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Student Reactions to the Shootings at Virginia Tech and Northern Illinois University: Does Sharing Grief and Support Over the Internet Affect Recovery?

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Abstract

After the shootings at Virginia Tech and Northern Illinois University, many students gravitated to the Internet for support. Despite the fact that the Internet plays a major role in how people live their lives in contemporary society, little is known about how people use the Internet in times of tragedy and whether this use affects well-being. To address these issues, the current study assessed the types of online activities more than 200 Virginia Tech and Northern Illinois University students participated in 2 weeks after the shootings and again 6 weeks later, as well as their depressive and posttraumatic stress disorder (PTSD) symptoms. Results showed that 2 weeks after the shootings, nearly 75% of students were suffering from significant psychological distress. Additionally, students participated in numerous online activities related to the shootings. Importantly, students perceived their Internet activities as being beneficial, although there was no evidence that Internet use affected their well-being.

Keywords

coping, depression, Internet use, PTSD, trauma

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On the morning of April 16, 2007, a gunman entered a residence hall on the campus of Virginia Tech and fatally shot two students. Several hours later, he chained shut the entrance doors to a four-story building that housed the Department of Engineering Science and Mechanics and stormed into multiple classrooms, firing more than 150 shots from two handguns. He killed 25 students and 5 faculty members before committing suicide. Shockingly, less than a year later, a similar incident occurred on Valentine's Day at Northern Illinois University when a former student opened fire on a geology class that was meeting in a large lecture hall. Five students were killed and 18 were injured.

Within minutes of the shootings at both universities, many students used a method to deal with their grief and confusion that just a few years ago would have been unavailable to them: Facebook. Facebook is a social networking website that has become extraordinarily popular since its inception in 2004. In fact, the site currently boasts more than 500 million users (Facebook, 2010). Not surprisingly, students at Virginia Tech and Northern Illinois University found Facebook to be a valuable resource for social support following the tragedies. Shortly after the incidents at both schools, students logged onto the site and began to create "groups" concerning the shootings. Other students could "join" these groups to read and post support messages. For example, one student at Virginia Tech created a group the day of the shooting entitled "A Tribute to Those Who Passed at the Virginia Tech Shooting." It was joined by more than 100,000 people by the end of the night ("Virginia Shootings," 2007). Similarly, only 2 hours after the shooting at Northern Illinois University, more than 100 groups had been created with names such as "Pray for the Students of NIU" and "Our Thoughts Are With the Northern Illinois Students."

In the days following the shootings at both universities, the media (including the *New York Times*, the *Washington Post*, and countless other newspapers and magazines) focused

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much of their attention on students' intense reliance on the Internet, especially Facebook, to share information and support. A key question posed by many of these writers (e.g., Vargas, 2007) was whether online activities, such as joining groups and posting support messages, affect the grieving process. These writers touched on a contemporary debate in the field of psychology—namely, does spending time on the Internet help or hinder people's psychological well-being?

Researchers have found conflicting answers to this question (see McKenna & Bargh, 2000, for a review). Some studies have shown that Internet use can be harmful. For instance, a national survey of more than 1,500 participants demonstrated that the intensity of Internet use differentiated adolescents reporting depressive symptoms from asymptomatic peers (Ybarra, Alexander, & Mitchell, 2005). More recently, researchers followed more than 600 students between 12 and 15 years of age and found that participants who often used instant messaging systems to communicate reported higher levels of depression 6 months later (Van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008).

Other studies have shown Internet use to be advantageous. For example, one study found that frequent Internet users experienced an increase of positive affect over time (Kraut et al., 2002). Another study found that people who used the Internet to communicate with friends and family experienced greater declines in depressive symptoms 6 months later (Bessiere, Kiesler, Kraut, & Boneva, 2008).

Finally, many studies have found no link between Internet use and psychological well-being. For instance, an investigation into Internet use among high school seniors found no correlation between time spent using the Internet and depressive symptoms (Sanders, Field, Diego, & Kaplan, 2000). A study of 500 university students also found no correlation between online activities and indicators of well-being (Wastlund, Norlander, & Archer, 2001).

