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The Role of Graphic Sounds and Images of a Mass Violence Event in Distress, Worry, and Helping Behaviors in its Aftermath

DISSERTATION

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DOCTOR OF PHILOSOPHY

in Psychology & Social Behavior

by

Sarah Ann Redmond

Dissertation Committee:
Professor Roxane Cohen Silver, Chair
Associate Professor E. Alison Holman
Professor Raymond W. Novaco

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CURRICULUM VITAE

Sarah Ann Redmond

FIELD OF STUDY:

Media exposure, terrorism, traumatic stress, fear, mixed-methods research

EDUCATION:

2019	Ph.D. in Psychology & Social Behavior, University of California, Irvine
2017	M.A. in Social Ecology, University of California, Irvine
2013	B.A. in Psychology, University of Southern California

ACADEMIC HONORS AND AWARDS:

2019	Social Ecology Dean's Dissertation Writing Fellowship
2018	Social Ecology Dean's Dissertation Data Collection Stipend
2018	Graduate Student Mentoring Award
2018	Social Ecology Dean's Advancement Fellowship for Diversity Students
2014	UC Irvine Diversity Recruitment Fellowship
2014	UC Irvine Provost Ph.D. Fellowship

RESEARCH EXPERIENCE:

2014 –2019 Doctoral Student in Silver Stress & Coping Lab
University of California, Irvine Irvine, CA
Duties:

- Conduct literature reviews
- Perform quantitative analyses using STATA
- Perform qualitative analyses
- Supervise undergraduate and post-baccalaureate research assistants
- Author manuscripts

2013 - 2014 Project Specialist
Center for Innovation and Research on Veterans & Military Families Los Angeles, CA
Duties:

- Project Specialist on Sexual Dysfunction Project
- Project Coordinator for study on sexual functioning as a result of military service
- Conducted literature reviews, data entry, manuscript writing
- Demo of virtual patient avatar to potential donors, military officials, and media

2012 - 2013 Research Assistant
Center for Innovation and Research on Veterans & Military Families Los Angeles, CA
Duties:

- Research Assistant to Sherrie Wilcox, Ph.D. and Jeffery Wilkins, M.D.
- Authored and tested virtual person used to train students
- Conducted literature reviews
- Wrote literature summaries for grant proposals
- Organized and reviewed articles submitted to Military Behavioral Health Journal

2012 - 2013 Counselor at Los Angeles Conservation Corps
University of Southern California Los Angeles, CA
Duties:

- Counseled students using Motivational Interviewing

2012 Field data collection in Department of Psychology
University of Southern California Los Angeles, CA
Duties:

- Administered surveys to middle school students

2011 - 2011 Creativity Research Assistant to William Breland, Ph.D.
University of Southern California Los Angeles, CA
Duties:

- Inputted and coded data for Los Angeles Team Mentoring Program (LATM)
- Performed literature reviews on factors promoting and inhibiting creativity
- Co-authored technical paper

2011 - 2011 Research Assistant for Behavioral Employment Program
University of Southern California Los Angeles, CA
Duties:

- Transcribed and coded therapy session between counselors and BEP participants
- Performed literature search on impact of fatherhood on inner-city youth

PUBLICATIONS:

Redmond, S., Jones, N. M., Holman, E. A., & Silver, R. C. (2019). Who watches an ISIS beheading—and why. *American Psychologist*. Advance online publication. http://dx.doi.org/10.1037/amp0000438

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MANUSCRIPTS IN PREPARATION:

Redmond, S.A., Lubens, P., & Silver, R.C. Photojournalists: Forgotten first responders.

Redmond, S.A., Lubens, P., & Silver, R.C. Why do journalists watch beheading videos?

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Wilcox, S.L., & **Redmond, S.** (2019). Protecting one's spouse from combat events and sexual functioning.

PRESENTATIONS:

Redmond, S., Lubens, P., & Silver, R.C. (2018, November). *Why Do photojournalists watch a beheading video? A mixed-methods approach*. Poster presented at the International Society for Traumatic Stress Studies Annual Meeting, Chicago, IL.

Redmond, S., Jones, N.M., Holman, E.A., & Silver, R.C. (2017, November). *Who views graphic media and why? A mixed-methods study of the ISIS beheading videos.* Poster presented at the International Society for Traumatic Stress Studies Annual Meeting, Chicago, IL.

Redmond, S., Silver, R.C., & Lubens, P. (2016, November). *Posttraumatic stress among photojournalists: An occupational hazard of repeated exposure to trauma*. In D. R. Garfin (Chair), *How does media coverage of traumatic events impact the populace and those who report it? Evidence from survey and experimental research*. Symposium presented at the International Society for Traumatic Stress Studies Annual Meeting, Dallas, TX.

Wilcox, S.L., **Redmond, S.**, & Hassan, A.M. (2014, November). *Sexual functioning in military personnel: Preliminary estimates and predictors*. Poster presented at the Canadian Institute for Military & Veteran Health Research Conference, Toronto, Ontario, Canada.

Wilcox, S.L., **Redmond, S.A.,** & Hassan, A.M. (2014, November). *Other invisible wounds: Sexual functioning in military service members and veterans.* Poster presented at the APHA 2014 Annual Meeting & Expo, New Orleans, LA.

Wilcox, S.L., Schuyler, S., Campbell, S., & **Redmond, S.** (2014, October). *Military sexual trauma in male military personnel*. Moderated poster presentation at the 16th World Meeting on Sexual Medicine, Sao Paulo, Brazil.

Wilcox, S.L., Latham Davis, T., & **Redmond, S.** (2014, October). *The impact of genital image and sexual anxiety on erectile dysfunction among male military personnel*. Presented at the 16th World Meeting on Sexual Medicine, Sao Paulo, Brazil.

Wilcox, S.L., Hassan, A.M., & **Redmond, S**. (2014, August). *The other invisible wounds: Sexual dysfunction as a result of military service.* Oral presentation at the APA 2014 Convention, Washington, DC.

Redmond, S., Campbell, S.M., Barr, K.J., Wilcox, S.L., & Hassan, A.H. (2013, July-August*). Attitudes towards evidence based practice: Definitions, openness, implementation, and barriers among military-related behavioral health providers*. In S. Wilcox

(Chair/Discussant), *Improving military cultural competency, practice behavior, and confidence in providers*. Symposium (Presidential Programming) at the American Psychological Association Convention, Honolulu, HI.

TEACHING AND MENTORING:

2014- 2019 Teaching Assistant, School of Social Ecology,
University of California, Irvine

PROFESSIONAL AFFILIATIONS AND MEMBERSHIPS:
Alpha Lambda Delta (USC chapter)
Phi Beta Kappa (USC chapter)
USC Golden Key
Psi Chi (USC chapter)

ABSTRACT OF THE DISSERTATION

The Role of Graphic Sounds and Images of a Mass Violence Event in Distress, Worry, and Helping Behaviors in its Aftermath

By

Sarah Redmond

Doctor of Philosophy in Psychology & Social Behavior

University of California, Irvine, 2019

Professor Roxane Cohen Silver, Chair

Exposure to media coverage has been linked to psychological symptoms, but less is known about specific aspects of this coverage (e.g., images vs. sounds) that predict deleterious outcomes. Additionally, literature has largely neglected potential positive correlates (e.g., helping behavior) of news coverage. **Study 1** examined the relationship between frequency of exposure to Boston Marathon bombings coverage presented as visuals plus audio, visuals, and audio and symptoms of psychological distress in a representative national U.S. sample (N = 4,342) assessed within weeks of the bombings and followed over time. Results indicated that shortly after the bombings, all types of media coverage predicted acute stress, but visuals with audio predicted psychological symptoms 18 years later. **Study 2** (N= 112 undergraduates) sought to replicate Study 1 experimentally by exploring whether the way graphic news coverage of mass violence events is presented produces differences in psychological symptoms. Participants were randomly exposed to one of four compilations of news clips of recent mass violence events in a laboratory setting (graphic

video with audio, graphic video only, graphic audio only, or "talking heads") and completed outcome measures online. The sample was too underpowered to detect any meaningful differences between all study groups, but post-hoc analyses comparing conditions containing graphic imagery to those without suggest that inclusion of graphic images leads to worse outcomes. In **Study 3**, undergraduates (*N*= 321) were randomly assigned to one of the same news coverage conditions as in Study 2. Participants were exposed to the clips online and completed measures assessing negative responses, intentions to help, and charitable giving. Findings revealed significant group differences in distress, fear, empathy, and changes in positive and negative affect. Those subjects in conditions containing graphic imagery exhibited worse outcomes. Graphic video with audio and graphic video only produced greater intentions to help compared to exposure to the "talking heads" control, but there were no group differences in charitable giving. Together, these studies suggest that traumatic media coverage containing graphic imagery (and to a lesser extent graphic sounds) may put individuals at risk for subsequent psychological symptoms, but it remains unclear whether graphic imagery can motivate individuals to take behavioral action.

CHAPTER 1:

Introduction

Introduction

"Don't watch the video. Don't share it. That's not how life should be." These were the words posted on Twitter by Kelly Foley (Stelter, 2014), whose cousin James Foley was brutally beheaded by the terrorist group known as the Islamic State of Iraq and Syria (ISIS). In 2014, a video of Foley's beheading was posted online by ISIS and subsequently went viral. This horrific act of terror was widely covered by news organizations, but due to its graphic, barbaric nature, they all struggled with the issue of how much of the video was necessary and appropriate to show to keep the public informed (Stelter, 2014). While many television stations opted to include screen grabs from the video, video links continued to pop up on Facebook and Twitter (Stelter, 2014). This video was somewhat unique in its extreme graphicness, but highlights challenging issues that have appeared as part of the new media landscape.

The new media landscape allows us to constantly access news on our televisions, computers, and smartphones, and check for the latest updates on social media sites such as Facebook and Twitter. News coverage is no longer tightly controlled by journalists and news editors who carefully curate the news for public consumption. This has allowed many individuals to become actively engaged in the news and post links to stories and videos they deem newsworthy, impacting what other users are exposed to on social media sites. In the case of James Foley, many Internet users decided to share links to the graphic footage of his murder, despite news organizations themselves deciding it was too graphic to show the public. More recently, individuals took to Twitter in the wake of the Paris and Brussels terror attacks to share news content, as well as their feelings surrounding the attacks (Bruns & Hanusch, 2017). However, citizens are not just sharing news stories, but are also

generating their own images and videos taken on smartphones as tragic events unfold. Indeed, journalists now find themselves sifting through user-generated content, and many find themselves being exposed to violent content on a daily basis as a result (Feinstein, Audet, & Waknine, 2014). Moreover, while journalists sifting through this content can determine what is relevant and appropriate to use in news stories they produce, this does not stop ordinary citizens from uploading these images and videos to social sharing sites. In this context, the opening quote by Kelly Foley reflects the fact that as news organizations no longer control the images that are shared, individuals must make choices about what content to view and how they perpetuate the availability of such content once it has been released.

Who watches coverage of collective traumas?

Given the ease with which images and videos are now shared in the wake of traumatic events, and the multitude of sources from which such coverage is available, it should come as no surprise that heavy exposure to news coverage in the wake of large-scale tragedies is quite common. When the September 11th terrorist attacks occurred, U.S. adults tuned into 8.1 hours of coverage on average, with 49% watching 8+ hours (Schuster et al., 2001), suggesting it was not a small number of heavy media users driving up the average. Similarly, another study with a representative national sample found that 44% of those sampled watched 4 or more hours of 9/11 coverage daily in the week following the attacks (Silver et al., 2013). Moreover, even when newsworthy coverage is exceedingly graphic in nature, as was the case in the ISIS beheading videos, many individuals are not dissuaded from watching this coverage. Recent research found that about 25% of a representative national sample watched at least part of an ISIS beheading video (Redmond,

Jones, Holman, & Silver, 2019). As research identifies the high frequency with which individuals tune into graphic coverage, other research has aimed to identify characteristics of those who watch it.

Research suggests that individuals with pre-existing mental health conditions are no more likely to watch graphic news coverage than those without such conditions (Jones, Garfin, Holman, & Silver, 2016), even though individuals with depression (Dittmar, 1994) and certain anxiety disorders (de Wit, van Straten, Lamers, Cuijpers, & Penninx, 2011) appear to display greater television consumption overall. However, both prior violent victimization and fear appear to be robust predictors of tuning into graphic content. A study of journalists found that those who reported experiencing more occupational danger were more likely to watch an ISIS beheading video (Redmond, Lubens, & Silver, n.d.), and a study of a representative national sample found that lifetime history of violent victimization and fear of terrorism both predicted viewing an ISIS beheading video (Redmond et al., 2019). Moreover, research on selective attention has demonstrated individuals' increased focus on stimuli of which they are afraid, whether that be the location of a spider had appeared on the screen for those fearing spiders (Mogg & Bradley, 2006), or attention to words pertaining to pain for those afraid of pain (Keogh, Ellery, Hunt, & Hannent, 2001). Thus, there is preliminary evidence that past violence and fear draw individuals to graphic media coverage.

When describing who watches graphic media coverage, it is important to note that this dissertation is referring to those who attend to real, graphic coverage of traumatic events. Moreover, in subsequent discussions of correlates of media exposure, this dissertation refers to correlates of exposure to real, graphic media coverage of traumatic

events unless otherwise specified. This distinction is important because although substantial research has identified those who enjoy violent content that is not real and created to entertain, these findings likely do not apply to those who watch graphic coverage of important real-life events (Hoffner & Levine, 2005). Further, simply thinking a graphic image is fictional can lessen its psychological impact (Kobach & Weaver, 2012) and fictional content appears to offer individuals opportunities to disengage, i.e. concentrating on special effects (Goldstein, 1999). Thus, research on responses to graphic fictional content is not relevant to the questions explored in the present dissertation.

Correlates of Media Exposure

While research has just begun to identify predictors of exposure to graphic media coverage, the psychological and physical health outcomes associated with consuming graphic media have been well documented. A number of studies suggest that it is those who watch large amounts of graphic news coverage in the wake of a tragedy who are most at risk. Watching 4 or more hours daily of 9/11 coverage in the first week after the attacks was associated with increased risk for physical health ailments 2 to 3 years later (Silver et al., 2013), and other research reported an elevated probable PTSD risk in highest as opposed to lowest 9/11 television consumers (Ahern, Galea, Resnick, & Vlahov, 2004). Furthermore, following the Boston Marathon bombings, those who were exposed to six or more hours of coverage daily in the week after the bombings displayed greater acute stress than those who were directly exposed to them (Holman, Garfin, & Silver, 2014). Other research suggests that a single, a highly graphic exposure may be associated with long term symptoms. Watching a beheading video was found to be associated with greater global distress measured over a year later in the days following the Pulse Nightclub shooting in

Orlando, Florida (Redmond et al., 2019). This study offers preliminary evidence that in addition to hours of collective trauma media exposure being associated with long term physical and psychological symptoms, brief intensely graphic exposures may predict long term symptoms as well.

While consuming large amounts of traumatic coverage or intensely graphic coverage appears to place individuals at risk for subsequent symptomatology, other research suggests that those with a history of victimization may be especially vulnerable to negative outcomes following media exposure. For example, viewing a single highly graphic video was associated with global distress in photojournalists who had experienced more negative childhood events (Redmond, Lubens, et al., n.d.). Furthermore, other research has found that both direct and indirect exposure to large-scale traumatic events via media may sensitize individuals to future collective traumas (Garfin, Holman, & Silver, 2015).These findings suggest that when examining the relationship between traumatic media coverage and negative outcomes, it is important to consider past history of traumatic exposures, which may help further explain individuals' reactions to such coverage.

In the absence of research demonstrating a causal relationship between media exposure to traumatic events and psychological symptoms, media-based traumatic exposure remains unrecognized as a trauma in the clinical diagnostic guidelines. The current Diagnostic and Statistical Manual of Mental Disorders (DSM-5) explicitly states that media exposure should not be considered a trauma when making a traumatic stress diagnosis that requires a traumatic "trigger," except when such exposure occurs in the context of work, e.g., police officers or journalists (American Psychiatric Association, 2013). Thus, although research has identified traumatic media exposure as a risk factor for

subsequent symptoms of psychological distress and psychiatric epidemiologists have become interested in topics previously explored by communications researchers (Pinchevski, 2016), the notion that indirect traumatic exposure may be similar to direct traumatic exposure has not been widely accepted.

Types of Images that may be Distressing

To provide more compelling evidence of the relationship between indirect media-based traumatic exposure and psychological and physical symptoms, the next step for trauma researchers may be identifying characteristics of graphic coverage that produce negative outcomes. Some research suggests that media exposure to graphic images may be particularly distressing. Greater exposure to images of the Iraq War and 9/11 terrorist attacks were both found to increase the risk for subsequent psychological symptoms (Silver et al., 2013). Furthermore, other research has explored how different *types* of images in the wake of large scale disasters may be associated with differential outcomes. One study found that different post-9/11 emotions (e.g., anger, shock, and sorrow) could uniquely predict memory of seeing certain images (Fahmy, Cho, Wanta, & Song, 2006). Moreover, other research found that repeated exposure to televised depictions of individuals jumping or falling during the attacks increased the risk of PTSD and depression in individuals also reporting direct 9/11 exposure (Ahern et al., 2002). Similarly, research has found that exposure to bloody images of the Boston Marathon bombings put individuals at greatest risk for subsequent psychological symptoms, at least in the immediate aftermath and six months later (Holman, Garfin, Lubens, & Silver, in press). This research offers preliminary evidence that specific graphic images and those that are particularly bloody may be associated with specific emotions and may be associated with

increased risk of psychological symptoms in some individuals. However, other research conducted with children after 9/11 further complicates this picture by suggesting both negative and positive images put children at risk for posttraumatic stress symptoms (Saylor, Cowart, Lipovsky, Jackson, & Finch, 2003). Together this research underscores the need to further explore the relationship between different types of images and psychological symptoms to clarify these findings.

Types of Media that May be Distressing

Although research on the impact of different types of disaster-related images is quite limited, research exploring the relationship between media format of disaster coverage and psychological symptoms is even more scarce. One study exploring language utilized by media sources to cover 9/11 found that language from television coverage employed more blame, praise, satisfaction, tenacity, and motion compared to newspaper reports, and getting news from television was associated with greater negative feelings at 1-2 months and about 6 months after the attacks (Cho et al., 2003). Other research has found that television exposure, but not other types of media exposure, increased the risk for overall posttraumatic stress symptoms and intrusive symptoms in the wake of 9/11 (Pfefferbaum et al., 2016). However, these studies' findings that television coverage is the most distressing should be interpreted with caution since they examined media use in 2001 following the September 11th attacks before the media landscape had grown to its current status and before the creation of social media sites such as Facebook and Twitter. A more recent study that tried to incorporate elements of the new media landscape modified news coverage of a restaurant engaging in unsafe food practices to include a factual article with or without comments and with or without video in various combinations (Spence,

Lachlan, Sellnow, Rice, & Seeger, 2017). Findings revealed that compared to the "article only" group, the article accompanied by a video and comments increased notions that consuming food prepared in the manner described would have more serious implications for one's health (Spence et al., 2017). Thus, multiple components of media may contribute to individuals' subsequent responses to this coverage and would benefit from further exploration.

Audio Versus Visual Content

When evaluating the impact of news media, it may be important to consider both audio and visual components. Research done with fMRI suggests that there are discrete brain networks for producing images of visual objects and images from audio, in addition to an overarching mental imagery network (Zvyaginstev et al., 2013). This suggests that individuals may differentially process both components. However, research exploring responses to distressing media content has tended to focus on images, and only minimal research has explored how individuals respond to distressing audio. Interviewing a small number of transcriptionists revealed that some reported crying and physical symptoms in response to hearing traumatic audio (Wilkes, Cummings, & Haigh, 2015). Another qualitative transcriptionist study led researchers to speculate that audio accompanied by video may be worse than just audio, but noted the lack of data to demonstrate whether this was the case (Kiyimba & Reilly, 2016). These studies offer preliminary evidence that graphic audio may be distressing and highlight the need for research that compares graphic audio with graphic audio and video.

Although research has yet to explore how audio and visual content contribute to psychological symptoms in the wake of large scale traumas, some research has explored

responses to graphic films of car accidents in a lab setting and manipulated the presentation of audio and visual components. In one study, individuals heard a journalist verbally depict accidents and imagined what they heard, producing subsequent visual intrusions (Krans, Näring, Holmes, & Becker, 2010). A similar study found that for individuals who saw a film and for those who just heard the audio version and mentally pictured the images, the amount of intrusions and resulting distress from these intrusions were the same (Krans, Näring, Speckens, & Becker, 2011). However, specifically having individuals imagine the distressing audio they hear may be a key component in producing subsequent distress. Past research found that when a negative scenario was presented via audio, imagining the scenario produced more anxiety than directing one's attention to the words' meaning (Holmes & Mathews, 2005). This preliminary evidence suggests distressing audio may be just as distressing as audio accompanied by visuals, but the importance of imagining the audio should be considered. Further, because these studies exposed participants to the aftermath of car accidents or fictional scenarios and only assessed psychological responses up to a week later, it is unclear to what extent the findings from these studies apply to individuals' long-term responses to media coverage of collective traumas.

Tendency to Create Vivid Mental Images

A body of research has identified individual differences in the ability to create vivid mental images. A study using fMRI found that those who indicated better vivid image-generating ability on a questionnaire demonstrated greater visual cortex activity initially when performing an imagery task (Cui, Jeter, Yang, Montague, & Eagleman, 2007). Other research has identified mental health conditions as a factor that may contribute to

differences in the ability to generate vivid images. For instance, depressive symptoms predicted greater vivid imagery ability in those with PTSD (Karatzias, Power, Brown, & McGoldrick, 2009). Another study with psychiatric outpatients found that those who have anxiety imagine negative hypothetical events with greater vividness in relation to healthy and depressed individuals when asked to do so (Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011). This suggests that when accounting for the ability to create vivid mental imagery while evaluating distress responses to traumatic events, it may be important to consider pre-existing mental health conditions since the two may be confounded.

