

The Psychological Effects on Personnel in a Mine Disaster

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Psychology

Psychology is the scientific study of human behavior.

Psychologists have studied human behavior under stress, including first responder behavior.

Mine Rescue team responders work in a dangerous environment under duress. What do we know about the normal human responses in this situation?

Normal Human Response to Stress: Fight or Flight response

Stress is a basic human instinctual response. It is the survival response.

It has physical, cognitive, emotional, and behavioral symptoms.

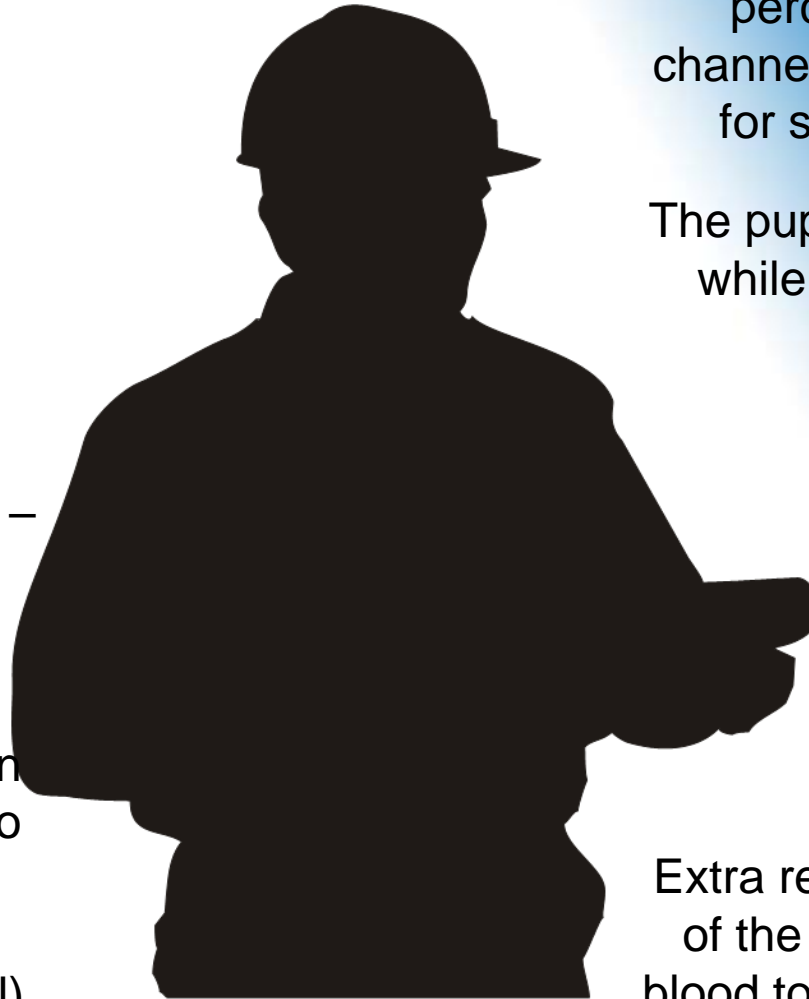


Physical reaction to stress

Body hairs become erect – puffed-up hair makes animals look bigger and more dangerous.

The Medulla (adrenal glands) secretes epinephrine (adrenaline) – the "fight-or-flight" hormone.

Sugar stored as glycogen in the liver is converted to glucose and the blood stream brings extra glucose and oxygen (fuel) for the heart.



The heart rate and blood pressure increase.

The immediate response to a perceived threat is the channeling of body resources for strength and speed.

The pupils dilate for better vision while the lungs take in more oxygen.

Stress dulls the body's sense of pain while thinking and memory improve.

Extra red blood cells flow out of the spleen, allowing the blood to carry more oxygen to the muscles.

Disease Response

Brain cortisol becomes toxic to brain cells potentially damaging the ability to think.

Decreases in blood flow to the intestine leave mucous lining vulnerable to ulcers.

The immune system is weakened as repeated suppression of disease-fighting cells ultimately weakens resistance to infection.



Fatigue, anger and depression increase.

The circulatory system is affected by the elevated blood pressure and heart rate and damage to the elasticity of blood vessels occurs.



Psychological Aspects

What do we mean when we discuss psychological effects on personnel in a mine disaster?

These are normal people responding to an exceptional situation. The psychological effects are not pathological. They are not mental illnesses.

Understanding the natural, normal, human response to danger provides the command center leadership, the escapees, and the mine rescue team responders with an ability to be more resilient in an emergency situation.

Types of Stress

Cumulative Stress

the daily hassles of life; slow erosion



Traumatic Incident Stress

exposure to a trauma, a catastrophic event or severe injury



Traumatic Stress



Quecreek Incident, July 24 - 28, 2002

Traumatic Stress



Sago Mine January 2, 2006

Utah August 2007





Traumatic Incidents

Traumatic incidents can produce unusually strong emotional reactions and may interfere with the ability to function *for awhile*.

Strong reactions are normal reactions to extraordinary situations.

Psychological Consequences

A traumatic incident may lead to *Acute Stress Disorder* or *Post - Traumatic Incident Stress Syndrome (PTSD)*

Exposed disaster workers - (including mine rescue teams), are at increased risk of acute stress disorder, depression, or PTSD

(Am J Psychiatry 2004; 161:1370-1376)

Short Term Symptoms

Cognitive, Behavioral, Emotional

Numbness

Avoidance

Withdrawal

Depression

Anger

Denial

Difficulty concentrating

Relationship problems

Feeling overwhelmed

Increased alcohol consumption

Change in sexual functioning

Change in eating habits

Long Term Symptoms

Cognitive, Behavioral, Emotional

Fearfulness

Sleep disturbance

Flashbacks

Feelings of guilt

High anxiety

Irritability

Exaggerated startle responses

May lead to a diagnosis of Post Traumatic Stress Disorder (PTSD) after three months

Post-traumatic Stress

It has been suggested that the most vulnerable time emotionally is from 6 months to one year after the event.

