.03, .08)	.02	.82	-.02	(-.08, .04)	.03	-.68
Age	.17	(.13, .20)***	.01	9.68	-.21	(-.25, -.16)***	.02	-9.26
Income	-.01	(-.05, .01)	.01	-.97	.02	(-.06, .01)	.02	-1.09
Ethnicity								
White = 0	-							
African American/Black	.04	(-.06, .14)	.05	.78	.04	(-.07, .15)	.05	.70
Other, non-Hispanic	-.03	(-.14, .07)	.05	-.63	.16	(.05, .27)**	.05	2.91
Hispanic/Latino	<.001	(-.09, .09)	.04	.01	.11	(.01, .22)*	.05	2.20
Education								
Less than HS diploma = 0	-							
High school diploma	-.002	(-.13, .12)	.06	-.04	-.06	(-.23, .10)	.08	-.77
Some college	-.03	(-.16, .09)	.06	-.49	-.10	(-.25, .05)	.08	-1.27
Bachelor's degree or higher	-.08	(-.21, .04)	.06	-1.31	-.03	(-.19, .12)	.08	-.44
Marital status								
Married/Partnered = 0	-							
Single	-.03	(-.12, .06)	.04	-.69	.03	(-.07, .14)	.05	.70
Separated/Divorced/Widowed	.06	(-.01, .14)	.04	1.54	-.06	(-.16, .03)	.05	-1.27
Employment								
Employed = 0	-							
Unemployed	-.13	(-.26, -.01)*	.06	-2.14	.16	(-.01, .32)	.08	1.89
Retired/disabled/other	.01	(-.05, .07)	.03	.42	.01	(-.05, .06)	.03	.25
Pre-BMB mental health ailments	.00	(-.02, .03)	.01	.22	<.001	(-.03, .02)	.01	-.06
Region								
Boston = 0	-							
New York	-.25	(-.37, -.14)***	.05	-4.34	.01	(-.11, .15)	.06	.27
Remainder U.S.	-.31	(-.41, -.21)***	.05	-6.14	.15	(.02, .28)*	.06	2.41
Pre-BMB television watching	.08	(.05, .11)***	.01	5.20	.01	(-.02, .05)	.01	.87
Prior exposure to collective trauma								
Direct exposure	.01	(-.02, .05)	.01	.85	.07	(.02, .11)**	.02	3.15
Indirect exposure	.10	(.06, .13)***	.01	5.90	<.001	(-.03, .04)	.01	.23
Direct BMB exposure								
Not exposed = 0	-							
Directly exposed	.07	(-.06, .21)	.07	1.06	.10	(-.06, .28)	.08	1.21
Lockdown exposure								
Not exposed = 0	-							
Directly exposed	.07	(-.06, .21)	.07	1.01	.09	(-.06, .24)	.07	1.16
Traditional or new media use$_c$	.58	(.51, .64)***	.03	17.02	.64	(.56, .72)***	.04	15.39
Constant	.26	(.11, .42)	.07	3.35	-.10	(-.29, .08)	.09	-1.10
Model statistics	$F(22, 4367)=45.02$, $p<.001$; $R^2=.46$				$F(22, 4367)=18.75$, $p<.001$; $R^2=.44$			

*$p < .05$; **$p < .01$; ***$p < .001$; $_a$N varies from total sample size due to missing data; $_b$Robust standard error; $_c$Traditional media use was a covariate in the analysis of new media use, and new media use was a covariate in the analysis of traditional media; BMB = Boston Marathon bombings

Table 4. *Predictors of exposure to chaotic and bloody BMB-related content (N = 4,372)*$_a$

