PROCESSING TERROR: AN INVESTIGATION INTO THE IMMEDIATE AND SHORT-TERM PSYCHOLOGICAL EFFECTS OF A TERRORIST ATTACK

by

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Abstract

In the years since the 9/11 attacks the incidence of terrorism has been on the rise. At the same time, news media coverage of major terrorist attacks has reached epic proportions, greatly expanding the number of individuals psychologically affected by terrorism. The goal of this dissertation is to better understand how individuals cope with terrorism experienced at a distance. Specifically, this investigation focuses on the impact of stress on integrative complexity (IC; a measure of cognitive processing; Suedfeld, Tetlock, & Streufert, 1992) during and shortly after a major terrorist event. Taken together, the findings from the three studies reported in this dissertation provide several insights into this process. Study 1 replicates and extends results from an earlier study of television newscasters reporting live on 9/11 (Jhangiani & Suedfeld, 2005), in the context of the 2005 London bombings and the medium of radio. In doing so, it provides the first empirical evidence outside of the research laboratory for the curvilinear relationship between stress and IC. Specifically, during the early stages of reports concerning the London bombings, a positive relationship is found between negative emotion and IC. However, once the nature and extent of the event become clearer, increases in negative emotion are related to decreases in IC (the disruptive stress hypothesis). Study 2 replicates this curvilinear relationship in the short-term reactions of two prominent political leaders to 9/11 and the 2005 London bombings. For one of these political leaders, the magnitude of his psychological reaction is moderated by the psychological distance between him and the victims of the attacks. Finally, Study 3 finds that two key personality variables, neuroticism and empathy, play important roles in determining the magnitude of the short-term psychological reactions to 9/11 of more than 250 students from Canada and the United States. This finding is particularly true for those students who were psychologically closer to the victims of the attacks. Implications, strengths and limitations of this research, and possible future directions are discussed.

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Dedication

For Khorshed Aunty and VRRP.

INTRODUCTION

On the morning of September 11, 2001, nineteen members of the terrorist organization known as al-Qaeda collectively perpetrated a heinous attack on the American people[1]. Four commercial airplanes were hijacked and flown directly into the twin towers of the World Trade Center in New York City and the Pentagon near Washington, D.C.. Were it not for the heroism of the passengers aboard United Flight 93, lawmakers and other personnel at the United States Capitol building would have added to the count of the 2,998 innocents murdered that morning.

What was unique about the 9/11 attacks (as they have come to be known) was neither the targets of the attacks nor the number of casualties involved. Rather, it was a combination of the means utilized by the terrorists (commercial airplanes used as weapons), the scale and success of their plan (simultaneous hijackings and major attacks across the country), and the unintended outcome of their actions (the collapse of the Twin Towers), which produced a mixture of disbelief, shock, horror, and anger among a majority of the viewing public (Walker & Chestnut, 2003). Seven years on, 9/11 remains among the boldest terrorist attacks ever perpetrated, and certainly the most vicious terrorist attack ever to occur within the continental United States.

The personal impact of 9/11 was profound. According to one estimate, one in five Americans nationwide personally knew someone injured or killed on 9/11 ("9/11 by the numbers," 2002). In the New York area, the corresponding estimate was 46% (Pew Research Center, 2002). The media coverage of the 9/11 attacks and their aftermath too was unprecedented, and remains the longest uninterrupted news event in the history of U.S. television (Blondheim & Liebes, 2002). Repeated showings of scenes from the attacks, particularly those of the planes crashing into the Twin Towers and individuals jumping to their deaths in order to avoid being burned alive, unwittingly aided the perpetrators in their attempt to terrify the nation.

[1] Among the victims were also an estimated 500 foreign nationals from 91 countries (Hirschkorn, 2003).

In Manhattan, for example, a survey of 988 residents found that 87% saw images of the collisions more than 7 times in 7 days, while images of the buildings collapsing and people running from a cloud of smoke were unseen by only 5% (Ahern et al., 2002). Children too did not escape this horror, as up to 90% of middle and high school teachers notified their students about the attacks by showing television coverage in the classroom for an average of 3 hours (Auger, Seymour, & Roberts, 2004). According to Crenshaw (2000a), a defining feature of terrorism is that it is designed "to shock and horrify an audience that extends well beyond its immediate victims" (p. 45). On September 11, 2001, with the help of the media, this goal was achieved.

Since the 9/11 attacks, there has been an increase in the number of terrorist attacks perpetrated worldwide. According to the annual reports on terrorism published by the National Counterterrorism Center[2], 11,156 terrorist attacks occurred worldwide in 2005, while the corresponding figures for 2006 and 2007 were 14,570 and 14,499. Even if one excludes from this tally the almost-daily acts of terrorism in post-Saddam Iraq, the incidence of terrorist attacks in the rest of the world increased steadily during this period, with 7,810 in 2005, 8,014 in 2006, and 8,265 in 2007. Inevitably, the human toll of terrorism also increased during this period, with the number of casualties resulting from acts of terrorism jumping from 14,616 in 2005 to 20,872 in 2006 and 22,685 in 2007[3].

[2] The manner in which data were collected by the United States government concerning terrorist attacks changed in 2005, with statistics before that year incomplete and only reflecting "significant acts of terrorism" – a term partially defined by the number of casualties involved.

[3] The opposite conclusion, that of a decline in the incidence of terrorism worldwide, was reached by a recent report entitled the Human Security Brief 2007 (HSB 2007; Human Security Report Project, 2008). However, there are at least two reasons for this contradictory finding. First, the HSB 2007 uses the number of fatalities resulting from terrorism (and not the number of terrorist attacks) as its measure of the threat of terrorism. Further, these numbers are trimmed as the HSB 2007 does not count as terrorism "violence intentionally perpetrated by non-state armed groups against civilians in Iraq" (p. 2). Second, the HSB 2007 focuses heavily on monthly trends in terrorism, particularly data from between July and October of 2007. The authors of the report do

This increase in the impact of terrorism worldwide is reflective in part of a fundamental shift in the nature of terrorism that began in the 1990s, with a greater emphasis on more "sensational" attacks and a lesser emphasis on claims of responsibility (in both 2006 and 2007, for example, the perpetrator groups for over 64% of terrorist attacks worldwide could not be identified; NCTC 2007). Coinciding with this trend has been the rise of radical Islamic terrorism. Although this category, which includes groups as diverse as al-Qaeda, Lakshar-e-Toiba, and Hizballah, is responsible for a minority of terrorist attacks worldwide, it continues to be disproportionately responsible for the number of casualties resulting from terrorism (Johnson, 2001).

Today, al-Qaeda remains the biggest terrorist threat worldwide. While most terrorist organizations have their preferred *modus operandi*, what makes this group a bigger threat than most is a combination of their lack of ties to a particular state, decentralized operational hierarchy, access to independent sources of funding, pan-Islamic ideology, and penchant for planning attacks that result in a very high number of civilian casualties. Indeed, al-Qaeda's support in much of the world today is a direct result of the success achieved and attention gained by the 9/11 attacks (Hoffman, 2003).

The importance of the media in furthering the goals of terrorists cannot be overstated (Nacos, Fan, & Young, 1989). According to Crenshaw, the news media often sensationalizes terrorist attacks, promotes an exaggeration of the threat of terrorism, and increases the amount of fear in the public mind[4] (2000a). Indeed, a symbiotic relationship between terrorists and the media has been a key feature of terrorism ever since the 1972 Munich Olympics. During that

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note, however, that while (according to their count) there has been a decline in the fatality toll from terrorism, this does not necessarily mean that the threat of terrorism has declined.

[4] Illustrative of this, during its live coverage of the 9/11 attacks, CNN displayed the caption "American under attack" as part of a graphic in red, white, and blue in the bottom third of the screen, incorporating the phrase into their summaries and introductions (Reynolds & Barnett, 2003).

event, the hostage-taking and eventual murder of Israeli athletes unfolded in a sensational manner on live television. It is no coincidence that the 1970s and 1980s witnessed numerous hijackings and high-profile hostage-takings, as terrorist groups worldwide took inspiration from the actions of the Black September organization. On 9/11, media coverage reached new heights (or sank to new lows, depending on your perspective), greatly increasing the number of individuals psychologically affected by the attacks. In the years since, this media frenzy has become almost routinized, with round-the-clock news coverage and the replay of early eyewitness video footage standard features of media coverage of the 2002 Bali nightclub bombing, the 2004 Madrid train bombings, the 2005 London transit system bombings, and the 2006 Mumbai train bombings.

Crenshaw draws a distinction between the general societal reaction to acts of terrorism and the responses of different segments of the populace (1990). Specifically, she distinguishes between direct and indirect audiences to acts of terrorism, the former being those people who identify with the victims of a terrorist attack and the latter being those who do not experience personal threat or vulnerability (in part due to their greater physical distance from the site of the attack). Importantly, she speculates that the former group will show signs of fear, anxiety, and terror, while the latter group will experience less emotional involvement and will regard a terrorist attack with the same level of curiosity and fascination as they would news of a natural disaster or a violent crime.

A separate category of reactions altogether is that of the direct physical victims of terrorism, who often suffer “deep and long-lasting emotional trauma” (Crenshaw, 2000a, p. 47). Survivors, and even the families of those killed, often suffer serious psychological consequences, ranging from a short-term period of shock to long-term psychological and psychosomatic

disability.[5]

This dissertation focuses on the psychological reactions of the first two groups; that is, of individuals who experience terrorist attacks at a distance, most often through the lens of the media. Furthermore, given the recent changes in the nature of terrorism as well as media coverage of terrorist attacks, the focus of this research is on 9/11 and other large-scale attacks that have taken place since.

While there exists a limited pre-9/11 literature on the psychological response to terrorism, it is not reviewed in this paper for a variety of reasons, foremost among which is that it is based largely on case studies of survivors of hostage-takings and the study of individuals who reside in Israel or Northern Ireland. Unsurprisingly, the case studies of former hostages show as much variability as the phenomenon of terrorism itself. Depending on what the individual experienced – as a short- or long-term hostage, and whether they were physical harmed or injured, the range of possible psychological reactions is enormous. More to the point, however, the focus of this dissertation is on the psychological reactions of the "audience" to acts of terrorism, who, while far greater in numbers than direct victims, generally experience terrorism only through the media. Studies conducted in Israel and Northern Ireland are also excluded from this paper because they constitute a separate category of terrorism – that which occurs in places where terrorist attacks have become a feature of daily life, and, consequently, where they do not receive the same level of media attention and cannot have the same impact on their audience (Somer, Ruvio, Sever, & Soref, 2007).

The next chapter discusses the existing research on the psychological effects of 9/11 and other large-scale terrorist attacks that have taken place since, before chapter 3 goes on to describe the construct of integrative complexity (the main dependent variable of interest in this

[5] Much of the evidence for these reactions come from the published autobiographies of survivors of hostage-takings (e.g., see Van der Ploeg & Kleijn, 1989).

dissertation). In chapters 4, 5, and 6, three sets of studies are presented, which jointly address the following questions: How do individuals react, in terms of their cognition and emotions, during and immediately following a major terrorist attack they experience vicariously through the media? Is there a universal psychological reaction across different segments of the populace of interest? What are the individual and interactive effects of dispositional and situational factors in determining how individuals react following a major terrorist attack? The last chapter points to some broad conclusions and includes a general discussion of the answers obtained to these questions, as well as some specific suggestions for future research.

THE PSYCHOLOGICAL EFFECTS OF THE 9/11 TERRORIST ATTACKS

The last seven years have witnessed an abundance of research considering the psychological implications of the 9/11 terrorist attacks. In fact, according to a recent keyword search in the PSYCINFO and PSYCARTICLES databases, well over 1000 articles and chapters have been published thus far on the topic. In contrast, prior to September of 2001, there were fewer than seventy-five published empirical studies detailing the psychological impact of terrorism. So why the sudden interest? Arguably, one important reason concerns the location of the 9/11 attacks. Given that the terrorists' targets were major symbols of American pre-eminence, that the widespread media coverage of the attacks brought images of the destruction into every American household as no other previous event had (e.g., the 1993 World Trade Center bombing), the extent of the domestic and foreign policy repercussions which followed, and the fact that the majority of psychological research is conducted in North American institutions, it is perhaps no surprise that psychologists of every bent sought to better understand this unique and historical event. Furthermore, much as first-responders, teachers, and health-care workers immersed themselves in their professional roles as a means of providing structure and coping with their uncertainty and feelings of anxiety, one might guess that psychologists, in seeking to place meaning on this event, tried to analyze its causes and consequences as a method of coping with their own anxiety.

The objective of the present chapter is to summarize what we have learned in the years since the 9/11 attacks about how individuals responded psychologically, in terms of both short and long-term outcomes. Two overarching questions guide this review. First, what was the nature of the public psychological response to the 9/11 terrorist attacks? Second, did any positive psychological outcomes emerge from 9/11?

The only review attempted of this literature thus far focused on 29 empirical studies conducted during the first year following September 11, 2001 (Miller & Heldring, 2004). From

these studies, the incidence of post-traumatic stress disorder (PTSD) was estimated at 40% locally and nationally in the period immediately following the 9/11 attacks (although exceptions were noted, including one study of adult residents of Manhattan in general and the area near the World Trade Center in particular, which found the prevalence of PTSD symptoms to vary between 7.5 and 20%). Symptoms of depression were estimated even higher at 60%, while findings pertaining to the incidence of substance abuse following the attacks were mixed. What is interesting, however, is that while PTSD symptoms appeared to show a longitudinal pattern consistent with what Bonnano would refer to as "recovery" (high initially and decreasing with time; Bonnano, Rennicke, & Dekel, 2005), depressive symptoms showed the opposite pattern of "delayed response" (low initially and increasing with time). Factors associated with these negative mental health outcomes included a history of mental illness, physical proximity to the sites of the attacks, exposure to the attacks (including through watching television coverage), other negative life events, a lack of social support, methods of coping such as disengagement or denial, as well as gender (female), age (younger), and ethnicity (non-White; Miller & Heldring, 2004).

The authors of this review, however, note several limitations to their work, including the short time-span considered (resulting in an inability to speak to longitudinal changes in symptoms), an almost-exclusive focus on PTSD among the included studies, a scarcity of data from places outside of New York and Washington, D.C., and the lack of attention paid to "at-risk" populations, including ethnic minorities, immigrants and refugees, children, and individuals with a history of mental illness (Miller & Heldring, 2004).

The present chapter addresses these limitations by widening the net of studies considered to the five-year period following 9/11, collating evidence of positive and negative outcomes (as well as noting null findings), including studies of individuals located at varying distances from the sites of the attacks (including in New York City and Washington, D.C., elsewhere within the

United States, as well as in other countries), as well as considering the cumulative evidence for and against a wide variety of psychological and demographic moderators of the personal psychological impact of the attacks.

Method

Articles were sought using relevant key words or phrases including "September 11" and "9/11" within the PSYCINFO and PSYCARTICLES databases. The search was limited to empirical (quantitative) studies concerned with psychological or psychosomatic outcomes and published in peer-reviewed journals during the five-year period between September 2001 and August 2006. The final set consisted of 183 studies, of which only one was published in 2001, 28 in 2002, 43 in 2003, 63 in 2004, 37 in 2005, and 11 in 2006.

What does this research literature look like? Studies have considered the reactions of different populations (including helping professionals, survivors and their families, victims' families, witnesses, adolescents, children, teachers, and veterans), employed diverse methodologies (including self-report measures, interviews, case studies, epidemiological studies, content analyses, and other archival methods), and represent a variety of disciplines (including psychiatry, epidemiology, psychology, sociology, and commerce).

Overall, however, this literature can be grouped into three broad categories on the basis of their focus on: 1) negative psychological (and related physiological) outcomes, 2) positive psychological outcomes, and 3) attitude changes at the intrapersonal, interpersonal, and international levels. Given that the specific attitudes considered within the last category are somewhat randomly distributed and are largely unrelated to psychological health, here we will only focus only on the negative and positive psychological outcomes of the 9/11 terrorist attacks.

Negative health outcomes

In the following sections, I will consider the impact of the 9/11 terrorist attacks on five important aspects of mental health, including measures of general (sub-clinical) distress, acute

stress disorder and post-traumatic stress disorder (ASD & PTSD), depression, substance use and abuse, and the use of health services. The studies are reviewed primarily on the basis of increasing distance of the population studied from sites of the terrorist attacks, and secondarily on the basis of the different populations under scrutiny.

General distress

Most studies conducted in the aftermath of the 9/11 terrorist attacks requested participants to report on their subjective experience of psychological distress (whether phrased in terms of anxiety, anger, fear, or some other manifestation). However, in the absence of a baseline score or available population norms, it is difficult to interpret whether these initial measurements represent an increase, decrease, or any change at all in symptom levels. Consequently, only those studies which included either a pre-9/11 baseline measure of psychological distress or, at the very least, a measure of participants' exposure to the 9/11 attacks are reported in this section. Considered first are studies which measured the impact of the 9/11 attacks on those who were most likely to show its ill effects – individuals residing or working near the sites of the attacks in New York City (NYC) or Washington, D.C.

One such study tracked over 14,000 first responders from the NYC Fire Department over a period of 11 months following the 9/11 attacks. During this time the incidence of stress-related illnesses among this group increased seventeen-fold over the 11 month period preceding 9/11 (Banauch et al., 2002). Similarly, a study of 757 Red Cross disaster workers who had served in NYC or Washington, D.C. immediately following the attacks found that their disaster work exposure predicted their experience of anxiety one year after 9/11 (although this variable accounted for less than a tenth of the variance in anxiety; McCaslin et al., 2005). Still another study, of military and civilian staff working at the Pentagon, found that 18% reported chronic distress two years after the attacks, with those who were physically present at the Pentagon during the attacks, those who sustained injuries during the attacks, and those who were exposed

to the dead or their families following the attacks, reporting significantly higher levels of chronic distress (30%, 61%, & 36%, respectively; Grieger, Waldrep, Lovasz, & Ursano, 2005). Finally, although there was no overall increase in the total number of health care visits made by military health system beneficiaries in Washington, D.C. during the 22 weeks following 9/11, there was a 46% increase in the number of anxiety-related visits and an 18% increase in visits pertaining to adjustment reactions during this same period (Hoge, Pavlin, & Milliken, 2002). The only study of helping professionals that did not find a negative mental health outcome stemming from 9/11 was a study of 236 NYC social workers (94% of whom reported counselling clients whose lives had been seriously affected by 9/11). In this study, the amount of 9/11-related counselling the social workers were engaged in was unrelated to either their psychological distress or "compassion fatigue" (which included measures of vicarious traumatization and job burnout; Adams, Boscarino, & Figley, 2006). Taken together, however, these studies suggest that psychological distress and anxiety were particularly high among those who were directly exposed to the horror of the attacks, and that for a significant minority of these individuals, symptoms of distress persisted months after the attacks.

For those who experienced the attacks through the media or at a distance, however, the evidence is less clear. For instance, a survey of more than a thousand adult residents of Manhattan found that a majority (56%) had some evidence of residual emotional distress 3-6 months after 9/11, mostly in the form of painful memories (DeLisi et al., 2003). A study of undergraduate students attending a NYC university, however, found their level of distress to be within the normal range when assessed between October and December of 2001 (Bonanno, Papa, Lalande, Westphal, & Coifman, 2004). Similarly, on the one-year anniversary of 9/11, students and staff at a NYC graduate school reported that their lives were stressful, on average, between "almost never" and "sometimes" (Friedberg, Adonis, Von Bergen, & Suchday, 2005).

A number of studies considered the responses of children and adolescents living in NYC. In one study, 362 NYC high school students who were part of an ongoing longitudinal study were tested one month after the 9/11 attacks (Gould, Munfakh, Kleinman, Lubell, & Provenzano, 2004). Compared to a different cohort assessed the previous year, this group showed significantly more symptoms of anxiety, although they were not more likely to experience symptoms at a level that warranted a clinical diagnosis. The parents of much younger children (under the age of five) were also interviewed between June and October of 2002. Although the data in this study were based on the parents' recollections and perceptions, their ratings of the extent to which their children were exposed to the 9/11 attacks significantly predicted their helpseeking on behalf of their children (DeVoe, Bannon, & Klein, 2006). Finally, among 768 NYC adolescents assessed, on average, 15 months after 9/11, media exposure was positively but weakly related to anxiety[6] (Aber, Gershoff, Ware, & Kotler, 2004).

The majority of studies of children and adolescents failed to find evidence of a negative mental health impact of 9/11. For example, in one study of NYC children, parents actually reported fewer behavioural problems in their children 4 months after 9/11, as compared with a pre-9/11 baseline (Stuber et al., 2005). Two months later, however, these children's behaviour had returned to normal. In a different study, 83 bereaved children of NYC's uniformed service personnel who died on 9/11 were interviewed during the first two years following the attacks. With a few exceptional cases, this group's mean level of anxiety fell between the national norms for average and well-adapted children[7] (Brown & Goodman, 2005). A different study by the same author found that a group of 63 NYC inner city children did not show any significant

[6] In this same study, media exposure was found to be unrelated to both conduct disorder and hostile attribution bias. In fact, according to the authors, neither direct nor indirect exposure to the events of September 11th exerted a strong or consistent effect on the adolescent outcomes.

[7] As assessed by a subscale of the Behavioral Assessment System for Children (BASC)

difference in their levels of anxiety or anger after 9/11, relative to comparison samples (Brown, McQuaid, Farina, Ali, & Winnick-Gelles, 2006).

As noted before, the psychological impact of the 9/11 attacks was not limited to New York City or Washington, D.C.. Indeed, the majority of studies considering the psychological implications of the attacks[8] were conducted outside of these two cities. These are reported next.

A community sample of 300 individuals in Pennsylvania (living more than a hour's drive from the site of the fourth plane crash on 9/11) showed no effect of exposure to the 9/11 attacks or personal acquaintance with a victim on a measure of psychological distress 2-3 months later (Dougall, Hayward, & Baum, 2005). During the same time-frame, a study of 281 fourth-grade children and their parents in Chicago found no changes in either parents' reports of their children's levels of anxiety and aggression, or their own fear of harm. In fact, while children did not show any change in their sense of safety following 9/11, their parents actually had a higher sense of safety following the attacks (Henry, Tolan, & Gorman-Smith, 2004). These findings were substantiated in a different study of 151 parents and their children in Seattle, who showed lower levels of anxiety and conduct problems during the first two months after 9/11[9] (Lengua, Long, Smith, & Meltzoff, 2005).

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[8] A few studies found evidence of physiological markers of stress. For example, a decrease in parasympathetic tone was found among 12 coronary artery disease patients during the week of September 11, 2001 (thought to increase susceptibility to other cardiac problems; Lampert, Baron, McPherson, & Lee, 2002). Similarly, increases in the number of symptoms reported involving the respiratory system or general chest symptoms were noted during the month following the attacks among a large sample of active duty military personnel (Eckart et al., 2004). The results among studies of children, however, are weaker, in that increases in cardiovascular reactivity were found on only two out of seven measures in the months following 9/11 (Gump, Reihman, Stewart, Lonky, & Darvill, 2005), while the incidence of recurrent abdominal pain did not change in the months following 9/11 (Gobble, Swenny, & Fishbein, 2004).

[9] The levels of symptoms and functional impairment exhibited by these children were also found to be at a lower level than a group of children assessed following the 1994 Northridge earthquake.

Limited evidence of increased distress after 9/11 was found in studies of the workplace. For instance, anxiety concerning terrorism affecting the workplace increased significantly among a sample of 620 young workers in Rhode Island (although these individuals also indicated that this factor would not influence their job search; Bosco & Harvey, 2003), while another study found that 9/11-related strain predicted absenteeism 10 weeks after the attacks among a sample of 108 students working full-time in the Midwest or Southeast United States (Byron & Peterson, 2002). Among a larger sample of 1730 Midwestern urban university employees, however, no change in anxiety was noted over previous years (Richman, Wislar, Flaherty, Fendrich, & Rospenda, 2004).

Although some studies of university students across the United States found no change in their level of anxiety following 9/11 (e.g., Liverant, Hofmann, & Litz, 2004; Richman et al., 2004), others found that self-reported trauma symptoms, fear, anger, and aggression were indeed at a significantly higher level in the months following the attacks (e.g., Argyrides & Downey, 2004; Carver, 2004; Lee & Waters, 2003). To some extent, the probability of detecting an effect of 9/11 appears to hinge on measuring the correct set of mediating variables. For example, one study of 227 Northern Arizona University students traced an increase in their psychological distress to the extent to which they perceived similarities between themselves and the victims. Perceived similarity, in turn, was predicted from their exposure to media reports about the victims (Wayment, 2004). As will be discussed later, however, many mediating variables have also received inconsistent support. Measuring the correct dependent variable is also of vital importance. For example, a personal connection to victims of the 9/11 attacks was related to anger (but not anxiety) reported by a student sample in Boston during the months following 9/11 (Liverant et al., 2004).