To the best of our knowledge, only one study has been conducted on the association between Internet use and well-being in individuals who are grieving. Vanderwerker and Prigerson (2004) interviewed approximately 300 people who had lost a spouse 6 months prior. Results showed that individuals who used the Internet reported lower levels of posttraumatic stress disorder (PTSD). However, the researchers did not focus on online grieving behaviors specifically (such as visiting memorial websites or posting support messages online) and did not assess how online activities affected psychological well-being over time.

These recent university shootings underscore the importance of the Internet as a medium that people use to deal with tragedy in contemporary culture, but they also highlight a profound deficit in our understanding of how people use the Internet and whether that use affects well-being. To address this issue, we contacted students at Virginia Tech and Northern Illinois University 2 weeks after the shootings at their respective universities. Students filled out measures that allowed us to assess symptoms of depression and posttraumatic stress, as well as the types of online behaviors they participated in following the shootings. Importantly, 2 months after each shooting, the same students filled out a similar survey, allowing us to assess how online activities were related to students' recovery over time.

Psychological Distress Following Mass Traumatic Events

Surprisingly, not much is known about the effects of school shootings (not only those at Virginia Tech and Northern Illinois University, but also those at Columbine and Jonesboro) on people's mental well-being, partly because of attempts by schools and communities to limit student involvement in research projects to minimize any further trauma ("PTSD and Evaluating Research," 2007). Thus, the present research also provides a unique opportunity to assess the psychological distress of people exposed to a mass shooting and how distress changed over time in the weeks following the tragedies.

Recent research has demonstrated that exposure to large-scale tragedies, such as the Oklahoma City bombing (North et al., 1999) and the September 11 terrorist attacks (Galea et al., 2003), can result in the formation of psychological problems, even among people who were not directly involved. For instance, researchers interviewing residents of Manhattan after the September 11 attack on the World Trade Center found that 7.5% of adults qualified for a diagnosis of PTSD related to the attacks, and 9.7% of adults reported symptoms consistent with depression (Galea et al., 2003). Additionally, tragic events can have both immediate and long-lasting effects. For instance, Schuster et al. (2001) assessed 560 adults across the country only 3-5 days after the September 11 attacks and found that 44% of respondents reported experiencing substantial distress. When these researchers followed up with these same participants 2 months later, they found that the percentage of adults reporting substantial distress had decreased nearly 25% (Schuster et al., 2001). Similarly, researchers analyzing grief-related chatroom discussions after the death of Princess Diana (Stone & Pennebaker, 2002) and online journal entries following September 11 (Cohn, Mehl, & Pennebaker, 2004) found that focus on the events decreased considerably after just a few weeks. One of the goals of the present research was to get an accurate assessment of how students were affected shortly after the shooting, as well as how their mental well-being changed over time.

Overview of the Present Research

We contacted Virginia Tech and Northern Illinois University students who had Facebook profiles 2 weeks after the shooting at their respective universities and asked them to complete measures concerning their depressive and PTSD symptoms,

as well as their Internet activities related to the shooting. Six weeks later, we recontacted these students to reassess their depression, PTSD symptoms, and online behaviors.

Researchers have found conflicting results concerning the impact of Internet use on social involvement and well-being. Only a handful of longitudinal studies concerning Internet use and well-being have been conducted (e.g., Kraut et al., 1998), and no longitudinal studies have been conducted concerning grief-related online behaviors specifically. It seems that despite the prevalence of online communication in modern life, we know little about the impact of using the Internet for social-emotional purposes. Our hope is that the present study will provide insight into these important issues.