There is also some evidence that the tendency to create vivid mental images may impact responses to traumatic coverage beyond mental health conditions. For instance, one study showed participants a film and still images depicting outcomes of emergencies and accidents and accounted for variability across individuals in generating vivid images in one's mind (Morina, Leibold, & Ehring, 2013). The researchers found that those higher in this ability experienced more intrusions immediately and over time, had more vivid intrusive thoughts, and were more distressed by these thoughts irrespective of anxiety and depressive symptoms (Morina, Leibold, & Ehring, 2013). While this study demonstrated that the tendency to create vivid mental images can predispose individuals to negative responses to distressing visual content above and beyond the impact of pre-existing mental health on distress, it did not explore the extent to which this tendency may exacerbate responses to purely audio content. Thus, research still needs to explore whether graphic audio coverage is associated with distress, while accounting for potential differences in vividness of mental imagery and pre-existing mental health conditions. Furthermore, although this study used film coverage and images of real, graphic accidents, it is possible

that individuals do not respond to coverage of graphic accidents in the same way they respond to coverage of collective traumas. Traffic accidents are a tragic but fairly common occurrence, whereas collective traumas often result in mass casualties intentionally inflicted by a ruthless individual or terrorist group, perhaps creating more shock and horror.

Under-researched Responses: Helping and Charitable Donations

Since psychological and physical symptoms associated with viewing graphic coverage of large-scale disasters have been consistently identified, a logical next step is for researchers to examine what aspects of this coverage (e.g., images, sounds, or a combination of the two) are particularly distressing so that news consumers can limit exposure to this coverage. However, before news consumers are advised to avoid certain forms of coverage, it is also important to explore potential positive outcomes of viewing graphic coverage since the research has largely focused on identifying negative correlates. By taking a one-sided approach, researchers may have missed possible positive correlates of this coverage, such as increased volunteering or charitable donating. If this is the case, advising individuals to avoid certain forms of media could have unintended effects of reducing philanthropy following large-scale disasters. Thus, research is needed to explore potential positive correlates so news consumers can be wholly informed on the outcomes associated with different forms of media coverage.

Despite the importance of providing aid to victims in the aftermath of large-scale disasters, it remains largely unknown to what extent tuning into different types of disaster-related media coverage may elicit helping behavior from news consumers. Some research has been conducted on the use of negative emotions and fear appeals to inspire helping

behavior, but these studies have yielded mixed findings. While one study found that eliciting negative emotions by using an emotional public service announcement may be important to foster empathy, which can encourage helping (Bagozzi & Moore, 1994), other research suggests graphic imagery is unnecessary to inspire aid if empathy is successfully evoked in another way (Shelton & Rogers, 1981). Furthermore, a survey of American Red Cross donors following the 2004 Indian Ocean tsunami indicated that once individuals learned the tsunami had occurred, those who experienced greater dissonance watched less news, and donating money appeared to ease dissonance (Waters, 2009). This suggests that individuals who felt badly after the tsunami may have donated money to make themselves feel better. Furthermore, while it appears that individuals did not need a constant bombardment of images to motivate them to act, the study did not explore whether individuals initially learned about the tsunami through graphic media coverage, and whether these initial graphic images played a role in their emotional response. Thus, no clear conclusions can be drawn from these studies of the role different media coverage may play in influencing helping behavior.

Literature Review Summary

Overall**,** a large body of research has found that many individuals tune into media coverage in the wake of large-scale disasters and being exposed to greater amounts of this coverage is associated with mental and physical health symptoms. However, most of this research has been correlational and failed to explore the mechanisms by which exposure to graphic coverage may lead to negative symptoms. Correlational research suggests that those who have a history of violent victimization may be sensitized to this coverage. Further, experimental research suggests that an individual's tendency to create vivid

mental images may also increase the risk for negative responses to coverage of car accidents. However, specific aspects of graphic coverage itself that may increase the risk for negative symptoms remain underexplored. The closest trauma researchers have come to addressing this question is exploring whether specific media sources are associated with negative symptoms (Cho et al., 2003; Pfefferbaum et al., 2016), and identifying associations between certain event-related images and negative symptoms. Further, although some researchers have begun to experimentally compare responses to graphic video with audio and graphic audio only, this research has yet to be conducted using news coverage of large-scale disasters. Thus, it remains unknown whether individuals are most distressed and fearful when they are exposed to news coverage presented in different mediums. This paves the way for experimental research to compare graphic video with audio, graphic video only, and graphic audio only to determine what sensory elements of media produce the most symptoms. Furthermore, due to the almost exclusive focus on the association between graphic coverage and negative symptomatology by past researchers, whether certain types of graphic coverage may be associated with positive outcomes is notably missing from the literature.

Plan for the Dissertation

This dissertation sought to expand on past research demonstrating that media coverage of large scale traumatic events is associated with distress by exploring what aspects of this coverage in particular may be most distressing (*video with audio, visual (non-audio)*, or *audio (non-visual)*). This question was first addressed in Study 1 with a longitudinal representative national U.S. sample, recruited a few weeks after the Boston Marathon bombings, to explore whether the frequency with which individuals tuned in to

different types of media coverage in the wake of a collective trauma predicted psychological symptoms. Next, because much of the research examining media coverage and its associated outcomes has been correlational in nature (including Study 1), Study 2 used an in-lab methodology to explore whether exposure to different types of graphic mass violence media coverage produces differences in symptoms of psychological distress. Further, because it is important to weigh both the risks and benefits of graphic news coverage, Study 3 experimentally explored potential positive outcomes produced by different types of news coverage. Thus, Study 3 sought to identify whether there were any positive effects of distressing media coverage, such as increased helping behavior, that must be considered when making recommendations about limiting exposure to certain types of graphic media. This program of research sought to understand whether the way in which media coverage of collective traumas is presented predicts subsequent psychological and behavioral responses- both good and bad. This marks a necessary first step to understand the elements of mass violence media coverage that can have a great impact.

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CHAPTER 2:

Comparing Exposure to Visuals and/or Audio of the Boston Marathon Bombings and Negative Psychological Responses Over Time

Abstract

In the wake of a collective trauma, many individuals consume large amounts of media coverage, some of it graphic, potentially putting themselves at risk for subsequent psychological symptoms. However, less is known about what aspects of this coverage are most distressing. The present longitudinal study conducted with a representative national U.S. sample (N = 4,342) explored how exposure to coverage of the 2013 Boston Marathon bombings (BMB) presented as visuals plus audio, visual (non-audio), and audio (non-visual) each predicted psychological symptoms shortly after the bombings and over time. Findings revealed that consuming BMB coverage presented as visuals plus audio, visual (non-audio), and audio (non-visual) all predicted acute stress responses to the BMB 2- 4 weeks later. Further, exposure to BMB visuals plus audio coverage and visual (non-audio) coverage predicted posttraumatic stress symptoms to the BMB, fear of future terrorism, and functional impairment 6 months later. Only exposure to BMB visuals plus audio coverage predicted global distress and functional impairment 2 years later. These findings suggest that exposure to all types of sensory media coverage predict symptoms of psychological distress in the wake of a tragedy. However, audio (non-visual) coverage predicts only short-term psychological symptoms, while visuals plus audio coverage predicts long-term psychological symptoms.

Keywords: Boston Marathon bombings, psychological symptoms, media type, audio, visuals

Comparing Exposure to Visuals and/or Audio of the Boston Marathon Bombings and Negative Psychological Responses Over Time

In the last couple decades, tragic events such as the September 11th terrorist attacks, Boston Marathon bombings, and Las Vegas Route 91 music festival shooting have touched the lives of many Americans as the media has brought horrific footage of these events to homes across the nation. With scenes of human suffering available on repeat, trauma researchers have been interested in the psychological toll heavy exposure to these horrific images may have. Researchers have consistently found that large amounts of exposure to media coverage of collective traumas is associated with psychological symptomatology (e.g., Ahern et al., 2002; Holman, Garfin, & Silver, 2014; Silver et al., 2013). However, less is known about what aspects of this coverage, specifically, are most strongly associated with negative outcomes. For instance, is viewing a particularly gory image associated with worse psychological symptoms than hearing the sounds of rapid gunfire or horrific cries of anguish from victims? Do videos that contain gory images accompanied by horrific cries have more of a psychological impact than images and sounds in isolation? These are the questions that trauma researchers have yet to fully explore, but appear important for a more nuanced understanding of why exposure to media coverage of collective traumas is consistently found to predict psychological outcomes.

In the aftermath of collective traumas, research has largely focused on responses to cumulative amount of media exposure (Holman et al., 2014; Silver et al., 2013), different media sources (e.g., television, Internet, or newspaper, Cho et al., 2003), or different types of disaster images (Fahmy et al., 2006b; Holman, Garfin, Lubens, & Silver, in press; Iyer, Webster, Hornsey, & Vanman, 2014), instead of exploring responses to different sensory

elements of disaster media coverage (e.g., images, sounds, or a combination of the two). However, scholars from other disciplines have long been interested in using experimental methodology to explore how individuals react to various sensory elements of media. For instance, developmental researchers have explored how different sensory media presentations impact learning in children (Nugent, 1982; Peracchio, 1993). Additionally, communication scholars have explored how audio alone or paired with various types of images (Fox et al., 2004) and audio and video pairs that convey similar or different information (Fox, 2004) affect recognition for elements of the previously presented content. Indeed, some researchers propose that verbal and nonverbal input may enhance recall when identical information is conveyed by both (Paivio, 1991), especially when comparing the recall of audio alone to audio with a similar visual component (Lang, 1995). This research suggests that it is possible that depicting large-scale disasters with cohesive audio and visual elements may produce enhanced memory of the coverage. Thus, while this research does not offer any evidence as to whether one type of sensory media presentation may produce more symptoms of psychological distress than another, it does suggest that the memory of graphic media coverage containing similar audio and visuals paired together may stay in individuals' minds longer.

In addition to studying the effect of audio and visuals on learning and memory, research has compared how audio and visuals by themselves and together influence emotional responses. One study found that, in general, audio and visuals of news events paired together elicited stronger emotional responses than audio or visuals by themselves (Crigler, Just, & Neuman, 1994). However, this finding was not universal for all news stories, and the types of new stories tested were not reflective of the type of collective

traumas that are widely publicized in today's media age. Moreover, other more general research has attempted to identify how pairing different types of images with a horrible sound influenced its impact (Cox, 2008). However, no consistent pattern of findings emerged, with the influence of various kinds of images (e.g., consistent with the horrible sound, pleasant, or a neutral box) appearing to differ depending on the sound tested (Cox, 2008). Together these findings suggest that pairing audio and visuals can heighten emotional responses in some cases, but the events/content of the exposure matters (Cox, 2008; Crigler et al., 1994). Thus, it remains difficult to predict how individuals' emotional responses to media coverage of large-scale disasters will be influenced by audio, visuals, and a combination of the two, because the events and content previous research has used to explore this question are quite different from collective traumas.

While there remains a dearth of knowledge on the influence of audio, visuals, and a combination of the two in predicting responses to coverage of collective traumas, the closest research has come to exploring this question is research exploring individuals' responses to an audio only version of a film describing horrific car accidents and research comparing the audio only version of the car accident film to a version with both video and audio. Researchers found that hearing an audio depiction of the car accident film and imagining what was being verbally illustrated was sufficient to cause intrusions (Krans, Näring, Holmes, & Becker, 2010). Moreover, both an audio only version of the car accident film and a video with audio version of the film produced similar amounts of distress and intrusions (Krans, Näring, Speckens, & Becker, 2011). This suggests that removing the images from traumatic coverage may do little to lessen the psychological impact graphic coverage has on an audience. However, the authors contend that the events portrayed in

the car accident film differ from real life traumas, calling into question the generalizability of these findings to media coverage of collective traumas (Krans et al., 2011). Although the car accident film used real footage, exposure to collective traumas that leave many victims may engage viewers in ways smaller-scale accidents do not.

The Present Study

The 2013 Boston Marathon became the target of a terrorist bombing that killed three Americans and injured hundreds more. The Boston Marathon was a prime target for terrorists because the nature of the event ensured a large audience and widespread media coverage (Galily, Yarchi, Tamir, & Samuel-Azran, 2016). Indeed, multiple media sources quickly picked up coverage of the Boston Marathon bombings (BMB) with individuals turning to television, social media, radio, and the newspaper to learn more about new developments unfolding. With many Americans actively following this coverage, research has demonstrated that heavy consumption of media coverage of the BMB was associated with greater acute stress than direct exposure to the BMB when all types of media coverage were aggregated (Holman et al., 2014). However, there remain important differences in the sensory elements included in different types of media coverage. For instance, television informed Americans via visuals with audio, images shared online and printed in newspapers informed Americans via visuals only, and radio informed Americans via audio. While many Americans consume media coverage of collective traumas from a multitude of sources, it is unknown whether certain sensory elements of BMB coverage (e.g., visuals plus audio, visuals (non-audio), or audio (non-visual)) were associated with greater symptoms of psychological distress than other types of sensory elements of the coverage Americans may have been exposed to.

The present study sought to identify the association between exposure to BMB coverage presented in visuals plus audio format (e.g., television and videos on social media), visual (non-audio) format (pictures on social media; news and text updates on social media; and print media, e.g., newspapers, magazines), and audio (non-visual) format (e.g., radio) and psychological symptoms. Because many individuals consume many different types of media in the wake of a collective trauma, the present study measured the frequency with which each participant reported exposure to each of the three different media presentation types to determine the relationship between different sensory media elements and negative outcomes. Thus, each type of media exposure was not mutually exclusive and participants could report exposure to all three types of media presentations. Moreover, because a representative national U.S. sample was recruited shortly after the BMB and followed over time as part of a longitudinal study, we were able to explore how exposure to different sensory media elements in the week after the BMB predicted symptoms of psychological distress weeks after the BMB, about 6 months later, and about 18 months later. We predicted that exposure to visuals plus audio BMB coverage would be the strongest predictor of psychological symptoms in the weeks after exposure and over time because this form of exposure engaged both visual and auditory senses.

Methods

Overview

A national U.S. sample was first surveyed about 2-4 weeks after the BMB (Wave 1). At Wave 1, participants reported their exposure to different types of BMB media coverage in the week after the attacks, direct exposure to the BMB, and acute stress responses to the BMB. Additionally, we had access to previously collected data on participants' television

watching habits, mental health history, and demographics, allowing us to control for these variables when exploring the relationship between consuming BMB media coverage containing different sensory elements and acute stress to the BMB. Further, due to the longitudinal nature of the study, we were able to explore how consuming BMB coverage containing different sensory elements in the week after the bombings was associated with symptoms of psychological distress over time. First, we explored how exposure to BMB media coverage containing different sensory elements was associated acute stress (Wave 1: 2-4 weeks post-BMB). Next, we explored how exposure to media coverage of the BMB containing different sensory elements was associated with BMB-related posttraumatic stress symptoms, fear of future terrorism, and functional impairment 6 months later (Wave 2: 6 months post-BMB). Additionally, we explored how exposure to media coverage of the BMB containing different sensory elements was associated with global distress and functional impairment 18 months later (Wave 3: about 19 months post-BMB).

Sample

Participants comprised a representative national U.S. sample recruited by GfK Knowledge Panel. GfK uses address-based sampling to recruit members to the panel and provides members with access to the Internet or other forms of compensation in return for taking part in online surveys. Participants who did not immediately complete the survey received reminders via phone calls and email. At the first wave of data collection, occurring 2-4 weeks after the BMB (Wave 1), n = 846 individuals residing in the Boston metro area, n = 941 individuals residing in the New York metro area, and n = 2,888 individuals representative of the rest of the U.S. participated in a survey. Boston Metro and New York metro were oversampled due to the greater chance of direct exposure to the BMB and

other large-scale disasters (e.g., the September 11th attacks). Individuals were surveyed again 6 months later (Wave 2, *N* = 3,598), and about 18 months later (months after the Ebola health scare began) (Wave 3, *N* = 3,447). For all waves of data collection, surveys were completed anonymously online.

Procedures

Active GfK panelists were emailed an invitation to complete the survey at the start of each wave of data collection. The email contained an introduction to the study and a link that panelists could click to take the online survey. Panelists who were no longer active on the panel during subsequent waves of data collection, but who had consented to being informed about longitudinal assessments, were given the opportunity to take the survey online or by mail. GfK sent postcards, emails, and made phone calls to panelists who did not complete the survey when the first invitation was sent.

Because different demographic groups are likely to participate in surveys at different rates, GfK creates design weights to account for this and keep a panel that is representative of the U.S. To account for differences in the likelihood of participating in our survey and attrition, poststratified design weights specially created for our sample were used (see Holman et al., 2014). The weighted sample was compared to benchmarks established by the American Community Survey (U.S. Department of Commerce, U.S. Census Bureau, 2015), revealing that the weighted sample was consistent with our target population despite some attrition over the course of this longitudinal study. This enables population-based inferences to be drawn from these findings. The Institutional Review Board at the University of California, Irvine approved all study procedures.

Measures

Pre- Wave 1 Covariates Collected by GFK

Demographics. When participants join the GfK panel, the following demographic information is recorded: gender, age, ethnicity, marital status, education level, income, and employment status. This information is updated yearly.

Mental health history. History of mental health conditions diagnosed by a physician was measured shortly after participants joined the GfK panel using modified items from the National Health Interview Survey, which is conducted annually by the National Center for Health Statistics within the Centers for Disease Control and Prevention (U.S. Department of Health & Human Services, National Center for Health Statistics, 2015). Individuals who reported ever being diagnosed with an anxiety and/or depressive disorder received a score of 1 for each type of diagnosis they had received and those without any prior diagnoses received a score of 0, creating a 0 to 2 variable. Sequential hot deck imputation (Andridge & Little, 2010) was used to impute missing data because mental health data was not available for 28% of the sample at Wave 1 (see Holman et al., 2014).

Television watching habits. GfK assessed participants' typical frequency of television watching before the BMB by asking participants to indicate the frequency with which they watched 117 different cable and broadcast networks on television using a 5-point Likert-type scale (1 = never, 5 = 3 times per week). An index of TV-watching habits was created to reflect the mean frequency of watching all 117 channels.

Predictor Variables Collected at Wave 1[1]

[1] Participants were also asked about the number of hours per day they saw coverage of the BMB and its aftermath on news sites. However, because this question was too general to determine what type of content participants came across on news sites (e.g., print articles/still images or videos), data from this question was not included in the variables assessing exposure to BMB coverage.

Exposure to BMB visuals plus audio coverage. Participants indicated their average BMB-related TV watching and social media video watching in the week following the attack, separately, by checking a box on a grid with 13 choices (0 = none, 11 = 11+ hours). The mean of these two items was used in analyses as a measure of frequency of exposure to visuals plus audio coverage.

Exposure to BMB audio (non-visual) coverage. Participants indicated the average number of hours per day they listened to radio coverage of the BMB and its aftermath in the week following the attacks. Ratings were made by checking a box on a grid with 13 choices (0 = none, 11 = 11+ hours). The mean of this variable was used in the analyses as a measure of frequency of exposure to audio (non-visual) coverage.

Exposure to BMB visual (non-audio) coverage. Participants indicated the average number of hours per day they looked at pictures on social media, news and text updates on social media, and print media (newspapers, magazines, etc.) about the BMB and its aftermath in the week following the attacks. Participants rated their daily use of each of these three sources separately, by checking a box on a grid with 13 choices (0 = none, 11= 11+ hours). The mean of these three items was used in analyses as a measure of frequency of exposure to visual(non-audio)coverage.

Direct BMB exposure. To assess whether participants had been directly exposed to the Boston Marathon bombings, participants indicated whether they or someone close to them were at or near the site of the bombing, they knew someone who was injured, or they knew someone who was killed in the bombings. If participants indicated any of those direct exposures, they received a score of 1. If participants indicated none of those direct

exposures, they received a score of 0. This created a dichotomous variable that was used in the analyses.

Wave 1 Outcomes

Acute Stress Response to the BMB. Participants completed the Stanford Acute Stress Reactions Questionnaire (Cardeña, Koopman, Classen, Waelde, & Spiegel, 2000) to measure acute stress responses to the BMB. The extent to which participants experienced 30 symptoms were rated on a 6-point Likert-type scale (1= not experienced, 6= very often experienced). The sum of all items was used in the analysis ($\alpha = 0.96$).

Wave 2 Outcomes

Posttraumatic Stress Symptoms (PTS) in response to the BMB. To assess posttraumatic stress responses to the BMB, participants completed the 4-item Primary Care PTSD screen (PC-PTSD) with 1 item measuring each of the following 4 symptoms of PTSD: avoidance, hyperarousal, re-experiencing, and numbing (Calhoun et al., 2010; Prins et al., 2003). Participants rated each item on a 5-point Likert-type scale (1= never, 5= all the time). The mean of all items was used in the analyses ($\alpha = 0.78$).

Functional Impairment. To assess impaired functioning, participants answered 4-items modified from the Short Form Health Survey (SF-36,(Ware & Sherbourne, 1992). Participants used a 5-point Likert-type scale to indicate how often they experienced impairment in their work and social life due to physical and emotional problems (1= none of the time, 5= all of the time). The analysis used the mean of the 4 items ($\alpha = 0.87$).

Fear of future terrorism. Two items measured fear and worry about future terrorism (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). The first item asked, "How often in the past week have you had fears about the possibility of another terrorist attack

(e.g., bombing, hijacking, etc.)?" The second item stated, "I worry that an act of terrorism (e.g., bombing, hijacking, etc.) will personally affect me or someone in my family in the future." Participants rated these items using a 5-point Likert-type scale (1 = never, 5= all the time). The sum of these items was used in the analysis ($\alpha = 0.82$, $r = 0.70$).

Wave 3 Outcomes

Global Distress. The 18-item Brief Symptom Inventory-18 (Derogatis, 2001) was used to measure global distress. This measure consists of 3 subscales: anxiety, depression, and somatization, with 6 items loading onto each subscale. Each item is rated on a 5-point Likert-type scale (0 = not at all, 4 = extremely), and the mean of all items was used in the analysis ($\alpha = 0.93$).

Functional Impairment. Impaired functioning was assessed using the same 4-item measure that was used in Wave 2. The sum of these items was used in the analysis ($\alpha = 0.87$).

Analytic Strategy

Analyses were run with Stata 14.2 (Stata Corp, College Station, TX). To explore how exposure to BMB coverage containing different sensory elements was associated with each of the outcome variables of interest, a series of three separate weighted bivariate regression analyses explored whether exposure to BMB 1) visuals plus audio, 2) visual (non-audio), and 3) audio (non-visual) coverage predicted our outcome variable of interest. This series of 3 bivariate regression analyses was run for each of the six outcome variables of interest: acute stress reactions to the BMB at Wave 1, posttraumatic stress symptoms to the BMB at Wave 2, functional impairment at Wave 2, fear of future terrorism at Wave 2, global distress at Wave 3, and functional impairment at Wave 3.