The first major nationwide study in the United States of the psychological implications of 9/11 was of 560 nationally representative adults conducted 3-5 days after the attacks (Schuster et

al., 2001). Although there was no pre-attack baseline measure available, physical proximity to the site of the attacks and hours of television viewing were significantly related to the number of symptoms of stress reported. When the same subjects were tested again two months later, the proportion reporting substantial distress fell from 44% to 21% (Stein et al., 2004). This improvement in symptom levels has since been replicated in a number of nationwide studies (e.g., Cohn, Mehl, & Pennebaker, 2004; Gil-Rivas, Holman, & Silver, 2004). Interestingly, those living closest to the World Trade Center, while most likely to be distressed at the initial measurement, were the most likely to show improvements in symptom levels two months after the attacks, suggesting that the impact of 9/11 was severe but short-lived among these individuals (Stein et al., 2004). A more comprehensive nationwide study found that the proportion of individuals experiencing symptoms of anxiety fell from 58.5% during the first month after the attacks to 29.6% a month later, and further to 11.2% six months after the attacks (Silver, Holman, McIntosh, Poulin, & Gil-Rivas, 2002). In this case, in addition to the severity of exposure to the attacks, the severity of loss (ranging from property loss to personal injury), negative life-events other than the 9/11 attacks, maladaptive coping (including denial and behavioural disengagement), and previous mental illness all predicted global distress as far as six months following the attacks.

Outside the United States, a study of 1928 representative adults in Italy assessed one month following the 9/11 attacks found their mental health to be slightly lower than both expected values and benchmarks set by a 2000 nationwide survey (although their physical health was found to be about the same; Apolone, Mosconi, & La Vecchia, 2002). On the other hand, the level of distress experienced by 30 Australian psychiatric inpatients on September 14, 2001 was not significantly higher than that of a control group (Taylor & Jenkins, 2004).

Overall, as can be seen in Figure 2.1, substantial distress or severe symptoms were reported by a significant minority of individuals (in the region of 18-45%) in the immediate

aftermath of the 9/11 terrorist attacks. Over the next six months, however, symptoms of anxiety reliably dropped to baseline or lower levels. The only exception to this rule was the case of individuals living in close proximity to the sites of the attacks, who were much more likely to have been directly exposed to the attacks, to have a personal connection to 9/11, and to have their lives affected the most in the months to come.

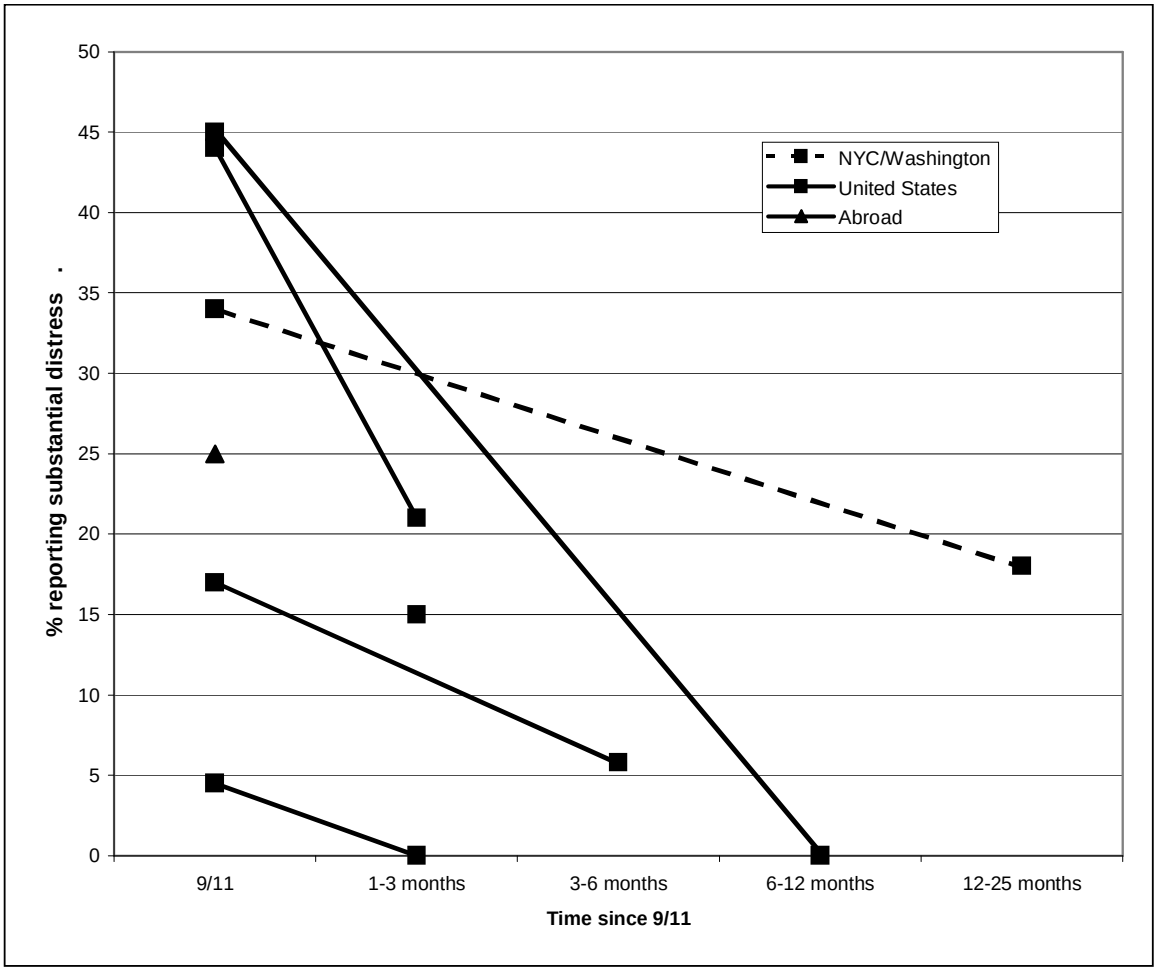

Figure 2-1: Proportion of individuals reporting substantial distress or severe symptoms following the 9/11 attacks (data from seven studies).

Acute stress disorder (ASD) & post-traumatic stress disorder (PTSD)[10]

Among nearly 1000 adults living in lower Manhattan, 9.9% of women and 4.8% of men (7.5% of the overall sample) met the criteria for a diagnosis of PTSD 5-8 weeks after the 9/11 attacks (Galea et al., 2002). In another study conducted during the same time period, 8.8% of 988 adult residents of Manhattan were diagnosed as suffering from PTSD (Boscarino, Galea, Ahern, Resnick, & Vlahov, 2003). This estimate did not change at 5 months after 9/11, even upon doubling the size of the sample (Boscarino et al., 2004). Finally, 10% of a sample of 757 Red Cross disaster workers in NYC & Washington, D. C. also had suspected cases of PTSD one year after 9/11 (McCaslin et al., 2005).

Studies of adults living in New York City or Washington, D.C. that found a higher prevalence of PTSD (>10%) tended to recruit individuals who were more likely to have been living close to the World Trade Center and been directly exposed to the 9/11 attacks (18.5%; DeLisi et al., 2003), including military and civilian staff working at the Pentagon (18%; Grieger et al., 2005), immigrants living in Manhattan Chinatown a large proportion of whom lost their jobs as a result of the attacks and 80% of whom directly witnessed the attack or the collapse of the towers (21%; de Bocanegra & Brickman, 2004), and NYC military veterans who had experienced prior trauma (39%; Copeland, Fletcher, & Patterson, 2005).

The only study of adults in NYC and Washington, D.C. that did not fit this general trend was a study of VA patients in the 40 largest US cities (Rosenheck & Fontana, 2003). In NYC, for example, these individuals were neither more likely to utilize services for PTSD nor to be diagnosed with PTSD during the six months following 9/11. In fact, visits to PTSD clinics actually decreased among this sample during September and October of 2001.

[10] The criteria for a diagnosis of ASD is different from that of PTSD only in that symptoms occur between 2 days and 4 weeks following exposure to a traumatic event, and there is a heavier emphasis on the development of dissociative symptoms (Speckhard, 2003).

Among studies of children living close to the site of the attacks, a 50% increase in health visits for acute stress reactions was noted among children living in Washington, D.C. who were assessed 22 weeks after 9/11[11] (Hoge et al., 2002), while in NYC, a group of 63 inner city children had a significantly higher incidence of PTSD after 9/11 relative to comparison samples (Brown et al., 2006). A relatively high estimate of the prevalence of PTSD comes from data gathered from 180 NYC parents[12], according to whose reports 17% of their children had probable cases of PTSD 9-12 months after 9/11, although this number is likely inflated by the 37% of these children who witnessed the attack in person, and who were 10 times more likely to be enrolled in counseling (DeVoe et al., 2006). On the other end of the spectrum, only 0.8% of a cohort of 362 NYC high school students met the criteria for a diagnosis of PTSD one month after 9/11 (Gould et al., 2004), although in this case 82% of the sample had been in school at the time of the attack and so were exposed to it only indirectly.

Factors such as a history of mental illness and prior exposure to trauma may have inflated estimates elsewhere within the United States, with 13.5% of a sample of patients with severe mental illness in Rhode Island presenting symptoms of acute stress attributable to 9/11 during 3 months following the attacks (Connery, 2003), and 21% of veterans living in the Midwest (43% of whom reported combat experience) reporting moderate to severe symptoms of PTSD during the first year following the attacks (Copeland et al., 2005). In comparison, a community sample of 300 individuals in Pennsylvania (living more than a hour's drive from the site of the fourth plane crash, in Somerset County) showed no effect of either exposure to the 9/11 attacks or personal acquaintance with a victim on PTS symptoms 2-3 months later (Dougall et al., 2005).

[11] These children were all beneficiaries of military health insurance.

[12] 49% of these parents also scored above the clinical cut-off for PTSD, suggesting a higher incidence among the children of parents who are also suffering from PTSD.

The only study of PTSD in children outside New York City and Washington, D.C. was conducted in Seattle two months after the 9/11 attacks and found that 8% of 151 children reported symptoms consistent with a PTSD diagnosis (Lengua et al., 2005).

Research conducted outside the United States has investigated rather disparate groups and does not permit any broad conclusions. For example, 5 out of a sample of 50 expatriate Americans living in Brussels met the criteria for ASD during the first week after the attacks (although only 4% met these criteria in the ensuing 3 months; Speckhard, 2003), while 2 out of 122 adults (fewer than 2% of the sample) living in Saskatchewan, Canada met criteria for PTSD 7-8 months after 9/11 (Asmundson, Carleton, Wright, & Taylor, 2004). A third study, this time of 30 Australian psychiatric inpatients found that 10% met the criteria for ASD 3 days after the attacks (Taylor & Jenkins, 2004).

In summary, a significant minority of individuals residing in New York City and Washington, D.C. (5-10%) showed symptoms consistent with a diagnosis of PTSD in the months following the 9/11 terrorist attacks. This number was even higher (18-21%) among those who directly witnessed the attacks, were personally affected by the attacks, or who were suffering from existing mental illnesses. Elsewhere within the United States and in other countries, the prevalence of PTSD stemming from vicariously witnessing the 9/11 attacks was relatively low, especially once previous mental illnesses were taken into account.

Depression

The direct causal effect between the 9/11 terrorist attacks and depressive symptomology is weak. On the one hand, 10% of a sample of 988 adult residents of Manhattan contacted by telephone 5-8 weeks after 9/11 reported symptoms of clinical depression (Boscarino et al., 2003). Among 172 NYC seniors, however, although there was a spike in depression scores during the 4 days immediately after 9/11, there were no significant differences in the number of cases of depression in this group during the two months before and after 9/11 (Brennan, Horowitz, &

Reinhardt, 2003). In general, depressive symptoms tended to be related to witnessing death and injury as well as incurring personal loss in those studies which measured these variables, including one study of 52 adult residents of NYC at both 7 and 18 months after 911 (Bonanno et al., 2005), a survey of military and civilian staff working at the Pentagon (7% of whom had probable depression 25 months after the attacks; Grieger et al., 2005), and another of 77 Chinese immigrants in NYC who lost their jobs after 9/11 (80% of whom had directly witnessed the attacks, and nearly a third of whom were moderately to severely depressed 8 months after 9/11; de Bocanegra & Brickman, 2004). Depressive symptoms typically decreased over the year following the 9/11 attacks (Bonnano et al., 2005; Wayment, 2004).

Three studies specifically investigated depression among New York City's youth. Of these, one (involving a group of 63 NYC inner city children the majority of whom were classified as having low socio-economic status) found evidence of a significantly higher incidence of depression after 9/11 relative to comparison samples (Brown et al., 2006). Another found depression to be positively but weakly related to direct exposure to the attacks among a sample of 768 adolescents assessed, on average, 15 months after 9/11 (Aber et al., 2004), while the third found a sample of 362 high school students to be not more depressed than a control group (Gould et al., 2004). Taken together, these studies suggest that the risk of developing depression in response to the 9/11 attacks was minimal among NYC's youth, although socio-economic and other related factors may have heightened this risk.

Among a large sample of 40, 981 active duty military personnel in San Antonio, Texas, neither the total number of psychological diagnoses nor the diagnosis of depressive disorders increased significantly during the months following the 9/11 attacks over the previous month (Eckart et al., 2004). Among 1730 employees of a Midwestern university too, no change in depression was noted over previous years (Richman et al., 2004). Similarly, no difference was found in the rates of either child or parent depression during the months before and after 9/11 in

a study of disadvantaged neighbourhoods in Chicago (Henry et al., 2004). In fact, some studies conducted outside of New York City and Washington, D.C. actually found evidence for improved levels of depressive symptoms after 9/11. For example, a study of 151 children living in Seattle found lower levels of depression two months after the 9/11 attacks than in their pre-attack baseline (Lengua et al., 2005).

In summary, there is some evidence to suggest that fewer than a tenth of those who lived closest to the sites of the attacks or who were directly exposed to the attacks suffered from clinical depression during the ensuing months, and that even these symptoms tended to recede over time. Among individuals living outside of the affected areas, there is no evidence to suggest that depression was a significant component of their community's response to the 9/11 terrorist attacks.

Substance use and abuse, suicide, and self-harm

Of 988 adult residents of Manhattan contacted by telephone 5-8 weeks after 9/11, 12% reported taking prescription psychiatric medications (up from 9% before 9/11; Boscarino et al., 2003). Data from a managed behavioural health organisation (MBHO) in NYC also showed an increase in the prescriptions for anti-anxiety medications over forecast figures during the first month following the attacks, although there was no increase noted in prescriptions for anti-depressants (McCarter & Goldman, 2002). By February of 2002, however, more than 95% of a sample of 2001 adults reported no change in psychiatric medication from prior to the 9/11 attacks (Boscarino et al., 2004). Similarly, there was no change in reported medication use 3-6 months after 9/11 (as compared with the months before) among a sample of over a thousand NYC adults (DeLisi et al., 2003).

Some evidence of increased substance abuse was found among NYC adults. Approximately 7% reported increased alcohol use 3-6 months after 9/11 (DeLisi et al., 2003; Vlahov et al., 2006). Up to 1% of immigrants who were rendered unemployed as a result of the

9/11 attacks reported an increased use of alcohol, tobacco, or other drugs 8 months after 9/11 (de Bocanegra & Brickman, 2004). No increase in substance abuse was found among a cohort of 362 NYC high school students (Gould et al., 2004). However , these same students were marginally more likely to have thoughts about suicide than a control group (from whom data were collected prior to the 9/11 attacks), although these thoughts were neither serious nor more likely to be linked to suicide attempts (Gould et al., 2004).

In Washington, D.C., the 9/11 attacks were associated with an increase in smoking as well as early relapse rates among a group of 462 smokers (Forman-Hoffman, Riley, & Pici, 2005), although these effects were relatively small.

Elsewhere within the United States, no change in tobacco or alcohol consumption by December 31, 2001 was reported by 1762 Connecticut households (Adams, Ford, & Dailey, 2004). Moreover, in studies in which increased substance abuse was detected, it tended to be true only for women, as seen among a sample of 730 young adults in North Carolina (Costello, Erkanli, Keeler, & Angold, 2004), as well as a sample of Midwest employees (Richman et al., 2004). Interestingly, among the latter sample, in the absence of workplace abuse (including verbal aggression, disrespectful behavior, isolation/exclusion, threats/bribes, and physical aggression) alcohol consumption actually decreased after the 9/11 attacks (Richman et al., 2004).

Among 675 navy personnel, self-reported alcohol use decreased among both officers and enlisted personnel during the 30 days following 9/11 (Moore, Cunradi, & Ames, 2004). During this same period, however, there was an increase in the number of cigarettes smoked and in the number of days for which prescription drugs were used among enlisted personnel (among whom the percentage of women was nearly three times higher than among the group of officers).

In one Canadian study, trends in weekly drug prescriptions were analysed for all Ontario seniors between September 11 and November 26, 2001 (Austin, Mamdani, Jaakkimainen, & Hux, 2002). For all medication classes, prescription rates were found to be similar to historical

trends, with the exception of prescriptions for one antibiotic medication, which rose above historical levels a week following the first reported anthrax infection in the United States.

Finally, suicide and deliberate self-harm rates in the Netherlands were analysed from 1997-2001 and 1993-2001, respectively (DeLange & Neeleman, 2004). Somewhat surprisingly, while suicide rates decreased from 1997-2001, they increased after September 11, 2001 (nullifying all previous decreases). No significant change in other deliberate self-harm rates was noted.

In summary, there is evidence that prescription drug and alcohol use increased slightly among NYC adults during the weeks immediately following the 9/11 attacks. Six months later, however, evidence for increased substance abuse was scant. Outside of these two cities, women appeared to be at a greater risk for increased substance abuse, particularly when experiencing strain in other areas of their lives. Outside of the United States, no change was found in prescription drug use among Canadian residents, but the suicide rate in the Netherlands increased dramatically in the weeks immediately following the 9/11 attacks.

Use of health services

One of the earliest studies conducted in the aftermath of the 9/11 attacks found that health visits in NYC had not increased among a sample of close to 1000 adults 5-8 weeks after September 11, 2001 (Galea et al., 2002). In another study, more than 95% of a sample of 2001 adult residents of Manhattan reported no change in their use of mental health services four months after 9/11. The remaining individuals reported both increases and decreases in mental health service use (Boscarino et al., 2004). Data from a large national MBHO also indicated only a very slight increase in the number of requests for individual or family mental health treatment (Goldman, 2002). Other studies conducted in NYC, however, found significant increases in the use of health services following the 9/11 attacks. For instance, of 988 adult residents of Manhattan contacted by telephone 5-8 weeks after 9/11, 10% reported an increased use of mental

health services (Boscarino et al., 2003). In a different study, 11% of 1009 Manhattan adults reported being in counselling 3-6 months after 9/11 (roughly half of these individuals met the criteria for a diagnosis of PTSD[13]; DeLisi et al., 2003). Finally, among veterans living in NYC, 10% sought care for 9/11 related problems (Copeland et al., 2005). On a positive note, NYC patients who did access health services were more satisfied with the care received after 9/11 than before (Copeland et al., 2005).

In Washington, D.C., 26%[14] of a sample of military and civilian staff working at the Pentagon reported at least one mental health visit when surveyed 25 months after 9/11 (Grieger et al., 2005). During the first five months following 9/11, however, there was no overall increase in the total number of health care visits made by military health system beneficiaries in Washington, D.C. (Hoge et al., 2002).

Helpseeking outside New York and Washington was at a predictably lower level. For instance, while 50% of K-12 schools in the Midwest provided greater access to counseling and support to students and their parents, these services were utilized by only an estimated 1-5% (Auger et al., 2004). Similarly, among 1762 Connecticut households, 3.3% had sought formal help[15] by 3 months after 9/11 (Adams et al., 2004). Furthermore, these individuals were more likely to have been injured during the attacks or related to victims. Finally, a much larger study of 40,981 active duty military personnel stationed in Texas found no increase in the use of health resources or the total number of psychological diagnoses during the first month following the

[13] Other indirect evidence also suggests that an increase in the use of health services in NYC could be largely traced to individuals suffering from PTSD, as although awareness of a free counselling program (Project Liberty) in NYC was found to be relatively low (24%) among a sample of 2001 adults, a majority of individuals from poor income background and with symptoms of post-traumatic stress said they would contact the program (Rudenstine, Galea, Ahern, Felton, & Vlahov, 2003).

[14] This figure includes 70% of those suffering from PTSD.

[15] Another 3.7% sought informal help.

9/11 attacks, once again suggesting that helpseeking was initially low. In fact, the number of diagnoses of psychoses, pneumonia, influenza, as well as other general symptoms actually decreased during this period (Eckart et al., 2004).

Interestingly, involuntary (but not voluntary) psychiatric treatment and mental health related police phone calls increased on September 12 and 13, 2001 in San Francisco (Catalano, Kessell, McConnell, & Pirkle, 2004), a finding that was replicated in a study of involuntary psychiatric assessments made in the state of Florida between July 1999 and December 2001 (Catalano, Kessell, Christy, & Monahan, 2005). In fact, in the latter study, the weeks immediately following 9/11 saw the most men and women presented by law-enforcement officials for involuntary examinations of the entire period. This selective increase in psychiatric treatment was explained by the authors of these studies as a manifestation of lower community tolerance during a period of societal strain. In their words, "witnessing harm done to others by ambient hazards lowers a population's tolerance for individuals who exhibit threatening behavior" (Catalano et al., 2005, p. 861).

Helpseeking of a different nature, that of coping with anti-Islamic discrimination, also increased after the 9/11 attacks. For instance, according to one survey of 62 Imams across America, there was an average increase of 51% in congregants seeking counselling for increased anxiety due to discrimination after 9/11 (Ali, Milstein, & Marzuk, 2005).

Two studies examined the use of health services outside of the United States. The first, conducted in the Province of Ontario in Canada, found no increase in the number of anxiety-related visits to physicians over previous years in the weeks following the 9/11 terrorist attacks (Austin, Mamdani, Chan, & Lin, 2003). The second, conducted in the Canton of Zurich, Switzerland, found no increase in the average number of weekly psychiatric inpatient admissions in the months before and after 9/11 (Haker, Lauber, Malti, & Rossler, 2004).

In summary, there was limited evidence of an increase in the use of health services (usually in the range of 10% over previous years, and particularly on the part of individuals suffering from symptoms of PTSD) in those areas closest to the sites of the 9/11 attacks. However, this increase only really became evident around 3-6 months after 9/11. Outside of New York City and Washington, D.C., the increased use of health services was much more limited (fewer than 5% of the sample in most studies), with the exception of involuntary psychiatric admissions. No evidence of an increase in the use of health services was found in studies conducted outside the United States.

Moderators

In this section I discuss several variables (both psychological and demographic) found to be important moderators of the negative psychological impact of the 9/11 attacks, beginning with the closely linked triad of physical proximity, media exposure, and a personal connection to the attacks.

Physical proximity, media exposure, & a personal connection

As can be seen, the overwhelming majority of studies that measured any of these three variables found that they played an important role in determining the personal impact of 9/11. For instance, among individuals living in New York City or Washington, D.C., exposure to the 9/11 attacks predicted general distress (Grieger et al., 2005; Silver et al., 2002), post-traumatic stress symptoms (Aber et al., 2004; Bonanno et al., 2005; de Bocanegra & Brickman, 2004; DeLisi et al., 2003; Grieger et al., 2005; Piotrkowski & Brannen, 2002; Pulcino et al., 2003), and depression (Grieger et al., 2005).

Indirect exposure to the 9/11 attacks (via the media[16]) was also found to be related to general distress (Lengua et al., 2005; Stout & Farooque, 2003; Wayment, 2004), PTSD (Aber et al., 2004), depression (Ahern et al., 2002), as well as help-seeking by parents on behalf of their children (DeVoe et al., 2006). This is a particularly important finding, given that most Americans experienced the attacks at a distance, via media coverage.

Finally, as might be expected, having a personal connection to the 9/11 attacks (through knowing a victim or someone injured) also predicted distress (Auger et al., 2004; Lengua et al., 2005; Liverant et al., 2004), post-traumatic stress symptoms (Ai, Evans-Campbell, Santangelo, & Cascio, 2006; Gould et al., 2004; Lengua et al., 2005), and depression (Lengua et al., 2005).

Although each of these variables individually predicted negative health outcomes, what is not clear is the extent to which their influences overlap. For instance, it is logical to assume that those who lived in closest proximity to the WTC (e.g., in Lower Manhattan) were also the most likely to have known a victim. Similarly, those who feared for the safety of loved ones who were unaccounted for would have been the most likely to watch media coverage of the attacks in the hope of obtaining useful information.

History of mental illness

In general, a history of mental illness was found to predict the severity of distress in response to the 9/11 attacks. In one study, 18 out of 133 individuals (13.5%) presented symptoms of stress attributable to 9/11 during 3 months following the attacks. However, all 18 were found to have been previously diagnosed with a primary mood disorder (Connery, 2003). Similarly, a history of mental illness predicted global distress (Auger et al., 2004; Brown & Goodman, 2005; Budson et al., 2004; Gil-Rivas et al., 2004; Silver et al., 2002), and greatly increased the likelihood of being diagnosed with substance abuse disorder (Costello et al., 2004), and PTSD

[16] The strongest effect of media exposure was for watching images of people falling or jumping off the WTC. Those who saw this were more than seven times more likely to have clinical depression (Ahern et al., 2002).

