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Intrusive Thoughts and Stress During the Evacuation Phase of a Technological Disaster

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Intrusive Thoughts and Stress During the Evacuation Phase of a Technological Disaster

by

Alisa Mastin Aston

A thesis submitted to the Department of Psychology in partial fulfillment of the requirements for the degree of
Master of Arts in General Psychology
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COLLEGE OF ARTS AND SCIENCES
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Abstract

The current study investigates the quantity and quality of intrusive thoughts (IT) experienced during the evacuation following a technological disaster. This study is aimed at evaluating which aspects of IT are related to increased frequency and disturbance of intrusive thoughts, as well as stress and coping outcomes. Participants were evacuees (N = 40) and a control group (N = 50) of a small community in Wisconsin. Evacuees were forced to leave their homes due to a train derailment and risk of explosion. The Impact of Event Scale (IES) measured frequency and avoidance of IT. The Intrusive Thoughts Questionnaire (ITQ) assessed qualitative aspects of IT associated with disturbance, with additional items indexing whether or not thoughts are cued and/or unwanted. The Global Symptom Index (GSI) of Symptom Checklist 90 – Revised, a proofreading task, and the escape/avoidance subscale of the Ways of Coping Inventory were used as stress outcome measures. Evacuees reported greater frequencies of intrusive thoughts and reported these thoughts to be more disturbing than did the control group. Disturbance of IT was related to stress outcomes more so than frequency of IT. Uncued thoughts that seem to “pop out of the blue”, unwanted thoughts, and thoughts which are avoided were experienced as more disturbing, with the avoidance effect stronger among evacuees than for the control group. Unwanted and avoided thoughts are associated with higher stress outcome measures. Findings suggest that intrusive thoughts are not necessarily destructive unless they are disturbing. Qualitative aspects such as unwanted and avoided thoughts may help predict who will develop posttraumatic symptoms.
Intrusive Thoughts and Stress during the Evacuation Phase of a Technological Disaster

Survivors of traumatic experiences often report symptoms of intrusive cognitions following such an event. Intrusive cognitions are thoughts or images related to the traumatic experience that seem to interrupt the victim’s stream of consciousness by capturing the focus of attention. Intrusions related to a traumatic experience are often uncontrollable, upsetting, and unwanted, but may be a sign that the brain is trying to process what happened. Intrusive thoughts are defined as unbidden, unintended, and uncontrollable thoughts or images of a past event, an anticipated event, or some other stimulus or situation (Horowitz, 1979). Intrusions can also take the form of sensory impressions, including stimuli that were present at the moment the event became traumatic (Elhers et al., 2002).

Proponents of a cognitive processing model suggest that intrusive thoughts are an essential part of the recovery process following a traumatic event (Creamer, Burgess, & Pattison, 1990; 1992). The victim’s conceptual framework, or schema, may not easily accommodate the trauma because of the qualitative difference between traumatic events and everyday life (Horowitz, 1986). Intrusions may serve the purpose of activating the trauma in working memory, allowing the mind to work through the event and integrate the trauma into pre-existing cognitive networks.

However, intrusive thoughts may also be maladaptive. Baum (1990) proposes that stress may be re-experienced if the victim thinks about the traumatic event, or has intrusive thoughts. Baum, Cohen, & Hall (1993) identified intrusive thoughts as a factor in long-term posttraumatic stress. Intrusive thoughts, such as uncontrollable
memories, dreams, or flashbacks can have a continuing impact on psychological distress (Vickberg, Bovbjerg, Du-Hamel, Currie, & Redd, 2000). One study demonstrated that intrusive thoughts were associated with considerable, short-term distress (Hall & Baum, 1995). Negative and upsetting cognitions are characteristic symptoms of Posttraumatic stress disorder (PTSD) and may indicate continued stress responding and general disturbance (Dougall, Craig, & Baum, 1999).

However, many people report intrusions after a traumatic event and do not develop PTSD. For these individuals, the frequency and intensity of intrusions decrease over time. Many questions remain regarding why some intrusive thoughts are properly processed, while others continue to be particularly disturbing. Greenberg (1995) discusses a need to differentiate between intrusions that facilitate cognitive integration, and those that merely prolong psychological distress.

A cognitive model of posttraumatic stress disorder suggests that the manner in which intrusions are appraised and processed may have an affect on the survivor (Steil & Ehlers, 2000). Some individuals are not bothered by intrusions, while for others they may be a source of psychological distress. Steil and Ehlers (2000) reported that dysfunctional meaning of intrusions (e.g. “Intrusive thoughts mean I am going crazy”) is a better predictor of distress than mere frequency of the thoughts. Individuals who are disturbed by their intrusions may experience more psychological distress than someone who accepts the thoughts as the mind’s way of attempting to process the event. Steil and Ehlers (2000) found that negative idiosyncratic meanings for intrusive thoughts predicted avoidance-coping strategies. Escape-avoidance
coping has been found to maintain intrusive thoughts (Falsetti, Monnier, Davis, & Resnick, 2002).

