[Student's Name]
[Linguistics 300 Level Course]
[Date]
Remembering 9/11
An Analysis of the Language Used Following a Tragedy
Word Count: 4,178

Introduction: Language Following a Tragedy

In the days following the September 11th attacks, Americans sought outlets to express their emotions of anger, fear, and confusion. One such outlet was newspapers, in which reporters and editors used words and phrases such as "terror, attacked, how many dead, bastards, a nation in anguish, act of war, evil acts, assault, and America's darkest day."1 More intimate outlets were the millions of text messages and telephone calls between family members and friends following the attacks. At the same time, Americans turned to television media to try and make sense of the tragedy and to unite behind the President's words.

The linguistic legacy of September 11th is profound. Words such as "ground zero," "terrorism," "Al-Qaeda," and "jihad" entered the American vernacular in full force. Yet, studying the language used immediately following a tragedy has a more important purpose than predicting the widespread adoption of a few new words. The long-term psychological impacts of mass violence are profound: 8-10% of New Yorkers experienced symptoms consistent with post-traumatic stress disorder and 40% of Americans felt a significant stress response.2 Analyzing the language used by Americans in the wake of the September 11th attacks will provide psychologists with a critical understanding of the emotional response following a tragedy. Even more importantly, it can enable health professionals to anticipate reactions and then proactively offer counseling and emotional support.

Until recently, analyzing the language used on and after September 11th was prohibitively difficult. However, recent advances in computer software have made it much easier to analyze the hundreds of newspapers, the thousands of video clips, and the half-million personal text messages released on the Internet about this national tragedy. In completing my research, I analyzed three types of data: personal text messages, newspaper headlines, and finally people's written responses 10-years later about their strongest memory of 9/11.

The personal data consisted of over a half-million text messages that were sent on September 11th. I turned to WikiLeaks, the website known for disclosing sensitive and classified information, to review the personal text messages.3 To help protect privacy, I removed all phone numbers when presenting text messages in this report. Next, I examined the Newseum's collection of over 100 newspapers published on September 12th.4 Finally, I turned to The New York Times to view responses that people wrote 10-years after the attack about their strongest memories.5

My hypothesis is as follows:

(Personal texts) Because an individual's first concern immediately following a tragedy is to check-in with family members, I expect to find words/phrases such as "please call." Psychological research dictates that during a tragedy people undergo a "fight or flight" response, which leads me to expect anxious words. Finally, I do not anticipate many words describing "sadness," because that emotion is typically delayed.6

(Newspaper headlines) Because journalists need to follow journalistic conventions when writing, I do not expect any substantial deviations from typical headlines. I do, however, anticipate the use of capital letters to denote the seriousness of the attack. I also believe that the word "terrorist" won't appear frequently simply because Americans had little exposure to the word and there was not complete certainty about the perpetrators as of 9/12/01.

(Reader comments) Consistent with idea of flashbulb memories, I predict that 9/11 responses will be highly detailed, vivid, and full of emotions even though 10 years had passed.7

It is my hope that mental health professionals will be able to use my linguistic data to better understand individuals' reactions following a tragedy. Please note that some of the data may be difficult for readers to review.

Literature Review: Deducing the Psychological Impact Through Language

Before discussing the literature about reactions to the September 11th attacks, it is important to highlight the general reactions following a traumatic event. According to a University of Buffalo publication, many people express shock and disbelief immediately following a tragedy. The shock and disbelief often manifests itself as feelings of hopelessness, detachment, and a sense of numbness. Next, individuals typically have a strong desire to check in with loved ones and seek more information about the event. “People will talk to others about what each knows. Seeking out and talking to others can be very helpful as it creates connections, defeats isolation, and allows individuals to naturally debrief traumatic experiences.”[8]

After the initial shock wears off, people typically become upset or angry. It is at this time that affected individuals must have a constructive “outlet for the ventilation of these feelings.”[9] These heightened feelings of sadness or anger can continue for weeks following the tragedy.[10]

In my research, I came across two reports specific to the linguistic events of September 11th. The first report entitled “The Emotional Timeline of September 11,” explored the immediate emotional reactions to the attacks.[11] Researchers Back, Kufner, and Egloff determined the percentage of words related to sadness, anxiety, and anger by running the WikiLeaks text message data through the Linguistic Inquiry and Word Count (LIWC) software (Back, Kufner, and Boris 2004). The study described the fact that the attacks did not “immediately result in sadness.”[12]

By contrast, anxiety levels spiked with each significant event—the planes hitting the World Trade Center (WTC), the attack on the Pentagon, and the collapse of the WTC. Interestingly, anxiety levels returned to baseline levels within a couple hours of each event. Finally, researchers found that anger expressed in text messages rose steadily throughout the day—only pausing during President Bush’s speeches, which can be “interpreted as a vicarious acting out of people’s anger.” All in all, “people did not react primarily with sadness; they experienced a number of anxiety outbursts, but recovered quickly; and that they steadily became angrier.”[13] A graphical representation from the study is included below:[14]

The second report, entitled “Linguistic Markers of Psychological Change Surrounding September 11th,” analyzed the diaries of 1,084 U.S. users of online journals from July 2001 (prior to the attack) to November 2001.[15] Journals were all publically available on livejournal.com. Researchers Cohn, Mehl, and Pennebaker then also used the LIWC software to analyze depression, psychological distancing, anxiety, and cognitive processing.[16]