	Chaotic content				Bloody content			
Variables	*B*	(95% CI)	SE_b	*t*	*B*	(95% CI)	SE_b	*t*
Traditional media								
Television	.30	(.25, .34)***	.02	11.96	.23	(.18, .28)**	.02	9.03
Radio	-.02	(-.06, .01)	.02	-1.19	-.01	(-.05, .04)	.02	-.34
Print	.00	(-.04, .04)	.02	<.001	.01	(-.03, .07)	.02	.70
New media								
Online news sites	.03	(-.01, .07)	.02	1.51	.06	(.01, .11)**	.02	2.67
Social media pictures/videos	.02	(-.03, .07)	.02	.81	.02	(-.05, .10)	.04	.68
Social media news	-.04	(-.10, .003)	.02	1.38	.01	(-.05, .08)	.03	.39
Demographics								
Gender								
Male = 0	-							
Female	.02	(-.05, .09)	.03	.59	.01	(-.06, .08)	.03	.29
Age	.09	(.04, .14)***	.02	3.53	.06	(.01, .12)**	.02	2.61
Income	.08	(.03, .12)**	.02	3.29	.10	(.05, .14)***	.02	4.37
Ethnicity								
White = 0	-							
African American/Black	-.38	(-.52, -.24)***	.06	-5.48	.28	(-.42, -.14)***	.06	-4.10
Other, non-Hispanic	-.19	(-.36, -.02)*	.08	-2.25	-.10	(-.24, .04)	.07	-1.34
Hispanic/Latino	-.14	(-.27, -.02)*	.06	-2.28	-.09	(-.22, .03)	.06	1.48
Education								
Less than HS diploma = 0	-							
High school diploma	.28	(.11, .45)**	.08	3.33	.12	(-.04, .28)	.08	1.46
Some college	.35	(.19, .52)***	.08	4.20	.19	(.02, .36)*	.08	2.29
Bachelor's degree or higher	.30	(.13, .46)***	.08	3.51	.12	(-.04, .29)	.08	1.44
Marital status								
Married/Partnered = 0	-							
Single	-.07	(-.17, .03)	.05	-1.33	.05	(-.15, .04)	.05	-1.10
Separated/Divorced/Widowed	.01	(-.09, .12)	.05	.27	.01	(-.09, .12)	.05	.26
Employment								
Employed = 0	-							
Unemployed	.03	(-.12, .20)	.08	.47	.05	(-.08, .19)	.07	.74
Retired/disabled/other	-.01	(-.10, .07)	.04	-.28	-.04	(-.14, .05)	.05	-.91
Pre-BMB mental health ailments	.01	(-.01, .05)	.01	1.09	.04	(.00, .07)*	.01	2.10
Region								
Boston = 0	-							
New York	-.03	(-.16, .10)	.07	-.46	-.02	(-.16, .12)	.07	-.29
Remainder U.S.	-.18	(-.31, -.06)**	.06	-3.00	-.19	(-.32, -.06)**	.06	-3.03
Pre-BMB television watching	.13	(.09, .17)***	.02	6.50	.07	(.03, .11)***	.02	3.55
Direct BMB exposure								
Not exposed = 0	-							
Directly exposed	.15	(.02, .27)*	.06	2.34	.13	(-.02, .28)	.08	1.62
Lockdown exposure								
Not exposed = 0	-							
Directly exposed	.26	(.13, .39)***	.06	3.99	.27	(.11, .42)**	.08	3.35
Constant	-.14	(-.34, .05)	.10	-1.38	<.001	(-.19, .19)	.10	.00
Model statistics	$F(25, 4125)=28.95$, $p<.001$; $R^2=.21$				$F(25, 4259)=22.20$, $p<.001$; $R^2=.17$			

*$p < .05$; **$p < .01$; ***$p < .001$; $_a$N varies from total sample size due to missing data; $_b$Robust standard error; BMB = Boston Marathon bombings

.39 (SE = .01). Having at least one prior indirect media-based exposure to collective trauma was reported by 81.42% (weighted n = 3780) of the sample, of which the largest proportion (29.14%, weighted n = 1,352) reported three exposures. Across the sample, the average number of indirect media-based exposures to prior collective traumas was 2.28 (SE = .03). Thirty-two respondents did not provide information on direct or indirect prior trauma exposures.