Next, six separate ordinary least squares (OLS) regression analyses were run. In each OLS regression, exposure to BMB visual plus audio coverage, exposure to BMB visual (non-audio) coverage, and exposure to BMB audio (non-visual) coverage were included as predictor variables. Additionally, each OLS regression controlled for mental health history and television watching habits (measured before the BMB), as well as direct exposure to the BMB and demographics. Further, region was also controlled for in each OLS regression because individuals from Boston metro and New York metro were more likely to have been directly exposed to large-scale disasters, including the BMB. The six outcomes explored by the six OLS regression analyses were the same as the six outcomes explored in the series of bivariate regression analyses described above. In all analyses, the data were weighted using study design weights and all continuous variables were standardized using z-scores.

Results

Mean Consumption of BMB Coverage with Different Sensory Elements

The mean exposure to BMB with visual plus audio coverage was 1.40 hours a day (SD = 1.59). Participants reported a mean exposure to BMB visual (non-audio) coverage of 0.59 hours a day (SD = 1.27) and a mean exposure to BMB audio (non-visual) coverage of 0.85 hours a day (SD = 1.65).

Acute Stress Responses to the BMB 2-4 weeks later

Three separate bivariate regression analyses revealed that exposure to BMB visual plus audio coverage (β = .39, p < .001, 95%CI[.33, .45]), exposure to BMB visual (non-audio) coverage (β = .40, p < .001, 95%CI[.33, .48]), and exposure to BMB audio (non-visual) coverage (β = .32, p < .001, 95%CI[.25, .39]) were each associated with acute stress responses to the BMB. These findings remained robust after entering all types of BMB

coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, typical television watching, and demographics (see Table 1).

6 Month Outcomes

Posttraumatic Stress Symptoms to the BMB

Three separate bivariate regression analyses revealed that exposure to BMB visual plus audio coverage (β = .35 p < .001, 95%CI[.27, .43]), exposure to BMB visual (non-audio) coverage (β = .36, p < .001, 95%CI[.26, .46]), and exposure to BMB audio (non-visual) coverage (β = .21, p < .001, 95%CI[.14, .28]) each predicted BMB-related posttraumatic stress symptoms six months later. However, after including all types of BMB coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, typical television watching, and demographics, only exposure to BMB visuals plus audio coverage and exposure to BMB visual (non-audio) coverage predicted posttraumatic stress symptoms to the BMB six months later (see Table 2).

Fear of Future Terrorism

Three separate bivariate regression analyses revealed that exposure to BMB visual plus audio coverage (β = .26, p < .001, 95%CI[.21, .31]), exposure to BMB visual (non-audio) coverage (β = .23, p < .001, 95%CI[.18, .28]), and exposure to BMB audio (non-visual) coverage (β = .16, p < .001, 95%CI[.12, .21]) each predicted fear of future terrorism 6 months after the BMB. However, after including all types of BMB coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, television watching habits, and demographics, only exposure to BMB visual plus audio coverage and exposure to BMB visual (non-audio) coverage predicted fear of future terrorism 6 months later (see Table 2).

Functional Impairment

Three separate bivariate analyses revealed that exposure to BMB visual plus audio coverage (β = .19, p < .001, 95%CI[.14, .25]) and exposure to BMB visual (non-audio) coverage (β = .18, p < .001, 95%CI[.12, .24]) predicted functional impairment six months after the BMB, while exposure to BMB audio (non-visual) coverage (β = .05, p < .07, 95%CI[<-.004, .10]) did not predict functional impairment. Further, after including all types of BMB coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, typical television watching, and demographics, only exposure to BMB visual plus audio coverage and exposure to BMB visual (non-audio) coverage predicted functional impairment six months later (see Table 2).

2 year outcomes

Global Distress

Three separate bivariate regression analyses revealed that exposure to BMB visual plus audio coverage (β = .22, p < .001, 95%CI[.14, .30]), exposure to BMB visual (non-audio) coverage (β = .20, p < .001, 95%CI[.11, .28]), and exposure to BMB audio (non-visual) coverage (β = .12, p < .05, 95%CI[.04, .19]) all predicted global distress two years after the BMB. However, after including all types of BMB coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, television watching habits, and demographics, only exposure to BMB visual plus audio coverage predicted global distress two years later (see Table 3).

Functional Impairment

Three separate bivariate regression analyses revealed that exposure to BMB visual plus audio coverage (β = .23, p < .001, 95%CI[.16, .30]), exposure to BMB visual (non-

audio) coverage (β = .18, p < .001, 95%CI[.11, .25]), and exposure to BMB audio (non-visual) coverage (β = .09, p < .05, 95%CI[.02, .16]) each predicted functional impairment two years after the BMB. However, after including all types of BMB coverage in the same OLS regression analysis and controlling for direct BMB exposure, mental health history, typical television watching habits, and demographics, only exposure to BMB visual plus audio coverage predicted functional impairment two years later (see Table 3).

Discussion

Expanding on a body of research demonstrating that heavy exposure to media coverage of large-scale disasters predicts symptoms of psychological distress (e.g., Ahern et al., 2002; Holman et al., 2014; Silver et al., 2013), the present study explored the novel question of whether early exposure to different types of BMB media coverage containing different sensory elements each uniquely predicted symptoms of psychological distress in the weeks after the bombings and over time. Findings suggest that exposure to BMB coverage that included visual plus auditory content increased the risk for symptoms of psychological distress up to 18 months later, while the risk for psychological symptoms was briefer for exposure to visual (non-audio) content, and shortest for exposure to audio(non-visual) content. This suggests that in the short term, individuals may not be able to completely eliminate their risk for psychological symptoms following exposure to media coverage of a collective trauma.

Symptoms of Psychological Distress Over Time

Exposure to BMB coverage presented as audio(non-visual) (e.g., radio) did not predict psychological symptoms beyond the acute post-bombing period. Other research has also found that fear responses conditioned via verbal information will become extinct faster

than fear conditioned via observation (Olsson & Phelps, 2004). While audio and visual cues can both teach a person to fear something, audio effects may be more fleeting and less deeply engrained. Indeed, exposure to BMB coverage containing visuals (either without audio or accompanied by sound) predicted psychological symptoms 6 months later. However, the risk for subsequent psychological symptoms following exposure to BMB coverage was the most long-lasting when visual content and audio occurred together. One possible explanation is that individuals remember media coverage containing visuals and audio better when both tell a repetitive story, which is consistent with communication theories (Lang, 1995; Paivio, 1991). However, in the present study we did not specifically assess memory for 2013 BMB media coverage, so it is possible that something other than memory makes visual plus audio coverage a strong predictor of psychological symptoms over time. This topic is an important one for future research to explore.

Predictive Strength of Each Sensory Media Type

Although exposure to BMB visual with audio coverage predicted the longest-lasting risk for symptoms of psychological distress, our findings suggest that exposure to BMB visual (non-audio) coverage placed individuals at greatest risk for shorter term psychological symptoms. Prior research on framing effects suggests that images leave more up to interpretation, whereas text tends to orient the consumer to a specific takeaway (Geise & Baden, 2015). Thus, pictures by themselves might leave room for an individual mentally to fill in the blanks of the story they tell. Indeed, using images that imply impending death but tell an incomplete story is a tactic used by terrorists because doing so prompts individuals to imagine what led up to and followed the scene photographed, sparking terror (Winkler, El Damanhoury, Dicker, & Lemieux, 2016). It is possible that BMB

coverage containing visuals plus audio formed a more complete story that left less to the imagination, while exposure to visual(non-audio) coverage sparked consumers' imaginations, leading them not only to bear witness to the images before them but also to paint mental pictures of the horrific scenes that followed that moment in time. However, this may also depend on individuals' natural inclination to vividly imagine scenarios in their minds because the vividness with which individuals generate mental images does appear to be subject to individual differences (Morina, Leibold, & Ehring, 2013).

Type of Sensory Media Coverage of the BMB vs. Direct BMB exposure

Consistent with past research demonstrating that large amounts of exposure to BMB media coverage was associated with greater acute stress than direct exposure to the BMB (Holman et al., 2014), the present study found that even when separating BMB media coverage into different sensory elements, media coverage of the BMB put some individuals at greater risk for psychological symptoms than direct exposure to the bombings. For instance, in the weeks after the BMB, repeated exposure to all types of media coverage (visuals plus audio, visual (non-audio), and audio(non-visual)) were more strongly associated with acute stress than direct exposure to the BMB (see Table 1). Further, although direct exposure to the BMB predicted posttraumatic stress symptoms to the BMB, fear of future terrorism, and functional impairment six months later, exposure to BMB visual plus audio coverage and exposure to BMB visual (non-audio) coverage were both stronger predictors of each of these three outcomes (see Table 2). Lastly, exposure to BMB visual plus audio coverage significantly predicted global distress and functional impairment 18 months later, while direct exposure to the BMB did not (see Table 3). These results highlight the power of media containing various sensory elements to have the

potential to influence individuals more strongly than being present at a horrific event. Indeed, Shapiro and Lang (1991) previously theorized that exposure to events via television may affect conceptions of the real world, and speculate that whereas direct exposure to a shooting might foster avoidance, indirect exposure via television might orient the individual toward a shooting, fostering absorption of sensory material. Further, other research suggests that individuals are able to acquire fears via observation and there is value in not having to learn the danger of something firsthand; moreover, both animal and human studies have demonstrated learning via observation (Olsson & Phelps, 2007).

Contributions and Limitations

The present study adds to a body of literature that has found that exposure to media coverage in the aftermath of a large-scale disaster predicts symptoms of psychological distress (e.g., Ahern et al., 2002; Silver et al., 2013) by exploring different sensory elements of this coverage (visuals plus audio, visuals(non-audio), and audio(non-visual)) that may contribute to psychological symptoms. In doing so, we sought to identify what it is, specifically, about exposure to media coverage of a collective trauma that predicts symptoms of psychological distress. However, because participants retrospectively reported how much BMB media exposure they consumed from various sources during the week following the bombings, it is possible that there was some level of error in participants' recall. This risk of error in recall was minimized by surveying participants only 2- 4 weeks after the bombings. Further, response bias was also minimized because all surveys were completed anonymously online.

Another potential limitation is that participants in our sample had consumed multiple types of media coverage of the BMB. Thus, we were not able to examine how

exposure to media coverage containing different sensory elements consumed in isolation predicted psychological symptoms, but instead examined how the frequency with which individuals consumed each of these types of coverage predicted negative outcomes. It is possible that if this question was explored experimentally with individuals assigned to be exposed to only one type of media coverage of a large-scale disaster, the findings might differ. Nonetheless, our approach to this question is more ecologically valid as individuals often consume media from different types of sources in the wake of a disaster (Jones et al., 2016).

The present study attempted to expand on past research that has focused on the *amount* of media coverage individuals consume in the wake of a disaster (e.g., Holman et al., 2014; Silver et al., 2013) by exploring the *type* of coverage consumed as a predictor of symptoms of psychological distress. However, our measure of the *type* of coverage was confounded with *amount* of exposure because individuals did not report consuming each type of coverage at the same frequency. On average, individuals consumed the most video plus audio coverage and the least visual (non-audio) coverage. A truer comparison of subsequent psychological responses to different types of collective trauma media coverage would have held the frequency of exposure to each type of media coverage constant, but the correlational nature of this study made doing so impossible. The findings of the present study would be strengthened by future experimental research that exposes participants to different types of media coverage of a collective trauma, but holds the amount of exposure constant across all types.

One of the major strengths of the present study was that we were able to follow participants longitudinally to determine their risk for subsequent psychological symptoms

up to 18 months later. However, some individuals may have been exposed to other large-scale disasters or meaningful life events after the Boston Marathon bombings, but before we measured global distress and functional impairment 18 months later, which may have also played a role in the outcomes measured. For instance, the outcomes measured 18 months later were measured a few months after the first case of Ebola in the United States, and about 26% of our sample watched at least an hour of Ebola media coverage daily (Thompson, Garfin, Holman, & Silver, 2017). However, global distress and functional impairment are outcome measures intended to assess general psychological symptoms as opposed to psychological symptoms in response to a particular event, and these measures were not administered in the immediate aftermath of any collective trauma. Nonetheless, the strength of the association between exposure to BMB visual plus audio coverage and global distress and functional impairment two years later should be interpreted with caution.

Conclusions and Future Directions

The present longitudinal study conducted among a representative national U.S. sample identified differences in the longevity of psychological risks associated with exposure to media coverage containing different sensory elements. While no type of media coverage appeared to come without risks, findings suggest that the magnitude and length of the risk varied by the sensory elements included in the coverage. Together these findings provide a more nuanced understanding of the association between heavy exposure to media coverage of collective traumas and psychological symptoms reported previously (e.g., Ahern et al., 2002; Holman et al., 2014; Silver et al., 2013). Further, although exposure to audio (non-visual) content only predicted psychological symptoms in the short-term, it

is possible that audio coverage of collective traumas may be a stronger predictor of negative psychological symptoms in individuals who have more direct exposure to prior collective traumas or negative life events. Thus, future research may consider exploring symptoms of psychological distress in response to collective trauma audio coverage in those with previous traumatic exposure or direct exposure to the collective trauma itself.

The present study is a first step in understanding specific aspects of media coverage of collective traumas that predict subsequent symptoms of psychological distress. However, due to the correlational nature of the study, we were unable to draw firm causal conclusions. Future experimental research could expand on the findings by randomly assigning individuals to view media coverage of the same collective traumas, isolating different forms of sensory exposure. Manipulating the sensory elements would increase confidence that our findings are due to different sensory elements themselves, and not due to exposure to differential content. Nonetheless, the present study indicates comparing responses to different types of collective trauma media coverage may be a fruitful area of research.

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Table 1. Exposure to BMB Visuals plus Audio, Visual (Non-audio), and Audio (Non-visual) Coverage and Acute Stress Responses 2-4 Weeks Later (Standardized Regression Coefficients n =4,342))

Variables	Acute Stress to BMB β(95% CI)
Multivariate Analysis	
BMB Media Presentation Type	
Visuals plus audio	.15(.09, .21)**
Visuals (Non-audio)	.21(.13, .29)**
Audio (Non-visual)	.13(.07, .19)**
Demographics	
Region	
Boston	-.08(-.20, .03)
New York	.12(.01, .23)*
Gender	
Male (ref. group)	--
Female	.12(.05, .20)*
Age	>-.01(-.04, .04)
Income	-.10(-.14, -.06)**
Race / Ethnicity	
White, non-Hispanic (ref. group)	--
Black, non-Hispanic	.06(-.07, .20)
Other, 2+ race, non-Hispanic	.42(.22, .63)*
Hispanic	.08(-.04, .19)
Education	
Less than high school	.34(.13, .54)*
High school	.06(-.03, .15)
Some college	<.01(-.08, .08)
Bachelor's or higher (ref. group)	--
Employment status	
Employed (ref. group)	--
Unemployed	.03(-.05, .12)
Marital Status	
Single (ref. group)	--
Married/cohabitating	.09(-.02, .13)
Widowed/divorced/separated	.13(-.03, .28)
Other covariates	
Mental health history	.09(.05, .13)**
Television watching habits	-.01(-.05, .02)
Direct BMB exposure	.10(.06, .15)**
Model Statistics	$F(20, 4321) = 17.13$; $p < .001$; $R^2 = .23$

Note: BMB = Boston Marathon bombings, *$p < .05$, **$p < .001$

Table 2. Exposure to BMB Visuals plus Audio, Visual (Non-audio), and Audio (Non-visual) Coverage and Psychological Symptoms Six Months Later (Standardized Regression Coefficients)

Variables	PTS to BMB β(95% CI)	Fear of Future Terrorism β(95% CI)	Functional Impairment β(95% CI)
Multivariate Analyses	(n = 3,420)	(*n* = 3,407)	(*n* = 3,396)
BMB Media Presentation Type			
Visuals plus audio	.13(.05, .22)*	.12(.05, .19)*	.08(.01, .15)*
Visual (non-audio)	.19(.05, .33)*	.10(.02, .18)*	.13(.04, .21)*
Audio (non-visual)	.07(-.02, .16)	.06(>-.01, .12)	-.03(-.09, .03)
Demographics			
Region			
Boston	.03(-.11, .16)	-.07(-.20, .05)	-.17(-.27, -.06)*
New York	.04(-.08, .15)	.09(-.04, .21)	.05(-.07, .16)
Gender			
Male (ref. group)	--	--	--
Female	<.01(-.09, .10)	.14(.05, .23)	.05(-.03, .13)
Age	.04(-.02, .09)	.10(.04, .15)*	.03(-.02, .09)
Income	-.06(-.11, >-.01)*	-.01(-.06, .04)*	-.15(-.19, -.11)**
Race / Ethnicity			
White, non-Hispanic (ref. group)	--	--	--
Black, non-Hispanic	.15(-.01, .32)	-.11(-.27, .05)	.04(-.13, .20)
Other, 2+ race, non-Hispanic	.56(.28, .84)**	.28(.09, .47)*	.22(.04, .40)*
Hispanic	.28(.12, .43)*	.22(.05, .38)*	.18(.04, .33)*
Education			
Less than high school	.16(-.04, .36)	.04(-.15, .23)	.24(.03, .45)*
High school	.13(<.01, .26)*	.08(-.04, .19)	>-.01(-.10, .10)
Some college	.14(.03, .26)*	.04(-.07, .15)	.01(-.08, .10)
Bachelor's or higher (ref. group)	--	--	--
Employment status			
Employed (ref. group)	--	--	--
Unemployed	.11(.01, .21)*	.07(-.03, .18)	.20(.10, .30)**

Marital Status			
Single (ref. group)	--	--	--
Married/cohabitating	-.11(-.26, .03)	-.01(-.14, .13)	-.07(-.19, .05)
Widowed/divorced/separated	-.04(-.21, .13)	-.03(-.20, .14)	-.02(-.19, .14)
Other covariates			
Mental health history	.07(.02, .12)*	.03(-.01, .07)	.23(.17, .29)**
Television watching habits	.03(-.03, .08)	.07(.02, .12)*	.04(-.01. .08)
Direct BMB exposure	.08(.02, .15)*	.07(.02, .12)*	.04(<.01, .09)*
Model Statistics	$F(20, 3399) = 10.22$; $p < .001$; $R^2 = .18$	$F(20, 3386) = 10.58$; $p < .001$; $R^2 = .10$	$F(20, 3375) = 14.00$; $p < .001$; $R^2 = .18$

Note: BMB = Boston Marathon bombing, PTS = posttraumatic stress symptoms, *$p < .05$, **$p < .001$. All regression coefficients are standardized.

Table 3. Exposure to BMB Visuals plus Audio, Visual (Non-audio), and Audio (Non-visual) Coverage and Psychological Symptoms 18 Months Later (Standardized Regression Coefficients)

Variables	Global Distress *β*(95% CI)	Functional Impairment *β*(95% CI)
Multivariate Analyses	(n = 3,244)	(*n* = 3,241)
BMB Media Presentation Type		
Visuals plus audio	.11(.02, .20)*	.15(.06, .24)*
Visual (non-audio)	.06(-.03, .15)	.04(-.04. .12)
Audio (non-visual)	.03(-.03, .10)	.01(-.05, .06)
Demographics		
Region		
Boston	-.12(-.26, .03)	-.10(-.23, .03)
New York	.02(-.14, .17)	<.01(-.12, .13)
Gender		
Male (ref. group)	--	--
Female	.02(-.08, .13)	-.02(-.12., .07)
Age	-.05(-.11, <.01)	-.01(-.07, .05)
Income	-.10(-.15, -.05)**	-.10(-.15, -.05)**
Race / Ethnicity		
White, non-Hispanic (ref. group)	--	--
Black, non-Hispanic	<.01(-.23, .23)	<.01(-.18, .19)
Other, 2+ race, non-Hispanic	.44(.18, .70)*	.32(.12, .53)*
Hispanic	.36(.16, .55)**	.25(.08, .43)*
Education		
Less than high school	.22(-.06, .50)	.33(.01, .64)*
High school	.03(-.09, .16)	-.04(-.15. .08)
Some college	.05(-.07, .18)	-.04(-.15, .07)
Bachelor's or higher (ref. group)	--	--
Employment status		
Employed (ref. group)	--	--
Unemployed	.06(-.07, .10)	.18(.06, .29)*
Marital Status		
Single (ref. group)	--	--
Married/cohabitating	-.15(-.30, >-.01)*	-.17(-.30, -.04)*
Widowed/divorced/separated	-.14(-.34, .07)	-.10(-.29, .09)
Other covariates		
Mental health history	.33(.26, .40)**	.32(.26 .38)**
Television watching habits	.06(.01, .11)*	-.03(-.02, .07)
Direct BMB exposure	.03(-.03, .08)	.05(>-.01, .10)
Model Statistics	$F(20, 3223) = 11.46$; $p < .001$; $R^2 = .21$	$F(20, 3220) = 14.30$; $p < .001$; $R^2 = .23$

Note: BMB= Boston Marathon bombings, *$p < .05$, **$p < .001$

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CHAPTER 3:

An Experimental Study of Negative Responses to Graphic Media Coverage of Mass Violence

Abstract

Correlational research has linked exposure to news coverage of collective traumas to psychological symptoms. However, research has not yet established a causal relationship, and it is unclear whether certain elements of coverage (e.g., visuals or audio) are particularly detrimental. The present study aimed to address these gaps in the literature by experimentally exploring whether the way in which media coverage of five recent mass violent events containing some graphic depictions was presented (visuals with audio, video only, or audio only) produced differences in change in negative affect, distress, fear of future mass violence, risk perceptions, and intentions to modify behavior with an undergraduate sample (N = 112). This study also compared each media condition that contained some graphic depictions to a control condition that did not contain graphic images or sounds. Findings revealed no significant group differences on any of the negative outcomes, likely because the study was underpowered. However, post-hoc analyses comparing negative outcomes between those exposed to some graphic media images (video with audio or video only) to those not exposed to any graphic images (audio only and control condition) revealed that those exposed to some graphic imagery reported greater change in negative affect, distress, and fear of future mass violence events. The present study suggests that including some graphic images in media coverage of collective traumas may be one element of media coverage that is particularly detrimental. Further, this study demonstrates the feasibility of exploring the effects of exposure to media coverage containing some graphic imagery to participants in the lab.

An Experimental Study of Negative Responses to Media Coverage of Mass Violence

Staying informed is now easier than ever before due to technological advancements that provide near constant access to media updates about current events, including coverage of collective traumas taking place across the world. Media outlets cover these events extensively, and horrific videos depicting the carnage have been widely circulated on the Internet, including footage of events like the 2016 Bastille Day killings in Nice, France, and Christchurch massacre in New Zealand. As these tragic events continue to occur and news organizations do their best to keep citizens informed -- often using vivid images and videos -- it is important to consider the potential effects of repeated exposure to this graphic news footage. Previous research has linked repeated exposure to media coverage of collective traumas to negative outcomes, including both mental (Silver et al., 2013; Thompson et al., 2017) and physical health ailments (Holman & Silver, 2011). In fact, following the 2013 Boston Marathon bombings, research indicated that extensive media exposure to the bombings (i.e., 6+ hours on average per day) was a stronger predictor of acute stress responses than was direct exposure to the bombings themselves (Holman et al., 2014). These findings suggest that large amounts of exposure to collective trauma media coverage are associated with greater psychological symptoms, but these studies have all been correlational and explored outcomes associated with the amount of media coverage individuals report consuming. However, specific elements of the coverage that may be most linked to negative symptoms, i.e. audio vs visual presentations of coverage that contain some graphic depictions, remain largely underexplored.