Initially, assessment of intrusive thoughts involved a quantitative rather than a qualitative approach, with measures indexing the frequencies of intrusions (Horowitz, 1979). Whereas this approach was informative, frequency was not necessarily a good predictor of the disturbance that can accompany intrusive thoughts. It has been suggested that certain qualitative aspects of intrusive thoughts may cause distress above and beyond mere frequency (Schooler, Dougall, & Baum, 1999). To assess disturbance associated with intrusive thoughts, Dougall, Craig, & Baum (1999) developed the Intrusive Thoughts Questionnaire (ITQ). The ITQ measures the degree to which intrusions are difficult and disturbing. Additional questions assess qualitative aspects such as whether thoughts are triggered by cues, and if they are experienced at times when they are unwanted.

Intrusive thoughts may be cued by stimuli in the environment, or one may have uncued thoughts that seem to "pop out of the blue". Schooler, Dougall, & Baum (1999) examined stress symptoms in rescue workers exposed to human remains on the crash site of Flight 427 (Pittsburgh, PA, 1994). Some workers experienced intrusive thoughts only when cued (see, hear or otherwise sense something that reminds them of the disaster), while others experienced intrusive thoughts with no identifiable cues.

Participants who reported uncued intrusive thoughts rated their thoughts as more disturbing than those reporting cued thoughts. There were no differences between the Cued only group and the Uncued group with respect to how frequently
they thought about the accident. The Uncued group showed higher levels of psychological distress than the Cued only group. Schooler et al. suggest that the distress accompanying uncued thoughts could be due to the fact that uncued thoughts are more unpredictable and are perceived as less controllable.

Some individuals may experience intrusive thoughts at times when they would rather not, and find these thoughts to be extremely unwanted. Other individuals experience intrusive thoughts without considering them to be unwanted and may have a better time processing the event into their everyday schemas. Individuals experiencing unwanted thoughts may experience these unwelcome thoughts as more disturbing than those who experience thoughts which are not unwanted. Also, individuals who appraise their thoughts as unwanted may experience psychological distress and revert to escape-related coping tactics. Reynolds and Brewin (1998) found coping techniques related to distraction and suppression to be the most common among clinical PTSD and depressed patients.

Another aspect of intrusive thoughts that may predict increased frequency and disturbance of thoughts is the attempt to avoid or suppress intrusive thoughts. The ironic process theory suggests that thought suppression involves conscious distraction to divert attention away from unwanted thoughts, and an unconscious monitoring system that remains vigilant for intrusions that call for more distraction (Wenzlaff, Meier, & Salas, 2002). When working together, the distraction and monitoring processes help keep intrusive thoughts just out of consciousness. Ironically, the vigilance of the monitoring system keeps the thoughts from ever becoming dormant, and may even lead to increased frequency of thoughts, especially if the distraction
The ironic process theory has been supported empirically, with avoidance behaviors shown to increase the frequency of intrusions (Lawrence, Fauerbach, & Munster, 1996). Recent research on thought suppression supports the theory that consciously trying to avoid certain thoughts may increase the frequency of intrusive thoughts (Rassin, Merckelback, & Muris, 2001; Salkovskis & Campbell, 1994; Shipherd & Beck, 1999). When thoughts continue to intrude consciousness, regardless of attempts to avoid them, they may be particularly disturbing. The constant vigilance and distraction process related to avoidance may be associated with cognitive stress. Several research studies report that cognitive stress is evidenced by deficits in ability to detect errors on a proofreading task (Fleming, Baum, Gisriel, & Gatchel, 1982; Glass & Singer, 1972; Lange, Toussaint, & Fleming, 2004).

Avoidance tactics are often considered maladaptive because they do not allow processing to occur (Ehlers & Clark, 2000), and may contribute to increased psychological distress. For recovery to occur, memories must be activated long enough to allow for effective processing. Avoidance causes thoughts to be suppressed as soon as they are detected, and processing does not occur. According to Creamer's cognitive processing theory (1990), avoidance mediates the relationship between intrusive thoughts and later psychological distress. This theory was supported by a study on the longitudinal associations among intrusions, avoidance, and psychological distress in a sample of cancer patients undergoing treatment for
their disease (Manne, Glassman, & DuHamel, 2000). The relationship between intrusive thoughts and later psychological distress in late stage cancer patients was directly influenced by attempts to avoid thinking about or dealing with reminders of the cancer experience. Intrusive thoughts were related to higher avoidance and had an indirect effect on the psychological distress through avoidance.