Correlates of traditional media use

Correlates of traditional and new media use are juxtaposed in Table 3. In the adjusted model of traditional media use, older respondents reported using more traditional media than younger respondents (H1). Contrary to prediction, mental health history was not significantly associated with traditional media use (H2). Prior indirect media-based exposure to a collective trauma was positively associated with traditional media use (H3). However, contrary to prediction, prior direct exposure was not (H4). Respondents in the New York City and national samples reported fewer hours of traditional media use compared to those in the Boston area, when controlling for all other variables in the model. Although the analysis revealed that unemployed individuals attended to fewer hours of traditional media than those who were employed, the bivariate association between these variables was non-significant. This finding reveals a suppression effect that, upon further examination, was found to be driven by the inclusion of the new media use covariate. There was no significant interaction between employment status and new media use and as such, we take this finding to be a statistical artifact.

Correlates of new media use

As expected, younger respondents used more new media than older respondents (H1). However, contrary to prediction, mental health history was not significantly associated with new media use (H2). Prior direct exposure to a collective trauma was positively associated with new media use (H3). However, contrary to prediction, prior indirect media-based exposure was not (H3). Our results indicated that respondents in the U.S. sample reported more hours of new media use than the Boston metro sample. However, this was due to statistical suppression, as evidenced by the weighted means presented in Table 2 that demonstrate that the U.S. sample reported fewer hours of new media use than the Boston sample. Ethnicity was associated with new media use such that Hispanics and those classified as "other" race or ethnicity reported more daily hours of new media use compared to Whites.

Exposure to chaotic and bloody content

Correlates of exposure to chaotic and bloody content in the week following the bombings are juxtaposed in Table 4. In the adjusted model for chaotic content exposure, respondents who reported more hours of television use saw chaotic content more frequently than respondents who reported fewer hours of television use (H4). Older, wealthier respondents reported greater exposure to chaotic content. African Americans, Hispanics, and those of "other" race reported less chaotic content exposure than Whites.

Those with a high school diploma, some college, or a Bachelor's degree reported more exposure to chaotic content compared to those with less than a high school diploma. Individuals from the national sample reported less exposure to chaotic content than Boston residents. Respondents with direct exposure to the BMB and the lockdown, respectively, reported more chaotic content exposure than those not exposed.

Television and online news were associated with greater exposure to bloody content (H4). However, social media was not associated with exposure to bloody content. Older, wealthier respondents reported more frequent exposure to bloody content than other respondents. African Americans reported less exposure to bloody content than Whites. Those with some college exposure reported significantly more exposure to bloody content than those with less than a high school diploma. Individuals in the U.S. sample reported less exposure to bloody content when compared to Boston residents. Those who reported being in or knowing someone in the lockdown area reported significantly more bloody content exposure than those who were not exposed to the lockdown.

Having a history of mental health problems was positively associated with increased exposure to bloody content. However, the bivariate relationship between mental health and exposure to bloody content was not significant (p = .11). Reaching significance in the adjusted model suggests that the inclusion of another variable in the model strengthened the observed relationship (suppression effect). We suspected this was due, in part, to demographic variables in our model and found that the bivariate relationship became significant (p = .01) with the inclusion of income in the adjusted model. It should be noted that no interaction between these variables was found. [*Note*: Because prior mental health could also be treated as a categorical variable, we entered it into the model as such and found that there was no effect of mental health ailments (compared to healthy controls) when income was entered into the model.]

Complementarity of media use

We explored whether respondents used both traditional media and new media complementarily after the BMB.

Roughly two thirds of the sample reported using both traditional and new media sources after the BMB. We also found that average daily hours of traditional and new media use were strongly and positively correlated (r = .62, p < .001) and the strength of this relationship varied significantly according to age groups. The association between post-BMB traditional and new media use was strongest among those aged 18–29 (r = .81, p < .001). The correlation decreased for those aged 30–44 (r = .66, p < .001), and again for those aged 45–59 (r = .59, p < .001). Individuals aged 60+ demonstrated the weakest correlation (r = .47, p < .001). A Fisher's r-to-z transformation was used to compare correlations between age categories and revealed that the differences between all groups were statistically significant (all ps < .001).