Current research demonstrates the following: (1) Young adults use more “first-person singular pronouns” when “depressed or dealing with a personal crisis.”[17] (2) Traumatic events are “often followed by social sharing, seeking of social support…and an increased collective orientation.”[18] Linguistically, this is demonstrated with additional second-person, third-person, and first-person plural pronouns.[19] (3) People try to distance themselves from a tragedy by using “verbal nonimmediacy,” which manifests itself as longer words, more articles, and fewer uses of present tense and first-person singular.[20] (4) Finally, causal words, such as because, cause, and effect” are suggestive of high cognitive processing, which helps “predict recovery from the trauma.”[21]

Using the above guidelines, researchers Cohn, Mehl, and Pennebaker found that in the short run following the September 11th attacks, participants “expressed more negative emotions, were more cognitively and socially engaged, and were psychologically distant in their daily journal writings.”[22] However, 2 weeks after the attacks participant’s “moods and social referencing returned to baseline, but the increase in distancing persisted, and their level of cognitive analysis was significantly lower.”[23] Two critical conclusions emerged: The first was that the ability to experience “positive emotions following a tragedy was critical for resistance.”[24] The second was that “the cognitive effects of traumatic events may persist for long periods of time, even after the emotional effects have faded.”[25]

Methodology:

I first started by analyzing the personal text message data available on WikiLeaks. After downloading over 500,000 text messages containing 6.4 million words and 6,450 pages of data, I was quite overwhelmed. I therefore turned to the internet to try and find already analyzed data. Thankfully, in 2010, Jeff Clark created a “Phrase Cloud” video that highlighted the most used words.[26] The larger a word appeared in the video meant that it was used more often than a smaller word. I transcribed the data from his video and re-created it graphically below: The “Y-axis” indicates the frequency of the words used and the “X-axis” shows the time (Figure 2)

After compiling a high-level overview of the most frequently used words in the 9/11 text messages, I combed through the data to identify 50 representative sample texts. 27 While difficult to read, these messages represent a sample of the half-million messages sent. I have included them below: All formatting is identical to the original text message. I replaced phone numbers with the (*) symbol to help protect the privacy of the sender. (Figure 3). I then followed the same procedure as in the “Emotional Timeline of September 11th” by using the LIWC program to analyze all the text messages below.28
West Wing of White House evacuated amid terrorist threats.
?LET ME KNOW IF YOU'RE OKAY. IF YOU CAN'T GET THROUGH THE PHONE JUST SEND ME AN E-MAIL.

BE SAFE. USE YOUR BEST JUDGEMENT. FINISH, COME IN, OR GO HOME. NO IN
From Rapp, Kim A.: DONNA, GOD BLESS YOU AND YOUR FAMILY. KIM

Robyn.Ba***@gecapital.com|Please call!|Team - we just want to make sure everyone is okay. Please call me, Jody or Heather. 501-587-*** or 70** or 7**. Robyn

Stele*| Please call Steve Lee when you can to let me know you are ok. 408-776-****

Dbau**|To all, because of the bombings, coming into work today is optional. I would encourage all of you to work at home if at all possible today.

are closing. Downtown is closing. Offices are giving options to leave. What should we do? -per Woodrina - Switchboard 11:59:15 AM

PLEASE CALL MOM AT 845 878 **** OR LEAVE A MESSAGE ON MY HOME PHONE WHERE EVERYBODY IS. (60

Ai, we are on emergency status. Call your first line supervisor at RO and be advised of further information. Again, FAA is on high alert and emergency status. Please call me

to take advantage of it. I would like to hear from you to make sure you are safe. JR

CALL JIMMY AS SOON AS POSSIBLE. IT'S IMPORTANT. 510-843-****

cstucki|Please...Leave me a message or e-mail or 949-709-*** to let me know that you and all your friends and family are ok. Chuck

schools are experienciing some problems with parents showing up in a little =>

Please call me when you get this message at 650-833-**** or 650-269-****. I hope you are both fine.
PLEASE LET ME KNOW THAT YOU ARE SAFE. -D .
jay did you get a glimpse of the news?please call me if you get a chance..i love you-trisha

OUT OF THE DARKNESS WE CRY TO YOU, O GOD. ENABLE VICTIMS,

CNN.com -- Second World Trade Center tower collapses in Manhattan For complete coverage of this story visit: http://www.CNN.com or AOL Keyword: CNN CNN Headline News has changed everything but -1/3
Osama Bin Louden gave a report to an Arabic newspaper that the US was going to suffer immediate attacks.