Only recently has research begun to explore whether the graphicness of collective trauma media coverage matters. For instance, a recent correlational study found that

exposure to bloody images of the Boston Marathon bombings predicted worse psychological symptoms than non-graphic images (Holman, Garfin, Lubens, & Silver, in press). Although this study did not explore psychological responses to graphic sounds, a limited body of experimental research has compared psychological symptoms following exposure to either visual-audio presentations or audio (non-visual) presentations of graphic car accidents. Krans and colleagues (2011) found that listening to a journalist's report of a film depicting the traumatic outcomes of car accidents and imagining what they heard resulted in students subsequently experiencing intrusive images. A second study compared individuals who watched a video of the aftermath of traumatic accidents (including injuries containing blood and bodies of those who had died)to those who heard only an audio version and imagined what they heard, and found the total number of intrusions and distress caused by these intrusions did not differ between groups (Krans et al., 2011). This offers some evidence that graphic audio may be just as distressing as viewing graphic film. However, another study conducted with college freshmen found that after being shown a film of the outcomes of car accidents (including footage of dead and injured individuals), students' typical tendencies toward creating their own vivid mental images were associated with a greater number of intrusive memories that were more vivid and caused more emotional distress, occurring spontaneously during the session and for five days after the session (Morina et al., 2013). This suggests that the tendency to create vivid mental images may be an important individual difference factor to examine when exploring the impact of media exposure to traumatic events.

While these past studies exploring responses to audio and visual outcomes of car accidents offer some suggestions as to how individuals respond to different formats of

coverage containing some graphic depictions, this research has only explored differences in intrusions and distress. However, there are other negative outcomes that might be important to explore when considering the impact of different types of media coverage of collective traumas containing some graphic depictions. Two such outcomes might be risk perceptions and behavioral modifications as individuals show behavioral responses indicative of increased risk perceptions in the wake of collective traumas. For example, September 11th was associated with decreased air travel and increased car travel, resulting in more car fatalities; also, train use decreased following the train bombing in Madrid 2004 (Gigerenzer, 2006). It is possible that exposure to graphic images in the wake of a collective trauma are particularly effective at making certain activities seem risky and motivating individuals to modify their behavior; research indicates humans have been programmed to learn about danger via observation (Olsson & Phelps, 2007). Further, although research also suggests audio can be used to condition fear, fear conditioned in this manner might be more susceptible to extinction (Olsson & Phelps, 2004), suggesting audio might not be as effective at conditioning fear. Thus, it may be important for research to explore differences in risk perceptions and behavioral modifications following exposure to media coverage containing some graphic visuals compared to coverage containing some graphic audio in the wake of a collective trauma due to the potential real-world implications of such exposure.

Although the limited experimental research comparing coverage containing some graphic visuals and graphic audio offers some suggestions as to how these types of media may compare, it is unclear to what extent responses to different types of media coverage of car accidents correspond to different types of media coverage of collective traumas. Some

of the authors themselves acknowledge that findings from exposure to "a stressful film" likely do not apply to real traumas (Krans et al., 2011). Nonetheless, this research appears to be the closest researchers have come to addressing this question. A meta-analysis on the psychological effects of media exposure to large scale disasters found a large effect of the relationship between news coverage and psychological symptoms, but found no differences in effect size for studies using different formats of media (e.g., image, video, print) (Hopwood & Schutte, 2017). However, none of the studies included in the meta-analysis had examined media presented in an audio only format (Hopwood & Schutte, 2017), indicating researchers have yet to explore the effects of exposure to audio (non-visual) coverage of collective traumas by itself. Nonetheless, identifying whether certain formats of news coverage predict more negative outcomes than others is crucial; if we can identify presentations of this coverage that are less negatively impactful than others, individuals can learn what types of media coverage to avoid so that they can stay informed while minimizing their risk for negative outcomes.

The Present Study

To help individuals minimize their risk for negative outcomes following exposure to news coverage of collective traumas containing some graphic depictions, the present study sought to identify whether certain formats of media coverage (e.g. images, sounds, or both) produced more negative outcomes. In order to establish a causal relationship, a stimulus clip was created specifically for this study that that featured five mass violence events that garnered widespread media coverage in the years prior: the Boston Marathon bombings, Ariana Grande concert bombing, Pulse Night Club shooting, Bastille Day attack, and Fort Lauderdale airport shooting. The stimulus clip contained some graphic content including

images of dead bodies, bloody people, and people firing guns (described in more detail below). There were three versions of the stimulus clip, which were identical in content, but varied in media format (graphic video with audio, graphic video only, or graphic audio only). This allowed for a true comparison of how methods of media coverage delivery (e.g., images, sounds, both) might influence subsequent responses because the length and content of exposure were identical. Additionally, a control stimulus clip was also created that featured news anchors discussing and interviewing individuals about the same five events featured in the graphic stimulus clip, but no graphic images or sounds were used (e.g., no dead bodies, bloody individuals, or gunfire). This was done to compare negative responses to different types of graphic coverage to non-graphic coverage of mass violence events. Further, although participants were randomly assigned to conditions, analyses were conducted to ensure anxiety and depressive symptoms, disgust sensitivity, and negative life events were evenly distributed across groups because all these individual characteristics may predict how individuals respond to coverage that contains depictions of dead or bloody bodies.

The present study explored whether the different types of media coverage stimuli (*graphic video with audio*, *graphic video only*, *graphic audio only*, or *talking heads control*) produced differences in negative affect, distress, fear of future mass violence, perceptions of risk and behavior modifications. However, the stimulus clip was relatively brief compared to the amount of collective trauma media exposure participants typically report on correlational studies. Thus, it is possible that a brief stimulus exposure can alter individuals' temporary feelings, but is insufficient to produce distress, fear, risk perceptions, or intentions to modify behavior. Further, the novel nature of this question

made it difficult to form firm predictions about differences between conditions on the other negative outcomes explored. However, it was speculated that *graphic video with audio* would lead to more distress, negative affect, fear of future mass violence, higher perceptions of risk, and greater intentions to modify behavior than both *graphic video only* and *graphic audio only*, since *graphic video with audio* appeals to multiple senses.

Methods

Design, Sample, and Procedures

A sample of 112 undergraduate students was recruited from the University of California, Irvine Social Sciences Human Subjects Pool (SONA) through which participants can earn extra credit in their undergraduate courses by participating in studies. The sample first completed a pre-test online via Qualtrics to collect information on individual characteristics and past negative life events. This pre-test was also used to screen out potential participants who reported a self- or physician- diagnosed anxiety or depressive disorder within the past year or who had taken medication to treat an anxiety or depressive disorder within the past year. This screening criteria was used due to ethical concerns about exposing potentially vulnerable individuals to potentially distressing content (discussed in more detail below). Those deemed eligible to participate were invited to come into the lab to complete the second part of the study.[2]

In the lab, participants first read the study information sheet on the lab computer and checked a box to indicate consent. Next, participants were randomly assigned to

[2] In total n = 1779 participants provided some data for the pre-test online. However, many individuals who were deemed eligible to participate in the second part of the study did not sign up for a time to come into the lab. This may have been due to the perceived inconvenience of coming into the lab and the multitude of online studies in which undergraduates may partake for extra credit.

exposure to one of the following stimulus news conditions: a) *graphic video with audio* (*n* = 24), b) *graphic video only* (*n* = 31), c) *graphic audio only* (*n* = 29)[3], or d) *talking heads control* (*n* = 28)[4]. Participants then answered a series of questions assessing responses to the content to which they were exposed.

Participants sat in front of a 21.5-inch monitor wearing noise cancelling head phones while exposed to the stimulus. A single stimulus clip was created for the three experimental conditions (*graphic video with audio*, *graphic video only*, and *graphic audio only*). In the *graphic video with audio* condition, a video with audio was created by splicing together news coverage of five different mass violence events. In the *graphic video only* condition, the audio was removed; in the *graphic audio only* condition, the images were removed and replaced with a black screen with a white fixation cross in the center. Thus, while the way in which the coverage was delivered differed across conditions, the content was identical. The *talking heads control* condition consisted of news anchors interviewing individuals and discussing the same five mass violence events included in the experimental conditions, but without any graphic descriptions.

A research assistant started the stimulus media coverage in full screen for the subject and gave the subject instructions on how to exit out of full screen and advance to

[3] One participant in the graphic audio only condition advanced to the stimulus clip before being instructed to do so. The research assistant had the participant start over and their first set of responses were deleted. The second full set of responses they provided (when following the research assistant's instructions) were kept. However, it should be noted that the randomization built into the survey put the participant in the video with audio condition for the first survey they took, and randomized them to the audio only condition when they started the survey over. The analyses were rerun with this participant deleted and the pattern of findings remained the same. Thus, the participant was kept in the analyses to maintain the sample size.

[4] An additional 26 participants were randomly assigned to a news clip that consisted of non-graphic video with sound depicting chaotic images of the events. However, data collected on this condition was not analyzed because the present study aimed to explore differences between media formats (e.g., images, sounds, or both) and not differences in content of news coverage

the post-stimulus survey once the stimulus media coverage ended. The research assistant then exited the room and remained outside the room for the duration of the study to remain blind to condition and give the participant privacy while he or she completed the post-stimulus survey. Participants were instructed to ring a bell in the room once they had 'completed all the surveys. The research assistant then returned to the room to debrief the participant and provide a list of available counseling resources if the participant found himself/herself experiencing any distress. The research assistant also collected the participant's email address and phone number to send a text and email reminder with an online survey link to complete daily diaries that measured mental intrusions over the next five days, as well as a final assessment on the fifth day[5]. (See Appendix A for a diagram of the study design.) Participants were compensated half a SONA credit for completing the pre-test, 1 SONA credit for participating in the lab portion[6], and $5 disseminated via PayPal or Amazon and entry into a drawing for a $200 Amazon gift card for completing the final survey. The Institutional Review Board at the University of California, Irvine approved all procedures.

Stimulus media coverage used in lab

Each stimulus news clip was created by the authors for the purposes of this study and was about 5 minutes and 40 seconds long. All stimuli included coverage of the same five events in the following order: Boston Marathon bombings (about 1 minute 30

[5] This study did not analyze the daily diaries or post-test because this study sought to establish whether there were negative psychological differences between experimental groups immediately after exposure.

[6] After running a number of participants, it was determined that the in-lab portion of the study only took 30 minutes to complete (instead of an hour), so later participants were only compensated .5 SONA credits for their participation in the lab portion. All study materials were modified so participants were aware they would only be compensated .5 SONA credits for the lab portion.

seconds), Ariana Grande concert bombing in Manchester, England (about a minute), Pulse Nightclub shooting in Orlando, Florida (about a minute), Bastille Day attack in Nice, France (about a minute), and shooting at Ft. Lauderdale airport in Florida (about a minute). The graphic stimuli clip contained about 37 seconds of graphic coverage (e.g., bloody individuals, uncensored dead bodies) and the rest of the clip was composed of chaotic content (e.g. gunfire but no one visibly being hit, individuals being taken away on stretchers without visible bloody injuries, explosions, individuals running from the scene, or emergency personnel and vehicles.) Thus, the content was similar to previously used car accident films, which depicted dead and injured individuals and emergency workers, to experimentally explore intrusive responses to "traumatic material" (Zetsche, Ehring, & Ehlers, 2009; Morina, Leibold, & Ehring, 2013). However, past research using the car accident film did not state what proportion of the film contained graphic compared to non-graphic depictions.

In order to create the graphic stimuli clip for the present study, the authors spent about 2 months carefully reviewing coverage of the five mass violence events on YouTube. The goal was to find coverage that could be potentially distressing (e.g. coverage that showed dead bodies, blood, or injuries), but to only use coverage shown on broadcast news networks. This choice was made so that the study would accurately measure psychological risks posed by mainstream news coverage. However, as a result, the graphic stimuli clip contained a handful of depictions of dead bodies and bloody injuries interspersed in mostly non-graphic chaotic content. Thus, for some individuals who typically seek out graphic coverage on websites such as Heavy or Reddit the clips may have seemed much less graphic than content they typically view. For instance, one of the authors did come across a

clip of uncensored dead bodies in the aftermath of the Ariana Grande concert bombing, but because this image was not available from a broadcast news site, the decision was made not to include it. Further, recent research found that 25% of individuals actively sought out an ISIS beheading video (Redmond et al., 2019), suggesting our graphic stimuli may have seemed much less graphic to those who view coverage showing up close decapitations.

The non-graphic control stimuli clip was 5 minutes and 30 seconds long and featured news anchors and politicians discussing the same five mass violence events included in the graphic stimuli. The non-graphic control also included a couple interviews with individuals present at the events. However, there were no graphic images or descriptions and no chaotic-scenes featuring individuals running from danger or showing emergency vehicles or personnel. This was done to enable a comparison between graphic stimuli featuring some graphic images and/or sounds to non-graphic coverage of mass violence events that omitted graphic elements entirely.

Clips of mass violence events that occurred in the past few years were chosen because clips of events that occurred decades ago display dated production quality and other dated elements (e.g., clothes and hairstyles) that may have been distracting or prevented some participants from taking the clips seriously. However, by choosing more recent collective traumas, some participants may have already been exposed to some coverage of these events because they were widely publicized when they occurred. Although the most recent event included in the stimulus news clips occurred at least about a year before data collection began, ensuring all events had long been out of daily news coverage, the stimulus news clips may have elicited thoughts about past coverage to which one was exposed and one's feelings at the time. To account for this, frequency of past

exposure to these events was measured and controlled for in the statistical analyses (see below).

Study eligibility based on ethical concerns

Individuals who reported on the pre-test that in the past year they were self- or physician-diagnosed with an anxiety or depressive disorder or took medication intended to treat anxiety or depression were ineligible to come into the lab due to ethical concerns about exposing these individuals to potentially distressing, graphic coverage of mass violence events. This is similar to exclusion criteria used in past research that showed participants a potentially traumatic film featuring real traffic accidents (Morina et al., 2013). However, we did not exclude individuals who had experienced traumatic events as other research had done (Morina et al., 2013) because this criteria appeared overly stringent; only 8.1% of a representative national sample indicated no lifetime adverse experiences (Seery, Holman, & Silver, 2010). Thus, we chose an exclusion criterion that protected those who might be predisposed to experiencing symptoms of psychological distress, but was not overly stringent. It should be noted that the stimulus news clips in the present study were created from parts of readily accessible news coverage on traditional media sites that individuals could be exposed to in their daily lives. However, graphic coverage that had not been vetted by news organization and included in broadcast coverage, were not included in the stimulus news clips. The latter perhaps requiring additional precautions.

Measures

Online pre-test measures[7]

The measures below appear in the same order as they appeared on the pre-test.

Anxiety and Depressive Symptoms. Symptoms of depression and anxiety were assessed using the Patient Health Questionnaire for Depression and Anxiety (PHQ-4; Kroenke, Spitzer, Williams, & Lowe, 2009). Two items measured depressive symptoms and two items measured anxiety symptoms. A 4-point Likert-type scale was used to rate each item (0= not at all and 3= every day). The sum of all items was used in the analyses ($\alpha = 0.86$).

Recent diagnoses/medication for affective disorder. Recent diagnosis or medication use for an anxiety or depressive disorder was assessed with two questions. The first question asked participants if they had been diagnosed with an anxiety or depressive disorder in the past year to which they could select "Yes—Physician diagnosed", "Yes—Self-diagnosed", or "No". A second yes/no question asked if they had taken medications in the past year that are used to treat anxiety or depressive disorders. Participants who answered yes to either question were not eligible for continued participation in the study due to ethical considerations discussed above.

Vividness of Mental Imagery. To measure individuals' tendency to vividly imagine various objects, 21 items were taken from the 35-item Plymouth Sensory Imagery Questionnaire (PSI-Q; Andrade, May, Deeprose, Baugh, & Ganis, 2014). The

[7] As part of the online pre-test, participants also completed measures assessing typical news consumption; frequency of viewing graphic news coverage; likelihood of choosing to watch content that has a warning label; and neuroticism, extraversion, and openness (subscales taken from the Big Five Inventory; John & Srivastava, 1999).

original version has five items for each of the following seven subscales: vividness of imagining appearance, sound, smell, taste, touch, bodily sensation, and feeling. However, we only chose three items for each of the seven subscales. The three items from each subscale that participants were likely to be most familiar with were chosen because vividness ratings could be artificially lower if participants had not had much exposure to an item. Participants indicated the vividness with which they could imagine the item using an 11-point Likert-type scale, ranging from "no image at all" (0) to "image as clear and vivid as real life" (10). The mean of all 21 items was used in the analyses ($\alpha = 0.94$).

Disgust Sensitivity. Disgust sensitivity was assessed with an 8-item modified version of the Disgust Sensitivity Questionnaire (Haidt, McCauley, & Rozin, 1994). Four items were taken from the envelope violations subscale (e.g., when the body is no longer enclosed as it typically is, such as during surgery) and four came from the death subscale. Each subscale had two true/false items and two items that asked participants to rate their level of disgust with the statement on a 3-point Likert Type scale: 0= "not disgusting at all," 1= "slightly disgusting," and 2= "very disgusting." All items were scored according to scale instructions to create a total disgust sensitivity score ($\alpha = 0.77$).

Negative Life Events. Respondents indicated whether they had ever experienced any of 32 possible negative life events at any point in their life (Blum, Silver, & Poulin, 2014; Holman, Silver, & Waitzkin, 2000). Each yes received a score of one and each no received a score of 0. The sum of all negative life events was used in the analyses with higher numbers indicating more negative life events.

Demographics. Participants were asked to indicate their gender, year in school, race/ethnicity, whether they were of Hispanic decent or origin, and whether they were

born in the United States. They were also provided with a text box to type their age in years. Additionally, subjective socioeconomic status was assessed by showing participants an image of a 9-rung ladder and asking them to use a slider scale to indicate which rung of the ladder they belonged on compared to other people in the United States; the first rung indicated being the worst off and higher rungs indicated being better off (Adler, Epel, Castellazzo, & Ickovics, 2000).

In Lab measures

All measures below are listed in the order that they appeared in the survey.

Change in Negative Affect. To measure negative affect prior to the stimulus clip exposure, participants completed a modified version of the PANAS (Watson, Clark, & Tellegen, 1988). It consisted of 10 items measuring negative affect that came from the original scale. One additional item measuring anger and three additional items measuring sadness were added and integrated into the measure. (The 10 items measuring positive affect from the original PANAS were also included, but were not analyzed because this study only explored negative outcomes). Each item was rated on a 5-point Likert-type scale ranging from very slightly or not at all (1) to extremely (5). The original 10 items measuring negative affect, the one additional anger item, and the three additional sadness items were summed ($\alpha = 0.87$). To measure negative affect after exposure to the stimulus clip, the measure was administered and scored again identically (negative affect, $\alpha = 0.94$). Change in negative affect was then calculated by subtracting the pre-stimulus clip negative affect score from the post-stimulus clip negative affect score.

Distress. Participants completed a single item distress measure that asked, "How distressing was what you saw/heard?" modeled after a measure created by Holmes, and colleagues (2004). Ratings were made on a sliding scale ranging from 0 ("not at all distressing") to 100 ("extremely distressing").

Fear of future mass violence. Fear of future mass violence was assessed with two questions that asked about fear of another mass violence event and worry that oneself or one's family would be the victim of a mass violence event in the future (Holman et al., 2008). Both items were rated on a 5-point Likert-type scale ranging from "never" (1) to "all of the time" (5). Both items were summed (α = 0.80).

Risk perceptions. To assess perceived risk of future negative events (modified from Blum et al., 2014), seven items[8] assessed respondents' perceptions of the likelihood that in the next 12 months there would be a terrorist attack in Europe, there would be a terrorist attack in the U.S., they would be the victim of a terrorist attack, someone they knew would be the victim of a terrorist attack, there would be a mass shooting in one's community, they would be the victim of a mass shooting, and that someone they knew would be the victim of a mass shooting. Participants rated each item using a slider scale ranging from 0 to 100% chance (Fischhoff, Parker, Bruin, & Downs, 2000) and the mean of all seven items was used (α = 0.85).

Behavioral modifications. Participants were asked whether they would avoid the following five behaviors in response to the news coverage they viewed/heard: travel outside the U.S., public transportation, community events, nightclubs, and large sporting

[8] An eighth item that asked about the likelihood of travelling outside the U.S. in the next 12 months was dropped due to the lower alpha when it was included (α = 0.78), likely due to 50% of our sample indicating at least a 73% of travelling outside the U.S. in the next 12 months.

events. For each behavior, participants were asked to select, "I plan on doing this," "I might consider doing this," or "I would not do this," scored as 1, 2, and 3, respectively. These questions were modeled after past research that explored how individuals had already or might have changed their behavior due to the Ebola crisis (Fischhoff, Wong-Parodi, Garfin, Holman, & Silver, 2018). All items were summed (α = 0.83) and lower scores indicated greater intentions to modify behavior.

Past media exposure to stimulus events. Participants were asked to indicate how frequently they were exposed to coverage of each of the 5 events featured in the stimulus news clips (Boston Marathon bombing, Ariana Grande concert bombing in Manchester, Pulse Nightclub shooting, Nice Bastille Day attack, and Fort Lauderdale airport shooting). Each event was rated on a 5-point Likert-type scale ranging from "never" (1) to "very often" (5), indicating frequency of exposure. The mean of all 5-items was used (α = .80).

Analytic strategy

Ensuring Equivalence Across Group via Random Assignment

To ensure that random assignment to the four groups was effective in evenly distributing characteristics that may be associated with the outcome variables of interest across groups, a series of two one-sided tests (TOST) of equivalence were run. Using an Excel spreadsheet programmed by Lakens (2017), we explored whether negative life events, disgust sensitivity, and anxiety and depressive symptoms measured during the pre-test were equivalent between the *video with audio* group and *talking heads control* group, *video only* group and *talking heads control* group, *audio only* group and *talking heads control* group, *video with audio* group and *video only* group, and *video with audio*

and *audio only* group. Each two-group comparison was made in the Excel file by entering the mean, standard deviation, and number of participants in each group. The alpha was set to .05 and the desired power was set to .8. Further because of the small sample size, the TOST equivalence test could only detect non-equivalence between groups if the difference in the effect size of the characteristic tested was d = .87 or greater. TOST equivalence tests were run to explore whether mean negative life events, disgust sensitivity, and anxiety and depressive symptoms were equivalent between the following groups: g*raphic video with audio* vs. *talking heads control*, *graphic video only* vs. *talking heads control*, *graphic audio only* vs. *talking heads control*, *graphic video with audio* group vs. *graphic video only* group, and *graphic video with audio* group vs. *graphic audio only* group.