Method

Participants

Nine-hundred Virginia Tech and 900 Northern Illinois University students with Facebook profiles were e-mailed approximately 2 weeks after the shooting at their respective schools and were asked to fill out a survey regarding their reactions to the incident. Virginia Tech students were contacted in April 2007, and Northern Illinois University students were contacted in February 2008. These 1,800 students were selected via random searches on Facebook. Specifically, we selected the option to search for Virginia Tech or Northern Illinois University students only. Then, two randomly selected letters were typed into the search box. The first 100 students to appear were e-mailed. Searches were continued in this manner until 900 students from each school were contacted. In our opening e-mail, we introduced ourselves as University of Illinois researchers who were interested in conducting a study on sadness and grief. The e-mail included a link to the survey. It is important to note that Facebook has various privacy settings. For instance, even if a student has opted to have his or her Facebook profile blocked from students from other universities, he or she often will allow his or her name and an e-mail link to appear in searches. As such, it is not that only students with open profiles were contacted.

One-hundred twenty-four students completed the survey from Virginia Tech, and 160 students completed the survey from Northern Illinois University. Because a common set of measures was administered to both samples and because the results across the two samples were similar, we report our analyses based on a combined sample. (Readers who are interested in results based on separate samples may contact the first author.) The median age was 21 years (M = 21.34, SD = 3.42). Eighty-nine percent of the respondents were Caucasian. The remaining participants indicated other ethnicities. Twenty-two percent were freshmen, 19% were sophomores, 22% were juniors, 22% were seniors, and 11% were graduate students. Four percent were not current students but still had Virginia Tech or Northern Illinois University Facebook accounts. As several of these nonstudents indicated a close association with their school in the open-ended comments (e.g., had just graduated), we included these participants in the analyses. Thirty-one percent of participants indicated they knew one of the victims personally; 82% indicated they "knew someone who knew one of the victims." Sixty-five percent of the participants were female.

Procedure

Participants first completed an online consent form. They then completed a basic demographics survey. To assess depressive symptoms, we asked them to complete the 10-item Center for Epidemiologic Studies Short Depression Scale (CESD-10; Andresen, Malmgren, Carter, & Patrick, 1994). For this measure, participants were asked to indicate how often they felt or behaved in a variety of ways (e.g., "I had trouble keeping my mind on what I was doing") in the week following the shooting at their university. For most participants, this would have been just a few days before the administration of the survey. Immediately after the CESD-10, participants completed the 17-item PTSD Symptom Scale–Self-Report (PSS-SR; Foa, Riggs, Dancu, & Rothbaum, 1993). Participants were asked how often they had certain experiences in the week following the incident (e.g., "Reliving the event, acting, or feeling as if it were happening again"). Both measures use a 4-point response scale that ranges from 0 for *rarely or none of the time (less than 1 day)* to 3 for *all of the time (five to seven days)*. People are considered to have clinically significant depressive symptoms if they score 10 or higher on the CESD-10 (Andresen et al., 1994) and to have elevated symptoms of PTSD if they score 14 or higher on the PSS-SR (Coffey, Gudmundsdottir, Beck, Palyo, & Miller, 2006).

Following these instruments, participants completed a survey that asked about their Internet usage and other grieving behaviors. The questions were asked in the following order: (a) How many Facebook groups did you join that were created concerning the incident? (b) How many comments/messages did you post on the pages of these groups? (c) Have you written about the events on people's Facebook "walls" at any point since the incident? (d) Have you posted any comments on the Facebook walls of any of the victims? (e) Did you change your Facebook picture to a memorial ribbon or something else signifying the incident? (f) How many times have you posted comments/messages on any public sites besides Facebook, such as the university official memorial site? (g) About how often have you talked to friends over instant messenger concerning the event? (h) About how often have you text messaged friends concerning the event? (i) Did you know any of the victims personally? (j) Do you know someone who knew one of the victims? (k) Have you attended any candlelight vigils, memorial services, etc.? (l) Have you participated in a moment of silence or the wearing of

school colors on a certain day? (m) Have you met with a counselor/therapist concerning the incident? (n) How much have you considered transferring to another school? (o) How safe do you feel on campus? The specific response options are detailed in the Results section. Also, following most of these questions, participants were asked how they felt after participating in each behavior (from a lot better to a lot worse).

Results

What Were Students' Depressive and PTSD Symptoms 2 Weeks After the Shootings?