The current study examines acute measures of intrusive thoughts taken from evacuees of Weyauwega, Wisconsin (population = 1800) following a technological disaster. A train derailment and risk of a catastrophic explosion called for a swift evacuation of Weyauwega. Residents were ordered to leave their homes immediately, without time to gather any belongings. The scope of the disaster and the amount of spilled propane was unclear at that time, and residents were told they would only be gone a few hours. Evacuees were unprepared for an extended period of displacement, and were not able to return to Weyauwega for 18 days following the accident. The uncertainty regarding the condition of the neighborhood caused great social and economic disruption. Immediate data collection began while the evacuees were staying at shelters in the area. Control data were collected from the residents of Campbellsport, Wisconsin (population = 1913), located on the same railroad line running through Weyauwega.

Research from an earlier study conducted on the disaster at Weyauwega indicated that there was greater distress in evacuees than in control participants on global levels of stress outcomes (Lange, Toussaint, & Fleming, in press). Findings indicated that half of the evacuees were elevated on the psychological, behavioral, and physiological stress outcome categories, 32.5% of evacuees had mixed results,
and 17.5% of evacuees were low on all three dimensions. Questions remain regarding the reasons why many evacuees were highly stressed, some mixed, and yet another percentage at levels similar to controls. The current study examines the role that intrusive thoughts play in predicting stress outcome measures, and aims to identify which aspects of intrusive thoughts cause them to be particularly disturbing. The current study investigates intrusive thoughts in three approaches.

The first approach examines the effect of the accident and consequential evacuation on intrusive thoughts. Consistent with the disaster literature, this study hypothesizes that evacuees will show higher numbers of intrusive thoughts as compared to control participants. Intrusive thoughts experienced by evacuees will be more disturbing than thoughts experienced by control participants.

The second approach examines qualitative aspects of intrusive thoughts to determine if such aspects are related to increased frequency and/or disturbance of intrusive thoughts. Based on the findings by Schooler et al. (1999), it is hypothesized that thoughts which occur with no identifiable cue (uncued thoughts) will be associated with greater disturbance than cued thoughts. An exploratory prediction for another aspect of intrusive thoughts is that unwanted thoughts will be associated with greater disturbance than thoughts that are not unwanted. In line with the ironic process theory (Wenzlaff et al, 2002), high avoidance of thoughts is predicted to be related to greater frequency and disturbance than low avoidance of thoughts.

The third approach examines the relationship between intrusive thoughts and stress. Stress outcomes include psychological distress, poor concentration ability, and poor coping strategies. The disturbance that accompanies intrusive thoughts is
hypothesized to be a better predictor of stress on all dimensions than the mere frequency of the thoughts. Consistent with findings from Schooler et al. (1999), predictions include that uncued thoughts will be related to psychological distress, unwanted thoughts will be related to escape/avoidance coping, and avoided thoughts will be associated with psychological distress, poor concentration ability, and escape-related coping. Exploratory analyses will be conducted on the relationship between unwanted thoughts and stress.

Method

The disaster

On March 4, 1996 a freight train carrying hazardous materials derailed in the small community of Weyauwega, WI. Threat to the Midwestern community was immediate as 37 freight cars derailed, 14 of which contained an estimated million pounds of propane liquid gas. An inferno soon erupted as four propane cars ruptured and caught fire, shooting fireballs hundreds of feet into the air. The threat of explosion was compounded by the fact that the tank fire was just 100 feet from a Wisconsin Gas gate station and the main natural gas feeding line to the community. Following a quick response by the local fire department, and realization that the accident was beyond local capabilities, additional firefighters were called in and response was initiated by many government agencies (e.g., EPA, DNR, Wisconsin National Guard).

Upon awareness of the volatility of the situation due to highly flammable hazardous materials, firefighters were pulled back and evacuation of the entire community and surrounding rural areas was ordered. The evacuation was swift,
systematic, and efficient. Weyauwega residents were forced to leave their homes without time for gathering belongings, clothes, medicine, mail, money, or even pets. The threat to the community was high given the very real risk of a boiling liquid expanding vapor explosion (BLEVE) as the propane tanks were under increasing pressure. By noon of the day of the derailment, all 1,700 residents of Weyauwega and 600 from surrounding rural areas had been evacuated from their homes, businesses, and farms within a 1.5-mile radius.

Residents depended upon noon briefings and pictures from aerial views to assess any property damage and to monitor the dangerous situation. Uncertainty abounded regarding whether the entire community would be destroyed and exactly when residents would be allowed to return home as they were provided a rather indefinite timeline of "several weeks" before the disaster site would be contained and cleaned-up. Because clean-up was unexpectedly protracted, rumors about hidden health risks were widely circulated. To squelch the rumors and reassure the public, frequent town meetings were initiated during the evacuation in Waupaca, Wisconsin, a neighboring town where Weyauwega residents picked up vouchers for food and lodging.