Nearly 32% (weighted n = 1,484) of respondents reported using either traditional or new media sources in the week following the BMB. Of these, 93.39% (weighted n = 1,386) reported only using traditional media, while 6.60% (weighted n = 98) indicated only using new media. Those who indicated only using new media sources (M_{age} = 34.39, SE = 1.64) were significantly younger than those who indicated only using traditional media sources (M_{age} = 53.59, SE = .59; b = 17.56, p < .001). It should be noted that 3.45% of the total sample (weighted n = 161) reported no media use in the week following the bombings. These individuals had an average age of 41.68 (SE = 1.85); they were significantly younger than those who used only traditional media (b = 9.01, p < .001) and significantly older than those who used only new media (b = 13.56, p < .001).

Discussion

To our knowledge, this is the first study to examine correlates and patterns of media use and exposure to disaster-related content shortly after a collective trauma using a representative national sample of U.S. adults. Other key strengths include having pre-bombing measures of mental health history and television watching habits for the majority of respondents, which allowed us to control for the potential confounding influence of these variables on post-BMB media usage and exposure to disturbing BMB-related content. We were also able to control for employment status at the time of the bombings, which helps account for media use that may result from having leisure time due to unemployment or retirement.

The results of our analyses of traditional and new media use were consistent with prior studies demonstrating age effects: Young adults are more likely to use new media sources than older adults. Contrary to our hypothesis that prior collective trauma exposure would be associated with both traditional and new media use, our analyses suggest that prior direct exposure to collective trauma was positively associated with new media use but not traditional media use. Conversely, prior indirect media-based exposure to a collective trauma was positively associated with traditional media use but not new media use. The latter finding may be because our measure of indirect, media-based exposure to prior collective traumas was comprised of live television exposure and preference for viewing events on television is likely consistent over time. Taken together, this set of findings is consistent with uncertainty management studies, which demonstrate that individuals who have faced traumatic events engage in information seeking as a means of mitigating feelings of trauma-related anxiety (Lachlan et al., 2009; Seeger et al., 2003). Nonetheless, the differential pattern of BMB-related media use among those with prior direct and indirect trauma exposures warrant further exploration.

We also found that (a) daily hours of television use was associated with exposure to content containing bombing-related chaos and (b) daily hours of television and online news use were associated with exposure to bloody content. The positive relationship between bloody content and online news may be due, in part, to online news sites either being affiliates of large television/cable networks or being aggregated news sites reproducing coverage from news network sources. In the case of online news, the content streamed live on television is probably similar to what is streamed online. An alternative explanation of the relationship between bloody content and online news sites is the dissemination of user-driven content on news network sites. For example, some online news sites allow users to upload unedited, uncensored, video stories (e.g., CNN iReports). When disaster strikes, people in its proximity can digitally record the aftermath (via their smartphone or other device) and upload it directly to a national news organization's website without any oversight. Thus, content streamed online (which may be similar to television content), in addition to user-driven content disseminated on highly accessed websites, may increase the potential for indirect media-based trauma exposure.

Importantly, although Americans are increasingly getting their news from online news and social media sites (Pew Research Center, 2012), we found no association between social media use and exposure to bloody content. A plausible explanation for this is that social media users may not have been exposed to graphic content in their social media feeds, but rather clicked on links that directed them to online news sites where graphic depictions were presented. Thus, respondents would have indicated being exposed to graphic content via online news sites rather than on social media. This lack of a relationship between social media use and exposure to graphic content may change, however, as live-streaming videos on social media platforms (e.g., Facebook Livestream; Twitter's Periscope) become more prevalent.

Our final analysis revealed that two thirds of respondents reported using both traditional and new media sources to attend to bombing-related coverage. The correlation between these media types was strong, although it diminished as a

function of increasing age: Younger adults were more likely to access bombing-related coverage from both traditional and new media sources than were older adults. This supports the complementarity hypothesis that to obtain information about a given topic, people will use multiple media sources (Dutta-Bergman, 2004). These results also bring to bear the psychological implications of using multiple media sources depicting graphic imagery after a collective trauma. Given our finding that television and online news were uniquely associated with graphic content exposure, individuals who use both of these media sources to seek information about a collective trauma like the BMB may be at increased psychological risk. We glean from our analysis that because young adults are more likely to use both traditional and new media sources for disaster coverage, they may be more vulnerable to psychological distress than older adults. This is a topic worthy of future research.