(Brown et al., 2006; DeLisi et al., 2003; Pulcino et al., 2003). In one study of 1008 New Yorkers, for example, 21% of those with a history of panic attacks were diagnosed with PTSD, versus only 7% of those without a panic disorder (Boscarino et al., 2003).

The type of mental illness, however, appears to be an important factor. For example, studies of patients with obsessive-compulsive disorder (OCD) have found either no change in their stress-related symptoms following the attacks (Stout & Farooque, 2003), or that the 9/11 attacks had less of an impact on mood, behaviour, and somatic complaints expressed by this group than by a control group of students (Riemann, Braun, Greer, & Ullman, 2004).

Negative life events

Having experienced other negative life events (including community violence or previous trauma) was consistently found to exacerbate stress stemming from the 9/11 terrorist attacks. Specifically, having experienced more prior stressful events were related to general distress (Copeland et al., 2005; Creamer & Liddle, 2005; Silver et al., 2002; Wayment, 2004), PTSD symptoms (Aber et al., 2004; Ai et al., 2006), and medication use (Boscarino et al., 2004; Boscarino et al., 2003). Negative life events also mediated the relationship between disaster work on the one hand and state anxiety, state depression, and PTSD on the other among 757 Red Cross disaster workers (McCaslin et al., 2005).

Initial response

The manner in which individuals responded initially on September 11, 2001 was found to play an important role in predicting their mental health during the months following the attacks. For example, a study of 752 nationally representative households found that the more negative the initial response (in terms of either child or parent symptoms, measured 1-2 months after 9/11), the more negative were the later responses (measured at 5-7 months and again at 11-12 months after 9/11; Phillips, Featherman, & Liu, 2004). Similar results were found in studies of

1786 nationally representative adults and adolescents (Lerner, Gonzalez, Small, & Fischhoff, 2003), as well as 362 high school students in New York state (Gould et al., 2004).

Interestingly, a different pattern was found among 80 adults in Ottawa, Canada. In this case, the greater the initial distress, the more these individuals reported positive changes in their lives, including becoming closer to their family and refocusing their priorities. What is more, these positive changes were found to be quite stable 11 months later (Davis & Macdonald, 2004).

Manner of coping

Not surprisingly, the ways in which people coped with the stress of the attacks played an important role in determining their subsequent mental health. On the whole, those who engaged in active coping and talked about 9/11 with another person reported significantly lower levels of distress as far as six months following the 9/11 attacks (Mehl & Pennebaker, 2003; Silver et al., 2002). On the other hand, venting emotions, mental and behavioural disengagement, and denial predicted higher levels of anxiety and distress (Brown & Goodman, 2005; Liverant et al., 2004; Silver et al., 2002).

It is important also to note that sometimes the manner in which one chooses to cope with one's anxiety can backfire. For example, starting from the assumption that people tend to fear "dread risks" (low-probability, high-consequence events) like terrorist attacks more than mundane risks that result in the same number of casualties over a longer period of time (Myers, 2001), Gigerenzer (2004) analyzed data concerning the number of fatal traffic accidents in the United States during 2001. The results showed that, while the number of fatalities from January to August in 2001 was comparable to the figures from the previous five years, there were significantly more traffic fatalities than previous years from October to December. This finding can be attributed to the decision of many Americans to opt to drive instead of fly in the months

following the 9/11 attacks. Ironically, this irrational choice – one way of coping with the fear of terrorism, resulted in the deaths of about 350 more people than usual.

Parents and children: A special case

The long-term reactions of children were influenced in at least two ways by how their parents reacted to the 9/11 attacks. First is the basic finding that children were monitored more after 9/11, suggesting that parents were more attentive to their children's emotional needs at this time (Henry et al., 2004). This may have been particularly true among parents who themselves were experiencing poor mental health. For example, one study found that parents who were depressed in the aftermath of the 9/11 attacks were more likely to seek help for their children (DeVoe et al., 2006). Second, parent-adolescent conflict one month after 9/11 was found to predict general distress, post-traumatic stress, and functional impairment among a sample of 142 adolescents one year after 9/11 (Gil-Rivas et al., 2004). On a more positive note, however, parental positive affect and parental self-efficacy also predicted adolescent positive affect at the one year follow-up.

Social support

It was a consistent finding in this literature that help-seeking in the aftermath of 9/11 tended to occur informally and through known individuals, e.g., siblings and teachers (Gould et al., 2004). Perhaps as a result of this, social constraints against emotional disclosure[17] positively predicted general distress, PTSD, and depression in the months following the 9/11 attacks (Bonnano et al., 2005; Pulcino et al., 2003; Wayment, 2004). As well, social support (operationalized as the presence of individuals willing and able to provide emotional support) was related to more positive emotion words and signs of optimism in the writings of 537 adults two months after 9/11 (Graves, Schmidt, & Andrykowski, 2005).

[17] Defined as keeping one's worries or concerns to oneself because they make others feel uncomfortable (Bonnano et al., 2005).

Personality

Among the psychological variables considered as playing an important role in determining people's reactions to the 9/11 attacks, personality was given the least amount of attention. The few studies that looked at personality factors found that individual difference variables such as belief in a dangerous world (Liverant et al., 2004), empathic concern (Davis & Macdonald, 2004), and ruminative tendency (Friedberg et al., 2005), each amplified the negative impact of 9/11. On the other hand, greater emotional flexibility (the ability to both express and suppress emotion; Bonnano et al., 2004) and dispositional optimism (Ai et al., 2006) were found to provide a buffer against the negative impact of the 9/11 attacks.

Age

Age was negatively correlated with a variety of mental health outcomes[18], including depression (de Bocanegra & Brickman, 2004), general distress (Dougall et al., 2005), secondary traumatic stress (Creamer & Liddle, 2005), and fear (Walker & Chestnut, 2003). One possible reason for this relationship is that older people tended to cope in different ways as compared to younger individuals (e.g., more emotion-based coping, and less disengagement coping and rumination; Wadsworth et al., 2004).

Gender

The vast majority of studies that found gender differences in responses to the 9/11 attacks found that women tended to suffer poorer mental health, including experiencing more distress (Dougall et al., 2005; Gil-Rivas et al., 2004), more symptoms of ASD and PTSD (DeLisi et al., 2003; Piotrkowski & Brannen, 2002; Pulcino et al., 2003; Speckhard, 2003; Silver et al., 2002), and depression (Eckart et al., 2004). Women were also more likely to have been newly

[18] The only exception to this general rule was a study of 1928 nationally representative Italians, which found youth to be positively associated with better mental health one month after 9/11 (although this finding did not take into account pre-existing differences in mental health between these two age groups; Apolone et al., 2002).

medicated after 9/11 (Boscarino et al., 2003), and to be experiencing more recurrent abdominal pain (Gobble et al., 2004). Once again, a potential explanation for this trend may lie in the differential manner in which men and women tended to cope with the 9/11 attacks. For instance, one study found that while men reacted with more anger, while women reacted with more emotional distress after 9/11 (Walker & Chestnut, 2003).

Ethnicity and socio-economic status (SES)

Being non-White[19] and from a lower SES background were both associated with being more emotionally affected by the 9/11 attacks (Anthony, Rosselli, & Caparyan, 2003), feeling more threatened (Phillips, Prince, & Schiebelhut, 2004), and with a variety of negative outcomes, particularly heightened symptoms of post-traumatic stress (de Bocanegra & Brickman, 2004; Lengua et al., 2005; Pulcino et al., 2003). It remains a possibility, however, that these associations are really masking the effects of low social capital and reduced access to mental health resources.

Positive outcomes

Few studies specifically investigated positive psychological outcomes following the 9/11 attacks. More often, a positive outcome was operationalized either as a lack of negative symptoms (e.g., Riemann et al., 2004), or as a decrease in negative symptoms (e.g., Rosenheck & Fontana, 2003). Nonetheless, the few studies which looked for evidence of "light from the ashes" found several positive psychological effects of the 9/11 attacks, including an enhanced feeling of subjective well-being and greater appreciation for and satisfaction with life (Holmes, 2005), increased parental support (Gil-Rivas et al., 2004), greater valuing of friends and family (Linley, Joseph, Cooper, Harris, & Meyer, 2003), gratitude towards rescue workers and the principle of freedom (Gordon, Musher-Eizenman, Holub, & Dalrymple, 2004), an increase in

[19] The majority of studies that assessed the role of ethnicity coded it as a categorical variable (i.e., White vs. non-White).

patriotism (Landau et al., 2004), compassion (Ai, Cascio, Santangelo, & Evans-Campbell, 2005), and enduring character strength developments (Peterson & Seligman, 2003). What is more, these positive outcomes were also discovered in samples in Canada (Davis & Macdonald, 2004), Britain (Linley et al., 2003), Sri Lanka (Dundes & Rajapaksa, 2004), and Japan (Kumagai & Ohbuchi, 2002).

One of the most common positive themes to emerge was that of increased support for one's community or nation. For instance, in the United States, 10% of 807 nationally representative adults were found to be volunteering more of their time as far as 10-12 months after 9/11 (Torabi & Seo, 2004). In Ottawa, Canada, 59% of 80 adults surveyed reported offering some help to others as a way of coping with the 9/11 attacks, whether through financial means, blood donation, and school or work projects (Davis & Macdonald, 2004). Among the psychological benefits associated with engaging in helping behaviours after 9/11 were significant decreases in grief as well as in survivor guilt (Wayment, 2004).

Several studies also revealed that a significant minority of individuals turned to religious or spiritual faith as a way of coping with the events of 9/11[20]. For example, one study found that 24% of a sample of 807 nationally representative adults turned to religion or spirituality after 9/11 (Torabi & Seo, 2004). An increased need for spirituality following witnessing the 9/11 attacks has also been supported by experimental evidence, as 100 undergraduates who watched footage of the 9/11 attacks scored higher on transcendence, relative to a control group who watched footage of a gubernatorial debate (Briggs, Apple, & Aydlett, 2004).

As with helping behaviours, a move towards religious or spiritual faith had several positive implications for mental health. For example, among 457 graduate and undergraduate

[20] Very few individuals appeared to lose their faith as a result of the 9/11 attacks. In one study, for example, only 3 participants (<1% of the sample) turned away from their faith after 9/11 (Ai et al., 2005)

students at the Universities of Nevada, Pennsylvania, and Washington[21], depression and anxiety in the aftermath of the 9/11 attacks were negatively predicted by positive emotions, faith, hope, and spiritual meaning (Ai et al., 2005).

Discussion

The present chapter reviewed 118 empirical studies detailing the psychological implications of the 9/11 terrorist attacks, all published during the ensuing five year period. A few general findings emerged from this review, including that: 1) in the months immediately following the 9/11 attacks, a significant minority of individuals living in New York City or Washington, D.C. experienced increased symptoms of general distress (generally between 18-45%, but higher if other risk factors were present, such as a history of mental illness), PTSD (5-10%), depression (<10%), and substance abuse (1-7%), resulting in an increase in the use of health services (in the range of 10% over previous years); 2) this negative impact of the 9/11 attacks was substantially lower outside of these two cities, and often non existent outside of the United States; and 3) several factors moderated the personal psychological impact of the attacks, including physical proximity, media exposure, a personal connection to the attacks, a history of mental illness, negative life events, the person's initial response, manner of coping, social support, personality traits including emotional flexibility and dispositional optimism, age, gender, ethnicity, and socio-economic status.

On a more positive note, symptoms of these negative outcomes typically decreased to baseline or lower levels within 6-12 months after the attacks. What is more, for a significant proportion of individuals, the 9/11 attacks produced several enduring positive life changes, including sustained increases in helping behaviours, religious faith and spirituality, subjective well-being, patriotism, a greater appreciation for and satisfaction with life, and various character

[21] Among this sample, 78% had faith in the efficacy of prayer in coping with stress, while 62% of them actually used prayer to cope with 9/11-related stress (Ai, Tice, Peterson, & Huang, 2005).

strength developments. In fact, without meaning to trivialize the psychological impact of the attacks, it can be said that a significant proportion of studies conducted (particularly those outside New York City and Washington, D.C.) failed to find evidence of negative psychological or health outcomes, while many actually found evidence for improved mental health following the attacks. Furthermore, the minority of studies that explicitly looked for evidence of positive outcomes found convincing support. Thus, taken together, the 9/11 research literature attests to the resilience and indomitability of the human spirit (Suedfeld, 1997), more than it paints a picture of emotional devastation and misery in the wake of a murderous attack.

Shortcomings of the 9/11 literature

According to the author of the most comprehensive longitudinal study of the psychological effects of the 9/11 attacks, conducting research on terrorism and its aftermath presents several unique challenges for researchers to overcome (Silver, 2004). These include the costs involved with conducting research in the "natural laboratory" (in terms of finances, time, and labour), the difficulty in obtaining quick-response funding and timely ethical approval, low response and high attrition rates[22]. One of the implications of these constraints is that studies are too often conducted with small, non-representative samples (often samples of convenience, including over-sampling from clinical populations accessible to psychologists). Other shortcomings of this literature include: a) the use of widely differing instruments for measuring the same constructs, resulting in an inability to summarize this research quantitatively via a meta-analysis, b) the lack of a baseline measure of the variables under consideration, c) the lack of an appropriate control group, d) the lack of longitudinal measures of the variables under

[22] Among the studies reviewed in this paper, the average response rate was 53% (ranging between 6% and 91%), while the average attrition rate (i.e., the proportion of participants who dropped out of the study) was 41% (ranging between 18% and 80%). Taken together, this means that the typical study tracked only 31% of those individuals from the population under study across time, which brings into question the representativeness of the samples obtained as well as the generalizability of the findings.

consideration, e) and long intervals (usually months or years) between data collection points, with the result that even when participants are tracked across time, a fine-grained analysis of their reactions is not possible, often resulting in inaccurate conclusions being reached (e.g., see (Bonanno et al., 2005). A more pervasive problem, however, and one that is especially evident in this review, is the general bias of researchers towards anticipating, measuring, and testing hypotheses only pertaining to negative psychological outcomes, to the detriment of even considering the possibility of positive outcomes or the role of positive emotions in the coping process[23].

As one example of this sometimes-subtle bias towards pathogenesis, the authors of one study of NYC children that failed to find evidence of predicted behaviour problems in the aftermath of the 9/11 attacks (there was actually evidence of an improvement in behaviour) refused to consider this to be a potential positive outcome. Rather, this finding was immediately taken as evidence of either a dampened emotional response on the part of the children or decreased sensitivity of parental assessment to behavioural problems (Stuber et al., 2005).

According to Silver (2004) this is a serious problem because "a narrow focus on clinical outcomes, ignoring subclinical levels of reactions and decrements in positive emotions, can paint a distorted picture of people's responses to negative events" (p. 50). Indeed, after fifty years of research on the aftereffects of trauma (including and especially with survivors of the Holocaust), one fact that should be painfully obvious by now is that a comprehensive understanding of how individuals respond to trauma requires considering both positive as well as negative outcomes (Suedfeld, 2000).

[23] Given that the vast majority of this research literature is oriented towards negative outcomes, the file-drawer problem (the reality that studies with null findings are less likely to be published) may also be of larger concern here than usual. That is, the number of studies reviewed here that do not find a negative effect of 9/11 might be dwarfed by the actual number of such studies.

On a final note, it is customary when concluding a review paper to point to areas for future research. Given the size of the 9/11 literature, however, I believe a general call for "more research" to be a disservice to the field. Rather, what is required is sophisticated and thoughtful research which takes us beyond the general conclusions reached in this paper. For example, given that media exposure played such as vital role in spreading the negative psychological impact of 9/11, it would be useful to investigate whether and in what ways the style of communication of television broadcasters (e.g., sensationalist versus fact-driven) may have influenced the reactions of the viewing public. Similarly, given that people's initial responses predicted their longer-term mental health, it would be useful to gain a better understanding of how individuals react during the immediate moments of a terrorist attack. While it may be too late to begin new research on the 9/11 attacks, given the alarming regularity with which such events seem to now occur, time would not be wasted designing methodologically sound studies and aligning resources so that these would be quick to initiate in the event of a subsequent terrorist attack.

Given the size of the 9/11 literature, one is tempted to conclude that psychologists, in seeking to place meaning on this event, tried to analyze its causes and consequences as a method of coping with their own anxiety. Nonetheless, a parallel can be drawn between the number of researchers who published papers concerning the 9/11 attacks and the number of psychologists, counsellors, and therapists that flocked to New York City after September 11, 2001, all seeking to help supply what was imagined to be a looming massive demand for mental health resources. In either case, it may be said that the demand never quite lived up to the hype.

Postscript: Beyond 9/11

Since 9/11, terrorism has become a permanent part of the vocabulary of the Western world. This is in part due to the number of high-profile attacks which have occurred in recent years (e.g., Bali, Madrid, London, Mumbai, etc.). In seeking to define which of these might be

considered "large-scale," one method is to count the number of civilian casualties. While this is admittedly a crude and imperfect measure, using a rule of 100 or more civilian casualties yields a list of thirty-five major terrorist attacks that have taken place worldwide since September 11, 2001[24] (listed in Appendix B). Of these, the psychological reactions of civilian populations to only two (Madrid and London) have been examined in published empirical research thus far.

Madrid

During the morning rush-hour commute on March 11, 2004, 10 bombs left on four commuter trains in Madrid killed 191 and injured more than 1,800 persons. It remains the largest human toll in modern record from a single act of terrorism committed on European soil. The attacks prompted countrywide demonstrations, eventually culminating in the defeat of the governing People's Party in the general election held three days later, as well as the subsequent pullout of Spanish troops from the U.S.-led coalition force in Iraq. In the years since the Madrid train bombings 24 empirical studies have been published detailing the psychological impact of the attack. The results from these studies are summarized next.

Negative psychological outcomes

As is to be expected, victims and direct witnesses to the terrorist attack suffered the most severe psychological consequences. Studies investigating the incidence of PTSD in those injured in the attacks have produced estimates that range from 33% to 64% (Gabriel et al., 2007; Hillers & Rey, 2006; Rodríguez & Bruguera, 2006). In one such study, 54% of a sample of 185 victims (64% of whom were female) showed symptoms of PTSD 3 months after the attack. However, the vast majority of these respondents (83%) indicated a reduction of their initial symptoms since the attack (Bruguera & Rodríguez, 2006). Similarly, a group of disaster professionals who witnessed the aftermath of the attack showed symptoms of posttraumatic stress disorder (PTSD) and

[24] Interestingly, between 1974 and 2001 (up to and including 9/11), only 22 terrorist attacks on this scale took place, reinforcing the notion of a fundamental shift in the nature of terrorism worldwide.

depression, and a higher prevalence of panic attacks and drugs and alcohol consumption one month after the attack; however, none of these outcomes was found to have developed into chronic conditions at a six-month follow-up (González Ordi, Miguel-Tobal, Vindel, & Iruarrizaga, 2004).

In a study of direct witnesses to the attack, 45.53% of the sample were found to have suffered a panic attack during or soon after the terrorist attacks, while 31.3% presented symptoms of depression and 28.2% of posttraumatic stress disorder one to three months after the attack (Iruarrizaga, Miguel-Tobal, Cano-Vindel, & González-Ordi, 2004). Other psychological sequelae found in this sample included increased tobacco, alcohol and drug consumption. Similarly high levels of psychological problems were also found among a large sample of adult residents of Madrid. In this case, 49.6% of the sample presented symptoms of depression while 46.7% showed symptoms of acute stress, two weeks after the attack (Muñoz, Crespo, Pérez-Santos, & Vázquez, 2004; Muñoz, Crespo, Pérez-Santos, & Vázquez, 2005).

Far lower rates of psychopathology, however, were found in what is perhaps the most systematic and comprehensive study of the psychological consequences of the March 11 attack (Miguel-Tobal et al., 2006; Miguel-Tobal, Cano-Vindel, Iruarrizaga, Gonzales, & Galea, 2004; Miguel-Tobal, Vindel, Iruarrizaga, Ordi, & Galea, 2005). Using methodology identical to that of an early study of residents of Manhattan following the 9/11 terrorist attacks (Galea et al., 2002), a study of a representative sample of 1589 Madrid city residents found that 8% suffered from clinical depression three months after the attack, similar to the level found in Manhattan following 9/11. On the other hand, only 2.3% showed symptoms of probable PTSD, a figure significantly lower than was the case in Manhattan. This figure, however, is remarkably close to the that from another study of over 500 residents of Madrid, of which 1.9% met the DSM criteria for a probable diagnosis of PTSD three weeks after the attack (Vázquez, Pérez-Sales, & Matt, 2006; Vázquez, Pérez-Sales, Matt, & Trappler, 2007). Together, these results suggest the scale of

the terrorist attack may be a more important factor in determining the prevalence of PTSD than of depression.

Finally, at least one study of Madrid residents found no evidence of significant levels of psychological disturbance three weeks following the attack (Vázquez & Pérez-Sales, 2007). Further, according to the authors, although estimates for the incidence of PTSD may range from "what can be expected as a normal prevalence in general population in Spain under non-traumatic conditions to values that, when applied to the general population, could be considered a dramatic epidemic of PTSD" (p. 27), these variations largely result from variability in the definitions, criteria, and measured employed to assess psychological functioning.

Moderators

As with the 9/11 literature, moderators of traumatic stress included living close to the attacked locations, physical proximity to the attacks when they occurred, identification with the victims, degree of Spanish identification, a perception of one's life being at risk, the intensity of initial emotional reactions, a history of mental illness, and being a daily user of the attacked train lines (Conejero, de Rivera, Páez, & Jiménez, 2004; Conejero & Etxebarria, 2007; Gabriel et al., 2007; Vázquez et al., 2006). Physical proximity was also related to a "negative psychological climate" in one study (Conejero et al., 2004), but unrelated to negative psychological outcomes in another following the Madrid train bombings (Cano-Vindel, Miguel-Tobal, González-Ordi, & Iruarrizaga, 2004).

Finally, women tended to show more signs of distress and symptoms of depression and PTSD following the March 11 attack, as did individuals who scored higher on the personality trait of neuroticism (Miguel-Tobal et al., 2006; Val & Linley, 2006).

Positive psychological outcomes

Participation in national demonstrations following the March 11 attack appears to have served as a communal way of coping with the tragedy, as it was positively associated with

national identification, collective self-esteem, social support, positive affect, pro-social behaviours, and post-traumatic growth, and negatively associated with helplessness and avoidance (Jiménez, Páez, & Javaloy, 2005; Páez, Basabe, Ubillos, & Gonzalez-Castro, 2007). Participation also predicted changes in values and attitudes, including a greater emphasis being placed on security and benevolence, and a stronger belief in a benevolent social world (Jiménez et al., 2005). Finally, evidence of post-traumatic growth (Tedeschi, Park, & Calhoun, 1998) also comes from a study of 153 residents of Madrid who did not directly witness the March 11 bombings (Val & Linley, 2006). Interestingly, in this study, participants who knew someone injured or killed experienced higher levels of post-traumatic growth.

Consistent with the previous findings, expressive writing and social sharing about the March 11 bombings were related to better emotional adjustment (Fernández & Páez, 2008; Fernández, Páez, & Pennebaker, 2004; Rovira, Martínez-Sánchez, & Rimé, 2004).

Finally, like Americans after 9/11, Spanish citizens too gave in to dread risk, as they changed their use of mass transportation during the three months immediately following the Madrid train bombings (López-Rousseau, 2005). However, although they used the train system somewhat less, unlike the Americans they did not suffer more fatalities than usual from car accidents because they also drove less than usual following the attack.

London

During the morning rush-hour commute on July 7, 2005, three suicide bombers detonated devices which exploded at different points in London's underground "tube" network. A fourth suicide bomber detonated another device on a double-decker bus. The attack killed 52 and injured 700 persons, and is the second-deadliest terrorist attack ever to occur in the UK, after the bombing of Pan Am Flight 103 over Lockerbie, Scotland. In the years since the London

bombings only three empirical studies have been published detailing the psychological impact of that attack[25].

In the first major study of psychological sequelae following the London bombings, 27% of a sample of over 1000 Londoners surveyed 1-2 weeks after the attack reported experiencing substantial distress[26] (Rubin, Brewin, Greenberg, Simpson, & Wessely, 2005). When 574 of these individuals were contacted 7-8 months later, the proportion of individuals experiencing persistent distress had dropped to 7% (Rubin et al., 2007). Over the same time period, participants' sense of safety improved. Persistent distress was predicted by gender (female), lower SES, and fear at the time of the attacks for the safety of a loved one.

The only other study conducted following the attack found that residents of London showed higher levels of both fear and positive emotions and lower levels of despair than comparison groups in Manchester (England) and London (Canada) in the days immediately following the attack (Blanchette, Richards, Melnyk, & Lavda, 2007).