There is increased fear of rages, self-destructive behavior and even suicide. “The despair, the helplessness gets so intense... it bursts out” (Lagnado, 2002).



(COURTESY KMTW)



Mine Rescue Experiences

Mining is a small community world-wide.

We work and live in rural communities.

Mine Rescue personnel may personally know the victims and their families.

Men tend to ignore the discomfort of emotions.



Judgment and Decision-making

Constantly unpredictable, hazardous environments and emergency situations demand heightened judgment and decision-making skills.

Stress is one of the factors that decision-makers must contend with in most life and death situations, natural or man-made.

Judgment and Decision-making

Key issues with Stress

1. ... and perception
2. ... and compromised judgment
3. ... and focus of attention

1. Stress and Perception

Stress is affected by perception.

The ability to cope with stress is dependent upon an individual's *perception or interpretation* of an event.



2. Stress and compromised judgment

Stress restricts cue sampling.

(Kontogiannis & Kossiavelou, 1999)

Both improved performance and performance degradation are associated with stress. (Poulton, 1976)

Stressed \underline{S} focus on the *general outline* of the problem, non-stressed \underline{S} rely on *in-depth analysis*. (Dorner & Pfeifer, 1993)



2. Stress and compromised judgment

Successful Response Teams are *adaptive*.



Their *mode* of communication changes.

3. Stress and focus of attention

Conflicting theories

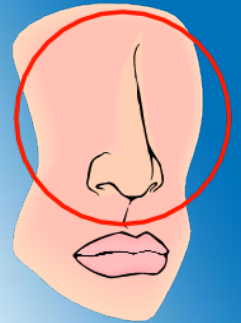
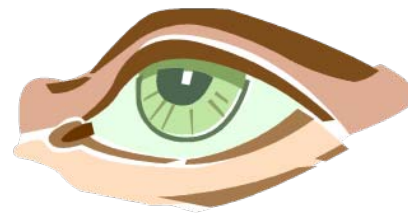


Psychological Aspects

Of the five senses, smell lasts the longest in memory.

Thus, even many years after a mine disaster, a smell can trigger a flashback.

The visual sense is next and can also trigger a flashback.



The Nose

First Responder Community after 9/11

RAND/NIOSH report:

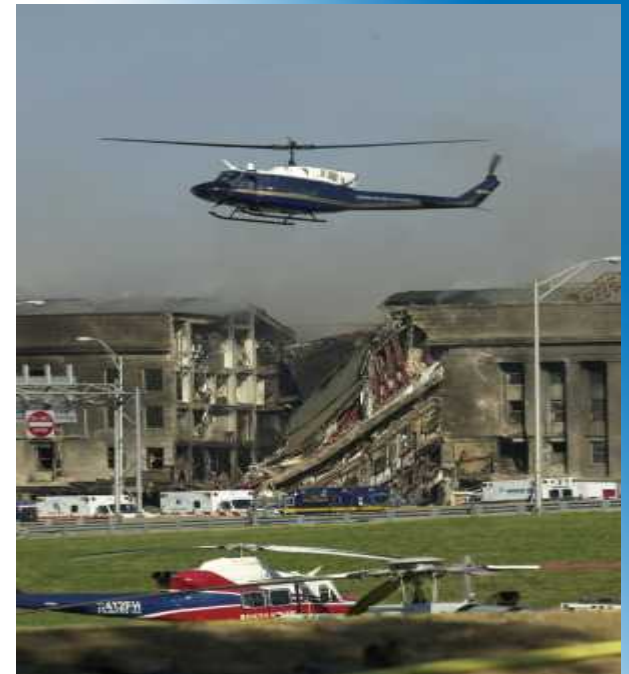
- “intensity of responders’ work, the long duration of the response campaigns, the multiplicity of risks, the horrifying outcomes (of the attacks), and the lack of knowledge about hazards all contributed to stress.”
- Many bodies horribly mangled; mostly body parts



First Responder Community

RAND/NIOSH report:

- Stress affects responders' judgment about their own health and safety. Personal and professional bonds led to greater risk taking at WTC.
- At the Pentagon, some workers succumbed to seizure-related heat exhaustion due to stretching the limits of their breathing PPE, and with the long hoses, and excessive heat, they stayed too long.



Interventions

Many times rescue workers do not recognize the need to take care of themselves and to monitor their own emotional health.

They can become part of the problem.



Example of suggestions for rescuers on-site

Pace yourself

Watch out for each other

Maintain regular eating and sleeping habits

Drink plenty of fluids

Recognize and accept what you cannot change

Communicate with home

In Conclusion



Psychologically **PREPARATION** is the most important activity in which to engage to mitigate the effects of a disaster.

Information lowers anxiety; **planning** quiets fears.

Part of mine rescue training should include the human response to traumatic incidents so you can be prepared and understand what you are experiencing.

Resources

<http://www.cdc.gov/niosh/mining/pubs>

1-800-35-NIOSH

Traumatic Incident Stress: Information for Emergency Response Workers (2002) DHHS (NIOSH) Pub # 2202-107

Kowalski & Vaught (2001) *The Safety and Health of Emergency Workers* J of Contingencies & Crisis Mgt Vol 9 No 3 Sept

Kowalski, KM (1995) *A human component to consider in your emergency management plans: the critical incident stress factor.* Safety Science 20 (115-123) Elsevier



Questions/Comments



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