Two weeks after the shooting, 71% of the respondents (203 people) scored 10 or higher on the CESD-10, indicating significant depressive symptoms ($M = 13.68$, $SD = 6.30$). The average rate of depression in a college student population has been estimated at 14.9% (Bernat, Ronfeldt, Calhoun, & Arias, 1998). Participants' scores ranged from 0 to 27 out of a possible 30. Women ($M = 15.34$, $SD = 5.87$) reported more depressive symptoms than did men ($M = 10.60$, $SD = 5.92$), $t(282) = 6.46$, $p < .001$, $d = .80$. Participants who knew a victim ($M = 14.83$, $SD = 5.73$) reported more depressive symptoms than did those who did not know a victim ($M = 12.61$, $SD = 6.33$), $t(259) = 1.77$, $p = .006$, $d = .37$.

Two weeks after the shooting, 64% of the respondents (182 people) scored 14 or higher on the PSS-SR, indicating significant PTSD symptoms ($M = 18.06$, $SD = 9.19$). The average rate of PTSD in a college student population has been estimated at 3.4% (Bernat et al., 1998). Participants' scores ranged from 0 to 43 out of a possible 51. Women ($M = 20.24$, $SD = 9.00$) reported more PTSD symptoms than did men ($M = 13.93$, $SD = 8.12$), $t(281) = 5.81$, $p < .001$, $d = .74$. Participants who knew one of the victims ($M = 19.78$, $SD = 8.76$) reported more PTSD symptoms than did those who did not know a victim ($M = 16.48$, $SD = 9.04$), $t(258) = 2.82$, $p = .005$, $d = .37$.

What Online Activities Did Students Participate in After the Shootings and Did These Activities Make Them Feel Better or Worse?

Eighty-nine percent of participants indicated they had joined at least one Facebook group concerning the shooting. Participants were asked to indicate how many groups they had joined by selecting from the following options: 0, 1, 2-5, 6-10, or more than 10. These responses were coded from 0 to 4. The average response was "between 2-5 groups" ($M = 1.93$, $SD = .96$). Twenty-eight percent of respondents had left a message on the page of at least one of these groups. Using the same scale as previously described, the average participant indicated he or she left between 0 and 1 messages ($M = .51$, $SD = .94$).

Each person's profile on Facebook contains a virtual wall on which people can leave messages. Many people use this feature to communicate back and forth with their friends. Participants were asked if they had posted messages about the shooting on people's walls. Response options ranged from *no* (coded as 0), to *at least several times a day* (coded as 4). Sixty-four percent of participants indicated they had left a message concerning the shooting on someone's wall. The average response was 1.26 ($SD = 1.20$), indicating students used the wall feature to discuss the incident about once a week. Participants were also asked if they had left a message on any of the victims' walls. Thirteen percent indicated they had done so.

Many students participated in another activity to show support for the victims: changing their Facebook profile picture. Each person with a Facebook profile has a picture associated with his or her account. Generally, people post pictures of themselves as their profile picture. However, after the shooting, many people replaced their profile picture with a picture of a Virginia Tech or Northern Illinois University memorial ribbon. Seventy-two percent of participants indicated they had done this.

Students participated in numerous virtual activities besides those available to them on Facebook. For example, 28% of participants indicated that they had left a message on a memorial website, such as the one created by each university. Also, 78% of respondents indicated they had used an online chat program (such as AOL Instant Messenger) to discuss the shooting. Seventy-four percent of respondents had used text messaging.

Finally, we asked students how they felt after participating in specific online activities. Response options ranged from 1 (*a lot worse*) to 5 (*a lot better*). In general, students reported feeling better after participating in online activities such as joining Facebook groups ($M = 3.57$, $SD = .60$), posting a message on the pages of these groups ($M = 3.72$, $SD = .60$), using the wall feature to discuss the shootings ($M = 3.62$, $SD = .69$), posting on the victims' walls ($M = 3.72$, $SD = .97$), and posting messages on memorial sites ($M = 3.97$, $SD = .61$).