As can be seen, there is remarkable convergence between the 9/11 research literature and studies of the psychological impact of the Madrid and London bombings. The differences (such as in the rates of PTSD) can largely be attributed to the differences in scale of the attacks. Overall, psychological distress was high immediately following the attacks, particularly among the injured and first-responders. However, for over 90% of the population, this did not translate into long-term psychological problems. As with 9/11, important moderators of these effects included physical proximity to the attacks, psychological distance, a history of mental illness, gender (female), and relevant personality variables (e.g., neuroticism). Finally, several indicators of post-traumatic growth also emerged, including increases in prosocial behaviours, positive

[25] Reports of case studies (e.g., Whalley, Farmer, & Brewin, 2007) and studies of flashbulb memory (e.g., Ost, Granhag, Udell, & Roos af Hjelmsäter, 2008) are not included in this tally.

[26] The reliability of this estimate is unclear, given a response rate of only 10% in this study.

emotions, and collective self-esteem, lower levels of despair, and a reevaluation of personal values. While all of this convergence increases confidence in the generalizability of the 9/11 literature to the attacks that have occurred since, unfortunately, the shortcomings of the 9/11 literature remain to be addressed.

INTEGRATIVE COMPLEXITY

Derived from conceptual complexity theory (Schroder, Driver, & Streufert, 1967), integrative complexity (IC) is a measure of cognitive processing that assesses the complexity at which an individual is currently thinking or reasoning (Suedfeld, Guttieri, & Tetlock, 2003). It measures the degree to which a person's speech or writing shows evidence of differentiation (the recognition of legitimate alternate perspectives or dimensions) and integration (recognizing interrelationships among these). Obviously, differentiation is a pre-requisite for integration. IC is scored on a 1-7 scale, with 1 = no differentiation, 3 = clear evidence of differentiation, 5 = low-level integration, and 7 = high-level integration within a superordinate schema. Even numbers indicate implicit evidence for the next higher level (see Appendix A; Baker-Brown et al., 1992).

The conceptual framework for IC that has received the most empirical support is known as the cognitive manager model (Suedfeld, 1992). Starting from the assumption that human beings have limited cognitive resources at their disposal, the model posits that the level of complexity of thought achieved is directly related to the amount of cognitive resources invested in the task. In other words, higher IC reflects a greater proportion of cognitive and other (e.g., time, information gathering, etc.) resources having been allocated to deal with a particular task or problem, and vice-versa. However, high complexity is not a panacea. It is neither indicative of moral superiority nor always predictive of successful decision-making. Rather, good cognitive managers are able to match their complexity to the demands of the situation (Suedfeld, 1992; see Figure 3.1). As a case in point, a recent study found that U.S. presidents who are successful in their bid for re-election tend to show two distinct patterns of IC: 1) They operate at a higher level of complexity when they first come into office (when having to appease opposing factions and satisfy conflicting demands); and 2) they show a decrease in complexity during the year of their re-election campaign (when an unequivocal stance is more effective in order to rally support and

when recognizing the validity of different perspectives can be regarded as "waffling;" Thoemmes & Conway, 2007).

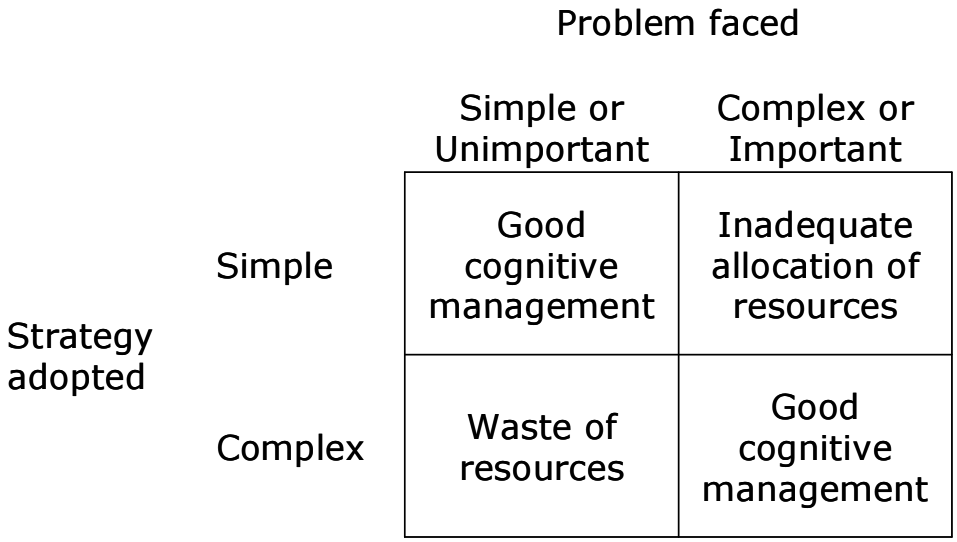

Figure 3.1: The cognitive manager model

The idea that complexity is normatively neutral is also supported by Tetlock's (1991) cost-benefit analysis of low and high complexity. According to Tetlock, complex decision strategies increase one's awareness of trade-offs, increase the probability that mutually beneficial solutions may be identified, reduce one's susceptibility to biases such as overconfidence or belief perseverance, and convey the impression of a person who is flexible and thoughtful. On the other hand, operating at a more complex level is more time-consuming, results in more emotional and cognitive strain, runs the risk of appeasing aggressors, increases susceptibility to biases such as dilution or worst-case thinking, and conveys the impression of a person who is weak and indecisive. The advantages of adopting integratively simple decision strategies correspond to the weaknesses of maintaining higher complexity, and vice-versa.

Whereas previous research in the complexity tradition focused on stable individual differences in information-processing complexity (what is properly known as conceptual

complexity[27]), IC reflects the joint influence of both personality and situational forces on cognitive processing. The assumption here is that situational forces can increase the demands on an individual's cognitive resources, thereby lowering the upper limit of complexity achievable at any given moment in time. In other words, although different individuals may generally operate at different levels of complexity, situational forces, particularly if these are strong, affect the complexity of different individuals similarly. IC research is thus more concerned with relative changes in complexity across time or situations within the same individuals than with absolute differences in complexity across individuals. Accordingly, research has found IC to be affected by factors such as cognitive load, emotional involvement, accountability, fatigue, and illness (Suedfeld et al., 2003).

Stress and integrative complexity

IC is moderated by emotional involvement in the task at hand. With increased emotional involvement, the use of more cognitive resources can be justified, as per the cognitive manager model (Suedfeld, Bluck, & Ballard, 1994). This relationship only holds up to a point, however. If emotional arousal surpasses an optimal level, it has a deleterious effect on IC.

When faced with stressful situations, the cognitive manager model likens the individual's cognitive reaction to Selye's (1956) general adaptation syndrome: i.e., proceeding through the stages of alarm (recognizing the problem), resistance (mustering the required resources to cope with the stressor), and, ultimately, exhaustion (when cognitive resources are depleted due to a "disruptive" level of stress; Suedfeld & Tetlock, 2001). Thus "if the challenge is too severe, too persistent, occurs simultaneously with too many other demands, or if cognitive resources are

[27] Conceptual (trait) complexity is correlated with intelligence and verbal fluency, with correlations ranging between .10 and .45, depending on the intelligence test used or criterion measured (Suedfeld & Coren, 1992; Schroder et al., 1967). Other dispositional correlates of conceptual complexity include authoritarianism, dogmatism, power-motivation, and need for closure (all negatively correlated), as well as openness, creativity, need for cognition, and moral development (all positively correlated; Suedfeld & Tetlock, 2001).

depleted through fatigue, illness, fear, or other adversities, complexity decreases" (Suedfeld & Tetlock, 2001, p. 294). A major terrorist attack should present no exception. According to Suedfeld and his colleagues,

> when one's entire nation is at risk, the combined effects of personal and societal upheaval (and perhaps a lesser sense of control) may lead to a level of emotional arousal that surpasses some optimal point and interferes with information processing complexity. (Suedfeld et al., 1994, p. 445)

Graphically, the relationship between stress and IC is hypothesized to resemble an inverted "U," akin to the Yerkes-Dodson law that specifies the relationship between arousal and performance (1908; see Figure 3.2). Initially, increases in stress are expected to result in increases in IC. Past a certain optimal point, however, any further increases in stress ought to lead to a decrease in information-processing complexity (Schroder et al., 1967). This latter effect is referred to as the disruptive stress hypothesis of IC. Thus far, empirical support for the curvilinear relationship between stress and IC comes principally from laboratory-based simulation studies conducted by Schroder and his colleagues (Driver, 1962; Schroder & Streufert, 1963; Streufert & Driver, 1965; Streufert & Schroder, 1965; Streufert & Swezey, 1986).

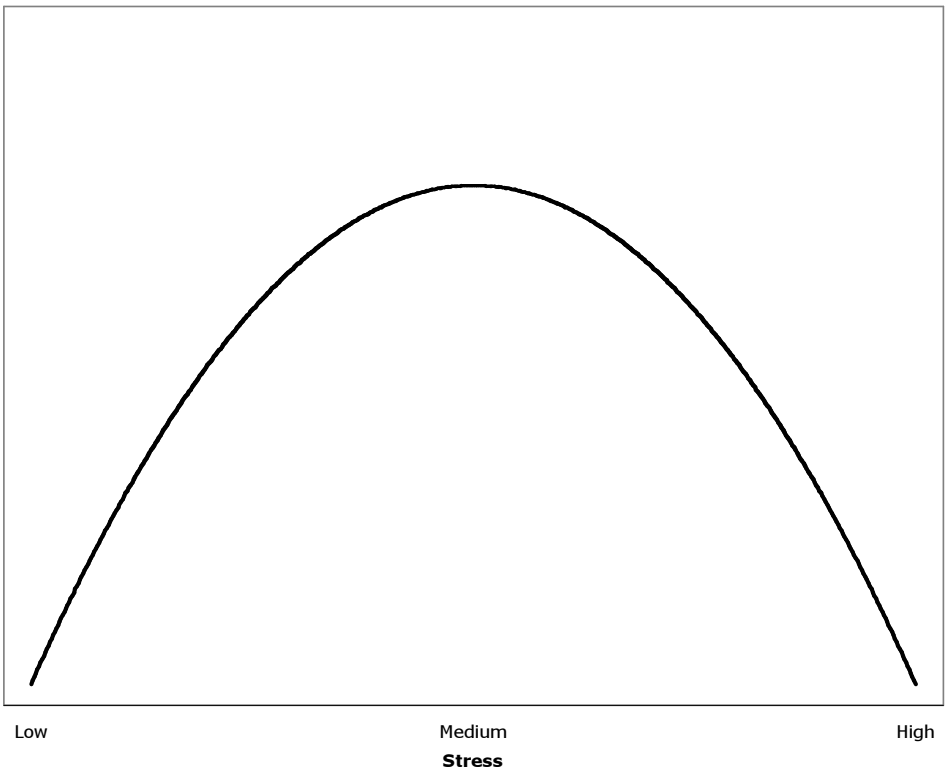

Figure 3.2: Theoretical relationship between stress and integrative complexity

IC scoring is easily adapted to virtually any written or spoken material and allows for the investigation of psychological processes as they occur outside of the research laboratory[28]. For example, in previous research, source materials have included APA presidential addresses (Suedfeld, 1985), U.S. presidents' state of the union speeches (Thoemmes & Conway, 2007), interviews with Holocaust survivors (Suedfeld, Fell, & Krell, 1998), transcripts of face-to-face negotiations between armed rebel groups and the Mexican government (Liht, Suedfeld, & Krawczyk, 2005), the personal memoirs of military leaders (Suedfeld, Corteen, & McCormick,

[28] The point of IC scoring is to focus on real world behaviour. IC scoring does not assess a trans-situational or trans-temporal trait, and there is no attempt to code materials that sample a variety of domains. Most of the time IC scoring focuses on documents produced in the course of personal or professional life, thus reducing the threat of experimenter expectancy and other challenges to ecological validity. Conceptual complexity scoring, on the other hand, focuses on materials produced in the context of research and for research purposes, and therefore faces the dangers of reactance and reduced ecological validity.

1986), and the private correspondence of literary figures (Porter & Suedfeld, 1981). What follows is a brief sample of some of the more important outcomes found to correlate with IC.

War and peace

IC is a reliable predictor of the outcome of international crises. Specifically, in tense standoffs between two nations, a bilateral decrease in IC of the respective heads of government and other officials reliably predicts the outbreak of armed conflict (e.g., Suedfeld, Tetlock, & Ramirez, 1977; Suedfeld & Jhangiani, in press) [29]. On the other hand, when the leaders of both countries concerned show increases in IC (or at least maintain their baseline level of IC), the conflict is typically resolved through negotiation or other peaceful diplomatic solutions. Finally, and perhaps most interestingly, unilateral drops in IC during international conflicts precede surprise attacks by the country concerned (e.g., the Nazi invasion of the Soviet Union, Pearl Harbor, the Yom Kippur War, the start of the Korean War; Suedfeld & Bluck, 1988).

Life and death

Complexity is quite stable across the lifetime. For example, a longitudinal study of General Robert E. Lee found that his complexity was generally high throughout most of his life, declining only during periods of great mental strain (Suedfeld et al., 1986). The temporary negative effect of personal and societal stressors on IC has also been found in the writings of prominent 19th and 20th century British novelists (Porter & Suedfeld, 1981). In this same study, however, a significant decrease in IC in the writings of the novelists was found during the last few years of their lives. This unexpected "terminal drop" in complexity was subsequently confirmed using a larger sample, in cases of both protracted as well as sudden death (Suedfeld & Piedrahita, 1984). In cases of protracted death (e.g., cancer), IC tended to decrease from four years prior to death, whereas in cases of sudden death (e.g., heart attack), IC decreased sharply in

[29] A decrease in IC on the part of heads of government is an even more powerful predictor of war when accompanied with high power motivation (e.g., Winter & Bryant, 2003).

the last year of life. Whether these decreases in IC reflect a response to the stress of disease, or a change in personality or cognitive ability resulting from neurological or physical deterioration is unclear. Nonetheless, that complexity is able to reliably predict death underscores the importance of information processing ability as an index of general functioning.

Success and failure

The ability to maintain one's level of complexity in the face of crises is associated with personal career success. For example, in a study of leading statesmen spanning three centuries, the ability to "rise to the occasion" was a strong predictor of career longevity (surely a mark of success in public office; Wallace & Suedfeld, 1988). Compared to other world leaders, who showed an average 28% decrease in IC during international crises (e.g., Nikita Khrushchev, Dwight Eisenhower, and Ronald Reagan), leaders who were personally involved in dealing with disputes and who retained active responsibility for foreign policy for at least twenty years were those who showed a slight increase in IC during times of crisis (e.g., the Duke of Wellington, Prince Otto von Bismarck, Lester B. Pearson, and Andrei Gromyko; Wallace & Suedfeld, 1988).

Another study of leaders, this time of revolutionary movements, found that only those leaders whose IC increased following successful revolutions managed to avoid being ousted from office (Suedfeld & Rank, 1976). On the other hand, those who continued at their low pre-revolution level of IC and those who operated at a high level of IC during the revolution failed to maintain the confidence of their peers. This finding mirrors the pattern of IC found among successfully re-elected US presidents mentioned earlier and once again suggests that what is more important is not high or low complexity *per se*, but rather adapting one's complexity to suit the needs of the situation, or what may be termed meta-complexity[30] (Satish, 1997).

[30] The term meta-complexity has been foreshadowed in the use of the terms "meta-strategy" and "meta-decisional strategy" (Streufert & Streufert, 1978; Suedfeld & Tetlock, 1991).

Impression management

An alternative explanation for why IC may vary according to the situation is that of impression management (Tetlock & Manstead, 1985). According to this view, the way people speak and write is principally a function of their political and other goals. In other words, the level of complexity exhibited is not necessarily reflective of the level of complexity at which information is being processed. Rather, an issue is discussed "at the level the source believes will create the desired impression on the target audience" (Suedfeld et al., 2003, p. 258). For example, during international crises, a deliberately simplified communication may be used to signal firmness to an opponent. Conversely, higher complexity can project a misleading image of empathy towards the other side. As noted by Tetlock & Manstead (1985), however, in some respects it does not matter whether the direct sponsor of IC is cognitive management or impression management (e.g., complexity is a robust predictor of the outcome of conflicts regardless). Yet, some attempts have been made, primarily using archival methods, to test the two competing explanations:

1) Speeches or writings that are made public should be more prone to impression management, while those in private (e.g., personal journals) are less so. Consequently, one strategy to tease apart the two explanations is to analyze both public and private documentation (later discovered or made public) written during the same time periods. A difference in complexity between the two sources would provide support for the impression management hypothesis, while no difference would suggest that IC does, in fact, reflect the general level at which information is processed by the individual at a particular moment in time. Unfortunately, the evidence here is mixed, with one study showing significant differences (Guttieri, Suedfeld, & Wallace, 1995), and three studies failing to find any difference (Suedfeld & Rank, 1976; Tetlock & Tyler, 1996; Wallace, Suedfeld, & Thachuk, 1996).

2) Another method of testing the two competing explanations involves coding the writings of non-relevant actors during periods of national crises or societal stress, the premise being that people who are not directly involved in the conflict have nothing to gain from artificially manipulating their complexity during that time. Studies of novelists (Porter & Suedfeld, 1981), atomic scientists (Suedfeld, 1981), and even APA presidents (Suedfeld, 1985) have all shown their subjects' IC to have been affected during societal crises. While this erodes support for the impression management hypothesis, given that each of these groups has an audience of one kind or another, these results still do not entirely remove the possibility that they were all attempting to portray a particular image (e.g., a show of solidarity or disagreement).

3) It will be recalled that, during tense standoffs between two nations, a decrease in IC on the part of one of the leaders is a reliable signal of a surprise attack about to be launched by that nation (Suedfeld & Bluck, 1988). Were the impression management explanation true, it stands to reason that a leader aware of his or her country's planned assault would strive to create the opposite impression as a ruse (e.g., a show that they are willing to listen to the other side or take into consideration more than one point of view). However, this was not the case.

Despite these findings, doubts raised by the impression management hypothesis cannot fully be dismissed until controlled experimental research is conducted which can create conditions aimed at disconfirming one or both hypotheses[31].

Future directions

Despite the voluminous and compelling literature on IC, several issues remain to be addressed. Four are identified here:

[31] A third possibility, of course, is that both the cognitive management and impression management explanations are valid. For example, although in general IC may be affected by the amount of resources available and the complexity of the problem at hand, in certain situations people may be motivated to manipulate their audience. At this time, however, there is no evidence to suggest that individuals are able to adjust their IC as they might the content of their speech.

1) Although the manual coding of IC described earlier in this chapter remains the gold standard in this field, numerous efforts have been made to develop less time- and labour-intensive methods to code for IC, including through the use of computer software programs (e.g., Profiler Plus; Young, 2001). Thus far, however, no systematic effort has been made to assess the convergent validity of these different methods.
2) It will be recalled that, according to the cognitive manager model, the ability to match one's IC to the needs of the situation defines a "good cognitive manager." An implicit assumption here is that some individuals are better than others when it comes to adapting their complexity. A measure of this individual difference variable would be a great service to the field, and would enable complexity research to move from a descriptive measure of cognitive processing (IC) to an evaluative one (meta-complexity).
3) A recent advance in IC research is the elaboration of a coding scheme for dialectical complexity (the recognition of legitimate alternate perspectives) and elaborative complexity (the recognition of different dimensions within the same perspective[32]; Conway et al., in press). This coding scheme is not intended to replace the existing method for IC coding; rather, it is intended to complement it by recognizing that these two different forms of differentiation may reflect subtly different underlying psychological processes. This work holds great promise for establishing stronger predictive validity for IC. For example, in the context of war and peace, it may be that changes in one particular form of differentiation better predict the outcome of tense standoffs than does IC as a whole.
4) Experimental research to disentangle the cognitive management and impression management explanations for IC is sorely lacking. Were more evidence to accumulate in

[32] The concept of elaborative complexity resembles the earlier concept of discrimination (see Streufert & Streufert, 1978).

favour of the latter, however, a new measure of "implicit complexity" would have to be developed, in order to assess the complexity at which the individual is *actually* processing information, as opposed to simply the complexity on display (not unlike the basic premise of the implicit attitude test; Greenwald, McGhee, & Schwartz, 1998).

In addition to these four issues, new applications for IC coding continue to emerge, reaffirming the vitality and importance of this area of research. Examples of these new applications include the coding of the speeches and statements made by terrorist leaders in order to determine whether a decrease in IC reliably precedes impending terrorist attacks, and the coding of the writings of depressed or suicidal individuals, in order to determine whether particular patterns of IC accompany changes in their mental health status.

STUDY 1: REAL-TIME REACTIONS OF BROADCAST JOURNALISTS

Broadcast journalists are often required to report live, breaking news of catastrophes as they unfold. Recent such examples include the Columbia shuttle disaster, the Virginia Tech University shooting, Hurricane Katrina, and the assassination of Benazir Bhutto. Aside from providing factual details, these journalists comment on the possible causes and potential implications of such disasters, and provide a general context for interpreting the situation. Intentionally or not, they influence the perception and primary appraisal[33] of the events for the viewing or listening public (Schaap, Renckstorf, & Wester, 2005). Although their experience and skill often make it possible for them to manage or compartmentalize their personal emotional reaction to the event, the magnitude or shock of what they are reporting sometimes shows through (Gilbert, Hirschkorn, Murphy, Walensky, & Stephens, 2002). A major terrorist attack, it is reasonable to assume, constitutes such a case.

An earlier paper (Jhangiani & Suedfeld, 2005) considered the cognitive and emotional processing of television newscasters who reported live during the 9/11 terrorist attacks. Given that newscasters are required to supply a continuous commentary to accompany breaking news stories, and that, for most people, the realization that the plane crashes were not merely accidents, occurred after the second plane crash into the World Trade Center, the rationale for this study was that analyzing the speech of the newscasters would provide a unique window into their psychological reaction in real-time. Using transcripts of the live footage (starting from before news of the attacks broke), the speech of television newscasters from the United States (ABC, CBS, NBC, & CNN), Canada (CBC), and Qatar (Al-Jazeera) was coded for IC (IC, a cognitive structural measure) and negative emotion (an affective content-based measure), among other variables.

[33] Refers to the evaluation of the significance of a stressful or threatening event (Glanz, Rimer, & Lewis, 2002).

The results confirmed the hypothesized negative relationship between these variables (see Figure 4.1), supporting the model of "disruptive stress." That is, increases in negative emotion were accompanied by decreases in IC, and vice-versa. In the same study, the country of origin of the newscasters was found to moderate the effects of the terrorist attacks on their IC. US and Canadian newscasters showed virtually identical patterns of IC, while the Qatari newscaster did not show any significant change in IC during the attacks.

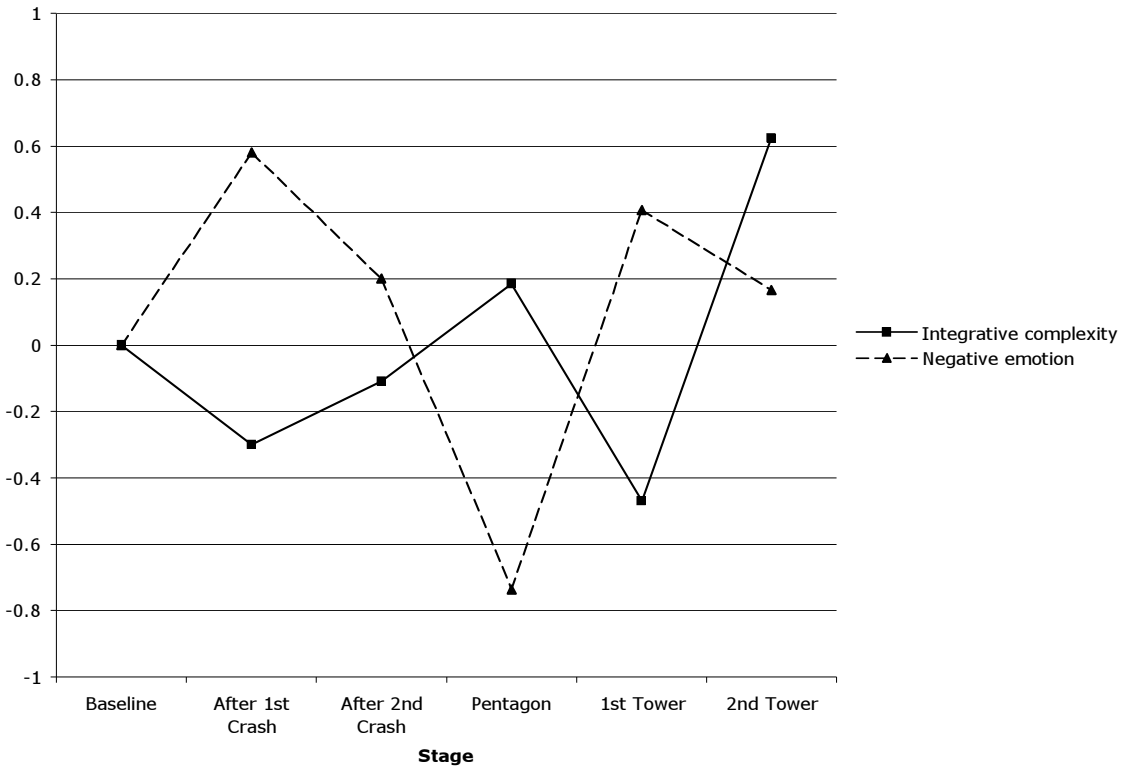

Figure 4.1: Integrative complexity and negative emotion of newscasters during the 9/11 attacks (from Jhangiani & Suedfeld, 2005)

While promising, given that this was the first ever application of IC scoring to the analysis of responses to terrorism, and to live news broadcasts as a medium, it is important to ascertain that these results are not idiosyncratic to this particular event, television as a medium, or newscasters as a special population. The present study addresses the first two of these concerns by attempting to replicate the results from the 9/11 newscaster study in a different yet

comparable context, that of the 2005 London transit system bombings, and with radio as the medium.