Participants

Ninety individuals (40 Weyauwega residents and 50 Campbellsport residents) participated. Fifty-seven percent of the sample was female, all were white, 94% had 12 or more years of education, and 63% were married. The mean age of participants was 45.2 years. Chi-square analyses and ANOVA indicated no significant differences between Weyauwega and Campbellsport participants on any demographic measures,
including age ($M = 42.08$ vs. $M = 48.4$; $F(1,88)=3.73, p>.05$), education (93% vs. 90% high school diploma or above), gender (53% vs. 64% female), marital status (68% vs. 60% married), home ownership (73% vs. 71% own home), number of children ($M = 2.54$ vs. $M = 2.92$; $F(1,87) = .83, p>.05$), family size ($M = 4.2$ vs. $M = 3.63$; $F(1,86) = .82, p>.05$), and family income (75% vs. 85% income $\geq$ $20,000/yr$). The frequency and quality of intrusive thoughts were not significantly related to sociodemographic variables.

**Measures**

*Intrusive Thoughts.* Intrusive thoughts related to the train accident at Weyauwega, WI were measured utilizing Horowitz's revision of his original Impact of Events Scale (Horowitz et al., 1979) and the Intrusive Thoughts Questionnaire (Dougall et al., 1999).

The Impact of Event Scale (IES) is a 15-item self-report measure designed by Horowitz and colleagues to assess current subjective distress for any life event (Horowitz et al., 1979). Meta-analysis indicates the IES is a general, reliable, and valid self-report measure for assessing psychological stress reactions after negative life events (Sundin and Horowitz, 2003). The IES contains two subscales, Intrusion and Avoidance, with seven items and eight items respectively. The IES Intrusion subscale symptoms include nightmares, unbidden thoughts or images, strong pangs or waves of feelings, and repetitive behavior. Avoidance symptoms include attempts to dampen or avoid experiences associated with the traumatic event, blunted sensation, behavioral inhibition, counterphobic activity, and awareness of emotional numbness (Horowitz et al., 1979). The scale measures these symptomatic responses in a one-
(Dougall et al., 1999). The current study found a reliability coefficient of .94 for the ITQ.

**Cues & Intrusive Thoughts.** Participants were asked whether certain cues, such as noises, colors, and places, reminded them of the accident. Participants listed those cues, if applicable. Participants were also asked if they remembered the event *without* experiencing a cue or reminder and, if so, to provide an example.

**Unwanted Intrusive Thoughts.** Participants answered “yes” or “no” to whether they had thoughts about the accident at times when they would rather not think about it, or when it is unwanted.

**Stress Outcomes.** Psychological and somatic symptoms of distress were assessed using the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1977 & 1983). The SCL-90-R is a self-report inventory of 90 statements that describe a variety of psychological and somatic complaints. Participants indicated on a 5-point scale (1) *not at all* to (5) *extremely* how often in the past two weeks they were bothered by each of the 90 symptoms on this instrument. The SCL-90-R was scored in accordance with the guidelines provided by Derogatis, yielding scores on nine primary symptom dimensions and three global summary measures. Internal consistencies for the subscales sufficiently ranged from .81 to .92 (Derogatis, 1999). The current study uses only the Global Symptom Index (GSI), an average symptom distress report over the 90 items.

The behavioral indicator of stress was a timed proofreading task originally used by Glass and Singer (1972) and subsequently used in several other investigations of technological disasters (Fleming, Baum, Gisriel, & Gatchel, 1982; Baum, Fleming,
& Singer, 1983; Lange et al., in press). Participants were given five minutes to read and identify grammatical, punctuation, and spelling errors in a brief, nonfictional, prose passage taken from *The Death and Life of Great American Cities*. The proofreading task was scored as the number of errors participants correctly identified as a percentage of the total number of errors present in the completed portion of the passage. The assumption is that individuals who are cognitively stressed will detect fewer errors (Glass & Singer, 1972). The measure controls for level of education by only scoring the percentage of the passage completed.

**Coping.** Coping strategies used to deal with the Weyauwega chemical accident were assessed using the revised Ways of Coping Inventory (WOC-R; Folkman & Lazarus, 1985). Respondents indicated the extent to which they used various coping strategies on a 5-point scale (0 = not at all; 5 = an extreme amount). The current study only uses eight items comprising the escape/avoidance subscale of the WOC-R. The escape/avoidance coping subscale of the WOC-R includes such items as "Wished that the situation would go away or somehow be over" and "Refused to believe that it had happened" (Folkman & Lazarus, 1985).