JOE IT WAS ANOTHER PLANE THAT HIT THE PENTAGON. NOT A BOMB AS ORIGINALLY REPORTED. ALL US FLIGHTS HAVE BEEN GROUNDED. DENNIS

9:30am who told me he had spoken to &#38; accounted for everyone in B&#38;I. I was stuck on my train and eventually able to make it back home @ 973-378-****. Pager &#38; cell services not working -1/2

(4)04-I AM FINE AND EVERYTHING IS NORMAL IN DALLAS. PLS CALL ME IF YOU HERE FROM STEPHANIE OR RYAN. CELL PHONE 214-549-****; OFFICE 214-880-****. ADRIENE

Netde*@nbc.com||FAA: ALL DOMESTIC AIR TRAVEL HAS BEEN CANCELLED. ALL PLANES CURRENTLY FLYING ARE BEING DIRECTED TO LAND AT NEAREST AIRPORT

I LEFT YOU A DETAILED MESSAGE ON YOUR OFFICE VOICEMAIL. PLEASE PAGE ME AND CALL ME AT 212 749 **** TO LET ME KNOW WHERE YOU ARE. I'M IN SOHO AND WALKING HOME. IT WILL TAKE ME SEVERAL HOURS

BESIDES JUST BOMBING THE PENTAGON, ELIZABETH'S GRAND DAUGHTER WORKS IN TALLAHASSEE AND SAID THEY HIT THE LINCOLN TUNNEL. CALL ME. LOVE, YOUR WIFE.

MAJOR BREAKING NEWS- I NEEED ALL NEWS PERSONNEL TO REPORT IN IMMEDIATELY- JOHN

THIS IS JIM TYLERS MOTHER. PLEASE HAVE HIM CALL ME 251 943 ****

Due to extremely high call volume we are blocking traffic. At this time only Costco. Costco call volume is at 11,000. Blocking 6,338.

Terrible tradgedy involving terorism and World Trade and Pentagon. US Air travel is grounded. Wanted to make you aware -- just in case time zones had prevented corporate awareness and response.

GOOD MORNING HOPE YOU HAD A GOOD EVENING WONDERING IF YOU HEARD THE NEWS, GIVE ME A CALL AT WORK IF YOU GET A CHANCE AND CHARGE TO HOME PHONE XOXO DANIELLA

Please call the office just to let us know you are okay. Thanks Patrice -Patrice Barber (70

I NEED TO KNOW YOUR AVAILABILITY ASAP WE KNOW NO DETAILS YET CALL ME AT 881-**** THE WHOLE TEAM NEEDS TO RESPOND WILL HAVE MORE DETAILS LATER NEED TO KNOW YOUR SITUATION NOW. LEE

Joseph: TURN AROUND. MICHELLE SAID NOT TO GO DOWNTOWN... Angelica

ks like you will be in Tucson for awhile. Let me know your status. This is horrible! Looks like war. -mm

BUCS-I HAVE BEEN UNSUCCESSFUL IN GETTING A STATUS ON MERRILL LYNCH EMPLOYEES IN THE WORLD FINANCIAL CTR, WHICH IS NEXT TO THE WORLD TRADE CT

PLEASE CALL SALLY

HI, USA! I HOPE EVERYONE IS FINE. WOULD YOU PLEASE CHECK PIN 5068** CC 438** WITH FM IN YOUR SYSTEM AND SEND A TEST PAGE? THANKS FOR ALL. WE ARE PRAYING FOR YOUR COUNTRY.. ILI CSC COSTA RICA.

LENNY, I'M FINE AND AT HOME. CHARLIE AT 718 945 ****.

CALL NADIA SOLOMON AT 508-650-**** AT YOUR EARLIEST CONVENIENCE TO CONFIRM YOURS AND TIM O'SHEA'S WHEREABOUTS, BECAUSE THE COMPANY AND FAMILY ARE WORRIED.

Anil - Just wanted to let you know that the class has been cancelled and the call center will probably be closed in the next couple of hours. I hope everyone in your family is OK - Michael

Linda...try some neighboring cities pls..maybe Richmond or Woodbridge or Fredericksburg Gwen Blythe

United States Suspects Osama Bin Laden
GENTLEMEN, A FEW WORDS OF CAUTION AROUND TERRORIST ACTIVITY TODAY. DO NOT DELIVER TO ANY AIRPORTS OR FEDERAL BUILDINGS TODAY. BE VERY PATIENCE AT SCHOOLS OR ANY BUILDINGS THAT MAY REQUIRE EXTRA SECURIT<
Class cancelled. I was at C street when Pentagon bombed. Rumor now that Main State was carbombed. I'm a nervous wreck, but home safe. Call when you can. XXXO Love, j.|

PLEASE CALL JENNY, ASAP, AT SCHOOL AT 215-576-****. SOMEBODY WILL FIND ME.

DUE TO TERRORIST ATTACKS ON SEVERAL INSTITUTIONS, BANK OF AMERICA IS EVACUATING LARGE/MAIN SITES. I WOULD RECOMMEND GOING HOME, IF YOU ARE IN THE OFFICE CURRENTLY. ROBERT.
"Molly K Wyatt" |I was GLAD to get your message. Stay safe where you are. I'm at my desk if you need to call. Do I need to call your husband?
FAA HAS AUTHORIZED EMERGENCY FLIGHTS ONLY. INF TOWER IT IS AN EMERGENCY. RICHARD
PER THE SAC - AS A PRECAUTIONARY MEASURE STAY HOME TODAY, DO NOT COME INTO WORK UNTIL FURTHER NOTICE. STANDY BY YOUR HOME PHONES AND/OR PAGER **LA CENTER

NETS Stay at the Hotel for now until we give you different direction. Jim stay home, Allen has been directed not to go back to ARL and to stay in HTV. Thks Molly