Method

A recording was obtained of the live broadcast of BBC London radio, as it occurred on the morning of July 7, 2005, the morning of the London transit system bombings. The recording spanned a live news and chat show with a single host that ran from approximately 9am GMT until approximately 12pm GMT[34]. Although the initial explosions of the London bombings occurred a few minutes prior to the start of this recording, news of the attack did not reach the airwaves until about fifteen minutes after the show had begun. The recording was transcribed, and any references that might identify the speaker or context were replaced with generic terms such as "person A" or "location A." This was done in order to reduce any scorer bias that might stem from knowledge or assumptions concerning the London bombings. The transcript was divided into scorable extracts (usually of paragraph length) on the basis of the host's natural conversational pauses and distinct streams of thought, and were coded for IC by a trained scorer[35].

The assessment of inter-rater reliability is standard practice in IC research, and was completed for all three studies reported in this dissertation. This involved a subset of the extracts (randomly selected) being scored by a second trained scorer. The proportion of extracts used to assess inter-rater reliability ranged from 15% (in Study 1) to 30% (in Study 3), but never involved less than 30 extracts. In Study 1, inter-rater reliability was found to be sufficiently high at $r = 0.85$.

[34] The London bombings involved 3 explosions on the underground tube network, all between 8:50 and 8:51am, with a fourth explosion in a bus at 9:47am. The bombings killed 52 and injured 700 people.

[35] Defined as someone who after training has achieved a reliability of at least $r = 0.85$ with an expert scorer.

As in the earlier study of 9/11 newscasters, in addition to IC, the extracts were also coded for the presence of words indicative of negative emotion (as a percentage of the total number of words used) through the use of the computer-based word-counting program *Linguistic Inquiry and Word Count* (LIWC; Pennebaker, Francis, & Booth, 2001). The use of negative emotion words as measured by LIWC has been shown to vary along with the experience of these emotions (e.g., anger, sadness, etc.) in experimental, correlational, as well as archival studies, and in the context of both personal as well as shared, societal upheavals (Pennebaker, Mehl, & Niederhoffer, 2003). For instance, the use of negative emotion words by Mayor Rudolph Giuliani in his press conferences increased following the September 11, 2001 terrorist attacks (Pennebaker & Lay, 2002), as it did in the language of a school newspaper at Texas A&M university in the weeks after a tragic bonfire claimed the lives of 12 students (Gortner & Pennebaker, 2002). Negative emotion word use also increases in accordance with experimental manipulations, whether this involves participants writing about negative events in their lives or reflecting on a sad movie clip (Tobin, 2005). Importantly, the use of negative emotion words has been shown to share a curvilinear relationship with health outcomes, such that a moderate level of negative emotion word use actually predicts improved health. This initial positive effect is explained as overcoming the perils of repressive coping (a failure to acknowledge one's own emotions when encountering a stressor; Pennebaker et al., 2003). Much like the disruptive stress hypothesis of IC (Suedfeld, Tetlock, & Streufert, 1992), however, past an optimal point, negative emotion word use predicts poor health (Pennebaker, Mayne, & Francis, 1997; Pennebaker et al., 2003; Pennebaker & Chung, 2007). As in the earlier study of 9/11 newscasters, negative emotion word use here functions as a proxy measure of the amount of stress experienced by the individual.

IC and negative emotion word use scores were plotted against a timeline of significant periods during the broadcast, starting from a baseline period (prior to the breaking news),

through various stages of information assimilation and speculation, to the release of official reports and confirmation of casualties (see Figure 4.2). In all cases, data were aggregated at the stage level (with each data point reflecting the average score for between 9 and 30 extracts[36]) in order to provide more stable measures of the variables. Each of the nine stages represented in Figure 4.2 is accompanied with a label that depicts the prevailing understanding of the bombings at the time.

[36] IC scores ranged between 1 and 4 in the present study.

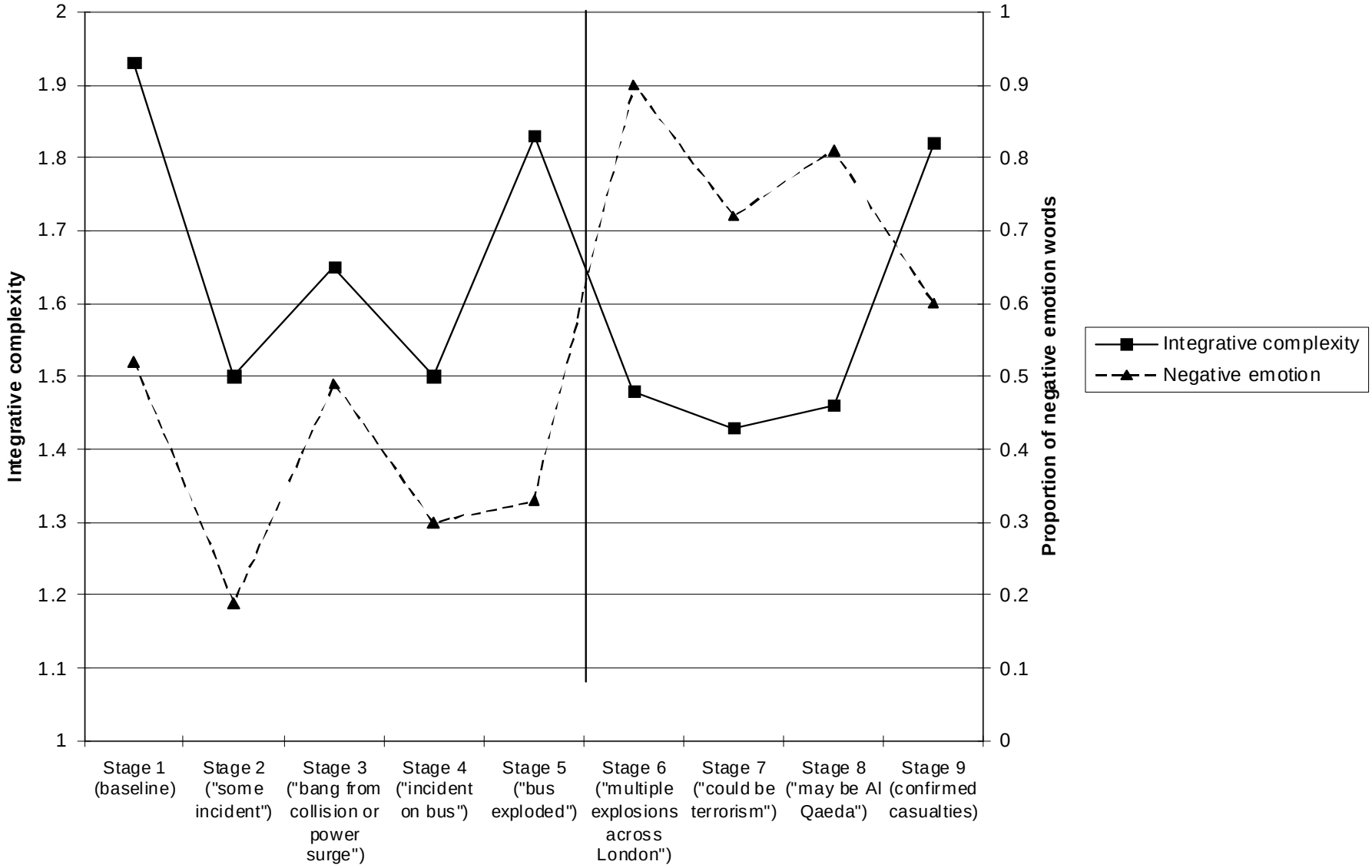

Figure 4.2: Integrative complexity and negative emotion during breaking news of the London bombings

Results

Two features of Figure 4.2 are especially salient. First, there is a systematic and non-random relationship between IC and negative emotion; second, the nature of this relationship is reversed following Stage 5 in the timeline (a vertical line added to the graph highlights this point). Specifically, during the early stages of information assimilation during breaking news of the London bombings, there is a strong positive relationship between the use of negative emotion words and IC [$r(5) = 0.68$, $p>.05$][37]. However, once it was announced that there had been "multiple explosions across London," there is a strong negative relationship between the two variables [$r\ (4)= -0.75$, $p>.05$].

As mentioned earlier, according to the disruptive stress hypothesis, the relationship between emotional arousal and IC is best described as curvilinear. In order to assess the veracity of this claim properly, IC was regressed on negative emotion (with the data aggregated at stage level). As expected, a quadratic function best fit the data (see Figure 4.3). Moreover, despite the use of only one predictor, 47% of the variance in IC was accounted for.

[37] As can be seen, although these correlations are not statistically significant, this is attributable to the very small sample size (4-5 cases). As such, the correlation coefficients should be interpreted solely as indices of effect size, and not as indications of the likelihood of obtaining these results due to chance.

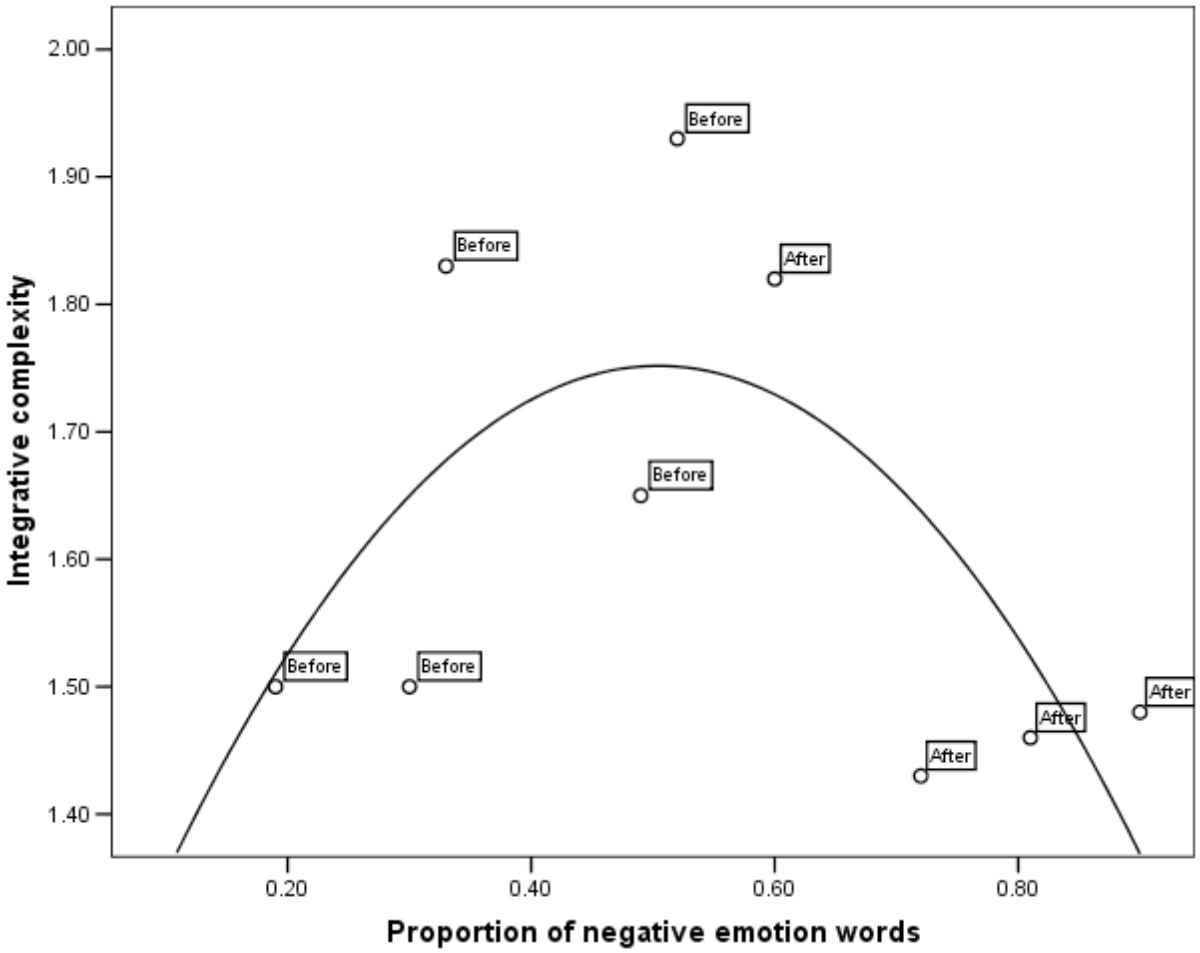

Figure 4.3: Integrative complexity as a function of negative emotion during a live report of the London bombings

In order to assess whether this curvilinear relationship proceeded in the hypothesized sequential fashion, data points in Figure 4.3 representing Stages from 1 to 5 are labeled "Before," while data points from the subsequent stages are labeled "After." As predicted, the former all appear on the positive slope of the regression line (i.e., before the "tip-over" point), while the latter all fall along the negative slope. In other words, during the initial stages of information assimilation, increasing levels of negative emotion were associated with increased IC; however, later on during the broadcast, further increases in negative emotion were associated with decreases in IC.

Discussion

The present study sought to replicate and extend earlier findings in two ways – by testing the disruptive stress hypothesis using a different medium (radio) and in the context of a different terrorist attack (the 2005 London bombings). Despite the new medium and context, however, the data once again support the disruptive stress hypothesis of IC. That is, at low levels of stress, there is a positive relationship between stress and IC, whereas at high levels of stress, there is a negative relationship between stress and IC. Furthermore, in the case of the BBC London radio host this relationship proceeded sequentially, so that the positive slope of the relationship between stress and complexity corresponded to the early stages of the terrorist attack, whereas the negative slope corresponded to the later stages of the attack.

The 2005 London bombings were selected as the ideal context for this case study because they are comparable to the 9/11 terrorist attacks in several ways: i) Both involved multiple, coordinated attacks planned and perpetrated ii) by militant Islamic groups; iii) both targeted modes of transportation in major urban centers during the morning rush hour commute, and iv) they took place in two countries that share a common heritage and are ideologically aligned. Having said this, it is also important not to gloss over the unique features of each event.

One such unique feature may be the source of an inconsistency between the findings of the 9/11 study and the present research – that out of 5 newscasters in the 9/11 newscaster study, only one showed clear evidence of the curvilinear pattern found in the present study (the relationships found were mainly linear and negative). The explanation I offer here concerns the difference between the manner in which news broke regarding the 9/11 attacks and the London bombings. During the 9/11 attacks, while there was room for ambiguity following the crash of the first plane into the World Trade Center (e.g., at that stage the NBC news anchor assumed that "a small plane" had "accidentally collided" with the tower; Couric, 2001), the presence of murderous intent became clear to the newscasters rather abruptly following the second plane

crash into the World Trade Center. During the London bombings, however, the reality that Britain was dealing with a major terrorist attack set in much more slowly. For example, while reports of an innocuous "bang" in the tube network (reportedly due to a power surge) began filtering in at 9:15am, the true extent of the horror only began coming through the news wire an hour later. This gradual inflow of information may have facilitated an extended period of relatively low stress during the London bombings that did not occur during the 9/11 attacks.

Originally, the intent was to replicate the 9/11 newscaster study in more than one context. In fact, a recording of the live broadcast of Radio One (a popular English language music and news radio station in Mumbai, India) was obtained, as it was aired on the evening of July 11, 2006 (the evening of the Mumbai train bombings). This recording comprised a live music and news show with a single host that ran from approximately 6pm IST to approximately 10pm IST[38]. The period between 6pm and 8pm was transcribed and prepared for coding as in Study 1. However, given that this was a music and news show, the selected time period yielded a total of only 10 scorable extracts, rendering the measures considerably less stable. Nonetheless, the extracts were coded for IC and the use of negative emotion words in the same manner as with the BBC London radio newscaster. Inter-rater reliability for IC was also assessed, with a second trained scorer coding all of the extracts, and was found to be sufficiently high at $r = 0.86$.

Once again, the results replicated the curvilinear relationship between the use of negative emotion words and IC, with former explaining 74% of the variance in the latter (see Figure 4.4). However, given the very small number of extracts in this case (10 versus 127 in the case of the London bombings), this result should be interpreted with caution.

One important limitation of this study concerns the statistical techniques employed to test the hypotheses. Data from case studies of this nature, no matter how reliable, do not lend

[38] The Mumbai bombings involved 6 explosions in the city's local train system, all between 6:24pm and 6:35pm. The bombings killed 209 and injured 714 people.

themselves easily to traditional methods as the available statistical power is far too low to detect effects of all but the largest sizes. In this paper, therefore, statistics such as coefficients of determination and Pearson product-moment correlations should be taken only as indices of effect size, and not of statistical significance.

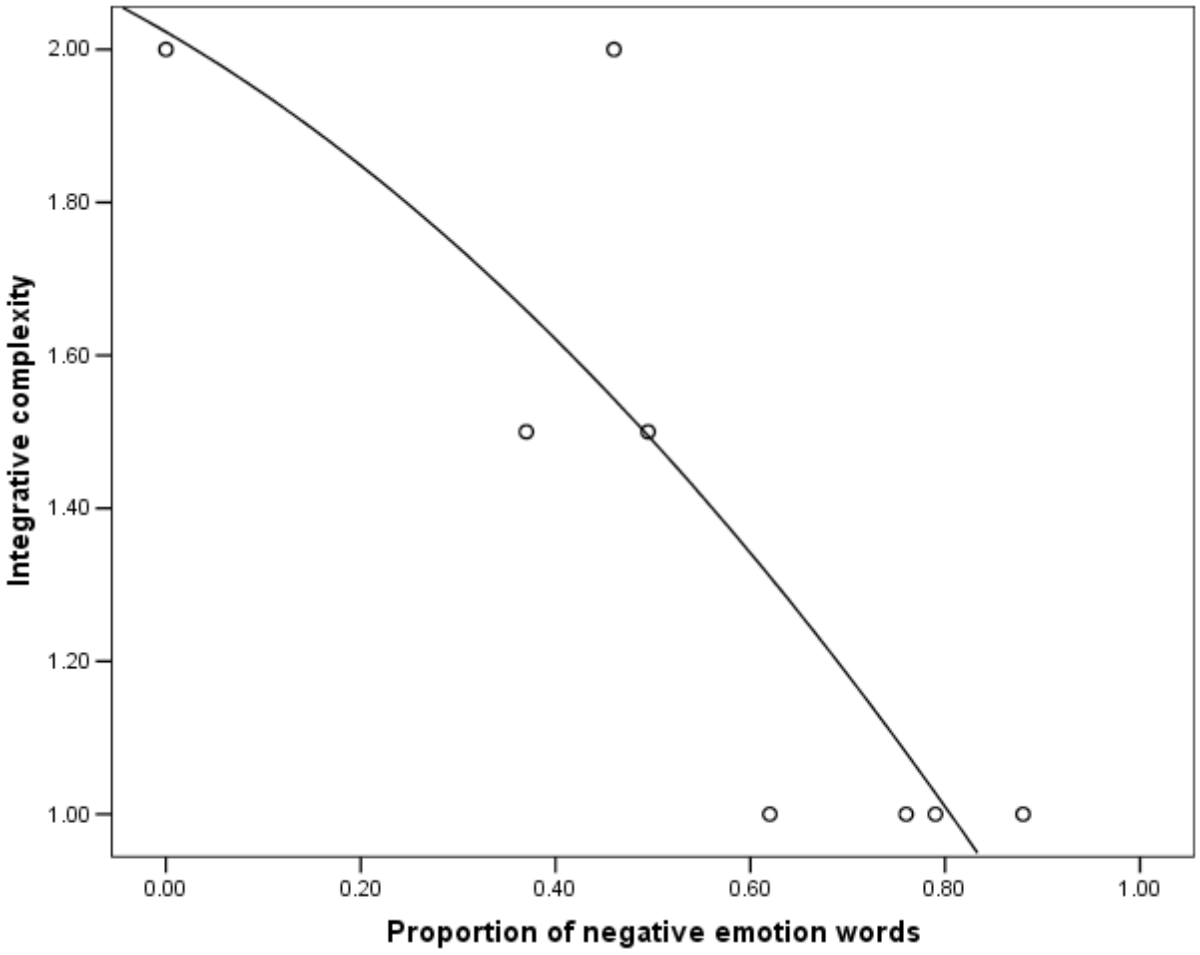

Figure 4.4: Integrative complexity as a function of negative emotion during a live report of the Mumbai bombings

Overall, Study 1 provides good support for the disruptive stress hypothesis of IC. Moreover, it demonstrates empirically for the first time the theoretically-conceived "tipping point" between when stress switches from being an adaptive influence on cognitive processing to being a maladaptive influence. Obviously, the absolute location of this point will differ from individual to individual, as well as within the same individual across different situations. Among

other things, the exact location will depend on the amount of demand placed on the individual's cognitive resources, as well as the person's dispositional ability to cope with the psychological effects of stress.

Another factor shown to affect IC in the study of 9/11 newscasters is psychological distance, i.e., the amount of emotional closeness one feels towards the victims (Jhangiani & Suedfeld, 2005). However, in that study, as only the Qatari newscaster was categorized as having high psychological distance, this factor was confounded with personality. In other words, it is possible that the Qatari newscaster's personality (and not high psychological distance) led to a flattened cognitive and emotional response on his part. This possibility, along with the question of whether the curvilinear relationship between stress and IC holds up for populations other than broadcast journalists, are the issues addressed in Study 2.

STUDY 2: SHORT-TERM REACTIONS OF POLITICAL LEADERS

Having replicated and extended findings from the 9/11 newscaster study in the context of live news reporting during the 2005 London bombings, a second objective was to test the applicability of the disruptive stress hypothesis to the real-world reactions of a different population to terrorist attacks. Whereas newscasters shape the perception of events such as terrorist attacks in the minds of the public, political leaders play a large role in shaping the reactions of their country as a whole. This, together with the relative frequency and accessibility of their statements following national and international disasters, are the reasons why prominent political leaders constitute the sample of this second study.

Research on IC has often used as source materials the speeches and writings of prominent leaders, whether military or political (e.g., Suedfeld et al., 1986; Suedfeld, Tetlock, & Jhangiani, 2007). The latter category has included US Presidents, Canadian and British Prime Ministers, Indian and Pakistani heads of state, various United Nations representatives, revolutionary leaders, and even terrorists (Suedfeld, Conway, & Eichhorn, 2001; Suedfeld & Jhangiani, in press; Suedfeld & Leighton, 2002; Suedfeld & Rank, 1976; Suedfeld, Wallace, & Thachuk, 1993; Tetlock & Tyler, 1996; Thoemmes & Conway, 2007).

The primary goal of these studies of leaders has typically involved the identification of particular patterns of IC in order to predict some outcome of interest, whether electoral success, longevity in office, or even the outbreak of war. However, given the nature of complexity scoring and the roles these leaders perform, the majority of these studies also speak to the effects of personal or societal stressors on cognitive processing. For example, a case study of General Robert E. Lee of the Confederate army showed that he maintained a relatively high level of complexity throughout his lifetime; however, during periods of personal and professional setbacks (e.g., towards the end of the Civil War when the North became increasingly successful), his complexity temporarily declined (Suedfeld et al., 1986). Another general, E.L.M. Burns,

showed a similar pattern of decreased complexity during a sustained period of professional setbacks (Suedfeld & Granatstein, 1995). Similarly, in both 1998 and 2002, the IC of the head of state of Pakistan decreased following nuclear tests conducted by India (presumably a stressful event in Pakistan). Interestingly, in both cases, a similar decrease was observed just a few weeks later in the IC of the Prime Minister of India after reciprocal nuclear tests were conducted by Pakistan (Jhangiani, 2005).