**Procedure**

The city opened a central site for distribution of relief vouchers to evacuees for food and lodging. Researchers used this site to recruit evacuees for the study. As Weyauwega evacuees waited to meet with a disaster relief representative, researchers approached them and provided a description of the study. Approximately 67% of those evacuees approached agreed to participate. Evacuees providing informed consent completed an on-site portion of the study in a partitioned office room where
noise and other distractions were minimal. During this portion, researchers provided complete oral and written instructions for the study and a description of the questionnaire. Evacuees then left with the questionnaires and completed them individually at his or her shelter site. Each participant returned the study materials to the researcher at the recruitment site the following day.

At the same time, participants in the control group were recruited from their place of residence in Campbellsport, WI. Of the individuals at home, 70% agreed to participate. Researchers approached every third house on randomly selected streets. Control participants were treated identically to evacuees. All participants were informed that the purpose of the study was to gauge reaction to the Weyauwega train accident. Researchers picked up study materials from each control participant at a prearranged time the following day.

Statistical Plan

Statistical analyses were conducted in a three-phase process. In the first phase, one-way Analyses of Variance were performed to assess whether experiencing the evacuation had an effect on the frequency (IES Intrusion subscale) and disturbance (ITQ) of intrusive thoughts. Due to violation of the homogeneity of variance assumption that underlies the ANOVA, analyses were rerun on natural log transformations of the ITQ scores. Since the significance of results were the same for the analyses on transformed scores, the original scores are reported for ease of interpretation. This same procedure was followed any time there was a violation of the homogeneity of variance assumption and only results that were significant on transformed scores are reported.
In the second phase, two-way Analyses of Variance were performed to assess whether certain aspects of intrusive thoughts were related to the frequency and the disturbance of the intrusions. Aspects of intrusive thoughts investigated included whether or not the thoughts are precipitated by cues (cue group), whether or not they are unwanted, and the level of engagement in the avoidance of thoughts. A weighted ANOVA with Type III Sum of Squares was used to control for unequal cell sizes. A median split was used on the avoidance subscale of the IES to group participants into high and low avoidance categories. The intrusion subscale of the IES was used to assess frequency, and the ITQ was the dependent measure for disturbance.

In phase three, a MANOVA was performed to evaluate the association between frequency and disturbance of intrusive thoughts on stress and coping outcomes. Median splits were used to dichotomize participants on the frequency and disturbance of intrusive thoughts. Measures of stress included the global symptom index for psychological distress, performance on a proofreading task as a cognitive/behavioral indicator of stress, and the Escape/Avoidance subscale of the Ways of Coping Inventory-Revised to measure coping. Additional two-way Analyses of Variance were performed to calculate the relationship of each qualitative aspect of intrusive thoughts with each dependent measure of stress. Alpha levels were set at the conventional .05 for all analyses. Eta squared is used to estimate effect sizes.

Results

Effect of the Evacuation on Intrusive Thoughts
Analyses on the Impact of Event Scale (IES) showed that evacuated residents of Weyauwega reported significantly more intrusive thoughts on average than did residents from the control group \[ F(1, 82) = 38.32, p < .001 \]. Statistically significant main effects for the town of residence on the subscales of the IES indicate that evacuees reported greater frequencies of intrusion \[ F(1, 82) = 38.646, p < .001 \] and avoidance \[ F(1, 82) = 22.27, p < .001 \] as compared to the control group. In addition, Weyauwega participants reported significantly more disturbing intrusive thoughts as demonstrated by higher scores on the Intrusive Thoughts Questionnaire (ITQ) over control participants \[ F(1, 84) = 36.08, p < .001 \]. Effect sizes were estimated using eta squared. Large effects were found for all analyses in phase one. See Table 1 for the means, standard deviations, and effect sizes of these analyses.

Table 1

Means, Standard Deviations, and Effects Sizes of Intrusive Thoughts for Evacuees and Controls.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Evacuees</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
</tr>
<tr>
<td>Impact of Event Scale</td>
<td>25.33***</td>
<td>14.25</td>
</tr>
<tr>
<td>Intrusion Subscale</td>
<td>13.85***</td>
<td>8.26</td>
</tr>
<tr>
<td>Avoidance Subscale</td>
<td>11.49***</td>
<td>11.49</td>
</tr>
<tr>
<td>Intrusive Thoughts Ques.</td>
<td>20.95***</td>
<td>12.91</td>
</tr>
</tbody>
</table>

***\( p < .001 \)
Aspects of Intrusive Thoughts

There was a significant main effect for Cues group on the ITQ [$F(1, 77) = 11.10, p < .001$]. The eta squared for this analysis indicates that cues group has a large effect on the disturbance of intrusive thoughts. Post hoc analysis indicated that uncued thoughts were significantly more disturbing than cued thoughts ($p < .05$). No differences were found between the cued only group and the uncued group with respect to how often they thought about the crash.