Responses to Stimulus

All data were analyzed using Stata 14 (Stata Corp, College Station, TX). A series of 5 ordinary least squares (OLS) regression analyses were conducted to separately explore differences in distress, changes in negative affect from before to after exposure to the stimulus clip, fear of future mass violence, risk perceptions, and intentions to modify behavior across conditions. All OLS regression analyses also controlled for frequency of past media exposure to the five events featured in the stimulus clip. Because stimulus clip media condition was a categorical predictor variable, the *talking heads control* group was coded as the reference group enabling the following comparisons: *graphic video with audio* vs. *talking heads control*, *graphic video only* vs. *talking heads control*, *graphic audio only* vs. *talking heads control.* Further, each OLS regression was followed by two planned contrasts comparing the *graphic video with audio* group to the *graphic video only* group

and the *graphic video with audio* group to the *graphic audio only* group. To control for the family-wise error rate of making five comparisons, a Bonferroni adjusted *p*-value (p = 0.01) and 99% confidence interval was used for all analyses.

Interaction with ability to generate vivid images

Because individuals vary in their ability to generate vivid mental images, it is possible that certain individuals were more likely to respond negatively to certain conditions. More specifically, individuals high in the ability to generate vivid mental images may have been better able to imagine corresponding sounds in the *graphic video only* condition and corresponding images in the *graphic audio only* condition, whereas someone lower in this ability may not have mentally filled in missing sounds or images. Thus, all original OLS regression analyses and planned contrasts were rerun a second time, exploring whether stimulus clip condition was moderated by one's vividness of mental imagery (using the PSI-Q score). All analyses used the Bonferroni adjusted p-value and 99% confidence interval. All continuous variables were standardized using z-scores so Table 1 and Table 2 present standardized regression coefficients.

Results

Sample characteristics

The sample was 83.04% female and had a mean age of 20.73 years (SD= 2.36). The majority of participants were Asian American/Pacific Islander (34.55%), followed by Latino or Hispanic (28.18%), then White, Caucasian (15.45%), then other (10.00%), and then multi-racial/multi-ethnic (8.18%). The remaining 3.64% reported being Black, African American, American Indian or Native American, or didn't know.

TOST equivalence test

The TOST equivalence tests revealed that disgust sensitivity was not equivalent between the *video with audio* group and *talking heads control* group ($t(49.47) = -1.14$, $p = .13$) or the *video only* group and *talking heads control* group ($t(56.01) = -1.63$, $p = .05$) because these two test failed to reach significance. Thus, the null hypothesis that mean disgust sensitivity was not equivalent between the groups could not be rejected. As a result, all OLS regression analyses described above also controlled for disgust sensitivity.

Psychological outcomes after exposure

On the one-item distress measure, those exposed to the graphic video with audio rated the stimulus as the most distressing ($M = 74.33$, $SD = 27.25$), followed by those exposed to graphic video only (M= 73.61, SD= 22.91), then those exposed to the talking heads control ($M = 65.68$, $SD = 19.07$), and lastly those exposed to graphic audio only ($M = 64.38$, $SD = 25.11$).

Findings revealed no significant group differences in change in negative affect, distress, fear of future mass violence, risk perceptions, and intentions to modify behavior (see Table 1). Additionally, the interaction between stimulus condition and vividness of mental imagery did not reveal any significant group differences (see Table 2). The lack of any significant group differences may have been due to the small sample size and small number of participants in each condition, making the analyses underpowered. Post-hoc t-tests were run comparing those who were in a stimulus news clip condition containing graphic imagery (the *video with audio* group and the *video only* group) to those who were in a stimulus news clip condition that did not contain graphic imagery (the *audio only* group and the *talking heads control* group). By creating two comparison groups (from the four study conditions) in this manner, there were $n = 55$ participants in the graphic

imagery condition and n = 57 participants in the no graphic imagery condition, providing greater statistical power. Further, because it was expected that those exposed to graphic imagery would show more symptoms of psychological distress than those not exposed to graphic imagery, one-sided t-tests were used. (Variables were not standardized for the t-tests). These analyses revealed that those exposed to graphic imagery experienced a significantly greater increase in negative affect ($p < .05$), were significantly more distressed ($p < .05$), and experienced significantly more fear of future mass violence ($p < .01$). However, there were no significant differences in risk perceptions or intentions to modify behavior between these two groups (see Table 3).

Discussion

The present study sought to experimentally identify differences in psychological symptoms between those exposed to graphic news coverage of the same five mass violence events presented as *video with audio*, *video only*, *audio only*, or *talking heads control*. The lack of any significant group differences ran counter to our hypothesis that exposure to video with audio would produce the greatest symptoms of psychological distress. However, our lack of significant findings may be due to the fact that our sample was likely underpowered. The present study sought to recruit a total sample size of 200 (n = 50 participants per media exposure condition). However, only n = 112 participants completed the lab portion of the study. A post-hoc power analyses using G*Power revealed that to detect a small effect, we would have needed to recruit 395 participants. Thus, it is possible that different types of graphic media exposure produce a significant but small sized effect on subsequent psychological symptoms, which our sample size did not allow us to detect.

Although data collection lasted about 11 months, participation for the lab study may have been low because about 32% of those who took the pretest were deemed ineligible for the lab study due to their mental health diagnosis or medication use[9]. However, even after considering the large number of ineligible participants, it was still surprising that only about 17% of those deemed eligible to participate in the lab study chose to do so. One possible explanation for this is that as more studies are becoming available online for course credit, college students may be less interested in taking the time to come into the lab if they are able to earn all the credit they need online. As a result, one should be extremely careful when interpreting findings from lab research using college students; although researchers have long known college students differ in important ways from other population samples (Henrich, Heine, & Norenzayan, 2010), our difficulty with recruitment suggests findings from college lab studies may not even apply to college students as a whole, but rather to a unique subset of college students.

Despite the present study likely being underpowered, there were several interesting findings when post hoc t-tests were run comparing the media coverage conditions that contained graphic images (*video with audio* group and *video only* group) to the media coverage conditions that did not contain graphic imagery (*audio only* group and *talking heads control* group). Findings revealed that those exposed to media coverage containing graphic imagery showed greater change in negative affect, greater distress, and greater fear of future mass violence compared to those not exposed to graphic imagery. Therefore, these findings suggest that the inclusion of graphic images in

[9] There were 2 participants who took the pretest, but did not provide data on mental health diagnosis or medication use.

collective trauma media coverage may play an important role in individuals' subsequent psychological responses. This is consistent with other research demonstrating an increased risk for subsequent psychological symptoms in those exposed to graphic disaster related images (Holman, Garfin, Lubens, & Silver, in press). Further, it suggests that exploring the effect of graphic news images, specifically, may help elucidate correlational research finding a link between exposure to graphic news coverage of collective traumas and negative outcomes. However, answers to more nuanced questions about differences in responses to different types of disaster media coverage still remain, i.e., does the addition of graphic sounds to graphic images increase psychological symptoms?

Despite this study's inability to draw firm conclusions about the effects of different types of graphic media exposure, this study marks an important expansion of current research on exposure to graphic traumatic coverage. Because it has been well-established that media coverage of collective traumas puts individuals at risk for subsequent negative outcomes (Pfefferbaum, Nitiema, & Newman, 2019), researchers need to begin experimentally establishing why this is the case. It is unrealistic, and likely inadvisable, to suggest individuals shield themselves from information about collective tragedies that unfold across the globe. However, establishing elements of graphic news coverage (e.g., images and sounds, repeated exposure to the same images, bloody images vs. non-bloody images) that produce the most distress can help individuals stay informed while avoiding particularly psychologically harmful coverage. This study attempted to begin to answer these questions and the post-hoc analyses revealing that those exposed to graphic imagery experienced greater change in negative affect, distress, and fear of

future mass violence suggests that graphic visuals may indeed cause more symptoms of psychological distress than graphic audio. Continuing to run this study until an adequate sample size is achieved may elucidate other differences between exposure to graphic coverage containing visuals, sounds, or both.

Although ethical concerns about exposing individuals to gruesome content has likely prevented researchers from exploring this topic experimentally, the present study offers evidence that this question can, and should, be explored in the lab. There is no evidence that any participants who took part in the study were highly disturbed by the graphic stimulus exposure. Even though participants were told they could stop their participation at any time and given the email of the lead researchers to voice any concerns, no participants chose to terminate their participation and no participants emailed the researchers to express concerns. This may have been due to the fact that all coverage in the stimuli was coverage that came from news programming. Thus, while the present study suggests exposing participants to graphic news coverage may not be overly distressing, researchers should exercise caution when considering whether to expose participants to more graphic forms of coverage experimentally (e.g., videos showing graphic murders only available on the Internet; even though some researchers have exposed participants to this content, Grizzard et al., 2017).

In addition to demonstrating that this question appears to be ethical to study in the lab, the present study also suggests that it is feasible to do so. By conducting a pre-test prior to participation in the lab portion of the study, we were able to collect information on participant's past negative life events, anxiety and depressive symptoms, and disgust sensitivity. This enabled us to ensure that important characteristics that

might predict negative responses to graphic media coverage were equivalent across groups and control for the characteristics that random assignment failed to equally distribute. Further, by collecting this information prior to participants coming into the lab, it reduced the likelihood that participants' responses to the stimulus exposure would be biased by being made to think about their own negative life events or anxiety and depressive symptoms at that time. Thus, future research that endeavors to explore this topic experimentally might consider collecting information on individual characteristics at a time separate from stimulus exposure. However, despite the ability to collect and control for important background characteristics, it is still important to note that by excluding individuals with anxiety and depressive disorders, those who are potentially most sensitive to this type of coverage may be excluded. Further, it is unclear what characteristics separate individuals who choose to participate in lab experiment from those who choose not to, potentially impacting findings from lab reserach in unknown ways.

The present study indicates the ability and importance of exploring a causal relationship between different types of media coverage of collective traumas and psychological symptoms. In addition to suggesting one characteristic of graphic media coverage that might be important to explore (e.g., images and sounds), it also offers guidance for successfully and ethically conducting this type of research. As correlational research in the field has grown, experimental research may be a crucial next step to fill in some of the gaps in the literature.

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Table 1. Psychological Responses to Different Types of Mass Violence Media Coverage (Standardized Regression Coefficients)

Variables	Distress β(99% CI)	Change in Negative Affect β(99% CI)	Fear of Future mass violence β(99% CI)	Risk Perceptions β(99% CI)	Behavioral Modification β(99% CI)
Multivariate Analyses	(n = 112)	(n = 112)	(n = 112)	(n = 112)	(n = 112)
Condition					
Talking heads (ref.)	--	--	--	--	--
Video with audio	.27(-.50, 1.04)	.54(-.19,1.27)	.41(-.25, 1.07)	.30(-.42, 1.02)	-.12(-.84, .60)
Video only	.27(-.45, .99)	.11(-.56, .79)	.43(-.19, 1.05)	.07(-.60, .74)	.29(-.38, .97)
Audio only	-.11(-.83, .61)	-.08(-.76, .60)	.15(-.47, .77)	.04(-.63, .71)	-.08(-.76, .60)
Other Covariates					
Disgust Sensitivity	.17(-.08, .42)	.10(-.14, .34)	.27(.05, .48)*	.11(-.12, .34)	-.16(-.39, .08)
Past media exp.	-.07(-.32, .19)	.02(-.22, .26)	.36(.14, .58)**	.25(.01, .49)*	-.08(-.32, .16)
Planned Contrasts					
Video with audio vs audio only	.38(-.37, 1.14)	.62(-.09, 1.34)	.26(-.39, .91)	.26(-.44, .96)	-.04(-.75. .67)
Video with audio vs video only	<.01(-.74, .74)	.43(-.27, 1.13)	-.02(-.66, .61)	.23(-.46, .92)	-.41(-1.11, .28)
Model Statistics	F(5, 106) = 1.61; p = .16; R^2 = 07	F(5, 106) = 1.64; p = .16; R^2 = .07	F(5, 106) = 6.66; p < .001; R^2 = .24	F(5, 106) = 1.97; p = .09; R^2 = .09	F(5, 106) = 1.26; p = .28; R^2 = .06

Note: ref. = reference group; *p < .01, **p < .001. All regression coefficients are standardized.

Table 2. Psychological Responses to Different Types of Mass Violence Media Coverage Moderated by Vividness of Mental Imagery (Standardized Regression Coefficients)

Variables	Distress β(99% CI)	Change in Negative Affect β(99% CI)	Fear of Future mass violence β(99% CI)	Risk Perceptions β(99% CI)	Behavioral Modification β(99% CI)
Multivariate Analyses	(n = 112)	(*n* = 112)	(*n* = 112)	(n = 112)	(n = 112)
Condition					
Talking heads (ref.)	--	--	--	--	--
Video with audio	.26(-.53, 1.04)	.53(-.21, 1.28)	.42(-.24, 1.09)	.30(-.42, 1.02)	.10(-.84, .63)
Video only	.27(-.52, 1.07)	.10(-.65, .86)	.49(-.19. 1.17)	.19(-.53, .92)	.31(-.43., 1.05)
Audio only	-.15 (-.89, .59)	-.10(-.80, .60)	.17(-.46, .81)	.0005(-.68, .68)	-.03(-.72, .66)
Vividness of Imagery	-.09(-.56, .39)	-.05(-.50, .40)	.04(-.36, .45)	-.02(-.45, .41)	.08(-.43, 1.05)
Condition x vividness					
Video with audio x vividness	.07(-.73, .86)	.10(-.65, .86)	.11(-.56, .79)	-.08(-.80, .65)	-.02(-.76, .72)
Video only x vividness	.05(-.79, .89)	.05(-.74, .84)	-.17(-.89, .54)	-.26(-1.03, .51)	-.09(-.87, .70)
Audio only x vividness	.28(-.38, .94)	.12(-.50, .74)	-.19(-.75, .37)	.30(-.30, .91)	-.32(-.93, .30)
Other Covariates					
Disgust Sensitivity	.16(-.09, .42)	.10(-.14, .34)	.27(.05, .49)*	.09(-.14, .33)	-.15(-.39, .09)
Past media exp.	-.09(-.35, .18)	.01(-.14, .34)	.37(.14, .60)**	.22(-.02, .47)	-.06(-.31, .19)
Planned Contrasts					
Video with audio vs audio only (ref. grp) x vividness	-.21(-.98, .56)	-.02(-.75, .72)	.30(-.36, .97)	-.38(-1.09, .33)	.29(-.43, 1.02)

Video with audio vs video only (ref. grp) x vividness	.02(-.92, .96)	.05(-.84, .94)	.29(-.52, 1.09)	.18(-.68, 1.04)	.07(-.81, .94)
Model Statistics	$F(9, 102) = 1.04$ $p = .42$; $R^2 = .08$	$F(9, 102) = .91$ $p = .52$; $R^2 = .07$	$F(9, 102) = 3.86$ $p < .001$; $R^2 = .25$	$F(9, 102) = 1.63$ $p = 12$; $R^2 = .13$	$F(9, 102) = .96$ $P = .48$; $R^2 = .08$

Note: ref. grp= reference group; *$p < .01$, **$p < .001$. All regression coefficients are standardized.

Table 3. One Sided T-tests comparing Psychological Responses to those Exposed to and not Exposed to Graphic Imagery (*N* =112)

Variables	Change in Negative Affect *Mean*(SD) (n = 112)	Distress *Mean*(SD)	Fear of Future mass violence *Mean*(SD)	Risk Perceptions *Mean*(SD)	Behavioral Modification *Mean*(SD)
Group					
No Imagery	9.02(8.29)	65.02(22.16)	5.61(1.87)	28.84(16.86)	12.70(2.64)
Graphic Imagery	12.56(9.83)*	73.93(24.65)*	6.44(1.68)*	32.09(15.88)	12.93(2.32)
Model Statistics	$t(110) = -2.07$; $p < .05$	$t(110) = -2.01$; $p < .05$	$t(110) = -2.45$; $p < .05$	$t(110) = -1.05$; $p = .15$	$t(110) = -.48$; $p = .32$

Note: *$p < .05$, **$p < .01$

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CHAPTER 4:

An Experimental Study of Positive and Negative Responses to Graphic Media Coverage of Mass Violence

Abstract

Seeking to replicate and expand on past research demonstrating a link between exposure to media coverage of mass violence events and symptoms of psychological distress, the present experiment explored whether different types of graphic media coverage (e.g., images, sounds, or both) produce differences in negative outcomes. Further, because much of the past research has focused on negative outcomes, the present study also sought to identify potential benefits of exposure to graphic media coverage. Drawing on research on fear appeals that suggests graphic exposure may motivate change, the present study examined whether exposure to graphic imagery and graphic audio of mass violence events increased intentions to provide aid and charitable giving. Findings from the present experiment (*N*= 319 undergraduates) revealed that exposure to media coverage of mass violence events that contained graphic imagery produced greater change in negative affect, distress, and fear of future mass violence compared to media coverage of mass violence events without graphic imagery. Further, exposure to media coverage containing graphic imagery had the benefit of increasing empathy and intentions to help, but no differences in charitable giving were observed across media types. The present study adds to the literature by identifying a specific aspect of graphic mass violence media coverage that may be most distressing – graphic media imagery. However, findings regarding whether exposure to different types of graphic media coverage promotes philanthropic behavior are inconclusive. Limitations of the experimental design that might have impacted these findings are discussed.

An Experimental Study of Positive and Negative Responses

to Graphic Media Coverage of Mass Violence

A body of research links media coverage of large scale-disasters to physical symptoms (Silver et al., 2013) and psychological outcomes (Ahern et al., 2004; Holman et al., 2014); the latter finding has been replicated many times (Pfefferbaum, Nitiema, & Newman, 2019). However, researchers have largely neglected to explore potential positive outcomes associated with exposure to disaster news coverage. Exploring potential positive correlates of disaster news coverage is crucial because any recommendations to limit certain forms of graphic media exposure drawn from the literature should also rule out or weigh any benefits that such exposure could have. Thus, in order to make such recommendations, research is needed that explores whether there are positive outcomes associated with exposure to collective traumas news coverage containing graphic depictions. Further, despite the dearth of research in this area, some research suggests that individuals will not be motivated to help following horrific events in the absence of affect being triggered (Slovic, 2007). Thus, it is possible that graphic images – or perhaps sounds – featured in news coverage may elicit emotional responses that prompt philanthropic behavior. The present study sought to address this topic by exploring whether exposure to different types of graphic news coverage (e.g., video with audio, video only, or audio only) of acts of mass violence elicited a desire to help and actual helping behavior.

While research exploring whether graphic news depictions of collective traumas prompt helping is quite limited, researchers have explored the role of graphic images in prompting personal behavior change. For example, research exploring the use of graphic images and information to motivate personal behavior change found that greater vividness

of graphic images of the consequences of smoking (e.g., rotted teeth, trachea tubes) on cigarette packages heightened emotional engagement, which then predicted stronger quitting intentions (Ophir, Brennan, Maloney, & Cappella, 2017). Other research found that an individual's graphic skin cancer depiction, which became widely publicized and shared on the Internet, was followed by an increase in related searches on Google (Noar et al., 2017). This suggests that vivid images may call individuals to action by prompting them to commit to change or at least seek out more information on the topic. However, these studies have not explored whether graphic sounds that portray graphic scenes in an auditory manner have a similar effect as graphic visual images. Further, the studies described above explored behavioral intentions or information seeking behaviors to determine the efficacy of graphic appeals, but other researchers have noted the importance of evaluating behavior *change* – rather than merely intentions – to determine if an appeal has the intended effect (Kok, Peters, Kessels, ten Hoor, & Ruiter, 2018).

Other research also cautions that individuals may mentally withdraw if messages use too many emotional appeals (e.g., using disgust and fear together may reduce encoding, see Leshner, Bolls, & Thomas, 2009). Thus, it is possible that graphic visuals and audio paired together overload individuals emotionally whereas delivering emotional messages in a singular format (e.g. visuals or sounds by themselves) may actually keep an individual more engaged, although no research has tested this. Thus, while some research argues that fear is a good motivator, other researchers suggest that it may influence thoughts but not actual behavior and can even cause disengagement when individuals experience too much negative emotion. Further, some research suggests graphic visuals may be an effective

mechanism for eliciting emotions that motivate change, but graphic sounds have not received the same attention.

Although fear appeals' research suggests fear can motivate changes in personal behavior, whether fear can motivate action on issues that do not affect oneself personally is unclear. More specifically, it is unclear whether fear may motivate individuals to help others when they themselves are not at risk. However, a recent study that manipulated an ISIS execution video to either include more or less of the horrific coverage found that feelings of anger and moral disgust mediated the relationship between graphicness and endorsing U.S. government action (Grizzard et al., 2017). This finding is in line with Slovic's (2007) suggestion that emotional response may be needed to inspire action. However, it is interesting to note that the authors found that anger and moral disgust evoked by the ISIS video were not tied to individuals' feelings that they themselves were at risk (Grizzard et al., 2017). Thus, it remains unclear whether graphic videos that make individuals personally fearful would amplify this effect even more, or whether the graphic video worked to make people support intervention by the very fact that it was graphic, without making them personally fearful. Moreover, the authors made no attempt to parse out whether it was the horrific images or sounds in the video that had a greater effect on endorsing government action. Thus, research is needed to clarify the relationship between viewing graphic media coverage and helping behavior. In particular, research is needed that compares the efficacy of graphic images and graphic sounds in motivating philanthropic behavior following exposure. Further, research should also explore whether graphic images and sounds are stronger predictors of philanthropic behavior when individuals also experience higher levels of fear.

Other research also suggests that while graphic media content may inspire people to intend to take action, it may not be necessary to employ graphic content if empathy is induced in other ways. In a video aimed at encouraging individuals to save animals, exposure to a graphic version of the video increased intentions to provide aid by way of experiencing more empathy and perceiving more severity, but when individuals received empathy- inducing instructions prior to exposure to a less graphic version, the less graphic version was just as effective (Shelton & Rogers, 1981). Furthermore, in the wake of the 2004 Indian tsunami, high cognitive dissonance predicted lowered media use, and monetary donation appeared to reduce dissonance (Waters, 2009). Thus, individuals who feel bad about tragic events may not need to be exposed to horrific images or sounds to motivate helping. Taken together, these studies suggest that experiencing high levels of empathy when learning about others who are in need of aid may play an important role in motivating helping.