Thus far, only one published study of political leaders has investigated IC following a terrorist attack (Suedfeld & Leighton, 2002). In this study, the IC of George W. Bush and Tony Blair were assessed, starting with a baseline measure of their cognitive processing prior to the September 11, 2001 terrorist attacks, continuing through the subsequent phase of coalition building, and concluding with the launch of the eventual counter-attack against al-Qaeda and the Taliban in Afghanistan a month later. The results from this study provided limited support for the disruptive stress hypothesis, in that Tony Blair's (but not George W. Bush's) IC decreased significantly following the terrorist attacks, while the IC of members of al-Qaeda and the Taliban (but not Osama Bin Laden) decreased significantly following the start of the counter-attack in Afghanistan. One of the explanations offered by the authors for the lack of change in IC observed in the cases of Bush and Bin Laden concerned the generally low level of IC at which each of them were operating at baseline (significantly lower than Blair and members of al-Qaeda, respectively), which may have resulted in a floor effect. Unfortunately, much like the other studies of the complexity of political leaders, this study did not include any direct measure of the stress experienced by the leaders in question, and therefore could not test the hypothesized curvilinear relationship between stress and IC. Furthermore, the post-attack measures of IC aggregated scores from statements made during the 7 days following the attack and counterattack periods, respectively, which did not permit an analysis of the leaders' cognitive processing on a more fine-grained timeline.

Nonetheless, together with the converging evidence of decreases in IC during periods of societal strain from the studies of novelists, scientists, and other prominent individuals (Porter & Suedfeld, 1981; Suedfeld, 1985; Suedfeld & Bluck, 1993), existing research on IC provides strong justification to expect that a terrorist attack would provoke a state of disruptive stress among political leaders, resulting in a decrease in IC. Furthermore, this decrease should be more prominent in cases in which their own country has been targeted or affected (a natural condition of low psychological distance).

The present study tests these two hypotheses by investigating the impact of two separate large-scale terrorist attacks on the IC of two prominent Western leaders. As with Study 1, a measure of stress is included in order to assess the nature of the relationship between stress and IC, and a finer timeline is employed in order to assess their proximal reactions to the attacks.

Method

Speeches and statements made by George W. Bush and Tony Blair before and after the 9/11 attacks and the 2005 London bombings were obtained from the official websites of the President of the United States (http://www.whitehouse.gov) and the British Prime Minister (http://www.number-10.gov.uk). In both cases, in addition to the statements made by both leaders on the days of the terrorist attacks, the nearest available speeches or statements prior to the attacks were also obtained (see Tables 5.1 and 5.2).

Table 5.1

Speeches and statements made by George W. Bush and Tony Blair before and after the 9/11 attacks

Details	Speaker	Time to/since terrorist attack	Location
Baseline	Bush	-1 day	Jacksonville, FL
First statement	Bush	+20 minutes	Sarasota, FL
Later statement	Bush	+2 hours	Barksdale Air Force Base, LA
Baseline	Blair	-10 days	Sao Paolo, Brazil
First statement	Blair	+1 hour	Brighton, England
Later statement	Blair	+5 hours	London, England

Table 5.2

Speeches and statements made by George W. Bush and Tony Blair before and after the 2005 London bombings

Details	Speaker	Time to/since terrorist attack	Location
Baseline	Blair	-15 minutes	Gleneagles, Scotland
First statement	Blair	+2 hours	Gleneagles, Scotland
Later statement	Blair	+7.5 hours	London, England
Baseline	Bush	-15 minutes	Gleneagles, Scotland
First statement	Bush	+3.5 hours	Gleneagles, Scotland

As with Study 1, paragraphs were extracted, coded, randomized, and prepared for scoring with the omission of identifying information. The extracts were coded for IC by a trained scorer, and inter-rater reliability was found to be sufficiently high at $r = 0.84$. Once again, the extracts were scored for the use of negative emotion words with the use of the LIWC program.

Given that the 9/11 terrorist attacks constituted a natural condition of low psychological distance for President Bush and (relatively) higher psychological distance for Prime Minister

Blair, while the 2005 London bombings constituted a natural condition of low psychological distance for Prime Minister Blair and (relatively) high psychological distance for President Bush, this study design also permitted a direct examination of the moderating effect of psychological distance. A dummy variable was therefore created (low versus high psychological distance) for inclusion in the subsequent analyses.

Results

For both Bush and Blair, the IC of their initial statements following the terrorist attacks did not differ significantly from that of their later statements on those days [$t(8) = 0.48$, $p>.05$ & $t(17) = -1.56$, $p>.05$, respectively]. Consequently, for each leader, scores from their initial and later statements were combined to produce an aggregated post-event measure of cognitive processing for each terrorist attack[39].

A 2 (psychological distance = low vs. high) x 2 (time = before vs. after[40]) MANOVA was conducted for Bush and Blair separately, with IC and negative emotion as the two dependent variables. For Bush, the multivariate test was significant for time [Pillai's Trace = 0.22, $F(2, 65) = 8.95$, $p<.001$], indicating a significant psychological impact of the two terrorist attacks. The univariate tests showed that Bush's IC did not change significantly following the terrorist attacks; however, he used significantly more negative emotion words following the attacks [$F(1, 66) = 18.16$, $p<.001$]. This main effect of time on negative emotion was qualified by a marginally significant interaction between time and psychological distance [$F(1, 66) = 3.76$, $p<.10$], indicating that the increase in negative emotion was sharper following the September 11, 2001 terrorist attacks than following the 2005 London bombings. The results for IC and negative emotion word use are depicted in Figures 5.1 and 5.2, respectively.

[39] IC scores ranged between 1 and 5 in the present study.

[40] Strictly speaking, the factor "time" ought to be entered as a within-subjects variable; however, given that scores for individual extracts comprise the "cases" in this study, this was not possible. The main consequence of this limitation is reduced power to detect a significant effect involving time. To compensate for this, marginally significant findings ($p<.10$) are also reported.

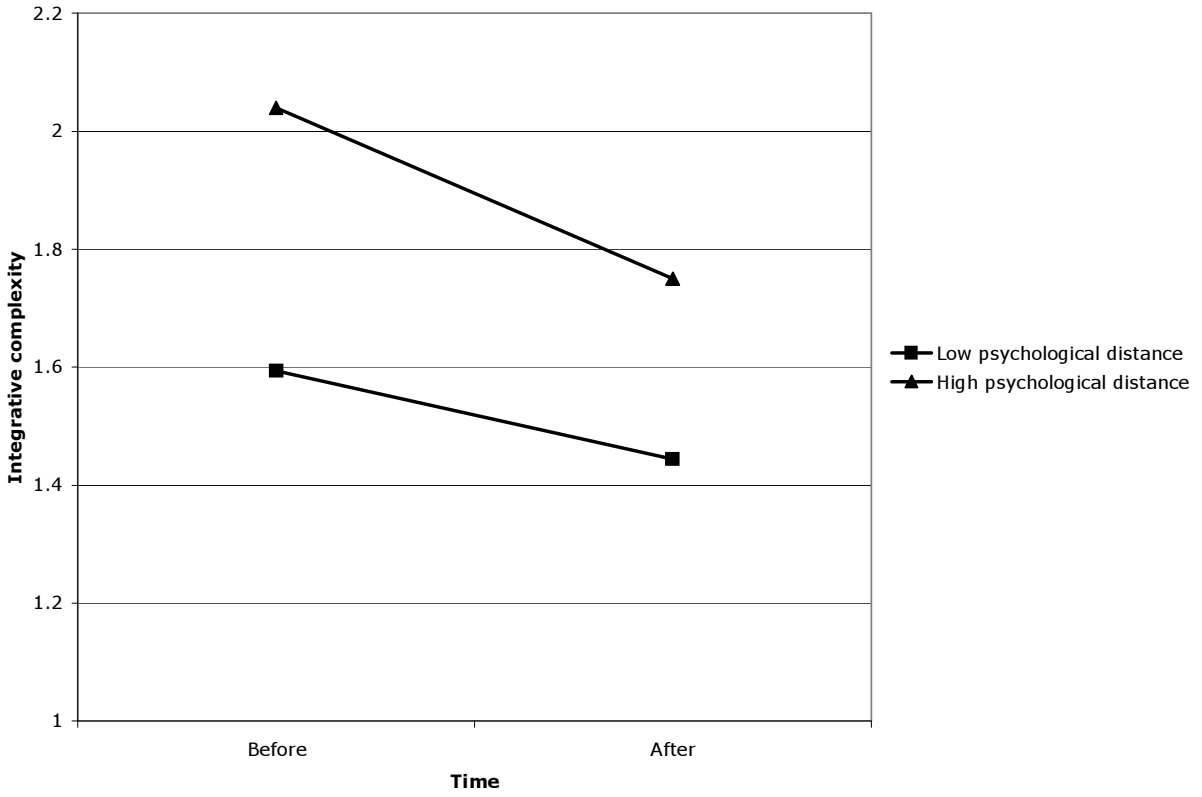

Figure 5.1: Mean changes in integrative complexity by George W. Bush

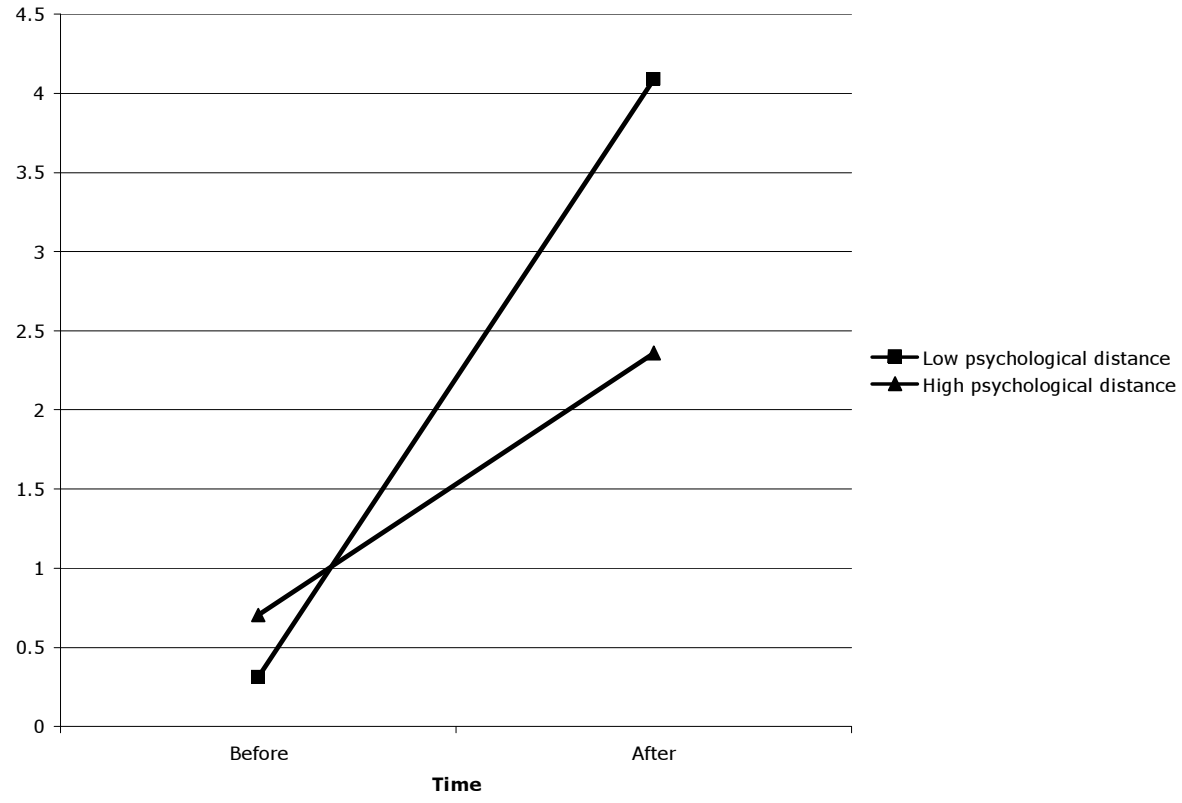

Figure 5.2: Mean changes in negative emotion word use by George W. Bush

For Blair, the multivariate test was also significant for time [Pillai's Trace = 0.47, $F(2, 57) = 24.94$, $p<.001$], indicating a significant psychological impact of the two terrorist attacks. The univariate tests showed that Blair's IC decreased, while his use of negative emotion words increased following the terrorist attacks [$F(1, 58) = 4.76$, $p<.05$ and $F(1, 58) = 117.85$, $p<.001$, respectively]. The results for IC and negative emotion word use are depicted in Figures 5.3 and 5.4, respectively.

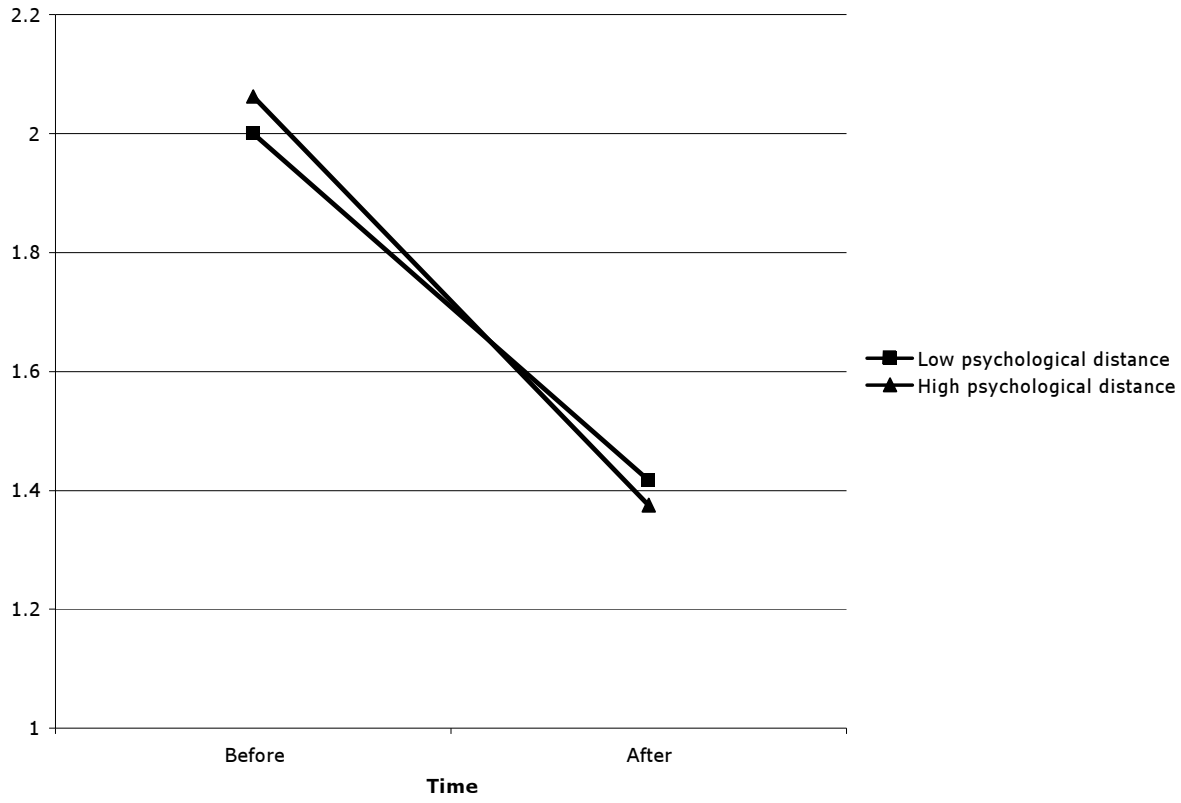

Figure 5.3: Mean changes in integrative complexity by Tony Blair

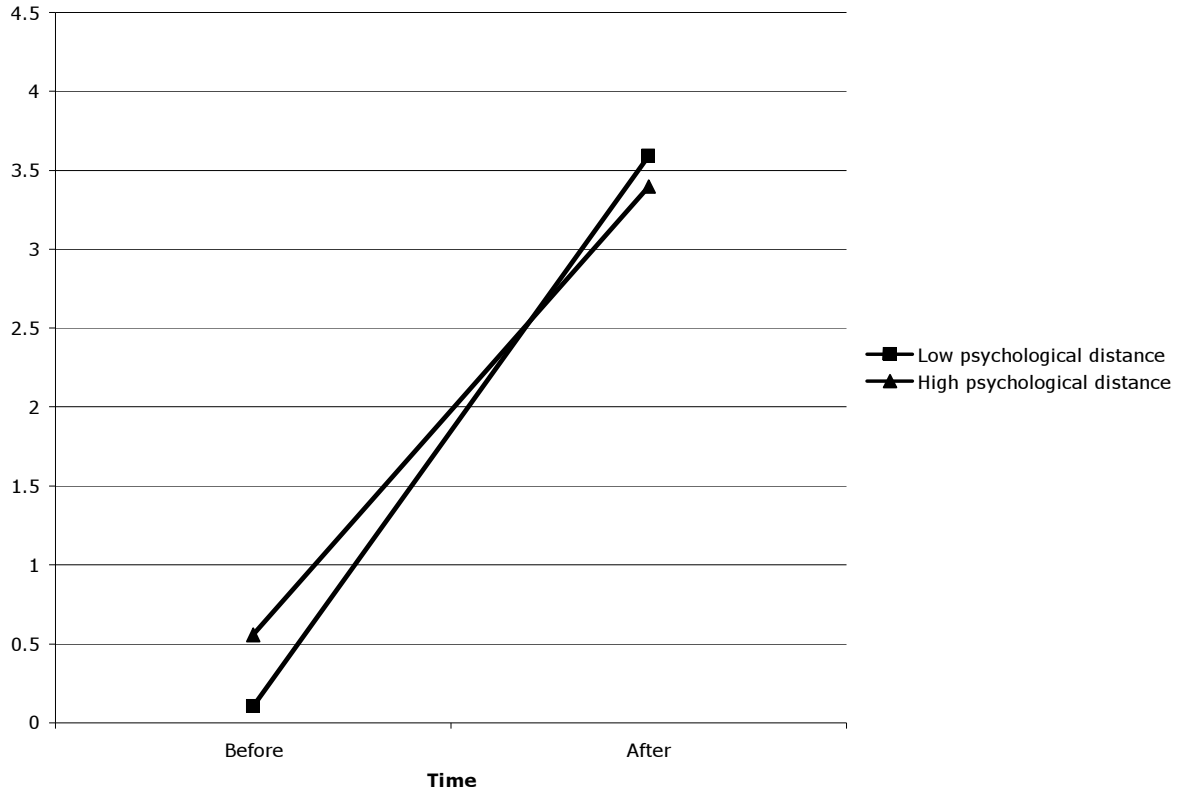

Figure 5.4: Mean changes in negative emotion word use by Tony Blair

Finally, regression analyses identical to that in Study 1 were conducted separately for each leader, with negative emotion as a predictor of IC (each data point representing the mean score of that variable for a particular speech). In the case of George W. Bush, as predicted, the relationship between negative emotion and IC is best described using a quadratic function (R^2 = .55, $F(2,2) = 1.24$, $p>.05$; see Figure 5.5). Furthermore, as was the case with the BBC London radio newscaster in Study 1, data points representing his baseline score appear on the positive slope of the graph, while the data points representing his statements following the two terrorist attacks appear around the negative slope.

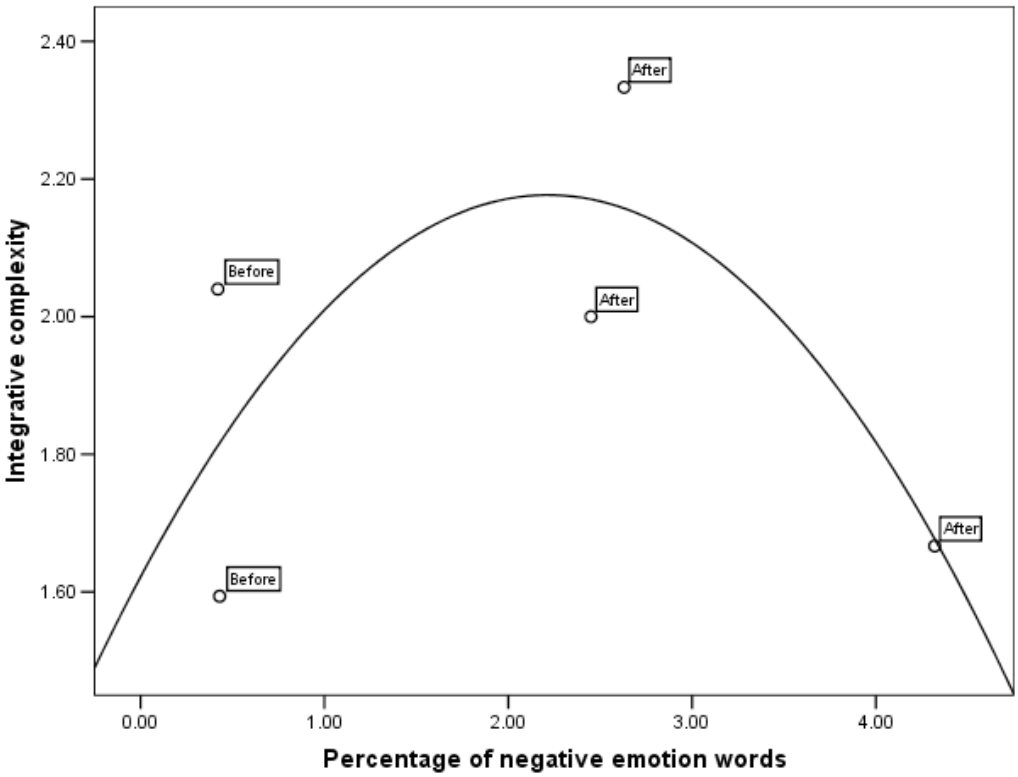

Figure 5.5: Integrative complexity as a function of negative emotion before and after 9/11 and the 2005 London bombings (George W. Bush)

In the case of Tony Blair, the relationship between negative emotion and IC was also slightly better described using a quadratic function than a linear function (R^2 = .94 versus .84, $F(2, 3) = 22.43$, $p<.05$; see Figure 5.6), with the data points once again falling into the hypothesized sequence.

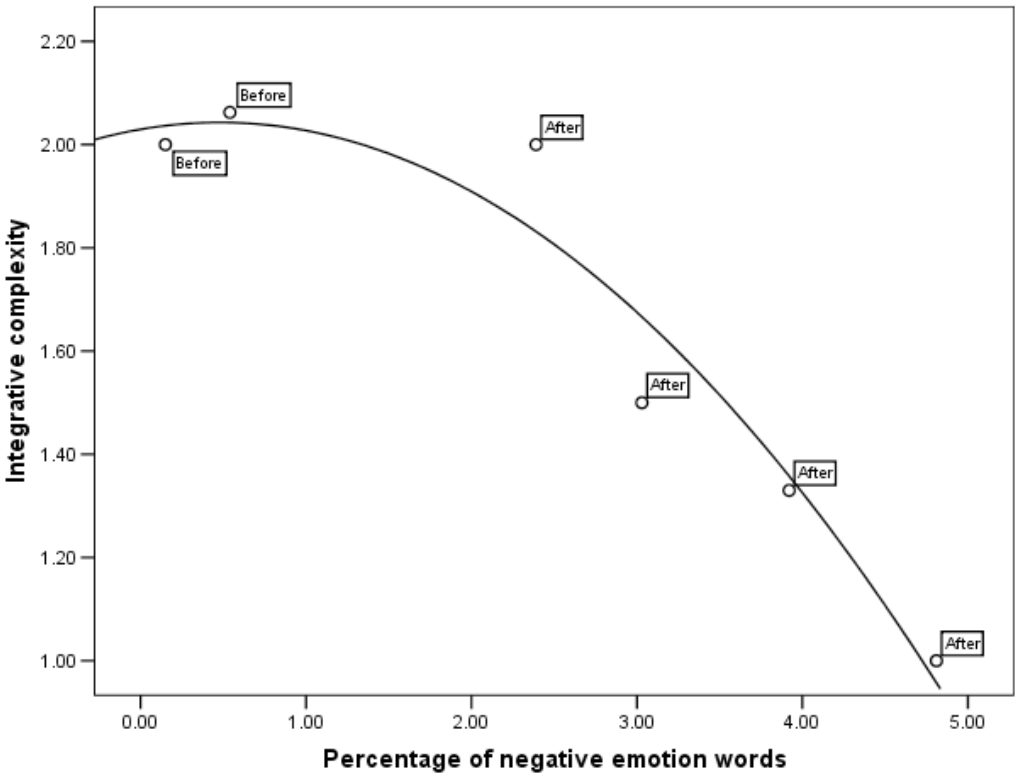

Figure 5.6: Integrative complexity as a function of negative emotion before and after 9/11 and the 2005 London bombings (Tony Blair)

In summary, for both George W. Bush and Tony Blair, the occurrence of a major terrorist attack prompted a significant increase in the use of negative emotion words (although for Bush this increase was particularly strong when the attack occurred at home). For Tony Blair, the attack also brought about a significant decrease in IC. For both leaders, however, negative emotion word use and IC shared a curvilinear and sequential relationship, such that before the terrorist attacks, negative emotion word use was positively (or not at all) related to IC, whereas in the hours following the terrorist attacks, negative emotion word use was negatively related to IC. This finding thus replicates that of Study 1, among a different population and in the context of one additional terrorist attack.