Participants who experienced unwanted thoughts about the accident reported a greater frequency of intrusive thoughts than participants who did not report unwanted thoughts [$F(1, 79) = 25.74, p < .001$]. Participants who report having unwanted thoughts also had more disturbing intrusions than participants who did not have unwanted thoughts, as measured by the ITQ [$F(1, 82) = 38.40, p < .001$]. Eta squared indicates a large effect for unwanted thoughts on frequency and disturbance of intrusive thoughts. See Table 2 for means, standard deviations, and effect sizes of these analyses.

There was a statistically significant interaction between town of residence and level of avoidance on the intrusion subscale of the IES [$F(1, 80) = 3.96, p = .05$]. The effect of avoidance on increased frequency of intrusive thoughts was stronger for evacuees than for the control group. Avoidance was associated with more intrusive thoughts for both evacuees and the control group, with the effect pronounced in evacuees as avoidant evacuees reported greater frequencies of intrusive thoughts than avoidant control participants. There was also an interaction between town of residence and level of avoidance for disturbance ratings on the ITQ [$F(1, 78) = 5.51,$}
p<.05]. The effect of avoidance on increased disturbance of intrusive thoughts was also stronger for evacuees than for the control group. Whereas avoidance of thoughts was associated with greater disturbance in both evacuees and controls, high avoidance evacuees reported their intrusions to be more disturbing than did high avoidance control participants. See Figures 1 & 2.

Table 2
Mean Frequencies and Disturbance Ratings of Aspects of Intrusive Thoughts (IT)

<table>
<thead>
<tr>
<th>Aspects of IT</th>
<th>Frequency (IES)</th>
<th>Disturbance (ITQ)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>η²</td>
<td>M</td>
</tr>
<tr>
<td>Uncued</td>
<td>.14</td>
<td>.23</td>
</tr>
<tr>
<td>Yes</td>
<td>12.96</td>
<td>08.31</td>
</tr>
<tr>
<td>No</td>
<td>10.00</td>
<td>07.75</td>
</tr>
<tr>
<td>Neither</td>
<td>04.57*</td>
<td>06.15</td>
</tr>
<tr>
<td>Unwanted</td>
<td>.25</td>
<td>.32</td>
</tr>
<tr>
<td>Yes</td>
<td>17.46***</td>
<td>07.29</td>
</tr>
<tr>
<td>No</td>
<td>05.31</td>
<td>05.94</td>
</tr>
<tr>
<td>Avoided</td>
<td>.28</td>
<td>.29</td>
</tr>
<tr>
<td>High</td>
<td>14.05***</td>
<td>07.71</td>
</tr>
<tr>
<td>Low</td>
<td>03.29</td>
<td>04.48</td>
</tr>
</tbody>
</table>

* p < .05  
*** p < .001
Figure 1.

Interaction for place of residence by avoidance on frequency of intrusive thoughts

Figure 2.

Interaction for place of residence by avoidance on disturbance of intrusive thoughts (ITQ)
Quality vs. Quantity of Intrusive Thoughts and Stress

MANOVA indicated that the disturbance associated with intrusive thoughts is a better predictor of stress than frequency of intrusive thoughts across all stress outcome measures. This is evidenced by a significant effect for the ITQ ($p < .05$) and not for the IES intrusion subscale ($p > .76$) on measures of stress. The eta-squared value indicates a medium to large effect for disturbing thoughts on stress outcomes. Follow up univariate analyses indicate that participants experiencing high levels of disturbance associated with intrusive thoughts reported greater levels of psychological distress than participants below the median split for disturbance of thoughts [$F(1, 71) = 4.68, p < .05$]. High disturbance participants also found fewer errors on the proof reading task (marginal significance) than their low disturbance counterparts [$F(1, 71) = 3.77, p < .06$], a behavioral indicator of cognitive stress. Escape/avoidance coping was reported significantly more by participants experiencing highly disturbing thoughts than by those below the median split for disturbance of thoughts [$F(1, 71) = 6.40, p < .05$]. See table 3 for descriptive statistics and the effect size.