Please tell us you drove. Dad just called me about what is going on in the world, very scarey!-bmitche**mi.us

NY update: Nasdaq, AMEX, NYSE, Options, and US Treasury are closed for the day. Toronto and London markets remain open. Updates to follow. (KRC 10:40)
The All Hands BBQ today has been cancelled. Brandon
- Sue called and is looking for an internet access form for Chris for school. Do we have it? Please call me if we do and I need to get it over there. Otherwise please call Sue and talk to her
This is for a fire at 2WT. Please call into TeleMeeting conference center at -877-913-**** . If Morgan Stanley has not initiated the call you will hear music until they initiate the call. Dallas Data Center Op

FYI----UPPER LEVEL OF WORLD TRADE CENTER IS ON FIRE...HEAVY EMGENCY UNITS O/S... AVOID ALL AREAS .OP#12

To truly understand the linguistic response following a tragedy it is important to analyze multiple forms of communication. Personal text messages are usually intended for a single recipient and thus contain different elements of speech than messages intended for a mass audience. Specifically, when journalists chose their newspaper headlines on 9/12, they attempted to convey the pain Americans felt following the attack while still following conventional journalistic norms. The Newseum included 86 newspapers from the United States on its website.29 I analyzed the headlines from 28 of those papers on both 9/12 and 4/16 (the day after the Boston Marathon Bombing): (Figure 4) [Note that all formatting—including capitalization—is identical to the original headlines.]

Newspaper (State)
Headlines on (9/12/01)
Newspaper (State)
Boston Marathon Bombing (4/16/13)

Alaska
TERROR, Thousands feared dead as hijacked jets topple World Trade Centers.

Alaska
Andy runer, family safe
Boston Marathon terrorist bombs kill 2, injure 141
California (Oakland)
TERRIFYING
California (Oakland)
TERROR AT THE BOSTON MARATHON; WHO? WHY?
California (San Francisco)
BASTARDS!
California (San Francisco)
Runners' dreams dashed by bombgs
Colorado
Our Nation Saw Evil
Colorado
FINISH LINE TERROR
Connecticut
Act of War
Connecticut
Terror in Boston
LIKE A 'WAR'
Delaware
Shock, Fear & Anger
Delaware
BOSTON TERROR
Georgia
Outrage
Georgia
TERROR ATTACK RATTLES NATION
Hawaii
AMERICA'S BLOODIEST DAY
Hawaii
NOT SINCE 9/11
Indiana
DAY OF DEATH
Indiana
CARNAGE IN BOSTON
AN ACT OF TERROR
Iowa
BUSH VOWS TO STRIKE BACK
Iowa
WE WILL FIND OUT WHO DID THIS
Maine
An Act of War
Maine
BOMBS IN BOSTON
Maryland
DEVASTATION
Maryland
Horrific
Massachusetts
New Day of Infamy
Massachusetts
Marathon terror
Mississippi

What Now?
Mississippi
Blasts bring tragedy for marathon finish
Nevada
Terror Strike
Nevada
Chaos, confusion at Boston Marathon
New York
IT'S WAR
ACT OF WAR
U.S. ATTACKED
MASS MURDER
FREEDOM UNDER SIEGE
New York
HIGH ALERT IN NYC
Tragedy in Boston
Marathon Massacre
ACT OF TERROR
North Carolina
ATTACK ON AMERICA
North Carolina
Horror in Boston
Ohio
WHO DID THIS?
Ohio
SAY A PRAYER FOR BOSTON
Oregon
FIND THE COURAGE
Oregon
Horror and confusion
Pittsburgh
Terror and Disbelief
Pittsburgh
TERROR IN BOSTON
Utah
The Unthinkable
Utah
Terror, again
Texas
War at Home
Texas
Terror at finish line
Virginia
America's Darkest Day
Virginia
TERROR
Washington
We Mourn
Washington
TWO BOMBS ROCK BOSTON MARATHON
W. Virginia
A New Day of Infamy
W. Virginia
Confusing and scary

Wisconsin
ATTACKED
Wisconsin
FINISH LINE TURNS GRUESOME, DEADLY
Washington, DC
Terrorists Hijack 4 Airliners, Destroy World Trade Center, Hit Pentagon, Hundreds Dead
Washington, DC
An ‘act of terror’ in Boston   My final source of data came from The New York Time’s comment section 10 years after September 11th.30 On the 10th anniversary, readers were asked to write a few sentences that described their strongest memory of 9/11. I found it particularly important to include data 10 years later so that I could analyze which emotions were still strong and at the forefront of people’s minds. Linguistically, I looked for words that conveyed anger, fear, sadness, anxiety, and hopelessness. A total of 275 readers commented and I selected six comments that I felt lent themselves to appropriate linguistic analysis. I have included those six comments below.31 (Figure 5)

(A) My morning started with a call from a colleague telling me to turn on the news. I didn't own a TV but started to pay closer attention to the radio. Listening intensely, I drove to work. The second tower had fallen by the time I got to the office (I was on the West Coast then) and it started to occur to me that I had one or two acquaintances in NY. Everyone in the office was distracted and trying to get any news they could. Most memorably, my cubicle neighbor demonstratively called his supervisor and requested a transfer to a military project (I worked for a major aerospace company at the time). "I want to do my part!" My thoughts and feelings were garbled and spanned the spectrum from horror to disbelief, but revenge was not among them. As the morning progressed, I felt more and more disconnected from the people in the office and alien in what I was doing. I told my manager that I felt unable to work that day and wanted to track down a friend in NY (I later found out that she was fine), and I left the office. A year later, I had left my job and moved to NY, having realized that how I thought about the world were at irreconcilable odds with my career.