What Other Grief-Related Activities Did Students Participate in Following the Shooting?

Participants were asked whether they had participated in a "moment of silence" or "the wearing of school colors on a certain day." Ninety percent of students had participated in at least one of these events, with most students indicating they had participated two to five times ($M = 1.82$, $SD = .95$). Additionally, 79% indicated they had participated in a candlelight vigil or memorial service, with most indicating they had done so once ($M = 1.31$, $SD = .86$). Finally, 21 respondents (7%) indicated they had met with a counselor or therapist concerning the shooting. As we did not ask participants if they were in therapy before the shootings, we cannot be

Table 1. Summary of Regression Analyses: Predicting Depressive and PTSD Symptoms 8 Weeks After the Shootings as a Function of Online Activities 2 Weeks After the Shootings

	Depression			PTSD		
Predictors	β	*t*	*df*	β	*t*	*df*
Composite	–.07	–.72	112	–.01	–.06	111
Groups joined	.06	.61	113	.06	.73	112
Mess-groups	–.10	–1.03	112	.04	.45	111
Wall feature	–.02	–.17	113	–.01	–.03	112
Mess-vic. wall	–.16	–1.78	113	–.10	–1.30	112
Mess-other sites	–.06	–.65	113	–.06	–.65	112
IM	–.02	–.25	113	–.01	–.06	112

Time 1 depressive and posttraumatic stress disorder (PTSD) symptoms were controlled for in the analyses. β = standardized regression coefficient; Groups joined = how many Facebook groups joined; Mess-groups = how many messages posted on a Facebook group page; Wall feature = time spent using the wall feature; Mess-vic. wall = how many messages posted on a victim's wall; Mess-other sites = how many messages posted on memorial websites; IM = time spent using an instant messaging system.

certain whether these individuals sought counseling specifically because of the shootings.

How Safe Did Students Feel on Campus Following the Shooting and Did They Want to Transfer to Another School?

We asked participants how safe they felt on campus. Response options ranged from 1 (*not very safe*) to 5 (*very safe*). The average response was 4.08 ($SD = 1.07$), indicating most students felt fairly safe on campus. We also asked participants how much they had considered transferring to another school. Response options ranged from 1 (*not at all*) to 5 (*very much*). The average response was 1.29 ($SD = .79$), indicating most students had not seriously considered changing schools.

Did Using the Internet to Share Grief and Support Influence Students' Depressive and PTSD Symptoms 6 Weeks Later?

Of the original respondents, 264 were e-mailed approximately 6 weeks after the original survey (2 months after the shooting at their respective schools). Twenty could not be reached. One-hundred sixteen (44%) responded. At Time 1, these 116 participants did not differ from the original sample in terms of demographics, depression, PTSD symptoms, or frequency of Internet behaviors.

Results showed that depressive symptoms decreased from 2 weeks after the shooting ($M = 13.26$, $SD = 6.31$) to 8 weeks after the shooting ($M = 7.35$, $SD = 5.29$), $t(115) = 9.07$, $p < .001$, $d = 1.02$. Compared to 71% of respondents at Time 1, 30% scored 10 or higher on the CESD-10 at Time 2.

PTSD symptoms also decreased from 2 weeks after the shooting ($M = 18.10$, $SD = 9.40$) to 8 weeks after the shooting ($M = 9.04$, $SD = 7.06$), $t(114) = 11.53$, $p < .001$, $d = 1.09$. Compared to 64% of respondents at Time 1, 22% of the respondents at Time 2 scored 14 or higher on the PSS-SR.

To assess whether Internet use was related to changes in psychological distress, we regressed depressive and PTSD symptoms at Time 2 onto various measures of Internet use. Controlling for depressive and PTSD symptoms at Time 1, we found that depressive and PTSD symptoms 6 weeks later were not related to the number of Facebook groups students joined 2 weeks after the attack, how many messages participants posted on the pages of these groups, how often they used the wall feature to discuss the tragedy, how many messages they posted on victims' profiles, how many messages they posted on memorial websites, and how often they used an instant messaging system to discuss the event (see Table 1 for more information).