Implications

In their model of the adaptive capacities of community resilience, Norris, Stevens, Pfefferbaum, Wyche, and Pfefferbaum (2008) make a compelling case for the role of media in helping to shape community narratives around collective traumas that have the potential to impact community resilience. On the one hand, media can serve as a mechanism for creating a shared sense of meaning about a traumatic event and fostering connectedness and collective understandings of the event. On the other hand, media can suppress recovery narratives (Cox & Perry, 2011), overwhelm a community (Wicke & Silver, 2009), and negatively impact a community's response. Understanding who is using what sources to view which type of content in a post-disaster context is critical given the mounting evidence of the media's role in transmitting trauma to consumers (Holman et al., 2014). Prolonged or repeated exposures to graphic content after a collective trauma could impair natural recovery processes (e.g., resilience) that would not be interrupted otherwise. Finally, the vast geographic reach of the media (Wicke & Silver, 2009; Wright, Ursano, Bartone, & Ingraham, 1990) could extend this impairment to communities distal from the traumatic event.

Repeated exposure to graphic imagery on local and national news outlets (across media sources) could also create community narratives of uncertainty and lack of safety. Indeed, media hype after a disaster has a tendency to take on a life of its own when a shocking story unfolds (Vasterman, Yzermans, & Dirkzwager, 2005). Although the media attempts to inform the public of the facts about that event, it can sometimes be responsible for amplifying social perceptions of risk (Kasperson et al., 1988), especially when repeatedly transmitting content that is likely distressing. This amplification of social risk and distress following collective traumas could also be exacerbated by the access people have to news via their smartphones. A recent study (Pew Research Center, 2015) found that nearly two thirds of Americans access the Internet through smartphones and that of these, 68% indicate occasionally following "breaking news" from their smartphone, and 67% report sharing pictures and videos about events happening in their communities. Thus, the potential for amplifying social risk and distress responses can occur in all contexts of daily life.

Limitations and conclusions

Because disasters and community traumas often occur without warning, it is exceedingly rare for methodologically rigorous studies to be conducted in their immediate aftermath (Garfin & Silver, 2015). Logistical challenges such as securing funding and gaining ethics board approval frequently preclude early post-disaster assessments. While we were able to begin a national data collection effort using representative samples as soon as 10 days after the perpetrator was caught, we nonetheless acknowledge several limitations. It would have been ideal to assess media exposure closer to the bombings and in real-time. Also, we do not know how accurate respondents' reports were for daily use of each type of media. In addition, while we found that the majority of respondents reported accessing news from traditional and new media sources after the bombings, we have no measure of their motivation to seek out information during and after the bombing. It could be that individuals motivated to stay informed attend to the media more and access more media sources than those for whom staying informed is less important. In fact, there is evidence that individuals vary in their interest in a collective traumatic event. Using the Uncertainty Reduction framework, a study by Boyle et al. (2004) found that media use dropped dramatically 3-4 months after 9/11 among individuals expressing no desire to learn about the attacks, but that the drop in usage was less prominent among those who were motivated to use the media for information seeking purposes. Finally, with respect to the content people saw, we do not know (a) the exact images or videos they saw, (b) the extent to which exposure was repetitive, or (c) the context in which people were exposed (alone vs. with others). Such factors might influence the psychological impact of viewing graphic content and are important topics for future research.

Despite these limitations, the results from this study shed light on key predictors of both traditional and new media use in the wake of a large-scale community disaster. Insofar as increased media exposure is associated with distress after a collective trauma, it is important to consider the roles prior trauma exposures and complementarity of news media use play in exacerbating subsequent trauma exposure. We believe, based on our findings, that further exploration of the psychological impact of viewing graphic disaster-related

content would benefit community psychologists and trauma scholars attempting to understand how the media shapes experiences of a collective trauma.

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