(B) I was a college student in Ohio. I had rolled out of bed and showed up to work at my journalism internship a little late - my boss was in a really bad mood. I asked what was wrong and she said she was worried about her parents because there had just been a plane crash at the WTC. I hadn't heard about it yet.

Even so, I said, "I'm sure they're OK if they weren't in that area. And those things don't happen very often."

Just after I said that, the TV above our heads showed the second plane hitting the building. I thought it was a replay until someone on TV clarified otherwise.

It didn't sink in for a moment what was going on, but when it did -- I felt different: About being an American, about being a journalist. I was angry and scared -- and I felt all I could do to help right then was work to tell the stories of what was going on both at the crash sites and on my campus. I feel that same way today. It's become a regular coping mechanism.

(C) We first heard about it at work from a co-worker with a son in NY. Then news trickled in on the internet and a tv was set up for employees to watch. Everybody watched in silent horror. When the footage turned to people jumping, I felt so sickened I had to leave. We were expected to stay at work although nobody could function. I felt absolutely overwhelmed by the problem of human evil. When I finally got home, I went to my garden and cried and prayed for the souls who had left us under such violent circumstances. I thought about how frightened they must have been and what their last moments were like. At night the only sounds were the sounds of fighter jets overhead.

(D) I was at home that day, which was unusual, and my older son called at around 9:15 to ask if I had heard from my younger son, who worked in a building across from the Towers. "No", I said. "Why?" He told me a plane had hit the World Trade Center. "Put on the news!" he said. I jumped up to call my son on his phone, because he should have been in his office by that time. No answer. No answer on his cell phone. I was very concerned because, depending on how the trains were running, he would sometimes take the subway that came up in one of the Towers instead of in his own building. We had to wait until 11AM before we heard from him. No sound was ever so sweet as the sound of his voice. As we sat watching the story unfold on TV for the rest of the day I could not stop thinking of the many people who would never be able to call in...who would never be heard from again

(E) Words that come to mind- shock- stunned- raw- scared -disbelieving-hopeless- angry at something I could not see. This day is as clear in my mind today as it was 10 yrs ago….

Disbelief . Went home and turned on the TV just in time to watch the first tower come down. I'm not sure I have ever cried so hard in my life. For some reason, the school requested we not pick up our children til the end of the day. I spent the day alone , glued to the TV , stunned and scared and wondering how I was going to tell my young children when I picked them up from school... Laying in bed that night crying for all the families who were in such pain.

(F) I had taken the subway to work that morning, and emerged 30 minutes later into a different world. I remember going to donate blood at a Red Cross center set up in the Citicorp building; the line of would-be donors stretched completely around the block. If there was a high point to the day, it was seeing so many New Yorkers doing what they could to help. The low point, for me, was a television image of emergency workers standing around at the emergency entrance to St. Vincent's Hospital, with nothing to do. They'd expected bloody pandemonium, I'm sure, but this was in many ways even more horrible. Results & Analysis

Personal Texts:

After using the LIWC program to analyze the text messages in figure 3, I was able to determine the percentage of words that were verbs, pronouns, about death, and a variety of other variables. I then transcribed the texts messages that I personally sent and received over the past 2-weeks so that I could meaningfully compare 9/11 texts with “average text messages.” I did so by calculating the percent change between the texts sent on 9/11 and my personal text messages. By analyzing the percent change, I was able to note which types of speech were used either extremely often or relatively infrequently on 9/11.1 The following variable are included on my graph below: (Figure 6)32

WPS= Words Per Sentence
> Six Letter Words
Future Tense
Pronouns
I
We
You
She/He
They
They
Article
Verbs
Past
Present Tense
Future Tense
Adverbs
Prepositions
Number
Social
Family
Friends
Anxious
Anger
Sad
Tentative
Inclusive
See
Hear
Feel
Work
Home
Money
Religion
Death

I constructued a table indicating the words/phrases that were used significantly more often, less often, and approximately the same level compared to my baseline data.

Word Frequency Table (Figure 8)
More often on 9/11
No Significant Change (Not statistically significant)
Less Often on 9/11
Words Per Sentence (WPS)
Future Tense
Feel
> Six Letter Words
Articles
I
You (2nd person pronouns)
Present Tense
We
She/He (3rd person sin. pronouns)
Social Words
Verbs
They (3rd person plural pronouns)
Anger
Past Tense
Prepositions
See
Future Tense
Words Describing Numbers
Hear
Adverbs
Words Describing Family
Pronoun
Words Describing Sadness
Words Describing Friends
Sources: WikiLeaks (Text Message Data)
LIWC Software Analysis Program, http://www.liwc.net/
Analysis, Graphs, and Tables by David Goldstein

Anxious Words (anx)

Tentative Words (tentat)

Inclusive Words (incl)

Work

Home

Money

Religion

Death

On 9/11, people all around the country used their phones to frantically check-in with family members. Therefore, it is no surprise that words describing family and friends were used about 300% more often than baseline. This is again confirmed by figure 2, which shows that the phrase “please call” was used with high frequency just five minutes after WTC North was hit. At the same time, one would also expect that anxious words and phrases (scared, bad, awful, chaos, devasted, etc) would also be used significantly more often as noted in the “Emotional Timeline of 9/11” study.