Discussion

The present study considered the short-term cognitive and emotional effects of two different terrorist attacks on two prominent Western leaders. The results supported the disruptive stress hypothesis of IC, replicating twice-over the curvilinear relationship between stress and IC found in Study 1. It can be thus said with some confidence that during a terrorist attack, as people struggle to come to terms with the nature of the event, the level of complexity at which they think may initially increase. However, often emotional arousal surpasses the optimal point and consequently has a negative effect on IC. Furthermore, as with the earlier study of 9/11 newscasters, at least for one of the two leaders, the magnitude of psychological distance between the individual and the target of the attacks determined the strength of their psychological reaction[41].

One issue that arises in the study of political leaders concerns the role of ghost writers, i.e., individuals other than the leader in question who may have written their speeches. This is a legitimate and important issue, as it raises the question of whose psychological reaction we are really measuring. This is not a new issue, however, and has been addressed previously. To begin with, according to Suedfeld and his colleagues:

> at least in the case of important statements, leaders either write much of the material themselves (although they may allow others to "polish" the product), set firm guidelines for the writer that embody their own cognitive approach, modify the final product to be compatible with how they think about the issue, or select writers whose thinking closely matches their own. (Suedfeld et al., 2003, pp. 265-266)

Nonetheless, steps have been taken to test this assumption empirically, for example, by comparing the IC of public and private communications of leaders during the same time period.

[41] It might be noted that the effect of psychological distance on George W. Bush's IC and use of negative emotion words were both in the predicted direction, although these trends did not reach statistical significance.

In such studies, no consistent differences between the two sources have emerged (Suedfeld et al., 2003). In addition, comparisons of scores on a variety of thematic content analysis (TCA) variables (including IC) have not been found to differ significantly between speeches known to have been written by the leader in question and those speeches known to have been written in part or whole by speech writers (e.g., Suedfeld et al., 2007).

Finally, it might be noted that, at least for the purposes of the present study, the distinction between who writes and who delivers a speech is not all that important for two reasons: 1) Regardless of whose words are being read out loud, the public still perceives the words as being that of the leader; and 2) the evidence in support of the hypothesis still stands, except that it may be generalized to reflect the psychological reaction of a team of individuals instead of merely their leader. For now, therefore, the question of ghost writers is immaterial.

As with Study 1, the present study is limited by a relatively small sample (or, more specifically, the small number of extracts available from the brief post-attack statements made by Bush and Blair) and by the treatment of "time" as a between-subjects factor (instead of a within-subjects factor) in the two MANOVAs, something that was unavoidable given that extracts, and not individuals, comprise the cases in the present study. Both of these limitations have the same effect in that they increase the size of the effect required in order to reach statistical significance. Keeping these constraints on statistical power in mind, the significant effects found in the present study are rendered all the more convincing.

Another limitation of the present study, as of Study 1, is that political leaders (and newscasters) differ from the general population in several ways that could conceivably influence the results of these studies. This matter is discussed in more detail and addressed directly in Study 3, which assesses the cognitive and emotional reactions of undergraduate students from Canada and the United States in the days immediately following the 9/11 attacks.

Despite its shortcomings, studying the cognitive and emotional processing of individuals in the manner of these first two studies offers several advantages over more traditional approaches. For instance, the well-known response biases that plague self-report research are wholly avoided, one is able to obtain a fine-grained picture of how individuals respond across time, and it is possible to study topics not amenable to study in the research laboratory (terrorist attacks being a prime example). The perennial questions of psychological realism and generalizability to the real world do not arise, as data collected from the real world are quantified and subjected to the same rigorous scientific methods employed in the research laboratory. Of course, this does not mean that the benefits of laboratory-based research can be supplanted entirely. In fact, it is equally desirable to conduct controlled studies with large sample sizes in order, for example, to assess the individual and interactive effects of dispositional as well as situational factors on cognitive and emotional processing with a reasonable amount of statistical power. This is the next logical step in this program of research.

STUDY 3: SHORT-TERM REACTIONS OF CANADIAN AND U.S. STUDENTS

While Studies 1 and 2 empirically validated the theoretically-conceived curvilinear relationship between negative emotion and IC across two different subject populations and episodes of terrorism, several issues remain to be addressed, foremost among which is the role of personality. So far, we have mainly considered the impact of situational variables (psychological distance and time) on cognition and emotion. We do not know, however, the extent to which personality plays a role in determining how individuals react during and immediately following a major terrorist attack. In addition, the extent to which relevant aspects of personality interact with situational factors to determine cognitive and emotional processing remains an open question. For example, it is possible that a psychological connection to the victims of a terrorist attack leads some (but not all) individuals to experience psychological distress. It is therefore desirable to design research studies that are able to assess the individual and interactive effects of personality and situational variables on participants' cognition and emotion. Two personality variables of principal interest are neuroticism and empathy.

Neuroticism, one of the "Big Five" factors of personality, refers to one's dispositional tendency to experience anxiety, nervousness, sadness, and tension (John & Srivastava, 1999). Neuroticism contrasts even-temperedness on the one hand with negative emotionality on the other, and subsumes six facets: anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability (Costa & McCrae, 1992). Neurotic individuals are more likely to interpret situations as threatening, experience more daily stressors, and respond to these with more anger and greater distress (Friedman, 2000). Neurotic individuals also report more frequent physical illnesses, with more frequent and severe symptoms, even in the absence of a physiological basis for these complaints (Smith & Williams, 1992). In terms of mental health outcomes, neuroticism has been consistently linked with the development of depression and anxiety (e.g., Roelofs, Huibers, Peeters, & Arntz, 2008; Zonderman, Stone, & Costa, 1989).

Empathy broadly refers to one's psychological response to the observed experiences of another (Davis, 1983). It is a multidimensional construct that includes both cognitive and emotional aspects. Specifically, it includes one's ability to take on the perspective of another person, as well one's emotional reactivity in response to the distress of another. The emotional aspect of empathy, too, has been disaggregated into the experience of "other-oriented" feelings of compassion and concern versus "self-oriented" feelings of distress and anxiety, in response to viewing the distress of others (Davis, 1983). These theoretical distinctions have stood up to empirical validation in that the cognitive ability to take the point of view of another person has consistently been found to be correlated positively with other-oriented emotional empathy on the one hand, and negatively with self-oriented emotional empathy on the other (e.g., Davis, 1980; Davis, 1983). The relationship of dispositional empathy to others measures of interpersonal functioning is similarly nuanced: Perspective-taking (cognitive empathy) is associated with less social dysfunction, more social competence, higher self-esteem, and trait forgivingness; other-oriented emotionality is associated with some shyness and anxiety, but with less boastfulness and egotism; and self-oriented emotional empathy is strongly associated with low self-esteem, shyness, social anxiety, vulnerability, uncertainty, and fearfulness (Berry, Worthington, O'Connor, Parrott, & Wade, 2005; Davis, 1983). Self-oriented emotional empathy thus appears to be correlated with a number of negative health and interpersonal outcomes.

A second question arising out of Studies 1 and 2 concerns the issue of generalizability. So far, this research has investigated the impact of major terrorist attacks on broadcast journalists and political leaders. These two groups differ from the general population in several ways, not the least of which are their relatively high status in society, their access to information not in the public domain, and the extent to which they routinely engage in impression management. This is a particularly important issue to consider in light of the personality traits that tend to go along with these roles (e.g., extraversion, self-monitoring, etc.). For this reason, it is desirable to

investigate the relationships between the variables among a sample drawn from, or at least more closely resembling, a normal population.

Finally, as mentioned earlier, while the idiographic approach adopted for Studies 1 and 2 enabled a fine-grained longitudinal investigation of intra-psychic processes among a few select individuals, the statistical limitations of the case study approach present problems including an inability to speak to statistical significance (in Study 1) and low power to detect small effects (in Study 2). A larger sample size is therefore a prerequisite for research in this area to move forward.

The present study attempts to address each of the three issues raised here, through concurrently investigating the impact of personality and situational factors on the short-term reactions of more than 250 undergraduate students from Canada and the United States in the days immediately following the 9/11 terrorist attacks.

Study 3a: Canada

Method

Seventy-two hours following the 9/11 attacks, 219 University of British Columbia (UBC) undergraduate students took part in the first phase of data collection for Study 3a in exchange for course credit[42]. Specifically, they provided written open-ended responses to the following instruction: "Please describe your reactions to the terrorist attacks, especially at the World Trade Center. Include 1) whom you contacted when you heard, and 2) whether you have any personal connection with New York City." These open-ended responses were transcribed, and then coded for the following variables:

[42] The raw data for Study 3a were collected by Delroy Paulhus and are used with permission.

Integrative complexity

A qualified scorer who was blind to the hypotheses coded the 219 open-ended responses for IC. Inter-rater reliability was assessed with a second qualified scorer coding 30% of the extracts, and was found to be sufficiently high at 0.89.

LIWC variables

As with the previous studies, the participants' open-ended responses were scanned into the LIWC program and coded for the incidence of negative emotion words.

With a view to expanding the set of variables under consideration, additional verbal indices of distress were sought. The use of function words in general and pronouns in particular has been discovered to vary according to psychological states, including anxiety in the face of personal as well as societal stressors (Chung & Pennebaker, 2007). In fact, James Pennebaker, the author of the LIWC software program, provides an argument for the study of pronouns that echoes the advantages of coding for IC: "Given that function words are so difficult to control, examining the use of these words in natural language samples . . . [provides] a non-reactive way to explore social and personality processes" (Chung & Pennebaker, 2007, p. 349). Accordingly, the use of first- person (e.g., I, me, we, our, etc.) and second-person (e.g., you, you'll, etc.) personal pronouns was also computed.

Connection to New York City

Two research assistants independently rated each participant's self-reported personal connection to New York City (NYC) on a binary scale [0=no connection to NYC (n=164), 1=some connection to NYC[43](n=53)] from reading their open-ended responses. Inter-rater agreement was perfect.

[43] This category included participants who had family, friends, or acquaintances living in NYC.

The second phase of data collection took place approximately 3-4 weeks after Phase 1. At this time, 221 UBC undergraduates (157 or 71%[44] of whom had also provided data during Phase 1) completed a take-home questionnaire battery, once again in exchange for course credit. The questionnaire battery collected basic, non-identifying demographic information from the participants[45] (e.g., gender, ethnicity, etc.), and also included the following measures of personality:

Neuroticism

The BFI-44 Scale[46] (John & Srivastava, 1999) is a widely-used measure that assesses each of the five fundamental dimensions of personality, including extraversion, neuroticism, agreeableness, conscientiousness, and openness. However, given that only neuroticism is theoretically relevant to the current investigation, results concerning the other factors are not discussed in this paper. The subscale for measuring neuroticism comprises 8 items, and includes statements such as "Worries a lot" and "Remains calm in tense situations." For each item, participants rate themselves on a five-point Likert-type scale ranging from 1 = Disagree strongly to 5 = Agree strongly. The alpha reliability for this subscale in the present study was 0.87.

Empathy

The Interpersonal Reactivity Index (IRI; Davis, 1980) is a well-validated and reliable measure of dispositional empathy. It includes four discrete subscales, each consisting of seven items assessed along a five-point Likert-type scale ranging from 0 = Does not describe me well

[44] Phase 2 of data collection included 64 new participants not present during Phase 1. Consequently, the attrition rate from the original sample of 219 students was 28.31%.
[45] The participants' open-ended responses were matched with their questionnaire data using numeric codes.
[46] While Costa and McCrae's NEO questionnaires remain the best-validated self-report measures of the big five factors, the BFI-44 has strong convergent validity with the NEO, with advantages including fewer items that are both shorter and easier to understand (John & Srivastava, 1999). As a result, the BFI-44 has been recommended for use in research settings where participant time is a matter of concern and where one is not specifically interested in the different facets of each of the big five.

to 5 = Describes me very well. The four subscales measure perspective-taking (PT; the cognitive ability or tendency to adopt the point of view of another person), empathic concern (EC; the tendency for the respondent to experience feelings of warmth, compassion, and concern when witnessing the distress of others), personal distress (PD; the tendency for the respondent to experience feelings of fear, discomfort, and anxiety when witnessing the distress of others), and fantasy (FS; the tendency of the respondent to imagine him or herself in fictional situations as in books or movies, or even daydreams). Given that the Fantasy Subscale is not theoretically relevant to the present study, it is not discussed further. Alpha reliabilities for the remaining subscales were as follows: PT = 0.76, EC = 0.75, and PD = 0.76.

Other measures included in the questionnaire battery were the Self-Concept Clarity Scale (Campbell et al., 1996), the Self-Report Psychopathy scale (SRP-II; Hare, Harpur, & Hemphill, 1989), the Mach IV scale (for measuring Machiavellianism; Christie & Geis, 1970), and the Narcissistic Personality Inventory (Raskin & Hall, 1979). However, as these measures are not relevant to the present study, they are not discussed further.

Hypotheses

On the basis of existing theory, several hypotheses are offered concerning the relationships among the measures in this study:

Relations among trait measures

1. There is considerable conceptual overlap between neuroticism and the Personal Distress Subscale of the IRI. Consequently, these two constructs will be positively correlated.[47]

[47] There are no other clear-cut predictions that can be derived from existing theory concerning the relationships between neuroticism and the other IRI subscales.

2. Given that seeing another person's point of view is a prerequisite for experiencing "other-oriented" distress, the Perspective-Taking Subscale of the IRI will correlate positively with the Empathic Concern Subscale of the IRI.

3. The more one takes the point of view of someone else in distress, the less one should be focused on one's own distress. Thus, the Perspective-Taking Subscale of the IRI will correlate negatively with the Personal Distress Subscale of the IRI.

Relations between trait measures and integrative complexity

4. Neurotic individuals will be more likely to experience anxiety and stress, and therefore show symptoms of cognitive strain, as per the disruptive stress hypothesis of IC. As a result, neuroticism will correlate negatively with IC[48].

5. Individuals who have a tendency to focus on their own reaction when witnessing others in distress are more likely to show signs of cognitive strain. As a result, the Personal Distress Subscale of the IRI will correlate negatively with IC.

6. The cognitive ability and tendency to take the point of view of another lends itself to arriving at a more differentiated opinion, regardless of the topic. Consequently, perspective-taking will correlate positively with IC.

Relations between trait measures and LIWC variables

7. Given that negative emotionality is a defining feature of neuroticism, the latter will correlate positively with the use of negative-emotion-related words.

[48] Given that the students' open-ended responses were collected shortly after the 9/11 terrorist attacks, there is no phase of reduced stress in the present study. Consequently, all hypotheses concerning IC anticipate linear relationships.

8. Empathic concern and the use of second-person personal pronouns might be regarded as trait and state measures of the same underlying construct; consequently, they are expected correlate positively.

9. Personal distress and the use of first-person personal pronouns might also be regarded as trait and state measures of the same underlying construct; consequently, they too are expected to correlate positively.

Moderators

10. One consistent finding in the research literature is that women tend to score higher on neuroticism and various state and trait measures of emotional distress. Women, therefore, are expected to score higher than men on neuroticism, personal distress, and the use of negative-emotion-related words.

11. Given that psychological distance appears to be an important moderator of the cognitive and emotional impact of a negative event, students with some connection to NYC will show more signs of distress (a greater use of negative emotion words and first-person personal pronouns, and lower IC) than those with no connection to NYC.

In addition to the formal hypotheses outlined above, other relationships of theoretical interest (e.g., between IC and the use of personal pronouns) will also be explored. However, in the absence of existing theory or research in these areas, no *a priori* hypotheses are offered. Similarly, while multiple regression analyses will be performed to assess the predictive validity of dispositional and situational factors on cognitive and emotional processing, no *a priori* hypotheses are offered.

Results

The zero-order correlations between all measures are reported in Table 6.1. Using Spearman's double-entry correction procedure (Ree & Carretta, 2006), the correlations involving

the measures of personality or IC[49] were corrected for attenuation due to measurement error. These are also reported in Table 6.1 in parentheses below the uncorrected correlation coefficients.

[49] IC scores ranged between 1 and 4 in the present study.

Table 6.1

Correlation matrix for the UBC sample

Variable name	1	2	3	4	5	6	7	8
1. Neuroticism	.87	-.14* (-.17)	.16* (.20)	.51*** (.63)	-.15 (-.17)	.03 (.03)	.14 (.15)	-.06 (-.06)
2. Perspective-taking		.76	.25*** (.33)	-.24*** (-.32)	.06 (.07)	-.12 (-.14)	-.08 (-.09)	.00 (.00)
3. Empathic concern			.75	.12† (.16)	-.03 (-.04)	.01 (.01)	.05 (.06)	.16* (.18)
4. Personal distress				.76	-.20* (-.24)	.09 (.10)	.24** (.28)	.07 (.08)
5. Integrative complexity					.89	-.05 (-.05)	-.14* (-.15)	.02 (.02)
6. Negative emotion words						-	.01	-.19**
7. First-person pronouns							-	.04
8. Second-person pronouns								-

† <.10, * <.05, ** <.01, *** <.001

Note: Alpha/inter-rater reliabilities on the diagonal.

Relations among trait measures

As predicted in Hypothesis 1, neuroticism is strongly positively correlated with personal distress [$r(221) = 0.51$, $p<.001$]. Neuroticism was also significantly related to perspective-taking [$r(221) = -0.14$, $p<.05$] and empathic concern [$r(221) = 0.16$, $p<.05$]. Hypotheses 2 and 3 were also supported, in that perspective-taking was positively related to empathic concern [$r(221) = 0.25$, $p<.001$] and negatively related to personal distress [$r(221) = -0.24$, $p<.001$]. Finally, there was a marginally significant positive relationship between empathic concern and personal distress [$r(221) = 0.12$, $p=.08$].

Among the 157 participants for whom data on all variables were available, the relationship between neuroticism and personal distress was even stronger [$r(157) = 0.61$, $p<.001$], while the relationships between perspective-taking on the one hand and empathic concern and perspective-taking on the other were comparable [$r(157) = 0.27$, $p<.05$ and $r(157) = -0.24$, $p<.05$, respectively]. However, in this subset of the sample, neuroticism did not predict perspective-taking or empathic concern (both p's $>.05$).

Relations between trait measures and integrative complexity

Hypothesis 4 received qualified support, as the negative correlation between neuroticism and IC approached statistical significance [$r(157) = -0.15$, $p=.07$]. Hypothesis 5 was also supported, as personal distress correlated negatively with IC [$r(157) = -0.20$, $p<.05$]. Hypothesis 6 was not supported.

Relations between trait measures and LIWC variables

Hypotheses 7 was not supported; however, hypotheses 8 and 9 received support, as empathic concern correlated positively with the use of second-person personal pronouns [$r(157) = 0.16$, $p<.05$], and personal distress correlated positively with the use of first-person personal pronouns [$r(157) = 0.24$, $p<.01$].

Moderators

The results generally supported Hypothesis 10, as women scored higher than men on neuroticism and personal distress [$t(155) = 2.63$, $p<.01$ and $t(155) = 3.01$, $p<.01$, respectively]. Women also scored higher on empathic concern and used more first-person personal pronouns than did men [$t(155) = 4.28$, $p<.001$ and $t(206) = 3.73$, $p<.001$, respectively]. It is noteworthy that men did not score higher than women on any of the trait or state measures of distress.

There was mixed support for the moderating effect of psychological distance (Hypothesis 11), as individuals with some connection to NYC used more first-person personal pronouns [$t(215) = -2.04$, $p<.05$] but also used fewer negative emotion words [$t'(138.51) = 2.58$, $p<.05$[50]] than those with no connection to NYC.

Multiple regression analyses

Given that the four measures of personality are moderately to strongly correlated with one another, multicollinearity due to essential ill-conditioning is a potential problem in this study (Cohen, Cohen, West, & Aiken, 2003). To work around this, the effect of each personality variable is considered separately.

In the first set of analyses, the personality variable was entered into the regression equation along with psychological distance and the term representing the interaction between the two. Following the procedure recommended by Aiken and West (1991), all continuous predictors were centered on zero. The same regression equation was used to predict each of the four criterion variables (IC, negative emotion word use, first-person pronoun use, and second-person pronoun use).

[50] The t-value and degrees of freedom reported here are corrected using Welch's (1947) procedure due to violation of the assumption of equality of variances.

A. Neuroticism

The overall regression equation for neuroticism did not explain a significant proportion of the variance for any of the four dependent variables. None of the individual predictors reached statistical significance.

B. Perspective taking

The overall regression equation predicting negative emotion word use was marginally significant [R^2 = 0.05, F(3,153) = 2.44, p = .07], with perspective taking the only significant individual predictor (β = -0.18). In other words, controlling for connection to NYC, perspective taking negatively predicted the use of negative emotion words.

C. Empathic concern

The overall regression equation predicting IC was not significant [R^2 = 0.04, F(3,153) = 2.31, p = .08]; however, the interaction term between empathic concern and connection to NYC reached statistical significance (β = -0.25). A simple slopes analysis indicated that for UBC students with no connection to NYC, empathic concern did not significantly predict IC; however, for UBC students with some connection to NYC, empathic concern negatively predicted IC (β = -0.33; see Figure 6.1).

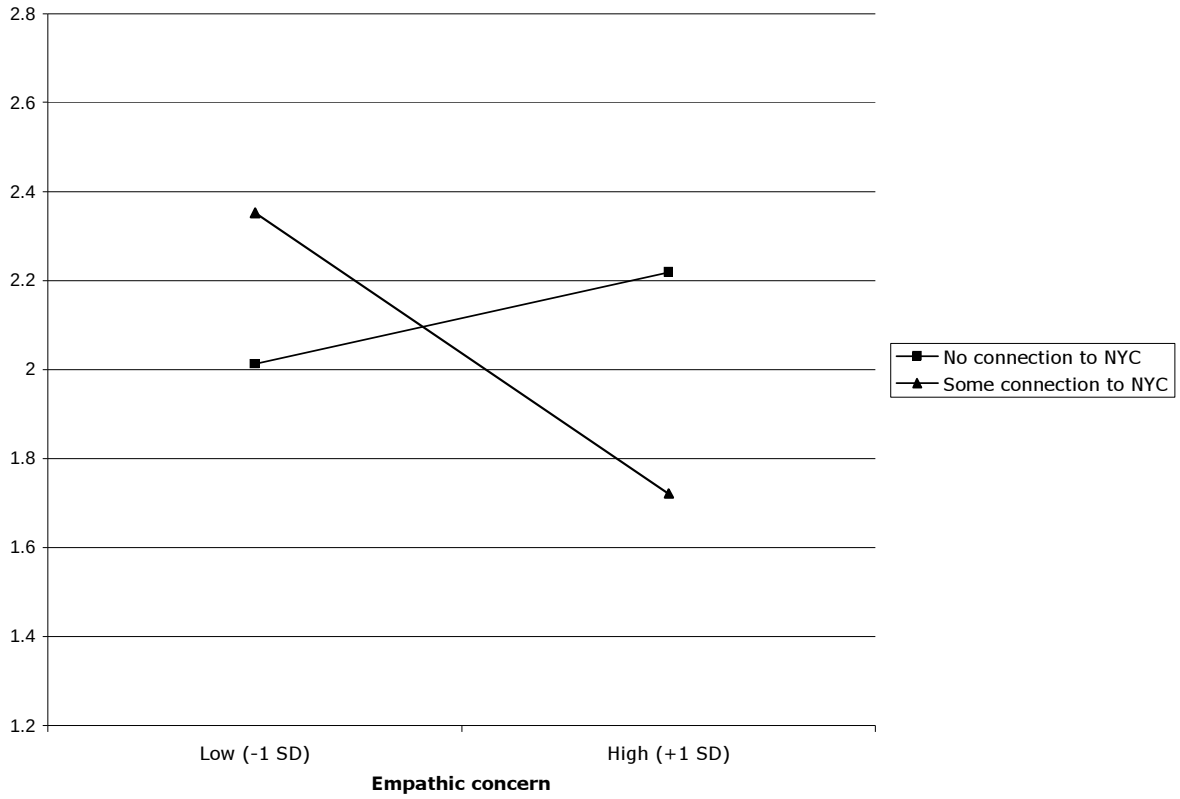

Figure 6.1: Integrative complexity as a function of empathic concern among students with some or no connection to NYC

The overall regression equation predicting the use of second-person personal pronouns did not reach significance; however, empathic concern was a significant individual predictor of the use of second-person personal pronouns ($\beta = 0.19$).

D. Personal distress

The overall regression equation predicting IC was statistically significant[51] [$R^2 = 0.06$, $F(3,153) = 3.51$, $p < .05$], with the interaction term between personal distress and connection to NYC reaching significance ($\beta = -0.19$). As with empathic concern, a simple slopes analysis indicated that for UBC students with no connection to NYC, personal distress did not significantly predict IC; however, for UBC students with some connection to NYC, personal distress negatively predicted IC ($\beta = -0.46$; see Figure 6.2).

[51] Although the value of R^2 in the analyses reported in this section range from .04 to .07 (the majority of which do not reach statistical significance), according to Cohen (1992), these are all in the range of small to medium effect sizes.