Present Study

The present study sought to expand on past research suggesting graphic appeals may motivate action by exploring this question in a new context: whether media coverage containing graphic depictions motivates philanthropic behavior in the wake of a mass violence event. Further, much of the research on graphic appeals only used graphic visuals so the present study sought to compare the efficacy of graphic images, graphic sounds, and both together in motivating helping behavior. While this question is exploratory in nature, the present study also sought to explore whether different media presentations (graphic visuals, graphic sounds, or both together) produced differences in symptoms of psychological distress due to extensive research linking exposure to media coverage of

collective traumas to psychological symptoms (Ahern et al., 2004; Holman et al., 2014; Pfefferbaum, Nitiema, & Newman, 2019). Thus, the present study also sought to replicate and expand on past research by exploring a causal relationship between media coverage and negative outcomes, and perhaps even identify differences in negative responses depending on how the coverage was presented.

Analyses first explored differences in negative affect, distress, and fear to examine whether the present study replicated past research and identify any differences in negative outcomes based on how the media coverage was presented. Next, the present study sought to answer the exploratory question of whether there were any positive effects of exposure to different types of media coverage containing graphic depictions. Analyses explored differences in change in positive affect, empathy, intentions to help, intentions to donate blood, and actual charitable giving across media presentations. Further, as past research suggests that feelings of empathy (Shelton & Rogers, 1981) may elicit aid and graphic images that may strike fear in individuals may motivate them do something to take action (Noar et al., 2017; Shelton & Rogers, 1981), the present study also explored a potential moderating role of both empathy and fear on intentions to help, intentions to donate blood, and charitable giving. It is possible that type of media coverage does not predict helping or giving by itself, but when an individual is exposed to certain media coverage and feels fearful or empathetic, he/she may be more likely to help or donate money. The present study did not have any firm hypotheses about whether media coverage containing graphic visuals or graphic audio would produce greater intentions to help and charitable behavior because past research has not explored graphic audio as a predictor of behavioral intentions. Further, although we expected exposure to media coverage containing graphic

depictions would produce negative outcomes, we had no predictions about what type of graphic media coverage would produce the greatest negative outcomes because research has not explored this question at this level of detail.

Methods

Design, Sample, and Procedures

A sample of undergraduate students was recruited from the University of California Irvine Social Sciences Human Subjects Pool (SONA) through which participants can earn extra credit in their undergraduate courses by participating in research. Students who signed up for the study received a link to a pre-test survey on Qualtrics, which was used to collect demographic and other information on individual characteristics and screen participants for eligibility. Individuals who reported a self- or physician- diagnosed anxiety or depressive disorder in the past year or reported taking medication used to treat an anxiety or depressive disorder in the past year were not eligible for participation in the experimental portion of the study. Individuals who were identified as being eligible for the experimental portion of the study based on these criteria received a code at the end of the survey that they could use to sign up for the next portion of the study online via SONA system. Eligible participants who did not sign up for the experimental portion of the study also received a reminder email informing them that they were eligible for the next portion of the study along with instructions on how to sign up[10]. Participants received 0.5 SONA

[10] Some individuals had completed the pre-test prior to the launch of the experimental online study as part of a screening procedure for a similar study conducted in the lab that exposed participants to the same experimental stimuli. Those who had previously completed the pre-test, but did not participate in the experimental lab portion of the other study were also sent emails inviting them to complete the online experimental portion of the study if they met eligibility criteria. By the end of the present study, a total of 1667 individuals had completed the pre-test at some time point.

credits for completing the pre-test on Qualtrics and an additional 0.5 SONA credits for completing the experimental portion of the study on Qualtrics. There were 321 participants who signed up for and completed the experimental portion of the study[11].

In order to explore responses to media coverage of mass violence containing some graphic images and/or sounds, graphic stimuli were created specifically for the experimental portion of the study that featured coverage of five mass violence events that have occurred over the past few years: the Boston Marathon bombings, Ariana Grande concert bombing, Pulse Night Club shooting, Bastille Day attack, and Fort Lauderdale airport shooting. Three versions of graphic stimuli media coverage were created. All three versions were identical in content and length, but were manipulated to either contain *video with audio*, *video only*, or *audio only*. The graphic stimuli contained depictions of dead bodies and bloody injuries interspersed in chaotic coverage of gunfire, individuals being wheeled away on stretchers, and individuals running for safety (described in more detail below). Further, to be able to compare different types of graphic news coverage to non-graphic news coverage, a control stimulus was created that featured news anchors and politicians talking about the same five events as in this graphic stimulus media coverage conditions but without any graphic images or graphic audio descriptions or sounds

The experimental portion of the study began with an informed consent page, and participants clicked a box to indicate their consent to participate. Next, participants

[11] An additional 82 participants signed up for and completed the experimental portion of the study and were part of a fifth study condition. The fifth condition was included to explore a separate research question and the data were not analyzed for the present study and are not further discussed. Also, 13 participants did not complete the survey in its entirety and did not get to the portion of the study where they were exposed to the stimulus clip so their data could not be analyzed. There was also one participant who appeared to complete the experimental survey twice so their second submission was deleted.

completed a measure of positive and negative affect to measure baseline mood. Participants were then informed that they would be exposed to a news clip that might contain images, sounds, or both and that they needed to have audio enabled on their computer. Participants responded to two questions indicating they had turned up their volume and that they understood the clip might not have sound or might not have images; if an individual answered "no" to either question, their data were dropped from the analyses. Participants were then randomly assigned to be exposed to one of the following four news clips: a) *graphic video with audio*, b) *graphic video only*, c) *graphic audio only*, or d) *talking heads control*.

After exposure to the news clip, participants completed the same positive and negative affect measure they completed prior to exposure to the news clip. Additionally, participants completed measures of distress, fear of future mass violence, empathy intentions to help, intentions to donate blood, and demographics. At the end of the survey, a behavioral measure of charitable giving was also included in which participants were given the option of receiving a $5 Amazon gift card as a thank you for completing the study or donating a portion of the $5 to the Red Cross. (See Appendix B for a diagram of the design of the study.)

Stimulus Materials

The stimulus news clips were created specifically for this study by the authors. To create the clips, the authors found and spliced together news coverage available on YouTube of the following five recent mass violence events: Boston Marathon bombings (about 1 minute 30 seconds), Ariana Grande concert bombing in Manchester, England (about 1 minute), Pulse Nightclub shooting in Orlando, Florida (about 1 minute), Bastille

Day attack in Nice (about 1 minute), and shooting at Ft. Lauderdale airport (about 1 minute). This created an approximately 5-minute and 40-second clip that was used for the *graphic video with audio* condition. For the *graphic video only* condition, the audio was removed from *graphic video with audio* clip. For the *graphic audio only* condition, the images were removed from the *graphic video with audio* clip. Out of the 5-minutes and 40 seconds, only 37 seconds contained graphic content (e.g. bloody individuals and uncensored dead bodies) interspersed with non-graphic content that showed individuals running away from danger, injuries that were bandaged but did not show blood, emergency crews and vehicles, explosions, and gunfire without bloody injuries. The graphic elements in the graphic stimuli clip created for this study were similar to graphic car accident films (which contained dead and bloodied bodies), used by past researchers to explore intrusive symptoms (Zetsche, Ehring, & Ehlers, 2009; Morina, Leibold, & Ehring, 2013). However, past researchers who used the car accident film did not provide info on the percent of the film that contained graphic (compared to non-graphic) content, preventing us from determining whether the proportion of graphic content in our graphic stimuli were similar.

However, unlike the car accident film used by past research, the graphic stimuli in the present study were created over 2 months by the present authors by finding mass violence coverage on YouTube that had been featured on broadcast news networks. This was done because the present study sought to explore potential benefits and risks of exposure to mass violence coverage containing graphic depictions that individuals may readily be exposed to in their everyday lives. Thus, although more graphic coverage could likely have been found on sites such as Heavy and Reddit, depicting raw footage taken by

bystanders showing bloody victims and dead individuals up close in an unedited manner, the present study only used coverage news organizations had deemed appropriate to show. With research indicating that 25% of a national U.S. sample sought out an ISIS beheading video depicting close- up high-definition coverage of a gruesome murder (Redmond et al., 2019), the graphic stimuli in the present study may have been considered less graphic by individuals used to consuming vivid, gruesome coverage.

A *talking heads control* clip was also created as a comparison for the three experimental conditions. The *talking heads control* clip was about 5 minutes and 30 seconds long and contained the same 5 events in the same order as the experimental clips, but featured news anchors and politicians discussing the events and a couple eyewitness interviews. However, no graphic video or audio depictions were included. Further, the talking heads control clip did not include any chaotic images (e.g. individuals running from danger or emergency personnel) and only featured the individuals talking with a neutral background. As previously stated, each participant was exposed to one of the four stimulus clips via random assignment on Qualtrics.

Ethical Considerations

Although the stimulus clips included potentially distressing graphic coverage of violent events, the use of coverage that was only available from news sources helped ensure the present study did not pose greater risk to individuals than they would experience while turning on the television or viewing news online. Additionally, we took the added precaution of screening out individuals who had been recently diagnosed with an anxiety or depressive disorder or who had recently taken medication used to treat such a disorder. Our precautions were similar to those taken by past research that exposed

individuals to potentially distressing content with the exception of our choosing to include individuals who reported past traumas in our study (Morina et al., 2013). The latter criteria appeared overly stringent given that research with a representative sample found that fewer than 10% of individuals reported no life adversities (Seery et al., 2010). Therefore, we chose to take a moderate approach in our exclusion criteria by screening out those who may be most susceptible to symptoms of psychological distress in response to graphic coverage, but not being overly restrictive.

Measures

Pre-test measures

All measures below are listed in the same order that they appeared in the survey.

Anxiety and Depressive Symptoms. To assess anxiety and depressive symptoms, the 4-item Patient Health Questionnaire for Depression and Anxiety (PHQ-4; Kroenke et al., 2009) was used. It consists of two items that measure symptoms of depression and two items that measure symptoms of anxiety. Each item is rated using a 4-point Likert-type scale, ranging from 0 (not at all) to 3 (every day). All four items were summed (α = 0.87).

Recent diagnoses/ medication for affective disorder. Recent diagnosis or medication use for an anxiety or depressive disorder was assessed with two questions. The first question asked participants if they had been diagnosed with an anxiety or depressive disorder in the past year to which they could select "Yes—Physician diagnosed", "Yes—Self-diagnosed", or "No". The second question asked if they had taken any medications used to treat anxiety or depressive disorders in the past year to which they could indicate "Yes" or "No". Participants who answered yes to either question were

screened out of the study and not eligible to complete the experimental portion of the study due to ethical considerations.

Vividness of Mental Imagery. Individuals' vividness of mental imagery was assessed using a modified version of the 35-item Plymouth Sensory Imagery Questionnaire (PSI-Q; Andrade, May, Deeprose, Baugh, & Ganis, 2014). The present study used 3 of the 5 items from each of the seven subscales to assess how vividly individuals can imagine the appearance, sound, smell, taste, touch, bodily sensation, and feeling of three different objects/scenes. For each subscale, the three items that participants were expected to have the most familiarity with were chosen because lack of familiarity with an item could interfere with ability to generate an image of it despite innate imagery abilities. Each item was rated on an 11-point Likert-type scale (0 = "no image at all", 10= "image as clear and vivid as real life"). The mean of all 21 items was used in the analyses (α = 0.94).

Disgust Sensitivity. To measure disgust sensitivity, a modified version of the Disgust Sensitivity Questionnaire (Haidt, McCauley, & Rozin, 1994) was administered. We used four items that comprised the envelope violations subscale and four items that comprised the death subscale. For each subscale, two items were presented as true/false statements (e.g., "It would bother me tremendously to touch a dead body.") and 2 items were statements that were rated on 0-2 scale with 0 indicating "not disgusting at all," 1 indicating "slightly disgusting," and 2 indicating "very disgusting" (e.g., "You see a man with his intestines exposed after an accident."). All items were scored according to the scale's scoring instructions and a total disgust sensitivity score was used in the analyses (α = 0.75).

Negative Life Events. Participants were asked whether they had experienced 32 different negative events over the course of their lifetimes (Blum, Silver, & Poulin, 2014; Holman, Silver, & Waitzkin, 2000). Participants could either select "yes" (scored as 1) if the event had ever happened to them or "no" (scored as 0) if it had not. All events were summed to create a total negative life events score.

Demographics. Participants were asked to indicate their gender, age, year in school, race/ethnicity, and country of birth. Subjective Socio-economic status was also assessed by asking participants to indicate which rung of a 9-rung ladder they belong on compared to others in the United States with the first rung being the lowest and ninth the highest (Adler, Epel, Castellazzo, & Ickovics, 200).

Experimental measures

All measures presented below appear in the order that they appeared in the survey.

Change in Positive and Negative Affect. Prior to exposure to the stimulus news clip, participants completed a modified version of the PANAS (Watson, Clark, & Tellegen, 1988), which measures positive and negative affect. The original measure contains 20 items (10 which measure positive affect and 10 which measure negative affect) that are each rated on a 5-point Likert-type scale (1= very slightly or not at all, 5= extremely). We supplemented the original 20 items with an additional anger item and three additional sadness items interspersed in the original items, using the same rating scale.

A pre-stimulus clip positive affect score was calculated by adding participant's scores on the 10 original positive affect items ($\alpha = 0.91$). This same measure was administered again after exposure to the stimulus clip and post-stimulus clip positive affect ($\alpha = 0.84$) was calculated in the same way. To calculate the change in positive affect

from before the stimulus clip to after the stimulus clip, the positive affect score calculated before the clip was subtracted from the positive affect score calculated after the clip. (Although see Oakes & Feldman, 2001, for more on the debate regarding calculating change scores).

A pre-stimulus clip negative affect score was calculated by adding participant's scores on the 10 original negative affect items, additional anger item, and three additional sadness items ($\alpha = 0.93$). This same measure was administered again after exposure to the stimulus clip and post-stimulus clip negative affect ($\alpha = 0.93$) was calculated in the same way. To calculate the change in negative affect from before the stimulus clip to after the stimulus clip, the negative affect score calculated before the clip was subtracted from the negative affect score calculated after the clip.

Comprehension Questions. To ensure that participants understood the instructions, participants were asked to select yes or no to the two following statements: "I have turned up the volume on the device that I am taking this survey." and "I understand that the clip on the next screen may not have audio or may not have images. I will focus on the fixation cross or images displayed." Individuals who selected "No" in response to either statement were dropped from analyses because their responses indicated they did not understand the instructions for the manipulation.

Distress measure. Participants completed a single item distress measure that asked, "How distressing was what you saw/heard?" which was modeled after a distress measure used by Holmes and colleagues (2004). Ratings were made on a sliding scale ranging from 0 ("not at all distressing") to 100 ("extremely distressing"). The response to this question was treated as a continuous variable.

Fear of future mass violence. Fear of future mass violence was assessed with two questions that asked about fear of another mass violence event (e.g., bombing, terrorist attack, shooting) and fear that oneself or one's family would be victimized (Holman et al., 2008). Both items were rated on a 5-point Likert-type scale ranging from "never" (1) to "all of the time" (5). The sum of both items was used in the analyses ($\alpha = 0.89$).

Empathy. Participants completed a modified version of the validated 12-item State Empathy Scale (Shen, 2010), which measured empathy in response to the news clip. Each item was rated on a 5-point Likert-type scale ranging from 0 ("not at all") to 4 ("completely"). The items load onto three subscales: affective empathy (e.g., "I was in a similar emotional state as the individuals when watching this message."), cognitive empathy (e.g., "I can feel the individuals' emotions"), and associative empathy (e.g., "When watching the message, I was fully absorbed."). A single empathy score was created using the mean of all items ($\alpha = 0.90$).

Intentions to help. Participants completed a three-item measure asking them how likely they would be to volunteer time to make care packages for the victims of large-scale disasters, how likely they would be to volunteer time to make phone calls to try and raise money for the victims of large-scale disasters, and how likely they would be to donate blood to help victims. This measure was modeled after questions used to assess risk perception by asking participants how likely they think an event is to occur (Blum et al., 2014).These items were chosen since some researchers identified literature noting increases in volunteering and blood donation following 9/11 (Morgan, Wisneski, & Skitka, 2011). Participants rated each item on a slider-scale ranging from 0- 100%. Due to a low alpha between all 3-items ($\alpha = 0.66$), the mean of intentions to make care packages and

intentions to make phone calls was used to create the intentions to help variable ($\alpha = 0.82$). Intentions to donate blood was used as a single-item, separate variable.

Intentions to donate blood. Intentions to donate blood was comprised of a single item as described above.

Past media exposure to stimulus events. Participants were asked to indicate how frequently they were exposed to coverage of each of the five events featured in the stimulus clips (Boston Marathon bombings, Ariana Grande concert bombing, Pulse Nightclub shooting, Bastille Day attack, and Fort Lauderdale airport shooting). For each event, participants used a 5-point Likert-type scale ranging from "never" (1) to "very often" (5) to indicate their frequency of past exposure. The mean of all 5-items was used to create total past exposure variable ($\alpha = 0.76$).

Charitable giving. At the end of the survey, participants were told that they would be emailed a $5 Amazon gift card as a thank you for completing the study. They were then asked if they would like to donate a portion of this compensation to the Red Cross, which helps victims of large-scale disasters. Those who selected "Yes" they wished to donate were then asked to select how much they wished to donate, ranging from $1 to $5 in increments of a dollar. This behavioral measure was chosen based on past research identifying monetary donation as a positive outcome in the wake of the September 11th terrorist attacks (Morgan et al., 2011). Participants received a continuous score for monetary donation, ranging from 0 to 5.

Analytic Strategy

All analyses were performed using STATA 14 (Stata Corp, College Station, TX). For all analyses, two comprehension check questions were used to determine if any

individual's data indicated failure to understand the study instructions. Those who answered "no" to either question were dropped from the analyses because these responses indicated individuals did not understand the instructions for the stimulus clip.

Efficacy of Random Assignment

To determine whether random assignment was successful in closely distributing characteristics that may also be associated with the outcome variables across groups, a series of two one sided tests (TOST) of equivalence were run using a programmed Excel spreadsheet created by Lakens (2017). More specifically, we wanted to ensure that disgust sensitivity, negative life events, and anxiety and depressive symptoms prior to watching the stimulus clip were equivalent across groups. For each of these three variables, we used STATA to determine the mean and standard deviation of the variable for each of the four study groups (*video with audio*, *video only*, *audio only*, and *talking heads control*). Additionally, to ensure the TOST test of equivalence were adequately powered, we conducted a TOST power analysis to determine the value of Cohen's d to use for the high and low equivalence bound in the TOST equivalence test. In the power analysis, the alpha was set to 0.05 and the desired power was set to 0.8. An appropriate Cohen's d was also calculated based on a sample size of 74 because this was the smallest number of participants in any of the four experimental groups for any of the three variables of interest (n = 15 participants were missing negative life events data, but no data were missing for disgust sensitivity or anxiety and depressive symptoms). Based on these parameters, the high and low equivalence bounds were set to 0.49 and -0.49, respectively, in each analysis. All the aforementioned values were entered into the programmed Excel sheet to explore whether the mean of each of the variables of interest was equivalent for the *video with*

audio group compared to the *talking heads control* group, the *audio only* group compared to the *talking heads control* group, the *video only* group compared to the *talking heads control* group, the *video with audio* group compared to the *audio only* group, and the *video with audio* group compared to the *video only* group.

Psychological Outcomes

We first explored whether there were differences in psychological responses to different types of graphic media coverage. More specifically, we explored differences in change in negative affect, distress, and fear of future mass violence across conditions (*graphic video with audio* vs. *talking heads control*, *graphic video only* vs. *talking heads control*, *graphic audio only* vs. *talking heads control*, *graphic video with audio* vs. *graphic audio only, and graphic video with audio vs. graphic video only*). To do this, for each outcome of interest, we ran an ordinary least squares (OLS) regression with experimental condition as a predictor of the outcome variable (with *talking heads control* coded as the reference group). This was followed by two planned contrasts comparing *video with audio* to *audio only* and *video with audio* to *video only*. This OLS regression and two planned contrasts were run for each of the three outcome variables of interest.

Moderating Role of Vividness of Mental Imagery

To explore whether vividness of mental imagery moderated the relationship between condition and negative affect, distress, and fear of future mass violence, the OLS regression analyses described above and subsequent planned contrasts were rerun for

each of these three outcome variables with vividness of mental imagery included as a moderator[12].

Positive Psychological Outcomes

To explore whether there were differences in positive psychological responses between conditions, two separate OLS regression analyses explored differences in change in positive affect and empathy between conditions. For both OLS regression analyses, experimental condition was entered as a predictor variable (with *talking heads control* coded as the reference group). Each OLS regression was followed by two planned contrasts as described above.

Philanthropic Behavior

To explore whether experimental condition predicted intentions to help, intentions to donate blood, and charitable giving, three separate OLS regression analyses were conducted with experimental condition entered as a predictor variable (with *talking heads control* coded as the reference group). Each OLS regression was followed by two planned contrasts as described above.

Moderating Role of Fear and Empathy

To explore whether the effect of media type on intentions to help, intentions to donate blood, and charitable giving were moderated by fear of future mass violence, the same three original OLS regressions and two planned contrasts described above were

[12] Analyses also explored whether there was an interaction between vividness of mental imagery and condition for the following outcomes variables: change in positive affect, empathy, intentions to help, intentions to donate blood, and charitable giving. There was only a marginally significant interaction between condition and vividness of mental imagery for charitable giving such that those exposed to video only compared to the talking heads control group were less likely to donate when vividness of mental imagery was high (B= -.41, p= .01, 99%CI[-.82, .001]).

rerun for each of these three outcome variables, but this time with fear of future mass violence as a moderator. Next, to explore whether empathy moderated the influence of media type on intentions to help, intentions to donate blood, and charitable giving, the same three original OLS regressions and two planned contrasts described above were rerun for each of the three outcomes variables with empathy included as a moderator.

All OLS analyses controlled for frequency of past media exposure to the five stimulus events depicted in the news clips. Only findings with a p-value less than .01 were considered to be significant, using a Bonferroni adjusted *p*-value to account for the family-wise error of making five comparisons. All continuous variables were standardized using z-scores so all results are presented with standardized regression coefficients.