One interesting finding was the fact that words conveying “sadness” were actually used below baseline. Perhaps one interpretation is that on 9/11 people were in such a state of shock that feelings of “grief and sadness” would take a few hours/days to set in. Moreover, the text messages sent on 9/11 were generally to check-in with family or friends, which would include words/phrases such as “please call” or “I love you,” that are not picked up as “sad” per se. The distinction between 2nd person singular pronouns such as “you” and “your” (+260%) and 1st person singular pronouns such as “I,” “me,” or “mine,” (-60%) underscores this point. Namely, that people texted to ask questions like “are you O.K,” in an attempt to seek out loved ones.33

Common knowledge dictates that during times of tragedy people turn to religion and God. The data confirmed this. Words describing “death” also increased 300% over baseline as people sadly came to the realization that thousands of Americans had perished in the attacks. At the same, one would also expect that anxious words and phrases such as “scared, freaked out, bad, attacked, awful, chaos, destruction, and devastated,” would increase during a tragedy (+300%).34

Research by Pennebaker explained that during a tragedy people often try to distance themselves, which is done linguistically by using longer words.35 Indeed, the data confirmed that 9/11 texts used longer words “>Six Letter Words” (at around 70% above baseline). Overly formalized phrases such as “at your earliest convenience,” “unsuccessful in getting a status,” and “as a precautionary measure” do seem to support the distancing hypothesis (available in figure 3).36 Present tense words also decreased (-30%), although not significantly so, which further supports distancing oneself from the reality at hand. Interesting, past tense words decreased—perhaps once again because people were reluctant to keep repeating the terrible events of 9/11. Another, equally plausible interpretation, however, is that 9/11 text messages were sent in an attempt to determine if family and friends were O.K. Therefore, one would expect more present tense phrases such as “are you O.K?”

It is difficult to determine why the number of verbs and adverbs decreased on 9/11 (-~50% for each category). After analyzing figure 3, I found the following frequently used verbs: “send, go, call, hear, and let (as in let me know).” These verbs are associated with the action of communicating with family/friends. My hypothesis is that the text messages sent on 9/11 contain a single idea and therefore only use one or two verbs. The average text message includes multiple ideas/subjects and therefore additional verbs.

Recall the University of Buffalo’s research stating that during a tragedy people have a strong desire to “seek more information about the event.”37 A quick glance at Figure 2, which details the most frequently used phrases in text messages, confirms this fact. Messages such as “terrorist attack,” “FBI investigating,” “White House evacuated,” and “Osama Bin Laden,” actively portray communication that is intent on informing others about the events of 9/11. A careful reading of the messages suggests that the sender, in many cases, is also interested in sharing information with other people in addition to the message’s recipient. For example, phrases such as “please call Steve Lee,” “please call me if you hear from Stephanie or Ryan,” and “leave a message at 949-709-****” indicate the strong desire to intiate subsequent communications with additional individuals who were not included in the original message. That many messages are signed and include contact numbers—an unusual occurence in text messages—I think indicates the expectation that the messages will simply be forwarded to another recipient.

As a final point of analysis, I think it is important to discuss my findings and compare them to the results in the “Emotional Timeline of September 11th.” Recall, that researchers found that the use of angry words increased substantially throughout the day (from 0.25% of total words to 2.5% of total words). At the same time, sadness stayed consistent at about 0.5% of total words.38 I found a slight decline for “sad words” and a very slight positive change for “angry words.” I am confident that this discrepancy is due to the fact that the researchers did not compare the 9/11 text data to “average text messages.” In average text messages, people will convey emotions—anger, sadness, anxiety—albeit, not at the same level of intensity as after the 9/11 attacks. The percent change—or the percentage of words related to emotions on 9/11 compared to average text messages—was miniscule. I believe that it this is an important distinction to make: In everyday life, people will experience sadness, happiness, and anger. On 9/11, people expressed anger via text messages slightly more often, but the intensity of anger (which is not measured by this data) was likely much stronger.

Newspaper Headlines:

Next, I examined 28 headlines printed on the day after September 11th and the Boston Marathon Bombings in 2013. Immediately, I noticed that the word “terror” appeared in 4/28 (14.3%) of headlines following 9/11 compared to 13/28 (46.3%) following the Marathon Bombings.39

Google’s Ngram Viewer, which analyzes the frequency of words in books, noted a similar trend. (Figure 9).40

According to Google, the use of the word “terror” in books has increased 33.4% between 1960 and 2008.41 Over the same timeframe, the word “terrorist,” which is a combination of the Latin word “terror” and the suffix “ist” increased by an astounding 1,232%.42 When describing terrorist activities in the media, it makes perfect sense that the word “terror” is included in the headline. After all, by definition, a terrorist aims to instill “terror” usually in the pursuit of some political aim.