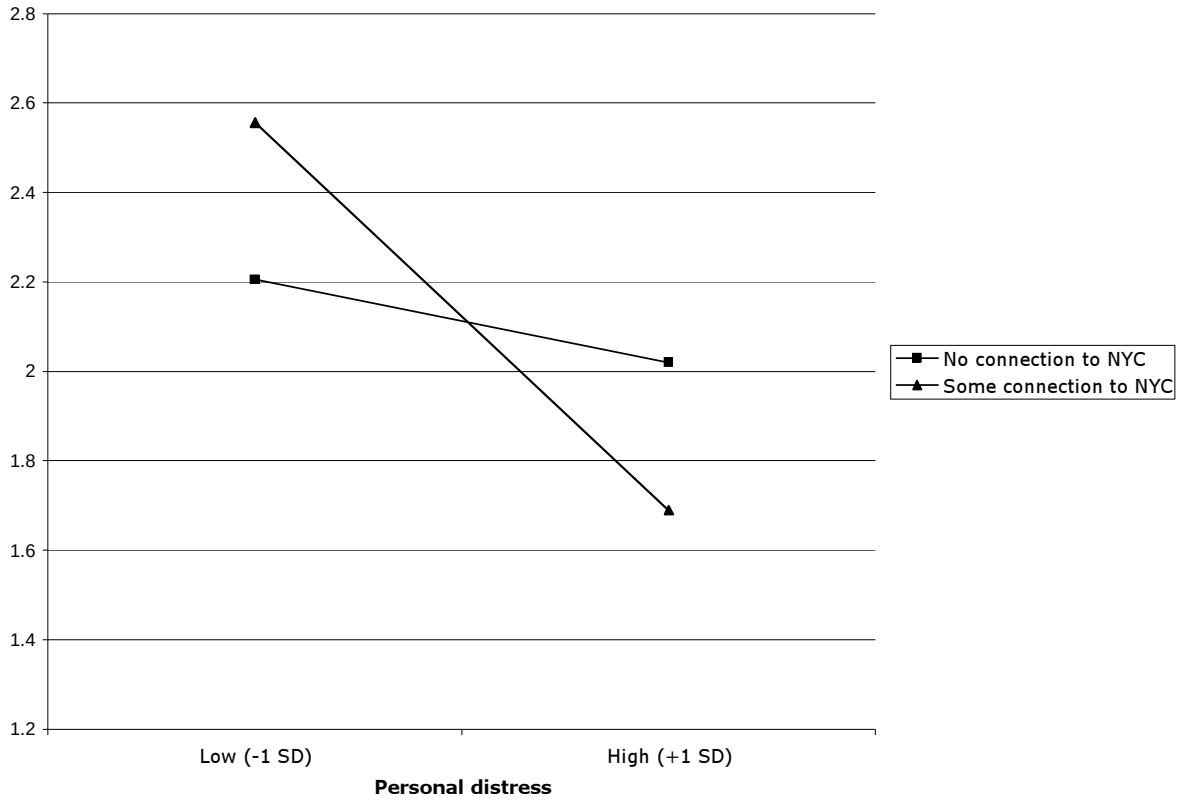

Figure 6.2: Integrative complexity as a function of personal distress among students with some or no connection to NYC

The regression equation predicting the use of first-person personal pronouns was also statistically significant [$R^2 = 0.07$, $F(3,153) = 3.74$, $p < .05$], with personal distress the only significant individual predictor ($\beta = 0.22$).

A second set of analyses included two additional terms, gender and the interaction term between gender and the personality predictor, in each of the regression equations. The results did not change substantially with the inclusion of these two predictors, except that gender emerged as a significant predictor of the use of first-person personal pronouns in the regression equation for each of the four personality variables (β's ranging between -0.35 and -0.25), with women using more first-person personal pronouns in all cases.

These results are discussed later, together with those of study 3b.

Study 3b: United States

Method

Twenty-four hours following the 9/11 attacks, 51 University of Rochester (UR) undergraduate students provided written open-ended responses to the following instruction: "Think about how you felt yesterday, as the news of the tragedy sank in. Try to reflect a moment on your feelings yesterday. How did the events make you feel? How do you make sense of your personal reaction to this situation?" The students received course credit in exchange for their participation[52]. As with the UBC undergraduates, these open-ended responses were first transcribed, and then coded for the following variables:

Integrative complexity

A qualified scorer who was blind to the hypotheses coded the 51 open-ended responses for IC. Inter-rater reliability was assessed with a second qualified scorer coding 30% of the extracts, and was found to be sufficiently high at $r = 0.85$.

LIWC variables

As with the Canadian students, the participants' open-ended responses were scanned into the LIWC program and coded for the use of negative emotion words, as well as the use of first- and second-person personal pronouns.

The participants also completed a brief questionnaire that collected basic demographic information (e.g., gender), and that included the following measure of mood:

Positive and negative affect

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a brief self-report measure of mood, specifically of positive affect (the extent to which one experiences enthusiasm and pleasurable engagement) and negative affect (the extent to which one experiences subjective distress and unpleasurable engagement). The scale has been shown to

[52] The raw data for Study 3b were collected by Harry Reis and are used with permission.

have high reliability, regardless of whether the instructions are modified to assess general (trait), recent, or momentary mood (Watson et al., 1988). The scale contains ten adjectives that load highly on each factor (e.g., excited, determined, and attentive vs. afraid, distressed, and irritable). In the present study, participants rated themselves on each adjective on a 7-point Likert-type scale, in accordance with the following instructions: "How did you feel once the news of yesterday's tragedy had sunk in?" The alpha reliabilities for the two subscales in the present study were 0.76 (positive affect) and 0.77 (negative affect).

Hypotheses

Test of convergent validity (negative emotion)

12. The PANAS and LIWC coding of negative emotion words are both measures of emotional state. It is therefore logical to expect a positive correlation between negative affect (PANAS) and the LIWC measure of negative emotion. Furthermore, although negative and positive affect were originally conceived of as orthogonal dimensions by the authors of the PANAS, recent research has repeatedly shown that a better-fitting model permits the two dimensions to be correlated, albeit only modestly (e.g., Crawford & Henry, 2004). As a result, there may also be a negative relationship between positive affect (PANAS) and the LIWC measure of negative emotion.

Moderator

13. Psychological connection to NYC, now expanded to a 3-point scale[53] across both student samples [0=no connection to NYC (n=164), 1=some connection to NYC (n=53), 2= residing in New York State (n=51)], will moderate the psychological impact of the 9/11 attacks. Individuals who have a stronger connection with NYC will show:

[53] Considered to be a nominal or (at best) ordinal scale.

a. Lower IC

b. Greater use of negative-emotion-related words

c. Greater use of first-person personal pronouns

d. Lesser use of second-person personal pronouns

Results

The zero-order correlations between all measures are reported in Table 6.2. Using Spearman's double-entry correction procedure (Ree & Carretta, 2006), the correlations involving the PANAS subscales and IC were corrected for attenuation due to measurement error. These are also reported in Table 6.2 in parentheses below the uncorrected correlation coefficients.

Table 6.2

Correlation matrix for the University of Rochester sample

Variable name	1	2	3	4	5	6
1. PANAS positive affect	.76	-.11 (-.14)	.18 (.22)	-.32* (-.37)	-.04 (-.05)	.00 (.00)
2. PANAS negative affect		.77	-.27† (-.33)	-.05 (-.06)	-.03 (-.03)	.32* (.36)
3. Integrative complexity			.85	-.10 (-.11)	.04 (.04)	.13 (.14)
4. Negative emotion words				-	.16	-.32*
5. First-person pronouns					-	-.02
6. Second-person pronouns						-

† <.10, * <.05, ** <.01, *** <.001

Note: Alpha/inter-rater reliabilities on the diagonal.

Test of convergent validity (negative emotion)

Hypothesis 12 received limited support, as although there was no relationship between PANAS negative affect and the use of negative-emotion-related words, PANAS positive affect was significantly inversely related to the use of negative-emotion-related words [$r(50) = -0.32$, $p<.05$].

Two other significant relationships emerged, between the use of second-person personal pronouns on the one hand and PANAS negative affect and negative emotion word use on the other, although, surprisingly, these relationships run in opposite directions [$r(50) = 0.32$, $p<.05$ and $r(51) = -0.32$, $p<.05$, respectively]. There was also a marginally significant negative relationship between PANAS negative affect and IC [$r(50) = -0.27$, $p=.06$].

Moderator

Collapsing data across both student samples, four one-way ANOVAs were performed in order to test for the effect of connection to NYC on IC and the three LIWC variables.

There was a non-significant trend for individuals residing in Rochester to score lower in IC than those residing in Vancouver, regardless of whether the latter had some or no connection to NYC [$F(2, 265) = 2.37$, $p = .08$; see Table 6.3 below].

The use of first-person personal pronouns varied significantly according to the degree of connection to NYC [$F(2, 265) = 17.92$, $p<.001$], with post-hoc Tukey tests showing that the students in Rochester used significantly more first-person personal pronouns than either of the two groups in Vancouver (both p's $<.01$).

Finally, the use of second-person personal pronouns varied significantly according to the degree of connection to NYC [$F(2, 265) = 3.37$, $p<.05$], with post-hoc Tukey tests showing that the students in Rochester used significantly more second-person personal pronouns than those in Vancouver with no connection to NYC ($p<.05$) and marginally more second-person personal pronouns than students in Vancouver with some connection to NYC ($p=.06$).

The use of negative-emotion-related words did not vary systematically according to the degree of connection to NYC.

Table 6.3

Means for all four dependent variables, as a function of psychological distance

Variable name	Group 1	Group 2	Group 3
Integrative complexity	2.15[a]	2.06[a]	1.80[a]
Use of negative emotion words	4.85[a]	4.03[a]	4.71[a]
Use of first-person pronouns	6.86[a]	7.71[a]	9.47[b]
Use of second-person pronouns	0.08[a]	0.06[a]	0.22[b]

Note: Group 1 = UBC students with no connection to NYC, Group 2 = UBC students with some connection to NYC, Group 3 = Students residing in New York state. Group means with different superscripts differ significantly (p<.06).

Discussion

Taken together, Studies 3a and 3b greatly enhance our understanding of how dispositional and situational factors combine to determine our cognitive and emotional reaction to a major terrorist attack. While Studies 1 and 2 demonstrated the curvilinear relationship between negative emotion and IC within the same individuals across time, Study 3a demonstrates that individuals who chronically experience more anxiety and negative emotion (i.e., those higher in neuroticism and personal distress) are also more likely to show lower IC when processing information.

Overall, eleven of thirteen hypotheses were supported by the data. The interrelationships among the three measures of empathy are consistent with previous research, while the theoretically-derived assumption concerning the overlap between neuroticism and the Personal Distress Subscale of the IRI was also borne out. Cognitive empathy played a role in determining the students' reactions to 9/11, with perspective-taking predicting negative emotion, even after controlling for the individual and interactive effects of psychological distance. A more important contribution to the literature, however, is the finding that individual differences in self- and

other-oriented emotional empathy are both reflected in spontaneous speech (in the use of first- and second-person personal pronouns, respectively). This provides criterion validity for the LIWC program, and also suggests an important tool for future research on the construct of empathy. Remarkably, despite the sizeable research literatures on the construct of empathy and the use of pronouns in natural language, we are not aware of any previous published study that has attempted to bring together these two lines of research.

Study 3b also tested the convergent validity of the two measures of mood (positive and negative effect as measured by the PANAS, and negative emotion as computed by the LIWC software program). Although positive affect and negative emotion were negatively correlated, the two measures of negative emotion were unrelated. While surprising, this finding is not unprecedented in the literature, as at least one study has found that mood (as measured by the PANAS) does not relate well to the overall affective content of written materials (as coded by computer software; Goldman, 2003). In this instance, the author suggested that the divergence may come from the fact that the PANAS and the computer word-counting program are tapping into separate aspects of emotional change, with the former representing emotions experienced at an explicit level and the latter representing emotions experienced at a more implicit level.

Two potential moderators of the psychological response to a terrorist attack were also investigated – gender and psychological distance. The former played an important role in Study 3a, with women scoring higher on neuroticism and both forms of emotional empathy. The use of first-person personal pronouns by women in Study 3a also suggested that their attention was directed inward to a greater extent than was the case with men, an outcome which has been consistently linked with negative health outcomes including depression, high blood pressure, frequency of physician visits, and even suicidal tendencies (Campbell & Pennebaker, 2003; Chung & Pennebaker, 2007; Stirman & Pennebaker, 2001).

The moderating effect of psychological distance in Study 3a was evidenced in the significant interactions between empathic concern and personal distress on the one hand and psychological distance on the other, when predicting IC (depicted in Figures 6.1 and 6.2, respectively). Both of these emotional aspects of trait empathy were found to have an effect on the psychological reactions of only those UBC students who had some personal connection to NYC.

Psychological distance was also found to have a direct effect on three of four outcome measures (IC, first- and second-person personal pronouns) after including the participants from Study 3b as a separate category. However, a few qualifications must accompany this finding. First, as with Study 2, psychological distance is confounded with geographical distance. The only group that permits one to tease the two apart (UBC students with some connection to NYC) was not consistently found to differ from the other Vancouver group on the four outcome variables, making it difficult to reach any firm conclusions about which construct is a more powerful predictor of cognitive and emotional processing. Of course, in most situations in the real world, psychological and geographic distance are highly correlated. The distinction, therefore, while conceptually important, may be moot in practice.

What is perhaps of greater concern is that the open-ended responses of the students from the University of Rochester differed from those of the UBC students in at least two ways that permit alternative explanations for the significant differences between the two groups. For one, the average length of the open-ended responses of the students from the University of Rochester was significantly different from that of the UBC students [182.14 vs. 152.62 words, respectively; $t(268) = 3.28$, $p<.001$]. Although this has no impact on the LIWC variables (which control for the total number of words in the extract), it might be a cause for concern with IC, which is known to correlate moderately with the length of the paragraph or scorable unit (Coren & Suedfeld, 1990). However, in this case, because it is the responses of the students from the

University of Rochester that are longer, this confound is ruled out as an alternative explanation. In fact, the case for psychological distance becomes all the more impressive, as despite having longer open-ended responses, the IC of the students at the University of Rochester was significantly lower than that of the students at UBC.

A second alternative explanation for the differences in IC and pronoun use between the two samples concerns the time frame during which the responses were collected. While the Rochester sample provided their open-ended responses 24 hours after the 9/11 attacks, the UBC sample provided theirs 72 hours after the attacks. Given that it is possible that the psychological impact of the attacks waned gradually as time elapsed following the attacks, the differences between the two samples might simply be attributed to the normal stress and coping response. Unfortunately, in the present study it is not possible to rule out this explanation.

On a final note, it should be mentioned that during the design phase of this study, it was decided to also code the participants' open-ended responses for psychological non-immediacy (Wiener & Mehrabian, 1968), a subtle, non-verbal indicator of emotional closeness (high non-immediacy equals low emotional closeness and vice-versa). The rationale for the inclusion of this variable was that, along with IC and the LIWC measures, non-immediacy is also a content-analytical measure, and might provide valuable convergent validity with the categorical measure of the participants' connection to NYC.

Indeed, when the statistical analyses were conducted, the participants' connection to NYC was found to have an effect on their non-immediacy [$F(2,265)=8.75$, $p<.001$]. However, Tukey post-hoc tests revealed that the Rochester University students ($M = 1.38$) scored significantly higher in non-immediacy than the UBC students with no connection to NYC ($M = 1.07$). On the surface, this result appears to be directly contrary to the hypothesis (UBC students showed more signs of emotional closeness than students at the University of Rochester). However, upon closer examination, this was found to be due to that the majority of the students'

open-ended responses referred not to the victims of the 9/11 attacks, but rather to the terrorists. To attempt to work around this, non-immediacy was re-scored for only those sentences with explicit references to the victims of the 9/11 attacks. Of the original combined sample of 270 students, only 80 (29.63%) were found to have made even a single reference to the victims in their open-ended responses. Even looking only at these references, the participants' non-immediacy scores were not found to vary along with their connection to NYC [$F(2,77)=0.27$, $p>.50$]. The variable non-immediacy was therefore excluded from all further analyses.

Overall, Studies 3a and 3b complemented the idiographic approach taken by Studies 1 and 2 by investigating the short-term psychological reactions of a large number of students from Canada and the United States. This approach allowed for proper statistical testing of a number of *a priori* hypotheses, as well as the investigation of several other relationships of interest. Both of the key personality variables of interest – neuroticism and empathy – were found to play an important role in determining how individuals cognitively and emotionally processed the horrific and tragic events of 9/11. In addition, gender and psychological distance also play a role in determining the severity of individuals' reactions. Perhaps most interesting, however, is the finding that for some aspects of personality, it is the interaction with situational factors such as psychological distance that proves crucial in determining the short-term psychological reactions of lay individuals.

Overall, this dissertation offers a much better understanding of the immediate and short-term cognitive and affective reactions to major terrorist attacks than was previously available. The successful application of IC coding promises much for the advancement of both the complexity and "reactions to terrorism" literatures. Additional merits of this research include the successful implementation of creative research techniques (e.g., the analyses of the speech of newscasters), the establishment of the validity of recent measures (e.g., the relationships between the use of first- and second-person personal pronouns as computed by the LIWC software

program and different aspects of dispositional empathy), the investigation of the psychological reaction to terrorism along a finer timeline than has been previously attempted, and the establishment of the generality of the results of this investigation across three different populations and two major terrorist attacks. Several questions arise from this dissertation, however, and form the basis for future research.

Future directions

1) Although Study 3 provides a portrait of the psychological reactions of a large group of students 2-3 days after the 9/11 attacks, a snapshot is all that it provides. Ideally, a replication of Study 3 should be attempted with the inclusion of a baseline measure of IC and negative emotion. This will enable a test of the individual and interactive effects of personality and situational factors on changes in cognitive and emotional processing.

2) According to a recent study, the verbal labeling of television news as "breaking" or "live" on its own results in more cognitive resources being used by viewers (Miller & Leshner, 2007). Other, related research has found that increases in the structural complexity of television messages (e.g., the number of camera changes per second) are related to the use of more cognitive resources, at least up until the point of cognitive overload (Lang, Park, Sanders-Jackson, Wilson, & Wang, 2007). However, the assumption in Study 1, that the manner in which breaking news about a terrorist attack is presented by newscasters could affect the psychological reactions of the viewing or listening public, remains to be tested. Specifically, it would be valuable to connect changes in the IC of newscasters with changes in the IC of their audience. This research could take the form of simulation-based studies, for example, with the different conditions involving breaking news about the same (fictitious) terrorist attack delivered at differing levels of IC. While the psychological realism of such a study will not compare to data obtained from the real world, this research would allow for the assessment of the impact of changes in IC and negative emotion on decision-making (e.g., the inclination of individuals to

make risky vs. cautious choices) and would provide a direct link between the findings from Studies 1 and 3 in this dissertation.

3) The question of whether the psychological reaction to a terrorist attack differs from that to any major negative event (e.g., a natural disaster) also remains to be addressed. According to Crenshaw:

> little is known about the psychology of government decision making with regard to terrorism. Often reactions to terrorism fall into the category of crisis responses, as many of the factors that encourage less than optimal decisions (time pressures, extremely consequential outcomes, lack of information, and concern for public image or reputation) are present. (2000a, p. 46)

Although Crenshaw makes specific reference to government decision-making here, the point may be generalized to the general population. Fortunately, case studies such as those in Studies 1 and 2, as well as the simulation-based research just proposed could both be used to address this question, with complementary levels of internal validity and real-world generalizability. Potential moderators include the extent to which the event was expected, perceived control over the personal impact of the event, and perceived culpability (e.g., claims of responsibility in the case of terrorism or a perceived lack of government response during a natural disaster).

4) Finally, as mentioned in Chapter 3, the development of a scale to measure meta-complexity is highly desirable. Apart from its obvious organizational applications, it would allow for the test of the hypothesis that individuals who are poorer cognitive managers (i.e., those who score low on meta-complexity) are likely to cope more poorly in the face of a major negative event such as a terrorist attack.

Terrorism is ubiquitous. It is not unique to a particular location, nor to people of a particular ethnic background or political leaning. The massacre of eleven Israeli athletes at the

1972 Munich Olympics, the bombing of Air India flight 182 over the Atlantic Ocean in June 1985, the sarin nerve gas attack in the Tokyo subway system in March 1995, and the bombing of the Murrah federal building in Oklahoma City in April 1995 are prominent twentieth-century examples that attest to the heterogeneity of this phenomenon. In fact, it is this heterogeneity that has made defining terrorism a challenging task, one that has occupied (or pre-occupied) scholars for several decades (Crenshaw, 2000b).

Prior to the 9/11 attacks, it is fair to say that far more was known about the psychologies of terrorists themselves than about the effects of their actions on the general public. Ever since the devastating attacks on September 11, 2001, however, terrorism and its effects have pervaded our daily lives as never before (whether on the news or through changes in public policy). As a result, it has become increasingly important to study the psychological effects of terrorism on individuals, particularly those individuals who shape how terrorism is perceived by the general population. As noted earlier, however, although the post-9/11 research literature on the psychological effects of terrorism is voluminous, it is plagued with problems that include an over-reliance on small, non-representative samples, the lack of a baseline measure of the variables under consideration, too great an emphasis on the search for negative outcomes, and a dearth of studies on immediate and short-term psychological reactions. This dissertation represents a first step towards addressing the gaps in this literature.

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Appendix I

Sample paragraphs representing different nodal scores of integrative complexity

Integrative complexity score	Extract	Explanation
Score of 1	Handcrafted furniture is expensive because there are few skilled artisans willing to work at this time-consuming craft.	One-dimensional statement, with no evidence of either differentiation or integration.
Score of 3	Handcrafted furniture is expensive in part because there are few skilled artisans and in part because most people do not have the good taste to appreciate high quality work.	Multiple dimensions recognized, revealing clear differentiation, but still no integration.
Score of 5	The market value of handcrafted furniture is determined jointly by the willingness of suppliers to produce such products at varying prices and the willingness of buyers to purchase such products at varying prices. In technical terms, price is the intersection of the supply and demand curves.	Alternative perspectives or dimensions held in focus simultaneously and viewed interactively. An explicit expression of integration.

Integrative complexity score	Extract	Explanation
Score of 7	The market value of handcrafted furniture is determined jointly by the willingness of suppliers to produce such products at varying prices and the willingness of buyers to purchase such products at varying prices. In technical terms, price is the intersection of the supply and demand curves. Many factors affect exactly where that intersection point lies. For example, in periods of economic recession, demand falls sharply because people turn to less aesthetically appealing, but more functional, forms of furniture. Many artisans are thrown out of work. In periods of prosperity, the opposite pattern of preferences emerges. The result may be a costly bidding war for handcrafted furniture. However, markets usually do return to equilibrium – either as a result of shortages pushing prices up and making it more profitable for artisans to return to work or as a result of high prices forcing buyers out of the market and reducing aggregate demand.	The presence of an overarching principle pertaining to the nature of the relationship between clearly delineated alternatives.

Appendix II

Terrorist attacks worldwide since 9/11 that resulted in 100 or more civilian casualties (as of July 1, 2008)

Date	Location	Date	Location
May 2, 2002	Bojayá, Colombia	Feb. 3, 2007	Baghdad, Iraq
Oct. 12, 2002	Bali, Indonesia	March 6, 2007	Hillah, Iraq
Oct. 23, 2002	Moscow, Russia	April 18, 2007	Baghdad, Iraq
Feb. 18, 2003	Daegu, South Korea	April 23, 2007	Mogadishu, Somalia
Feb. 1, 2004	Arbil, Iraq	July 3, 2007	Islamabad, Pakistan
Feb. 21, 2004	Lira, Uganda	July 7, 2007	Ameril, Iraq
Feb. 27, 2004	Mariveles, Philippines	Aug. 15, 2007	Sinjar, Iraq
March 2, 2004	Baghdad & Karbala, Iraq	Aug. 28, 2007	Kandahar, Afghanistan
March 11, 2004	Madrid, Spain	Oct. 6, 2007	N. Waziristan, Pakistan
Aug. 13, 2004	Bujumbura, Burundi	Oct. 18, 2007	Karachi, Pakistan
Sept. 1, 2004	Beslan, Russia	Oct. 22, 2007	Wardheer, Ethiopia
Feb. 28, 2005	Various locations, Iraq	Nov. 1, 2007	Ogaden region, Ethiopia
May 13, 2005	Andijan, Uzbekistan	Dec. 19, 2007	Various locations, Spain
Sept. 14, 2005	Baghdad, Iraq	Feb. 4, 2008	Kajo-Keji, Sudan
Oct. 13, 2005	Nalchik, Russia	Feb. 4, 2008	Ndjamena, Chad
April 12, 2006	Various locations, Chad	Feb. 8, 2008	Abu Soruj, Sudan
July 11, 2006	Bombay (Mumbai), India	Feb. 10, 2008	Darfur, Sudan
Nov. 23, 2006	Baghdad, Iraq		

Note: Data from the Terrorism Research Center (www.terrorism.com)