Results

Sample Characteristics

Two participants were dropped from the audio only condition (one did not respond to either of the comprehension questions and the second answered "no" to one of the comprehension questions, indicating they did not understand the instructions). This resulted in a sample of $n = 319$ individuals included in the analyses. The sample was 84.23% female ($n = 2$ did not report gender) and the mean age was 21.05 years (SD= 3.71). The majority of the sample was Asian-American/ Pacific Islander (36.0%), followed by Latino/a or Hispanic (30.9%), then White/Caucasian (15.9%), then Multi-racial/multi-ethnic (7.6%), and then other (7.0%). The remaining 2.6% of the sample reported being Black/ African-American, American Indian or Native American, or didn't know their ethnicity ($n = 5$ did not report ethnicity). The majority of the sample was born in the United

States (79.3%) (*n* = 1 did not report). Participants reported a mean subjective SES of 5.36 on a 1-9 scale (SD = 1.45) (*n* = 2 did not report subjective SES).

Test of Equivalence

The independent samples two one sided tests (TOST) of equivalence exploring whether prior negative life events were equivalent across groups revealed that negative life events were not equivalent between the *video only* group and *talking heads control* group ($t(145.73) = -1.35$, $p = .09$). Additionally, TOST equivalence tests revealed disgust sensitivity was not equivalent between the *video only* and *talking heads control* group ($t(156.40) = 1.39$, $p = .08$). Further, TOST equivalence tests revealed that anxiety and depressive symptoms were not equivalent between the *video with audio* and *talking heads control* group ($t(144.74) = -1.65$, $p = .05$), the *audio only* group and *talking heads control* group ($t(157.89) = -1.38$, $p = .09$), or the *video with audio* group and *video only* group ($t(153.34) = -1.07$, $p = .14$). As a result, all OLS regression analyses described above in the analytic strategy also controlled for negative life events, disgust sensitivity, and anxiety and depressive symptoms (measured prior to exposure to the stimulus clips).

Symptoms of Psychological Distress

Changes in Negative Affect

Findings revealed that the *video with audio* group and *video only* group both reported greater changes in negative affect from before to after exposure to the stimulus clip compared to the *talking heads control* group. The *video with audio* group also showed a trend toward a greater change in negative affect compared to the *audio only* group (see Table 1). There was no significant interaction between stimulus condition and vividness of mental imagery. However, there was trend toward greater change in negative affect for the

video with audio group compared to the audio only group at higher levels of vividness of mental imagery (see Table 2).

Distress

The graphic video with audio condition reported the greatest amount of distress following stimulus exposure (*M*= 83.54, *SD*= 19.60), followed by those exposed to graphic video only (M= 81.22, SD= 16.38), then those exposed to graphic audio only (*M*= 76.22, *SD*= 23.16), and lastly those exposed to the talking heads control (*M* = 69.83, *SD*= 23.28). Further, findings revealed that the *video with audio* group and the *video only* group both experienced significantly more distress than the *talking heads control* group. Additionally, the *audio only* group showed a trend toward greater distress than the talking heads control group (see Table 1). There was no significant interaction between stimulus condition and vividness of mental imagery (see Table 2).

Fear of Future Mass Violence

The *video with audio* group experienced more fear of future mass violence than the *audio only* group (see Table 1). There was no significant interaction between stimulus condition and vividness of mental imagery (see Table 2).

Positive Psychological Outcomes

Changes in Positive Affect

Findings revealed that the *video with audio* group reported greater change in positive affect compared to the audio only group (see Table 3). The *video with audio* group also showed a trend toward greater change in positive affect compared to the video only group.

Empathy

Findings revealed that the *video with audio* group, *video only* group, and *audio only* group all experienced more empathy than the *talking heads control* group (see Table 3).

Philanthropic Behavior

Intentions to Help

The *video with audio* group and the *video only* group both reported greater intentions to help compared to the *talking heads control* group. Additionally, the *audio only* group showed a trend toward greater intentions to help than the *talking heads control* group (see Table 4). There was no significant interaction between stimulus condition and empathy (see Table 5) or stimulus condition and fear (see Table 6).

Intentions to Donate Blood

There were no significant group differences observed for intentions to donate blood (see Table 4). Additionally, there were no significant interactions between stimulus condition and empathy (see Table 5) or stimulus condition and fear (see Table 6). However, it should be noted that intentions to donate blood in the next year were quite high, with roughly 54% of participants indicating at least a 50% chance of doing so and 30% of participants indicating a 75% or greater chance of doing so.

Charitable Giving

There were no significant group differences observed for intentions to donate money (see Table 4). Further, there was no significant interaction between stimulus condition and empathy (see Table 5) or stimulus condition and fear (see Table 6). Nonetheless, 48.90% of the sample chose to donate some portion of their study compensation, and of those who chose to donate 10.26% donated $1, 3.21% donated $2, 1.92% donated $3, 0% donated $4, and 84.62% donated $5. However, a series of post-hoc

t-tests revealed no differences in subjective SES, empathy, or U.S. born (compared to non-U.S. born) between those who chose not to donate any money and those who chose to donate some amount of money.

Discussion

The aims of the present study were two-fold. The present experiment sought first to replicate and expand on past research identifying psychological risks associated with exposure to graphic media coverage of collective traumas (Ahern et al., 2002; Holman et al., 2014; Silver et al., 2013) by exploring a causal relationship between different types of graphic media coverage and psychological symptoms. Second, the present experiment sought to identify potential positive outcomes following exposure to graphic media coverage because research has largely focused on negative correlates of exposure. Building off research on fear appeals that suggests graphic visuals might inspire personal change (e.g., Ophir, Brennan, Maloney, & Cappella, 2017), the present studyexplored whether exposure to graphic media coverage of mass violence events increased philanthropic intentions and behavior. Further, although research on fear appeals has focused on the effect of graphic visuals, the present study tested the effects of graphic visuals and graphic audio on philanthropy because it is possible that graphic audio may also motivate behavior.

Findings exploring negative outcomes revealed that exposure to graphic media coverage of mass violence events that contained graphic imagery lead to worse psychological and affective responses than media formats without graphic imagery. This finding expanded on past research demonstrating a link between exposure to media coverage of collective traumas and psychological symptoms (Ahern et al., 2002; Holman et al., 2014; Silver et al., 2013) by identifying a specific aspect of mass violence media

coverage that may be especially detrimental. Moreover, the experimental nature of this study allows causal inferences to be made. Thus, the findings suggest that exposure to graphic media coverage of mass violence events that contains graphic imagery *causes* more symptoms of psychological distress than exposure to media coverage of mass violence events without graphic imagery.

Findings exploring positive outcomes revealed that exposure to media coverage of mass violence events containing graphic images and/or sounds produced greater empathy than non-graphic media coverage of mass violence events (e.g. news anchors discussing the events). Further, media coverage of mass violence events containing graphic imagery produced an increase in positive affect and greater intentions to help trauma victims compared to non-graphic mass violence media coverage, while exposure to graphic media coverage containing only graphic sounds showed a trend toward greater intentions to help compared to exposure to non-graphic media coverage. This suggests that there may be some benefit to exposure to media coverage containing graphic images (and perhaps to a lesser extent graphic sounds) in the wake of a collective trauma, but findings revealed no differences in actual donating behavior between any of the experimental groups.

Group Differences in Negative Outcomes

Consistent with past research suggesting exposure to large amounts of media coverage of collective traumas is associated with psychological symptoms (Holman et al., 2014; Silver et al., 2013), the present experiment found that those exposed to graphic media coverage of mass violence events containing graphic imagery experienced greater change in negative affect and distress compared to those exposed to media coverage of news anchors discussing the events. Further, those exposed to graphic media coverage

containing only graphic sounds showed a trend toward greater distress and change in negative affect compared to those exposed to non-graphic coverage of news anchors, but these differences failed to reach statistical significance. Additionally, exposure to mass violence media coverage containing both graphic images and sounds produced greater fear of future mass violence than exposure to media coverage containing only graphic sounds. Together, these findings indicate that exposure to media coverage of mass violence events that contains graphic images produces more symptoms of psychological distress than exposure to media coverage of large scale-disasters without graphic images. Further, our findings hint at the possibility that the inclusion of graphic audio (e.g., sounds of gunfire, explosions, cries of anguish) in disaster media coverage may produce greater symptoms of psychological distress than media coverage of large-scale disasters that omits both graphic images and sounds. Notably, including or omitting graphic sounds did not produce any differences in psychological symptoms when media coverage contained graphic imagery, suggesting that the addition of graphic sounds to news coverage that already contains graphic visuals may not contribute further to psychological symptoms.

Group Differences in Positive Outcomes

Our findings suggest that graphic media coverage of mass violence events that contains graphic imagery produces greater empathy, positive affect, and intentions to help than non-graphic news coverage of mass violence events. Together these finding suggest that graphic images of a trauma may be particularly effective at raising individuals' feelings of concern for others and motivating helping. Furthermore, although it was somewhat surprising that graphic traumatic imagery increased positive affect following exposure, this is likely due to the way in which positive affect was measured. The 10-item measure of

positive affect included items such as “interested,” “alert,” “active,” and “attentive.” Thus, it is possible that the inclusion of graphic imagery in mass violence media coverage increased positive affect because these images garner more attention and interest. Further, although media coverage of mass violence events containing only graphic sounds produced greater empathy than non-graphic mass violence media coverage and showed a trend toward greater intentions to help, the relationship between exposure to mass violence media coverage containing sounds alone and positive outcomes appears much weaker. Together these findings suggest that exposure to graphic media coverage of mass violence events that contains graphic imagery (and to a lesser extent sounds) may be beneficial if the goal is to make people care and want to help disaster victims. However, results from the other positive outcomes explored call this interpretation into question.

Other findings revealed no differences in actual donating behavior or intentions to donate blood between any of the experimental groups. The latter finding can likely be explained by the fact that a number of college students in our sample likely already donate blood due to college campuses often bringing students’ attention to the need for blood donation and even offering small tokens for doing so. Indeed, a little over half of our sample reported at least a 50% chance of donating blood in the next year and about a quarter of the sample reported at least an 80% chance of doing so. However, our finding that there were no significant group differences in donating money despite there being group differences in intentions to help is less easily explained.

It is possible that participants exposed to graphic media coverage of mass violence events that included graphic imagery reported greater empathy and greater intentions to help (via making care packages or phone calls to raise money), but were not more likely to

donate to the Red Cross because they were college students who needed the money and were better equipped to provide aid in non-monetary ways. This interpretation is plausible as only a little under a quarter of participants rated themselves as a 7 or higher on subjective socioeconomic status on a 1-9 scale. It is possible that if this study were re-run with a population sample of older adults in the work force, group differences in donating may have emerged. However, it is also possible that graphic video coverage of mass violence events does indeed increase individuals' empathy and intentions to help, but not translate into actual behavioral helping, consistent with our findings. Past researchers have cautioned others to evaluate actual behavior and not intentions to determine the efficacy of a change agent because sometimes intentions may not correspond with one's actions (Kok et al., 2018). Other research has also found that those higher in "empathetic concern" indicated greater intentions to provide aid after reading about a disaster, but were not more likely to share potential raffle earnings when given the opportunity to do so (Marjanovic, Struthers, & Greenglass, 2012). However, it should be noted that in our study participants were only given the option to donate between $1-$5. It is possible we would have observed more variability in donation if there was a large donation amount possible and participants felt their monetary donation would have a greater impact.

While the study by Marjanovic and colleagues (2012) suggests that experiencing higher empathy may be more predictive of desiring to provide aid than actual donating behavior, it is possible that in both their study and ours, too much time had elapsed since the events to which participants were exposed had occurred. A study conducted after the 9/11 terror attacks found that for individuals who provided information on their helping behaviors in the wake of the attacks and again a year later, the prevalence of helping

dropped from about 68% to about 30% (Piferi, Jobe, & Jones, 2006). Because the present study used news coverage of mass violence events that were at least about a year old to ensure that participants had not recently been heavily exposed to news coverage of these events, it is possible that participants were less motivated to donate to events that were not deemed current. Further, participants were asked if they wished to donate money to the Red Cross, which helps victims of similar large-scale disasters, so perhaps participants were less motivated to donate money when they knew less about who the specific recipient would be.

Together, findings from this study suggest that exposure to media coverage of large-scale disasters that contains graphic images results in greater psychological and affective symptoms than exposure to media coverage without graphic images. Past research has demonstrated that remembering being exposed to different 9/11 pictures later elicited specific emotions unique to the image (Fahmy, Cho, Wanta, & Song, 2006), but this study expands on these findings by demonstrating images appear to be more impactful than other media elements (e.g., graphic sounds). Moreover, because the present study was experimental in nature, the findings indicate that exposure to graphic imagery of mass violence events does in fact *produce* greater fear of future mass violence, distress, and change in negative affect compared to media coverage that does not employ graphic imagery. These findings bolster past correlational research that noted an association between collective trauma media coverage and symptoms of psychological distress (Holman et al., 2014; Redmond, Jones, Holman, & Silver, 2019; Silver et al., 2002), but was unable to speak to a causal relationship or make distinctions between different types of disaster media coverage. Further, the findings lend support to speculations made by

Kiyimba and O'Reilly (2016), whose research on transcriptionists led them to speculate that video would perhaps be more psychologically difficult for transcriptionists than audio by itself.

Limitations

The present study used an experimental design to determine whether there were differences in psychological symptoms and philanthropic intentions and behavior between individuals exposed to graphic sounds versus images. Random assignment was used to minimize differences between groups. However, TOST equivalence tests revealed that characteristics that may be associated with the outcomes explored were not equally distributed across groups. This failure of random assignment is a limitation of the study design. Although random assignment is common place in experimental research, some suggest that comparability is a superior method, particularly for smaller samples (Saint-Mont, 2015). However, we addressed this shortcoming by controlling for important characteristics that were not equally distributed across groups (negative life events, disgust sensitivity, and anxiety and depressive symptoms) in the analyses.

Another limitation of this study was that by conducting it online, participants were not monitored by an experimenter to ensure that they were carefully attending to the stimulus clips and surveys and that they were not distracted while taking the survey. However, this risk is inherent to online research in general and not limited to this specific study. Further, by conducting the study online and allowing individuals to choose which device to access the survey on (e.g. smartphones or laptops), the manner in which participants were exposed to the stimulus clips was more ecologically valid than bringing them into the lab and exposing them to the stimulus on a desktop computer because

individuals are often exposed to graphic news coverage on their own electronic devices. This, however, introduced another source of variability within and across conditions because the size of the visuals and volume of the sound might have varied if some individuals chose to complete the online experiment on their smartphones and others completed the online experiment on laptop or desk top computers. Thus, the lack of standardized instructions to complete the online experiment on a specific device and set the volume to a specific level adds a source of error to the findings. It is possible that the effect of graphic images and sounds varies based on the size of the images and volume of the sound, but we were unable to control for differences in image size or volume of the audio.

Although the finding that there were no group differences in donating behavior might be explained by the use of a college student sample or by the fact that intentions may not lead to actual behavior, it is also possible that there were a couple flaws in our charitable giving measure that reduced the likelihood of donating. First, charitable giving was assessed by asking participants if they would like to donate money to the Red Cross, which helps victims of *similar* disasters. However, it may have been more appropriate to ask for donations that would go directly to the victims of the mass violence events featured in the stimuli coverage. The Red Cross appears to have a greater presence in the aftermath of large-scale natural disasters so it may have been less clear to participants how donating to the Red Cross would benefit victims of mass violence events. It is possible that there would have been differences in charitable giving across graphic media conditions if a more appropriate charity had been chosen. A second limitation of our charitable giving measure was then we were only able to offer participants $5 that they could choose to keep or

donate. Because this was a small amount of money, it is possible that some participants chose to donate it because they did not want to hassle with going through their email to find the gift card and apply it to their Amazon account. Thus, some participants' decision to donate may have been more influenced by avoiding a hassle than their response to the video, confounding our results.

A final limitation of this study was that the lack of significant interactions between vividness of mental imagery and condition and negative psychological outcomes may have been due to a ceiling effect. Participants received a vividness of mental imagery score that ranged from 0 to 10 using the Plymouth Sensory Imagery Questionnaire (Andrade et al., 2014). However, all participants scored fairly high on this measure (M = 7.81 and SD= 1.51 for the video with audio group, M = 7.45 and SD= 1.72 for the video only group, M = 7.61 and SD= 1.49 for the audio only group, and M = 7.32 and SD= 2.33 for the talking heads control group). Thus, it is possible that an individual's natural ability to generate vivid mental images in his/her mind is an important predictor of negative responses to mass violence media coverage presented in different sensory formats (e.g. graphic audio depictions), but the lack of variability on our measure may have prevented us from observing any statistically significant effects. Further, our finding suggest that the Plymouth Sensory Imagery Questionnaire may not be able to distinguish those high and low on the ability to create vivid mental images in their minds when used with college students.

Future Directions

The present study revealed mixed findings. On the one hand, exposure to graphic imagery of large-scale disasters induced more empathy and intentions to help. On the other

hand, exposure to this graphic imagery did not result in more donating behavior. It is possible that the failure to find a significant effect of exposure to graphic imagery on donating behavior was due to the use of a sample of college students, who as a whole may not have the financial resources to donate money. Thus, future research may consider attempting to duplicate this study with a more representative population not limited by the same financial constraints as college students. Additionally, the present study used mass violence events in the stimulus clips that had happened at least about a year earlier. By using events in the stimulus clips that were not particularly recent, it is possible that the urgency to donate may have been lessened. Future research may consider studying responses to graphic media coverage of events that are slightly more recent or whose ongoing impact is clear, such as highlighting the number of victims who are still facing medical costs from the disaster. Additionally, participants were asked if they would to donate to the Red Cross, which largely helps victims following natural disasters, but is not prominent in the wake of mass violence events. Thus, participants might not have believed their donations would help victims of the same type of violent events included in the stimulus coverage, decreasing their desire to donate. Future research might improve upon this measure by asking for donations to groups that directly benefit victims of mass violence events.

Because the results of the present study demonstrate that graphic imagery produces more psychological and affective symptoms than media coverage of mass violence events without graphic images, future research may consider exploring whether different types of graphic images have different effects on responses. For instance, researchers may want to explore experimentally responses to different types of graphic images (e.g. are bloody

image and images of dead bodies with no blood equally distressing?) Further, because the present study only explored the effect of graphic imagery presented as moving images (video with audio or video only), future research may consider comparing the psychological effect of exposure to graphic imagery presented in a video format and as still images. In addition to exploring other aspects of media coverage (e.g. bloody images vs. non-bloody images, moving pictures vs. non-moving pictures), future research might consider exploring the underlying mechanisms by which graphic news imagery produced psychological symptoms. For instance, it is possible that perceptions of personal threat or perceived similarity to the victims mediate the relationship between graphic news imagery and symptoms of psychological distress.

Conclusions

In conclusion, the present experiment suggests exposure to mass violence media coverage containing graphic imagery may be particularly psychologically harmful. Further, although mass violence media coverage containing graphic imagery also produced greater empathy and intentions to help, it did not increase charitable giving. Thus, the present study provides further support for the psychological risks posed by mass violence media coverage, but the question still remains as to whether exposure to mass violence coverage is important for increasing philanthropic behavior.

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Table 1. Differences in Psychological Responses to Different Types of Mass Violence Media Coverage (Standardized Regression Coefficients)

Variables	Distress β(99% CI)	Fear of Future Mass Violence β(99% CI)	. Change in Negative Affect β(99% CI)
Multivariate Analyses	(n = 304)	(*n* = 304)	(*n* = 302)
Experimental Condition			
Talking heads control (ref.)			
Video with audio	.71(.39, 1.12)**	.24(-.14, .62)	.72(.31,1.12)**
Video only	.73(.30, 1.15)**	-.16(-.55, .22)	.65(.24,1.07)**
Audio only	.42(>-.01, .84)	.06(-.001, .57)	.35(-.06, .76)
Covariates			
Disgust Sensitivity	.23(.08, .38)**	.22(.08, .36)**	.10(-.05, .25)
Negative life events	<.01(-.14, .15)	.12(-.02, .25)	-.02(-.16, .12)
Anxiety & Depressive Symptoms	.13(-.02, .28)	.30(.16, .43)**	.01(-.13, .15)
Past media exposure	.22(.07, .36)**	.22(.09, .36)**	.23(.08, .37)**
Planned Contrasts			
Video with audio vs audio only (ref.)	.29(-.13, .71)	.40(.02, .79)*	.37(-.04, .78)
Video with audio vs video only (ref.)	-.02(-.44, .41)	.06(-.33, .44)	.06(-.35, .48)
Model Statistics	$F(7, 296) = 8.84$; $p < .001$; $R^2 = .17$	$F(7, 297) = 13.36$; $p < .001$; $R^2 = .24$	$F(7, 294) = 6.27$; $p < .001$; $R^2 = .13$

*Note: ref. = reference group; * p <.01, **p < .001*

Table 2. Psychological Responses to Different Types of Mass Violence Media Coverage Moderated by Vividness of Mental Imagery (Standardized Regression Coefficients)

Variables	Negative affect β(99% CI)	Distress β(99% CI)	Fear of future mass violence β(99% CI)
Multivariate Analyses	(n = 302)	(n = 304)	(n = 304)
Experimental Condition			
Talking heads control (ref.)			
Video with audio	.65(.25, 1.06)**	.64(.213, 1.05)**	.20(-.18, .58)
Video only	.64(.24, 1.05)**	.71(.30, 1.13)**	.18(-.21, .56)
Audio only	.33(-.08, .74)	.39(-.03, .80)	-.18(-.57, .20)
Vividness of mental imagery	.14(-.15, .42)	.16(-.13, .45)	.19(-.08, .46)
Condition x vividness			
Video with audio x vividness	.18(-.24, .60)	.14(-.28, .56)	-.01(-.40, .38)
Video only x vividness	-.21(-.61, .19)	-.14(-.54, .26)	-.16(-.53, .21)
Audio only x vividness	.06(-.36, .48)	.16(-.27, .59)	-.03(-.43, .36)
Disgust Sensitivity	.08(-.07, .23)	.22(.07, .37)**	.21(.07, .35)
Negative life events	-.03(-.17, .11)	-.01(-.15, .13)	.11(-.02, .24)
Anxiety & Depressive Symptoms	<.01(-.14, .14)	.12(-.03, .27)	.29(.16, .43)
Past media exposure	.23(.09, .37)**	.21(.07, .36)**	.22(.09, .36)
Planned Contrasts			
Video with audio vs audio only (ref.) x vividness	.12(-.31, .55)	-.02(-.46, .42)	.02(-.39, .43)
Video with audio vs video only (ref.) x vividness	.39(-.02, .80)	.28(-.14, .69)	.15(-.23, .53)
Model Statistics	F(11, 290) = 5.18; p < .001; R^2 = .16	F(11, 292) = 7.21; p <.001; R^2 = .21	F(11, 292) = 9.33; p < .01; R^2 = .26

Note: ref. grp= reference group; *p < .01, **p < .001. All regression coefficients are standardized.

