

**Emergency Environmental Stress Induced Diminished Cognitive Capacities:  
Adapting to Audience Challenges for Successful Emergency Communication and  
Incident Alerting Notification Applications**

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**SUPDET 2011**

# Emergency Environmental Stress Induced Diminished Cognitive Capacities: Adapting to Audience Challenges for Successful Emergency Communication and Incident Alerting Notification Applications

## Introduction

Non-routine and stimulating sights, sounds, smells, and concern for personal safety are inherent aspects of most emergency contexts. For many people, such distractions are more than bothersome, but actually affect our abilities to think. During a fire or other emergency context, measurable physiological and psychological changes may occur that dramatically affect one's ability to hear, see, listen, process, decide, and act. The stress, distress, and duress of an emergency environment or a fire or evacuation can create changes in individual's perception, attention, cognitive processing capabilities, and capacities for behavioral response. Such human factors changes create challenges for successful emergency communication and can impede warning, information delivery, and lifesaving behavioral actions. Research indicates that such diminished capacities can impede successful warnings and emergency instructions.

Emergency communication efforts, in such contexts, can be enhanced with appropriate strategies and adaptations. Such applications include gaining insights from research and audience analysis when setting goals and targets for such messages; deliberate message construction adaptations; high credibility message source attributions; strategic message structure; choice of delivery modality; managing both reading ease and readability factors; appropriate redundancy; and avoiding communication breakdowns.

## Comprehension-Understanding-Information Processing

Effective communication and incident notification is essential to protect the health and safety of people during major disasters and emergencies such as natural disasters, industrial accidents, wildfires, criminal and terrorist situations, active shooters, and other types of emergencies. In fact, communication failures and breakdowns can often have tragic consequences. At the most basic level, emergency communication pertains to the alerts, warnings, and notifications that should be issued to those in danger as well as responders, key personnel, those in harm's way, and in many cases the general public during an emergency incident. Such emergency notification processes include the tools, techniques, systems, and messages that are used to ensure that they are able to contact the right people at the right time with the right message and to be successfully understood, comprehended, and to enable an appropriate behavioral response. In addition to the changes in cognitive processing capabilities that the stress, distress, and duress of an emergency environment can create, there are also other changes among

people experiencing an emergency that message writers should take into consideration.

These cognitive processing changes include the following variables:

- Changes in assessments of perceived risk changes
- Information-loading reductions (lower cognitive limits on how much or how many things we can think about)
- Attitude-behavioral consistency interaction and uncertainty anxiety effects
- Changes in situational awareness perception
- Selective attention (including attention blindness/deafness); reaction time changes (in most cases these changes result in slowed reaction times)
- Diminished cognitive processing that involves thinking, reasoning, remembering, imagining, or learning
- Diminished reading/listening abilities
- First language reversion tendencies in second language speakers

In most people the cognitive abilities typically decrease as crisis stress increases (peaks). Unless there is a lingering traumatic stress syndrome, these abilities return to normal levels relatively quickly. However, it is useful to remember that people possess different cognitive abilities and limitations, which in turn affects decision-making capabilities in a crisis in different ways and to different degrees.

One's ability to comprehend messages changes from low- to high-stress contexts. Typically individuals can, on average, process about seven distinctive issue or information features in a single message unit during low-stress contexts. As mentioned previously, the average reading level among the general (literate) public in the United States is approximately the 10th-reading level during routine and non-stressful measurements. When receiving instructions and directions, the average North American focuses on the competence, expertise, and knowledge of the message source.

In high-stress contexts, recipients are only able to process on average three distinctive issue or information features in a single message unit. Thus, there is on average a greater than 50 percent decrease in one's cognitive abilities to grasp various message factors. This is also true when measuring the recognition of the subtleties and nuances in messages (the highly stressed individuals had a diminished capacity to do so). Furthermore, as previously mentioned, typical (untrained) individuals drop on average about four grade levels in their reading and verbal comprehension abilities during peak periods of high-stress situations. Finally, even the evaluation standard used for receiving instructions and directions changes. During high-stress contexts the average North American no longer critically focuses on the competence, expertise, and knowledge of the message

source. This foreshadows a problem because misinformation and rumors can create unwanted behavioral responses during emergencies.

Communication processing shifts in low- to high-stress situations. Emergency and crisis stress (distress/duress) negatively affects the cognitive process. Therefore, emergency notification messages must balance ideas, information, and words in the context of a crisis. You should create messages that are accurate, consistent, simple, and that reinforce each other. Since confusion is easily achieved during an emergency, try as much as possible to avoid mixed or erroneous messages which will only add to the confusion and make your better written messages more likely to be lost in the chatter.

### Chandler 3 & 30 Principle

Individuals' perceptions and attention are impacted during an emergency. Their abilities to grasp multiple key points in a given message are limited, and their attention capability is also restricted. If there ever were a time when messages need to be brief and concise, this is it. It is necessary to organize complex information and make it easier to be understood by the reader or hearer. This is similar to the expectations for lead or front-page media and broadcast stories. They usually convey only three key messages in less than nine seconds for broadcast media or 27 words for print. It has been suggested that optimal messages are those that convey key information in three short sentences that convey no more than three key messages in 27 words.