With notable exceptions such as the World Trade Center (1993) and the Oklahoma City Bombing (1995), Americans were largely unaccustomed to large scale terrorist attacks on U.S. soil prior to 9/11. Therefore, one would not expect the words “terror” or “terroist” to appear frequently in newspaper headlines in the US prior to or on 9/11. By the time of the Boston Marathon Bombings, however, Americans were sadly accustomed to the possibility of terrorist activities and therefore it is not surprising that since that time both “terror” and “terrorists” have been used more often in the media to describe violent attacks.

Interestingly, Israel, a country that has known terrorism since its founding in 1948, shows different results. The Hebrew word for terrorist (?????????) only increased by 150% over the 1960-2008 timeframe (compared to US’s +1,232%).43 This analysis offers a unique glimpse at the interplay between historical events and the increase in the frequency in use of specific terminology. In other words, because Israel experienced terrorist attacks long before the United States, the use of the word “terrorist” increased with greater frequency in US media than in the Israeli media during the time period 1960-2008.

Next, I directly tested Pennebaker, Mehl, and Cohen’s hypotheses concerning linguistic changes following a tragedy. As mentioned above, researchers expected the following results:44 (Statistical Note: Actual represents the percent change from 4/16 headlines to a representative sample of headlines from around the world on 11/5/13: Reuters) [Figure 10]
Expectation (Pennebaker, Mehl, Cohen)
Actual (% Change: 4/16/13 -> 11/5/13
Increase Freq.(+)
Decrease Freq. (-)
Unfortunately, no statistically significant results were found to predict either increased frequency or decreased frequency under the Mehl’s, Cohen’s, and Pennebaker’s study. When comparing both 9/12 headlines and 4/16 headlines to today’s headlines, all percent change metrics were possible to attain simply by chance.
1st Person Singular Pronouns
Present Tense

Second-Person Plural Pronouns

Third-Person Plural Pronouns

Longer Words

Articles

That I could not replicate Pennebaker, Mehl, and Cohen’s results leads me to believe that their analysis does not apply to newspaper headlines. When using the 9/11 text data, I was able to confirm the (highlighted) results in the above table (Figures 10 & 8). As noted in figure 10, I confirmed 3/6 (50%) of the predictions for personal text messages compared to 0/6 (0%) for headlines. This strongly suggests that the above linguistic changes only appear in personal writing and not in official newspaper headlines.

Finally, it is important to note that headlines printed on 9/12 overwhelmingly expressed sentiments of retaliation and sadness (Figure 4). Words and phrases such as “BASTARDS,” “Bush vows to strike back,” and “act of war” serve as a call to seek revenge.45 This is consistent with the University of Buffalo’s conclusion that after the shock wears off people become angry or upset.46 Additionally, figure 1, which detailed the use of angry words in text messages showed anger rising steadily throughout the day. I believe that newspaper headlines and articles served as a forum for Americans to vent their anger by using inflammatory language calling for war.

New York Times Responses 10 Years Later:

Even ten years after 9/11, the sight of the World Trade Center collapsing is etched in millions of Americans’ minds. Proposed by psychologists Roger Brown and James Kulik in 1977 a flashbulb memory is the vivid remembrance of an emotionally significant moment.47 To test their theory and to better understand how emotions change over time I compared the comments in Figure 5 with general New York Times comments that I found when reading the "Bill de Blasio Elected Mayor of New York" article.48 My results are included below in Figure 11. (Statistical Note: I computed the percent change from the Bill de Blasio article to the 9/11 comments. A positive number indicates that the 9/11 comments had more of the given variable)

Note how usage of the question mark (?) declined by about 100%. By definition, a flashbulb memory is a vivid memory and therefore individuals have little reason to doubt its authenticity. This can be explained both by the substantial decline of question marks and tentative words. An analysis of the comments themselves show particularly descriptive language such as "absolutely overwhelmed by the problem of human evil," "the only sounds were the… fighter jets overhead," and the image of "emergency workers standing around…with nothing to do." Finally, as expected, negative emotions (+175%), anxiety (+225%), and anger (+260%) all increased substantially over baseline.49

Conclusion & A closer look at my hypothesis:

I am pleased to report that my research confirmed my hypothesis. Personal texts following 9/11 did overwhelmingly contain words and phrases indicating a desire to check-in with family members. Moreover, emotions such as anger and sadness were delayed and did not appear to surface until late that night. Newspaper headlines did contain all-caps and also did not often use the word "terrorist" often. Comments on the 10th anniversary were rife with emotion and were written with vivid descriptive language that suggested a high degree of confidence in the factual accuracy of the events experienced.

My analysis of the 9/11 texts supported Pennebaker and Lay's research by confirming both "social sharing" and "verbal nonimmediacy" as demonstrated by an increase in second-person and third person pronouns and longer words.50 My data did not, however, demonstrate an increase in first-person pronouns, an increase in articles, and a decrease in present tense. I was able to confirm Pennebaker's distancing hypothesis by noting the substantial increase in longer words and uncharacteristically formal phrases such as "unsuccessful in getting a status." My data did not suggest that anger and sadness rose compared to my baseline text messages. However, I explained the discrepancy by noting that Back, Kuffner, and Egloff did not compare the 9/11 texts to any other data.51 Additionally, I noted that people express sadness and anger in everday texts so one would not necessarily expect that the linguistic frequency expression those emotions would rise.