Table 3: Differences in Positive Affective Responses to Different Types of Mass Violence Media Coverage (Standardized Regression Coefficients)

Variables	Change in Positive Affect β(99% CI)	Empathy β(99% CI)
Multivariate Analyses	(n = 302)	(n = 301)
Experimental Condition		
Talking heads control (ref.)		
Video with audio	.33(-.09, .74)	.82(.42, 1.22)**
Video only	-.06(-.49, .37)	.66(.26, 1.06)**
Audio only	-.13(-.56, .29)	.45(.05, .85)*
Covariates		
Disgust Sensitivity	.07(-.09, .22)	.15(.002, .30)*
Negative life events	.01(-.14, .15)	-.04(-.17, .10)
Anxiety & Depressive Symptoms	.07(-.08, .22)	.16(.02, .30)*
Past media exposure	>-.01(-.15, .15)	.21(.07, .35)**
Planned Contrasts		
Video with audio vs audio only (ref.)	.46(.04, .88)*	.37(-.03, .77)
Video with audio vs video only (ref.)	.39(-.04, .81)	.16(-.24. .56)
Model Statistics	F(7, 297) = 1.92; p =.07; R^2 = .04	F(7, 293) = 8.99; p < .001; R^2 = .18

*Note: ref.= reference group; * p < .01, ** p < .001*

Table 4. Intentions to Help and Charitable Giving in Response to Different Types of Mass Violence Media Coverage (Standardized Regression Coefficients)

Variables	Intentions to Help β(99% CI)	Intentions to Donate Blood β(99% CI)	Charitable Giving β(99% CI)
Multivariate Analyses	(n = 303)	(n = 304)	(n = 304)
Experimental Condition			
Talking heads control (ref. grp)			
Video with audio	.44(.05, .83)*	.24(-.16, .64)	.26(-.16, .68)
Video only	.72(.32, 1.11)**	.30(-.11, .70)	.11(-.32, .53)
Audio only	.39(-.01, .78)	.13(-.27, .54)	.10(-.32, .53)
Covariates			
Disgust Sensitivity	.13(-.01, .28)*	-.12(-.27, .03)	-.03(-.18, .13)
Negative life events	.02(-.11, .16)	.10(-.04, .24)	-.05(-.20, .09)
Anxiety & Depressive Symptoms	.21(.07, .35)**	-.03(-.18, .11)	.09(-.06, .24)
Past media exposure	.20(.06, .34)**	.20(.06, .35)**	-.14(-.28, .01)
Planned Contrasts			
Video with audio vs audio only (ref. grp)	.05(-.34, .45)	.11(-.30, .51)	.15(-.27, .58)
Video with audio vs video only (ref. grp)	-.28(-.67, .12)	-.06(-.46, .35)	.15(-.27, .58)
Model Statistics	$F(7, 295) = 8.15$; $p < .001$; $R^2 = .16$	$F(7, 296) = 4.08$; $p < .001$; $R^2 = .09$	$F(7, 296) = 1.76$; $p = .095$; $R^2 = .04$

Note: ref. grp= reference group; *$p < .01$, **$p < .001$. All regression coefficients are standardized.

Table 5. Intentions to Help and Charitable Giving in Response to Different Types of Mass Violence Media Coverage Moderated by Empathy (Standardized Regression Coefficients)

Variables	Intentions to Help β(99% CI)	Intentions to Donate Blood β(99% CI)	Charitable Giving β(99% CI)
Multivariate Analyses	(n = 300)	(*n* = 301)	(*n* = 301)
Experimental Condition			
Talking heads control (ref. grp)			
Video with audio	.24(-.18, .66)	.21(-.23, .66)	.36(-.10, .82)
Video only	.54(.13, .95)	.30(-.14, .74)	.12(-.33, .58)
Audio only	.26(-.15, .67)	.12(-.31, .56)	.16(-.29, .61)
Empathy	.23(.13, .95)	>-.01(-.30, .30)	-.04(-.35, .27)
Condition x Empathy			
Video with audio x empathy	.02(-.38, .42)	.09(-.33, .52)	-.12(-.56, .33)
Video only x empathy	.15(-.25, .55)	.09(-.33, .51)	.19(-.25, .63)
Audio only x empathy	-.06(-.44, .32)	-.08(-.48, .32)	.01(-.41, .43)
Disgust Sensitivity	.10(-.04, .25)	-.11(-.26, .05)	-.02(-.18, .14)
Negative life events	.03(-.10, .17)	.11(-.03, .25)	-.06(-.20, .09)
Anxiety & Depressive Symptoms	.17(.03, .31)	-.04(-.18, .11)	.09(-.06, .25)
Past media exposure	.14(-.002, .28)	.20(.05, .35)**	-.13(-.29, .02)
Planned Contrasts			
Video with audio vs audio only (ref. grp) x empathy	.08(-.31, .47)	.17(-.24, .59)	-.13(-.56, .30)
Video with audio vs video only (ref. grp) x empathy	-.13(-.54, .28)	<.01(-.43, .44)	-.31(-.76, .14)
Model Statistics	$F(11, 288) = 7.30$; $p < .001$; $R^2 = .22$	$F(7, 296) = 4.08$; $p < .001$; $R^2 = .09$	$F(11, 289) = 1.43$; $p = .16$; $R^2 = .05$

Note: ref. grp= reference group; *$p < .01$, **$p < .001$. All regression coefficients are standardized.

Table 6. Intentions to Help and Charitable Giving in Response to Different Types of Mass Violence Media Coverage Moderated by Fear of Future Mass Violence (Standardized Regression Coefficients)

Variables	Intentions to Help β(99% CI)	Intentions to Donate Blood β(99% CI)	Charitable Giving β(99% CI)
Multivariate Analyses	(n = 303)	(*n* = 304)	(*n* = 304)
Experimental Condition			
Talking heads control (ref. grp)			
Video with audio	.40(.01, .79)*	.19(-.21, .60)	.28(-.14, .71)
Video only	.68(.29, 1.07)**	.28(-.13, .68)	.10(-.33, .52)
Audio only	.41(.02, .81)*	.16(-.26, .57)	.06(-.37, .48)
Fear of future mass violence	.21(-.07, 1.07)	.11(-.19, .41)	.12(-.19, .43)
Condition x Fear			
Video with audio x fear	-.02(-.41, .37)	.08(-.32, .48)	-.25(-.66, .17)
Video only x fear	.03(-.35, .41)	-.07(-.46, .33)	.06(-.35, .47)
Audio only x fear	-.04(-.44, .36)	.02(-.40, .44)	-.30(-.73, .13)
Disgust Sensitivity	.09(-.06, .37)	-.14(-.29, .01)	-.03(-.19, .13)
Negative life events	>-.01(-.14, .13)	.10(-.05, .24)	-.06(-.20, .09)
Anxiety & Depressive Symptoms	.15(.01, .30)*	-.07(-.22, .08)	.10(-.06, .25)
Past media exposure	.15(.01, .29)*	.18(.03, .33)*	-.14(-.29, .01)
Planned Contrasts			
Video with audio vs audio only (ref. grp) x fear	.02(-.38, .41)	.06(-.35, .46)	.05(-.37, .47)
Video with audio vs video only (ref. grp) x fear	-.05(-.42, .33)	.14(-.24, .53)	-.31(-.71, .09)
Model Statistics	$F(11, 291) = 6.47$; $p < .001$; $R^2 = .20$	$F(11, 292) = 3.01$; $p < .001$; $R^2 = .10$	$F(11, 292) = 1.81$; $p = .05$; $R^2 = .06$

Note: ref. grp= reference group; *$p < .01$, **$p < .001$. All regression coefficients are standardized.

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CHAPTER 5:

Epilogue

Epilogue

The notion that media exposure to real world tragedies can be just as distressing as witnessing trauma firsthand, and in some cases more so (Holman et al., 2014), was once controversial and met with skepticism. However, with a continually growing body of research demonstrating a link between exposure to large amounts of media coverage of collective traumas and symptoms of psychological distress (e.g., Ahern et al., 2002; Redmond et al., 2019; Silver et al., 2013), the evidence has become difficult to dispute. Still, less is known about which aspects of mass violence media coverage in particular make it so impactful or potentially psychologically harmful. Furthermore, some critics conflate researchers' empirically-based statements of caution about the potential risks of exposing oneself to such material as calls for censorship that could lull individuals into indifference about large-scale tragedies occurring across the globe.

This dissertation sought to evaluate specific aspects of news coverage of collective traumas that might increase the risk for symptoms of psychological distress by exploring whether type of graphic news coverage (e.g. graphic images, graphic sounds, or both together) predicted differences in psychological symptoms. This was tested using a correlational design with a longitudinal representative national U.S sample (Study 1), experimentally with college students in the lab (Study 2), and experimentally with college students online (Study 3). Findings from Studies 1 and 3 revealed a consistent pattern: exposure to collective trauma media coverage --containing likely at least graphic imagery --(visuals plus audio or visual (non-audio)) predicted greater symptoms of psychological distress. Further, both studies suggest that audio of mass violence events may also predict symptoms of psychological distress, but to a much lesser extent; audio (non-visual)

coverage only predicted symptoms of psychological distress in the immediate aftermath of the Boston Marathon bombings in Study 1, and graphic audio coverage only showed a trend toward producing greater distress compared to non-graphic coverage in Study 3. While Study 1 found a significant effect of audio (non-visual) in the short term and Study 3 only showed a trend toward an effect of graphic audio, this may be explained by the fact that Study 1 used a U.S. representative population sample and Study 3 used a college student sample. It is possible that younger generations who have grown up with graphic news images constantly on display have become more visual and are moved by visual graphic depictions than older generations who grew up with the radio and television being dominant media sources. However, an alternative explanation may be that because Study 1 found that audio (non-visual) coverage predicted negative symptoms in the immediate aftermath of a disasters, graphic audio may have been less impactful in Study 3 when participants were exposed to this audio at least a year after the tragic events had occurred.

Study 2 was too underpowered to find meaningful differences in psychological symptoms to different types of media coverage when comparing all four experimental groups (video with audio, video only, audio only, and talking heads control). However, post-hoc t-tests comparing individuals who were in a condition that exposed them to graphic imagery (video with audio and video only) to individuals who were in a condition without graphic imagery (audio only and talking heads control) found that those exposed to news coverage containing graphic media imagery experienced greater psychological symptoms. This pattern of findings is similar to Studies 1 and 3 and further suggests graphic images may be a key element of graphic traumatic media coverage that contribute to subsequent psychological symptoms.

Studies 2 and 3 took a novel approach by experimentally exploring the psychological consequences of exposure to mass violence coverage containing graphic depictions, when much of the research on collective trauma media coverage has explored a correlational relationship between psychological outcomes and the amount of overall collective trauma exposure (e.g., Bernstein et al., 2007; Silver et al., 2002). Correlational designs limit what can be gleaned about the effects of graphic media coverage, but experimental research in this area has likely been limited in part due to ethical concerns. Many researchers hesitate to expose participants to graphic content that may produce long-lasting negative consequences, but millions of Americans are already bombarded with graphic news coverage on their television, smartphone, and computer screens. Exposure to this graphic news coverage in a controlled setting is vital to understand the nuances of the effects of this exposure. However, identifying the true risk of doing this type of research is complicated by the lack of knowledge about what it is about exposure to graphic media coverage that is particularly risky, i.e., type of coverage, type of images, amount of exposure.

Studies 2 and 3 utilized an experimental design because it was the author's view that with millions of Americans already being exposed to this coverage on television and online, it was important to study a common, potentially risky behavior. A few researchers have begun to explore the impact of graphic images and sounds experimentally, using precautions to minimize study risks such as excluding participants with pre-existing mental health conditions or reported medication use in the past year to treat one of these disorders (Krans et al., 2011; Krans et al., 2010, Morina et al., 2013). Both studies took similar precautions. However, as a result, about 30% of participants who took the initial

online pre-test were not eligible for study participation. Although these exclusion criteria were used to minimize the risk for study participants, important information may have been lost by doing so. Research has found that individuals with pre-existing mental health conditions are neither more *nor less* likely to seek out graphic media coverage (Redmond et al., 2019). Thus, many individuals with anxiety and depressive symptoms may be readily exposed to graphic news coverage, suggesting that our exclusion criteria may make our findings modest estimates of the true effects of graphic media coverage when those already experiencing symptoms of psychological distress are left out.

The present studies also expanded on past research by using graphic news coverage of real mass violence events (rather than car accidents; Krans et al., 2011; Krans et al., 2010). This difference is likely important because large-scale traumas may resonate with individuals in a way that exposure to graphic images or sounds from a smaller accident cannot; coverage of large-scale disasters may elicit thoughts that one could have been the victim as these events often occur in popular, public places and claim many lives. Further, there is already some evidence that the significance of the graphic event depicted matters; for instance, fictional graphic violence is thought to be qualitatively different from real violent news depictions (Hoffner & Levine, 2005). This might be due to individuals prescribing different meaning to fictional and real violent events. Fictional media violence offers individuals the opportunity to remind themselves that the horror unfolding is not real by focusing on aspects of its production (Goldstein, 1999). However, real collective traumas can have far reaching implications even after one turns off the television. Large-scale terrorist attacks on American soil that target innocent civilians make individuals acutely aware about real world horrors, perhaps even altering individuals' views on the

benevolence of the world. When someone's place of worship is ruthlessly targeted, their worldview and ideas about the meaningfulness of life may be shaken and altered in a way exposure to car accidents happening to strangers likely does not. Moreover, exposure to coverage of innocent individuals' untimely deaths may trigger existential thoughts about the fragility of life and one's own mortality.

Future research needs to specifically explore whether psychological responses to real graphic news coverage in part depend on the type of event depicted. However, doing that type of research experimentally may pose its own set of challenges because when exposing participants to large-scale disasters that likely carry some significance, it becomes difficult to ascertain how much of the observed psychological responses can be attributed to the exposure in the lab and how much of the responses are attributable to a participant's past exposures to coverage of the event. With the current media landscape in which both professional and amateur photographs and videos spread near instantaneously across media platforms, sometimes even being live-streamed online by the perpetrator, it would be difficult to find an individual who has not been exposed to any coverage of a large-scale disaster once it breaks.

Media Exposure and Potential Positive Outcomes

While much of the research has focused on negative responses to graphic media coverage as Studies 1 and 2 of this dissertation did, less research has explored whether there are any potential benefits of watching graphic media coverage in the wake of large-scale disasters. One of the strongest critiques of this field of research is that individuals should not be shielded from graphic news coverage even if it is scary or distressing because graphic imagery elicits action. However, there is limited research that can support or refute

this claim. A recent study explored whether altering the graphicness of ISIS perpetrated killings influenced viewers support for governmental responses, finding that graphicness did in fact indirectly increase support by evoking certain emotions (Grizzard et al., 2017). However, indicating one's support for governmental action may not translate into much actual behavior change. If individuals who support the government taking certain actions in the wake of disasters do not act on their belief by electing politicians who share their views, calling their representatives, or donating money and supplies, beliefs may have little real-world impact.

Study 3 of this dissertation explored both negative and positive outcomes following exposure to graphic news coverage. Findings revealed that news coverage containing exposure to graphic imagery prompted individuals to report greater intentions to help victims of large-scale disasters compared to exposure to coverage featuring newscasters discussing the events without graphic images or sounds. However, there were no group differences in actual donating behavior. Because this research was conducted with college students, it is possible that graphic imagery fosters a desire to help but our sample simply did not have the financial means to donate. However, it is also possible that graphic imagery may make people want to help or want some sort of change, but is insufficient to set behavior in motion. Thus, further research should explore whether exposure to graphic news imagery increases actual donating behavior in a more economically diverse sample.

Conclusions and Future Directions

The modern media age allows us to witness life's triumphs in real time and rapidly share images, messages, and videos with others across the globe. This also means that horrific scenes of tragedy and carnage can be spread just as quickly, and perpetrators have

used social media to draw attention to their horrific acts. Gone are the days when news coverage was produced and shared by professionals who made difficult calls about what content to publish and what content was not for public consumption. A body of research suggests that exposure to this content puts individuals at risk for psychological symptoms in the short term and even years later. While this evidence is sufficient to make some call for avoidance of this coverage, others believe the public should watch this coverage to inspire change. However, there still is not enough research to determine whether exposure to graphic media coverage can indeed produce positive behavior.

Having collective trauma news coverage constantly available across multiple digital platforms is relatively new so we do not yet know the long term psychological implications. Children in particular are growing up in a media heavy environment not experienced by previous generations, and it remains to be seen how early repeated exposure to this graphic coverage affects brain development. It is possible that early repeated graphic media exposure puts individuals at even greater risk for symptoms of psychological distress, but it is also possible that there becomes some degree of habituation to graphic imagery over time. Moreover, even if children are not actively seeking out this coverage, it is likely that they will be exposed to it as videos and images quickly go viral and sometimes can even begin playing automatically on social media sites. Social media platforms over which these images spread rapidly will need to re-evaluate their policies and determine the best practices that honor free speech, but do not allow individuals to force horrific images upon others. However, in order for social media sites to make informed decisions about what content to limit, more research is needed.

While the present dissertation suggests limiting exposure to graphic imagery may be more important than limiting graphic audio exposure to prevent subsequent psychological symptoms, less is known about how the specific content of graphic images is related to psychological symptoms. It is possible that bloody images in particular elicit a more evolutionary-programmed visceral reaction as humans have been wired to scan the environment for signs of physical danger, and research finds that humans are capable of learning about danger via observation (Olsson & Phelps, 2007). However, it is unclear whether images showing blood elicit a different visceral reaction than images showing non-bloody injuries or dead bodies without any blood. Additionally, it is possible that images of a bloody crime scene without any human victims evoke similar threat or fear responses as images of bloody humans, but research has not explored this. Some research does suggest that an image that shows just enough so that a viewer anticipates the victim's impending death, but does not actually see it, leaves room for the viewer to imagine the whole scene, perhaps creating more of a psychological impact (Winkler, El Damanhoury, Dicker, & Lemieux, 2016). Thus, it is possible that images of destruction may evoke strong reactions even when there are no visible victims because individuals might imagine what happened. Future experimental research is needed to test and compare the psychological effects of exposure to each of these types of images. Thus, while the present dissertation sheds light on the sensory avenues through which graphic media coverage may produce symptoms of psychological distress, there still remain may unanswered questions. Addressing these questions may be key to inform viewers and policy and create the catalyst for change.

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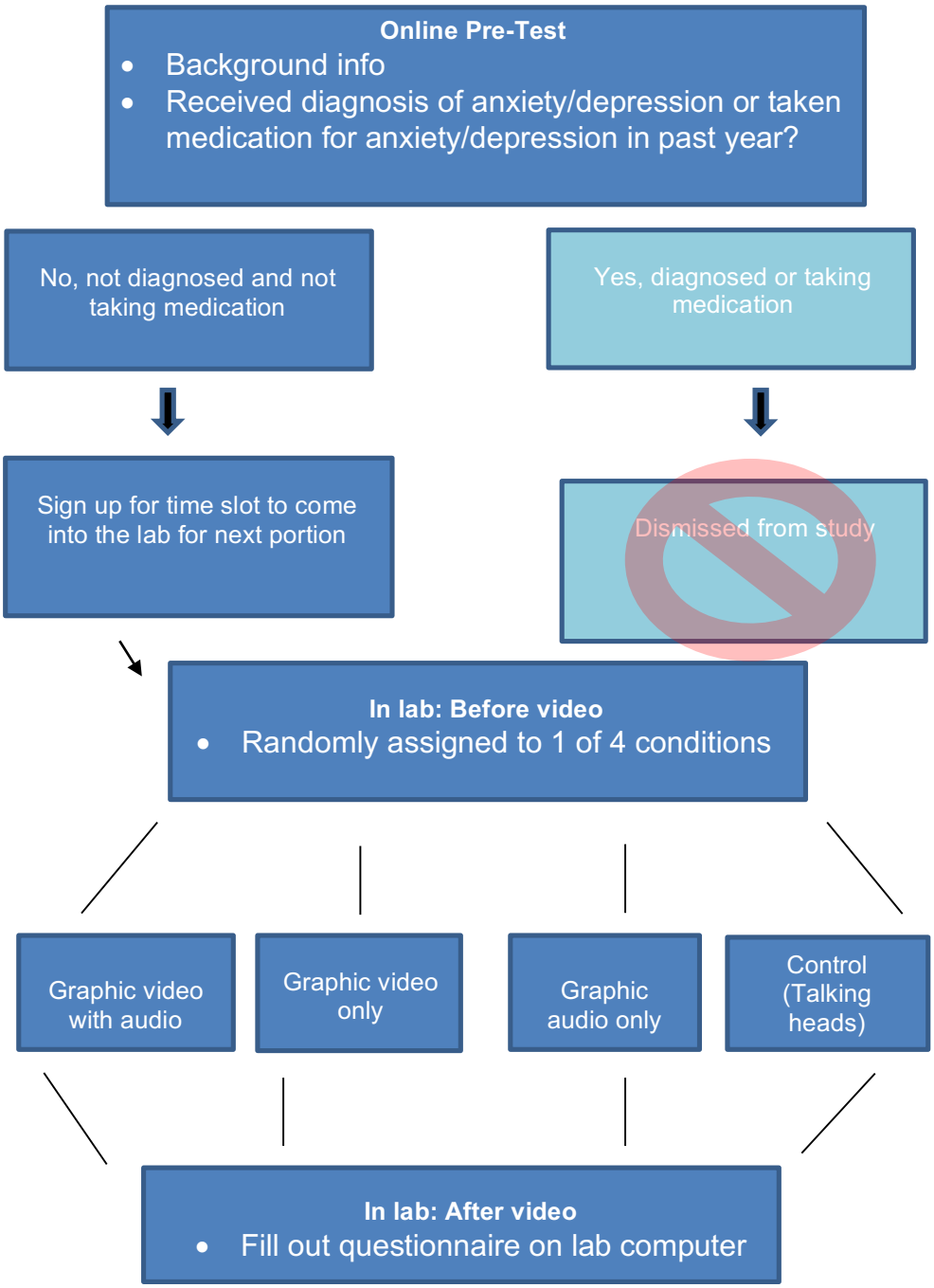
APPENDIX A

Study 2 Design



APPENDIX B

Study 3 Design