Qualitative Aspects of Intrusive Thoughts and Stress

Psychological distress. Unwanted thoughts were significantly related to psychological distress (GSI). Participants who experienced unwanted thoughts reported greater psychological distress than participants who did not report unwanted thoughts [$F(1, 80) = 11.01, p = .001$]. Avoided thoughts were also significantly related to psychological distress. Participants who reported high levels of avoidance reported greater psychological distress [$F(1, 77) = 7.57, p < .01$]. See Figure 3.
Table 3

Mean Scores and Standard Deviations for Measures of Stress & Coping Outcomes as a function of Disturbance of Intrusive Thoughts

<table>
<thead>
<tr>
<th>Group</th>
<th>MANOVA</th>
<th>Global Symptom Index</th>
<th>Proofreading Task</th>
<th>Escape/Avoid Coping</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITQ</td>
<td>.849*</td>
<td>.55</td>
<td>.58*</td>
<td>.92* .51</td>
</tr>
<tr>
<td>High</td>
<td>.83*</td>
<td>.55</td>
<td>.18</td>
<td>.44 .52</td>
</tr>
<tr>
<td>Low</td>
<td>.49</td>
<td>.27</td>
<td>.67</td>
<td>.13</td>
</tr>
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Note. F ratio is Wilks's approximation of F.
* *p < .05
* *p < .06

Figure 3

Aspects of Intrusive thoughts related to psychological distress
Cognitive Stress. The only aspect of intrusive thought significantly related to cognitive stress, as evidenced by poorer performance on the proofreading task, was avoidance (marginal significance). Individuals who engaged in high avoidance of thoughts detected fewer errors on the proofreading task than those who were avoiding less \( F(1, 75) = 3.81, p < .06 \).

Escape/Avoidance Coping. Unwanted thoughts were significantly related to escape/avoidance coping. Participants who reported unwanted thoughts scored higher on the escape/avoidance subscale of the Ways of Coping inventory than those who did not report their thoughts to be unwanted \( F(1, 80) = 5.91, p < .05 \). Participants high in avoidance of thoughts reported using significantly more escape/avoidance coping than those who avoided less \( F(1, 77) = 7.70, p < .01 \). See Figure 4.

Figure 4

Aspects of Intrusive thoughts related to escape/avoidance coping

![Graph showing aspects of intrusive thoughts related to escape/avoidance coping](image)
Discussion

Intrusive thoughts are common occurrences following a traumatic experience (Finnsdottir & Elklit, 2002). This study found that the evacuation of Weyauwega, Wisconsin following a technological disaster had an effect on the intrusive thoughts of residents compared to controls from Campbellsport, WI. Evacuees reported more intrusive thoughts than the control group and their thoughts were more disturbing. According to cognitive processing theories, intrusive thoughts are a necessary part of incorporating a trauma into our everyday schemas. The evacuation of Weyauwega, WI caused great social and economic disruption to the residents’ everyday lives. Due to the qualitative difference between life before and after the evacuation, it is not surprising that evacuees experienced greater numbers and more disturbing intrusive thoughts about the accident than the control group. Intrusive thoughts allow the traumatic event to be revisited and processed. The experience of disturbing intrusive thoughts may help to explain the finding of Lange et al. (in press) regarding the differences in stress levels among evacuees. Some control participants also experienced intrusive thoughts, which will be discussed later in more detail.

This study found that certain aspects of intrusive thoughts were related to increased frequency and disturbance of intrusive thoughts. For evacuees and controls alike, uncued thoughts were more disturbing than thoughts triggered by cues. This supports the research findings of Schooler et al. (1999) that the Uncued group consistently rated their thoughts about the crash as more disturbing than the other groups across several different time assessments. This could be due to the fact that uncued thoughts are less predictable and may be more disturbing if perceived as
uncontrollable. Uncued thoughts may also be more resistant to extinction. If an intrusive thought is only experienced after a cue, such as a train or siren, the thoughts may decrease over time due to habituation of that cue. However, uncued thoughts may be more likely to persist, keeping the stressor alive in the mind of the victim.

Participants reporting unwanted thoughts about the evacuation rated these as more disturbing than thoughts that were not unwanted, regardless of place of residence. This suggests that participants who experienced unwanted thoughts found these thoughts to be more disturbing than intrusive thoughts which were not unwanted. This again may be due to issues of control and predictability. The experience of unwanted thoughts may lead one to believe that they are losing control of their mind. Feelings of loss of control might be associated with unwanted thoughts being perceived as very disturbing.

The effect of avoidance of thoughts on increased frequency and increased disturbance showed a stronger effect for evacuees than for control participants. Evacuees engaging in high avoidance reported more thoughts and perceived these thoughts to be more disturbing than did control participants who are high in avoidance behaviors. The increased disturbance that accompanies avoided thoughts may suggest that avoidance is maladaptive for both groups, however evacuees who are avoiding are experiencing more distress and greater numbers of intrusive thoughts than participants in the control group who are avoiding. The larger effect for evacuees may suggest that evacuees need more of a chance to process the trauma than control participants, because they were directly affected. Control participants may not be as traumatized, so avoidance is not as distressing because their minds do not
need to work through the event as much as the evacuees who are traumatized. However, even for the controls group, those high in avoidance experienced more distress and greater frequencies of thoughts than those avoiding less.