The general rule of thumb is that the greatest number of recipients who perceive and attend to a message will listen or read to the first few seconds or words of the message. Gradually, individuals in the audience stop reading or listening because of fatigue, distractions, diminished cognitive capacity, or failure to recognize the relevance or importance of the message or because they are making predictive assumptions—based on past experiences or projections of what they think it should say—(frequently incorrect) about what the remainder of the message will be. All of these tendencies for audience erosion of understanding and comprehension are accelerated by time pressures, other distractions, cognitive impairments, and other stressors.

One useful technique for writing notification messages is to attempt to write an emergency alert message in no more than three sentences and in no more than 30 words. These compact 3 & 30 messages are what can be used for actual alerts. (I suppose that one could use a 3 & 27 or 3 & 33 principle just as well, but I have found that 3 & 30 is a practical target for those who are writing messages.) The 3 & 30 messages have the widest possible applications and are compatible with almost every communication device, including those that are character and byte capacity restricted. It may be difficult to create such brief, concise messages. However,

having done so, you will have far superior notification messages compared with longer and more rambling alert texts.

### Chandler 60 & 6 Principle

As discussed previously, the average individual suffers from diminished cognitive functions during peak stress periods of an emergency. We know that the ability to comprehend and understand messages decreases during these periods, and we also know that the typical person has a loss of about four grade levels in verbal or reading ability. To adapt to these tendencies, it is important that you simplify the grammar, syntax, vocabulary, and reading level of your emergency messages for general population audiences. Based on norms in North America, your messages should be written at a sixth-grade (or below) reading level. The Flesch Reading Ease scale measures comprehension difficulty of text on a 100-point scale. The Flesch–Kincaid Grade Level scale computes a grade level score for a written message. My field experience has demonstrated that in addition to writing notifications at a sixth-grade or lower reading level; it is best if the notifications have a reading ease score of at least 60 or greater (on the 100-point scale). Notifications should be at a sixth-grade reading level. They should have a reading ease score of at least 60.

### First Language Reversion Tendencies

One final area to consider for second language speaking audiences is the necessity of adapting to first language communication for warnings and emergency messages.

Research and normative practices recommendations have traditionally emphasized that such warning and emergency messages should be written (constructed) in the languages in which members of the target audience are proficient. No distinctions are made in such research and normative practices recommendations for target audience member groups for whom the language in which they are proficient is a first language or second language for the audience – rather the “threshold” for choosing a language for such messages is typically the level of competency or proficiency in a language to warrant using that language for warnings. For example, recommendations for a bi-lingual audience of first language Spanish speakers and second language English speakers who work in an English Speaking business environment, assume that warning and emergency messages written in English (reflecting the business communication norms and practices) are sufficient for maximum audience comprehension and decision making.

Such assumption for using competence or proficiency in a language may be adequate for routine and normal communication in the business, organizational or workplace environment. However, one important link in this chain of communication for non-routine situations is the relationship between message language and how

those who are experiencing heightened states of stress, anxiety, fear, and non-normative physiological reactions to the crisis context understand, interpret and comprehend such messages. Research has already demonstrated that peak periods of crisis stress can alter cognitive processes for reading, comprehension, interpretation, and assessment of risk calculus among target audiences for such emergency notification communication. The unexplored questions relate to how those who are proficient in a second (or subsequent) language react and respond to warnings and messages in peak periods of stress and complexity.

First language (Language 1 or L1) (also referred to as “native language” and sometimes “mother tongue”) is a construct which typically is used to indicate a language that a person either learned “first” in development chronology and/or is as proficient in as a native individual of that language's "base country," or as proficient as the average person who speaks no other language but that language. Subsequent language fluency is called “second language” (L2).

Language attrition is the loss of a first or second language (L2) or a portion of L2 language skills by individuals. Language reversion of L2 speakers is a phenomenon where cognitive processing (decoding/encoding) and comprehension abilities for communication of an L2 speaker unexpectedly diminish and L2 speakers shift to vocabulary, grammar, and lexical processing (thinking) in L1 languages. Some research has suggested that some higher order cognitive processes, including those performed under high stress conditions result in reversion to thinking and processing communication in primary L1 language and makes processing L2 warnings and emergency messages challenging and confusing.

Given the critical importance of successful message comprehension, understanding, decision-making and subsequent behavior actions by those who receive warnings and emergency notifications and the potential communication barriers that First Language Reversion tendencies may have for audiences for whom warnings and emergency notification messages are constructed in L2 languages. Such first language reversion could conceivably create communication barriers/problems for L2 centric emergency communication to L2 audiences during periods of high stress. The management of such L1 reversion tendencies may have significant implications for practical applications for those who are creating and sending emergency notification messages to L2 dominant audiences.

Crisis situations include high levels of stress, time pressures, and limited and changing information, as well as the burden of making important life and death decisions quickly, accurately, and under intense scrutiny. There are numerous cognitive processing changes affecting your intended audiences for warning and alert messages. These changes affect both your audience and your own team. Messages should be carefully crafted to work under these difficult conditions.