Next, I noted the fact that headlines following the Boston Marathon Bombings contained more uses of the word "terror" than the headlines following 9/11 attacks. I explained this phenomenon by noting how both the words "terror" and "terrorist" have increased substantially since 2001. Prior to 9/11, Americans had few exposures to terrorist attacks and therefore one would not expect the phrases "terror" and "terrorist" to appear often in headlines. However, by 2013, Americans had become more accustomed to the possibility of terrorist attacks and therefore started incorporating those phrases in their everyday vernacular. I concluded by exploring the interplay between historical events and a country's written language.

Finally, I examined readers' written responses on the 10th anniversary of 9/11. In doing so, I found evidence supporting cognitive psychology's flashbulb memory concept. Writers expressed vividly detailed and emotional portrayals of their 9/11 experiences.

Implications:

By applying the lessons learned—namely, how language changes during and after a tragedy—psychologists will be better able to serve their patients. During a typical therapy session, a psychologist asks probing question in an attempt to diagnose and treat a patient's psychological issues. However, determining the correct treatment requires that the psychologist fully understand his/her patient's current emotional state. As demonstrated above, noting how a person's language has changed after a tragedy can provide critical clues to determining the patient's mental state. In fact, a similar linguistic approach has already shown promising signs when diagnosing schizophrenia in patients.52

Accordingly, when providing therapy to patients who have personally experienced a tragedy, I suggest that psychologists/psychiatrists interview a patient's immediate family to discern how the patient's language use has changed. Only then can appropriate treatment begin and patients can begin to heal.

Appendix: (Explanation of LIWC Output Variables)

In my above data, I refer to results from the LIWC program. Below I included LIWC's explanation of output variables:

Source: (http://www.liwc.net/descriptiontable1.php)

LIWC2007 Output Variable Information

Category	Abbrev	Examples	Words In Category (that LIWC searches)
Word count	wc		
words/sentence	wps		
Dictionary words	dic		
Words>6 letters	sixltr		
Total function words	funct		464
Total pronouns	pronoun	I, them, itself	116
Personal pronouns	ppron	I, them, her	70
1st pers singular	i	I, me, mine	12
1st pers plural	we		

We, us, our
12
2nd person
you
You, your, thou
20
3rd pers singular
shehe
She, her, him
17
3rd pers plural
they
They, their, they’d
10
Impersonal pronouns
ipron
It, it’s, those
46
Articles
article
A, an, the
3
Common verbs
verb
Walk, went, see
383
Auxiliary verbs
auxverb
Am, will, have
144
Past tense
past
Went, ran, had
145
Present tense
present
Is, does, hear
169
Future tense
future
Will, gonna
48
Adverbs
adverb
Very, really, quickly
69
Prepositions
prep
To, with, above
60
Conjunctions
conj
And, but, whereas
28

Negations	negate	No, not, never	57
Quantifiers	quant	Few, many, much	89
Numbers	number	Second, thousand	34
Swear words	swear	Damn, piss, fuck	53
Social processes	social	Mate, talk, they, child	455
Family	family	Daughter, husband, aunt	64
Friends	friend	Buddy, friend, neighbor	37
Humans	human	Adult, baby, boy	61
Affective processes	affect	Happy, cried, abandon	915
Positive emotion	posemo	Love, nice, sweet	406
Negative emotion	negemo	Hurt, ugly, nasty	499
Anxiety	anx	Worried, fearful, nervous	91
Anger	anger	Hate, kill, annoyed	184
Sadness	sad		

Crying, grief, sad
101
Cognitive processes
cogmech
cause, know, ought
730
  Insight
insight
think, know, consider
195
  Causation
cause
because, effect, hence
108
  Discrepancy
discrep
should, would, could
76
  Tentative
tentat
maybe, perhaps, guess
155
  Certainty
certain
always, never
83
  Inhibition
inhib
block, constrain, stop
111
  Inclusive
incl
And, with, include
18
  Exclusive
excl
But, without, exclude
17
Perceptual processes
percept
Observing, heard, feeling
273
  See
see
View, saw, seen
72
  Hear
hear
Listen, hearing
51
  Feel
feel
Feels, touch
75

Biological processes
bio
Eat, blood, pain
567
Body
body
Cheek, hands, spit
180
Health
health
Clinic, flu, pill
236
Sexual
sexual
Horny, love, incest
96
Ingestion
ingest
Dish, eat, pizza
111
Relativity
relativ
Area, bend, exit, stop
638
Motion
motion
Arrive, car, go
168
Space
space
Down, in, thin
220
Time
time
End, until, season
239
Work
work
Job, majors, xerox
327
Achievement
achieve
Earn, hero, win
186
Leisure
leisure
Cook, chat, movie
229
Home
home
Apartment, kitchen, family
93
Money
money

Audit, cash, owe
173
Religion
relig
Altar, church, mosque
159
Death
death
Bury, coffin, kill
62
Assent
assent
Agree, OK, yes
30
Nonfluencies
nonflu
Er, hm, umm
8
Fillers
filler
Blah, Imean, youknow
9
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