Some participants experience intrusive thoughts that are not particularly disturbing, while for others, intrusive thoughts seem to be a source of considerable distress. Disturbance of intrusive thoughts consistently predicted higher stress outcome measures, whereas the mere frequency of intrusive thoughts did not have an effect on stress outcome measures. The disturbance that accompanies intrusive thoughts seems to be a better predictor of stress outcome measures than merely experiencing intrusive thoughts.

The importance of disturbance supports a cognitive model proposed by Steil and Ehlers (2000) (stating that dysfunctional appraisal of intrusions (e.g. “I am going crazy”) and the accompanying disturbance may have more of an affect on stress outcome measures than simply experiencing the thoughts. This highlights the importance of assessing more qualitative aspects of intrusive thoughts and how they relate to distress. Schooler et al. (1999) suggest that early distress may be a warning sign of more persistent intrusions and chronic stress as time progresses. By evaluating which victims are experiencing qualitative aspects of intrusive thoughts related to stress, it may be possible to determine who is most vulnerable to development of post traumatic symptoms.

Avoidance was directly related to all three stress outcome measures, and may be the most important qualitative aspect in determining who is at risk for developing post traumatic symptoms. People who engaged in avoidance of thoughts experienced
greater levels of psychological distress, performed poorer on a proofreading task (indicating cognitive stress) and resorted to more escape/avoidance coping than people who avoided less. This demonstrates that avoidance takes cognitive effort and is, for the most part, maladaptive. Unwanted thoughts were not as cognitively taxing as avoided thoughts. Participants who experienced unwanted thoughts did not show deficits on the proofreading task. Unwanted thoughts were related to increased levels of psychological distress, as would be expected. These aspects should serve as warning flags when evaluating the quality of intrusive thoughts. Uncued thoughts were not directly related to stress outcome measures. More significant findings may be established if future research focuses specifically at control and predictability of thoughts.

Whether intrusive thinking is a cause of stress, or an outcome is not determinable from this data. Longitudinal follow-ups are needed to determine temporal precedence. The important finding of this study is that frequency of intrusions does not predict distress following a technological disaster. In fact, experiencing intrusive thoughts may be a sign of cognitive processing. However, certain aspects of intrusive thoughts may cause them to be particularly disturbing. These aspects include uncued thoughts, unwanted thoughts, and avoided or suppressed thoughts. These aspects of intrusive thoughts may be important in determining who will process the event, and who will continue to experience prolonged distress.

For individuals who report a disturbing nature to their intrusive thoughts, expressive writing may serve as a means for more deliberate processing. Emotional
expression may reduce the distress associated with intrusive cognitions (Zakowski, Valdimarsdottir, & Bovbjerg, 2001). Although intrusive thoughts activate the memory network, they are often too brief to allow effective processing, especially if avoidance or suppression strategies are employed. Expressive writing may allow for extended processing by providing time to reinterpret the stressful information and integrate it with existing mental models. Park and Blumberg (2002) found that survivors of trauma who wrote about the experience experienced changes in appraisal of the situation, allowing accommodation of the stressful event.

One important note is that, although evacuees reported higher frequencies and disturbance ratings of their intrusive thoughts, the control group did experience some intrusive thoughts about the accident. In many disaster situations, it is difficult to find a completely unaffected control group, and many times a “less affected” group serves as an appropriate control. It is interesting to consider the relationship between intrusive thoughts and stress, even for those not directly involved in the evacuation. Even without the experience of evacuation, control participants that experienced disturbing intrusive thoughts about the accident scored high on stress measures. This suggests that intrusive thoughts containing the disturbing aspects mentioned in this study may serve as a stressor in and of themselves.

It is interesting to consider the influence that the media might have on fostering intrusive thoughts in individuals without direct exposure to the disaster. Participants whose only exposure to the disaster was through television, radio, newspaper, etc. experienced intrusive thoughts and stress. Many people experienced stress following the attacks of September 11, 2001 who were not directly exposed to
the disaster. Disturbing intrusive thoughts regarding a traumatic event seem to have the capacity of becoming a primary source of distress.

This data is very unique and valuable because researchers were able to obtain acute measures of quantity of quality of intrusive thoughts. In many disaster studies there is a time gap between the disaster and the collection of data. Due to the quick response of the research team, this data provides valuable insight into acute measures of subjective experience during a disaster. Since the experience of intrusive thoughts is expected during such a disaster, it is especially important for acute data to examine more qualitative aspects to determine who is experiencing disturbing aspects that may lead to psychological distress. Specifically, individuals engaging in high levels of avoidance may be at the greatest risk for experiencing difficulty integrating the trauma into their everyday lives. Detecting and addressing avoidance may benefit the health of individuals who have recently experienced a technological disaster.
References


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Curriculum Vitae

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