In addition, we created a composite measure of Internet use that consisted of the six Internet variables listed earlier. Cronbach's alpha for this scale was .53.[1] We then regressed depressive and PTSD symptoms at Time 2 onto this variable. Controlling for depressive and PTSD symptoms at Time 1, we again found that Internet use was not related to depressive or PTSD symptoms 6 weeks later (see Table 1).[2] We also computed correlations between depression, PTSD, and the individual Internet use variables. The correlation between depressive symptoms at Time 1 and Time 2 was .28 ($p < .01$); the correlation between PTSD symptoms at Time 1 and Time 2 was .51 ($p < .01$). See Tables 2 and 3 for correlations between these symptoms and Internet use.

Brief Summary of Results

The results indicate that students at Virginia Tech and Northern Illinois University were greatly affected by the tragedy, as 71% exhibited significant depressive symptoms and 64% exhibited significant PTSD symptoms 2 weeks after the shooting. Additionally, many of these students used the Internet, especially Facebook, to discuss the shootings and post messages

Table 2. Correlations Between Variables at Time 1

	1	2	3	4	5	6	7	8	9
1. CESD-10	1								
2. PSS-SR	.81**	1							
3. Composite	.30**	.29**	1						
4. Groups joined	.17**	.25**	.58**	1					
5. Mess-groups	.15*	.10	.60**	.32**	1				
6. Wall feature	.09	.08	.64**	.22**	.17**	1			
7. Mess-vic. wall	.14*	.08	.43**	.18**	.31**	.22**	1		
8. Mess-other sites	.22**	.15*	.41**	.06	.25**	.07	.14*	1	
9. IM	.24**	.25**	.62**	.18**	.13*	.27**	.06	.08	1

CESD-10 = 10-item Center for Epidemiologic Studies Short Depression Scale; PSS-SR = PTSD Symptom Scale–Self-Report; Groups joined = how many Facebook groups joined; Mess-groups = how many messages posted on a Facebook group page; Wall feature = time spent using the wall feature; Mess-vic. wall = how many messages posted on a victim's wall; Mess-other sites = how many messages posted on memorial websites; IM = time spent using an instant messaging system.
*$p < .05$. **$p < .01$.

Table 3. Correlations Between Variables at Time 2

	1	2	3	4	5	6	7	8	9
1. CESD-10	1								
2. PSS-SR	.77**	1							
3. Composite	.11	.22*	1						
4. Groups joined	.13	.21*	.70**	1					
5. Mess-groups	.10	.02	.49**	.22*	1				
6. Wall feature	–.08	.05	.40**	.03	–.07	1			
7. Mess-vic. wall	.02	.04	.26**	.13	.12	.21*	1		
8. Mess-other sites	.01	.13	.57**	.21*	.20*	.23*	.22*	1	
9. IM	.11	.23*	.63**	.13	.17	.21*	.16	.35**	1

CESD-10 = 10-item Center for Epidemiologic Studies Short Depression Scale; PSS-SR = PTSD Symptom Scale–Self-Report; Groups joined = how many Facebook groups joined; Mess-groups = how many messages posted on a Facebook group page; Wall feature = time spent using the wall feature; Mess-vic. wall = how many messages posted on a victim's wall; Mess-other sites = how many messages posted on memorial websites; IM = time spent using an instant messaging system.
*$p < .05$. **$p < .01$.

of support. Importantly, most participants indicated that these online behaviors made them feel better. Finally, Internet use was not related to psychological distress symptoms 2 months after the shooting. In other words, the data suggest that the use of the Internet had no beneficial or detrimental relationship to recovery—at least as far as depression and PTSD symptoms were concerned.

Discussion

"When I have a bout of loneliness, I can log on to Facebook or send someone an IM and I'll feel just a little more connected to people," said one Virginia Tech student in response to one of the open-ended questions in our study. Considering the number of students who turned to the Internet following the shootings at Virginia Tech and Northern Illinois University, this student was not alone in using Facebook and instant messaging in his or her time of distress.

Just how distressed were students at Virginia Tech and Northern Illinois University following the shootings? Nearly 75% of students were suffering from either significant depressive or PTSD symptoms 2 weeks after the tragedy. One Northern Illinois University respondent commented on students' mental states, saying that "some people have sympathy for us and try to relate, but they can't. They can't imagine the grief and state of mind we are in here at NIU [Northern Illinois University]. . . . We are on an emotional roller coaster where on some days we are fine and on others our lives seem like disasters."

It is important to note that these findings also indicate that a fair number of students did *not* suffer from significant depressive or PTSD symptoms following the shootings, a finding that is consistent with research demonstrating that resilience in the face of loss or traumatic events is common (Bonanno, 2004). For instance, researchers conducting a survey of Manhattan residents following the September 11

terrorist attacks found that more than 40% of participants did not report even one symptom of PTSD (Galea et al., 2002). As such, the fact that 25% of students reported neither significant depressive nor PTSD symptoms is consistent with findings concerning people's resilience when faced with traumatic circumstances (see Bonanno, 2004, for a review) but still suggests that these events had a powerful impact on many people.

Internet Use and Well-Being

In the aftermath of the shootings at Virginia Tech and Northern Illinois University, students from these universities turned to the Internet, especially to the website Facebook, as an outlet for their grief. Nearly 90% of students joined a Facebook group concerning the shooting, more than 60% used the Facebook wall feature to discuss the shooting, and nearly 80% used an instant messaging system to discuss the shooting. Additionally, posting messages on other memorial sites, as well as on the victims' Facebook profiles, was not uncommon. In fact, 13% of students indicated they had visited at least one victim's Facebook profile page and posted a message there.

How did these online activities affect psychological well-being? The longitudinal design of the present studies allows for an unprecedented understanding of how participation in online activities following a traumatic situation affects people's mental well-being. Our results indicated that these online activities did not affect changes in well-being over time. These findings are consistent with results from other studies that demonstrated no correlation between Internet use and well-being (e.g., Gross, 2004; Sanders et al., 2000).

Why do some studies find a positive relation between well-being and online behaviors, others a negative relation, and still others (including those presented here) no relation? There are several potential explanations. First, the type of online activities people participate in might have different implications for well-being. For instance, Bessiere et al. (2008) found that using the Internet to communicate with friends and family was helpful, but using it to communicate in online groups was harmful. Additionally, the majority of the online variables in the present studies (with the exception of instant messaging) did not demand a high time investment (e.g., joining a group, posting on a wall). Perhaps the low investment required of these behaviors makes it more difficult to gain social support compared to some of the online behaviors that have been studied previously (e.g., e-mailing friends or family members). Also, the majority of activities we studied, although involving communication, did not necessarily involve communication with close friends or potential support figures. In other words, people may often post on the wall of a casual acquaintance, whereas e-mails are typically exchanged between close friends or relatives. Most importantly, previous studies have focused on general Internet use, such as how many hours a person spent using the Internet each day, how many e-mails were sent, and not on online behaviors specific to grief (such as posting messages about a traumatic event). As such, the impact of these behaviors on well-being is harder to predict from previous research. We think future research in this area would benefit by taking into account some of these differences in online communication. It might be that online behavior that demands a greater investment (e.g., e-mail) is more influential in determining well-being than online behavior that does not (e.g., joining a Facebook group). It might also be that the target of communication (e.g., a close friend or family member vs. a broader and potentially anonymous Internet audience) is more important for predicting well-being than the medium of communication per se.

Although students did not experience a significant increase or decrease in well-being over time as a function of their online activities, these same students reported subjectively feeling better after participating in online activities such as posting messages on Facebook group pages, leaving messages on friends' walls, and posting messages on memorial websites. There are several potential explanations for the discrepancy between students' subjective reports (which indicated that the Internet activities made them feel better) and the longitudinal analyses (which showed that Internet activities did not improve well-being over time). First, it is possible that students felt better immediately after participating in an online activity but that the positive feelings did not last more than a few minutes. Second, perhaps students experienced a minor improvement in well-being after certain online activities, but this improvement was not large enough to influence an actual decrease in symptoms. Third, research has demonstrated that when people expect a treatment to be helpful, this expectation alone often is enough for them to report feelings of improvement. For instance, one recent study found that Parkinson's disease patients reported a subjective improvement in motor function following treatment with placebo pills, even though their motor function did not, in fact, improve (Fregni et al., 2006). Therefore, it may be that students expected to feel better after participating in online activities such as joining Facebook groups and, as such, reported feelings of improvement. Finally, countless studies have shown that people are not always accurate in determining the causes of their feelings. For example, Wilson, Laser, and Stone (1982) demonstrated that college students were only moderately accurate in determining which factors influenced their daily mood ratings, often assuming that factors (such as how much sleep they had received the night before) affected their feelings the next day, even though they did not. As such, it is possible that students in the present studies simply were not able to determine which activities influenced their feelings of well-being and misattributed their improved moods to the influence of the Internet.

Limitations and Future Directions

Although our data provide novel insight into students' psychological distress and Internet usage following these school shootings, there are several methodological considerations that are common in research on responses to trauma. First, we do not have measures of students' depressive or PTSD symptoms before the event; therefore, we do not know whether some participants were depressed or suffering from PTSD before the shootings. Second, because not every student contacted chose to participate in the study, we cannot be certain whether our estimates of depression and PTSD fully apply to the target population. However, even though are sample size is not large, it is important to note that it is consistent with most studies concerning reactions to traumatic events. For example, an empirical review of 20 years of research conducted by Norris et al. (2002) found that the median sample size for studies concerning psychosocial adjustment after disasters is 159 participants (our sample had 284 participants). Also, the number of participants who remained in our study at Time 2 (44%) is consistent with other research: Kraut et al.'s (2002) paper on the effect of Internet use on well-being retained 46% of participants at Time 3. Finally, the results concerning the frequency of online behaviors may not be accurate in terms of the entire student body at these universities because only students with Facebook profiles were contacted to participate in the study. Nevertheless, the popularity of Facebook leads us to suspect that the frequency of these online behaviors is not overly inflated.

Future research should attempt to study the relation between Internet use and psychological well-being in a nonstudent population, as well as how this relation may prove different for people experiencing more personal kinds of trauma. Additionally, psychological factors beyond depression and PTSD should be studied, such as positive affect. Finally, it may be of interest to assess how various individual differences (e.g., levels of extraversion, loneliness, anxiety, etc.) can affect the relation between Internet use and well-being following a tragedy.

Conclusion

> The Internet was not only a way to talk about the event, but was a way to see and feel the support from people all around the country. . . . I am very grateful for Facebook and the Internet in general to be the medium through which I received the most moral support.
>
> Virginia Tech student, age 20

It is not unreasonable to assume that another mass tragedy may occur in the United States, whether it be a school shooting, terrorist attack, or natural disaster. And it is likely that those affected will use the Internet as a means of dealing with the tragedy. As such, it is imperative that psychologists understand the role the Internet plays in people's responses to traumatic events. The current study provides for the first step in this important process of understanding how people use the Internet to cope with such events and will hopefully lead to further investigations as to why Internet use did not affect well-being, despite students' subjective reports of improvement, and under what conditions Facebook activities and other online behaviors may prove beneficial or detrimental to people's recovery over time.

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Notes

1. We experimented with alternative ways of combining the Internet behavior items based on factor analysis. No method of combining the items produced associations between Internet behaviors and depressive or posttraumatic stress disorder symptoms.
2. Although it is difficult to do a power analysis that mimics precisely the kind of analytic framework used here, it is instructive to summarize some basic power computations for bivariate correlations. In short, to observe a bivariate correlation of .30 or higher with 80% power, we would need a sample size of approximately 100 people. Our combined sample of 116 should be more than adequate for detecting effects that are in the moderate to large region.

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