

**PTSD 101**

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**COURSE TRANSCRIPT FOR:**

**Physical Health Effects of Traumatic Exposure**

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**Slide 1: Physical Health Effects of Traumatic Exposure**

I'm Paula Schnurr from the National Center for PTSD. This presentation focuses on physical health. Traumatic exposure can affect many aspects of a person's well-being and functioning, not merely their mental state or the psycho-social situation, but also their physical well-being.

**Slide 2: Presentation Goals**

The goals of this presentation are to increase your understanding that trauma is related to poor health, that a person's reaction to trauma, PTSD especially, mediates the effect of exposure on health, and that there are plausible mechanisms through which PTSD could promote poor health. The focus is on research but the emphasis is on clinical practice. My premise is that good clinical practice is informed by knowledge of research findings.

The data reviewed in this presentation focus primarily on chronic PTSD; Individuals who've had PTSD for some point in time, and it makes sense to think that the effects of traumatic exposure on health would take a while to unfold. However, there are reasons to think that these findings should generalize to newer trauma survivors, to veterans returning from Iraq and Afghanistan, to newly traumatized women who've been sexually assaulted in the military, and so on. We know less about the effects of trauma and PTSD on health in these populations, but the mechanisms; the pathways; should be the same.

**Slide 3: Common Views About How Mental States Affect Health**

Both laypersons and professionals tend to trivialize the effect of mental states on health. For example: We've all heard people say, "Oh, it's all in your head. It's just stress. You're not really sick." In fact mental states can have significant impacts on physical health.

**Slide 4: Example: How Depression (vs. Smoking) Affects Coronary Disease Onset**

This slide presents the results of a meta-analysis on the relationship between depression and coronary artery disease. As you can see from the slide, depression increases the risk of disease by 60% more than passive smoking-not as much as smoking, but more than passive smoking, which we all consider to have health effects. So the health effects of depression and other mental states are quite real.

## **Slide 5: What Are Health Outcomes?**

These next 2 slides provide background information about the conceptualization of physical health. On this slide, the question is addressed: “What are health outcomes?” And a useful way to think about health outcomes is in 4 domains:

1. Self-reports: people reporting on how they feel.
2. Utilization: What services they use.
3. Morbidity: Physician exams or laboratory tests.
4. Mortality.

Now, there’s often a concern that self-reports are an invalid measure of physical health, and in fact this is because self-reports, more than other measures, are effected by a person’s mental state. This is particularly the case for reports of physical symptoms. So individuals who are anxious, depressed, and so on, and not really ill, may experience symptoms as a consequence of these mental states and therefore their self-reports of symptoms may be higher.

That said, self-reports are still valid, and particularly so for reports of conditions. So measures that include questions such as, “Has the doctor ever told you that you have such-and-such?” are really quite useful. Now note that all self-reports are subject to memory errors, but at least they are not biased.

The best research combines several measures or the best understanding of this area looks across evidence on several measures and that’s what we’re going to do today.

## **Slide 6: Trauma in Relation to Illness and Injury**

Trauma relates to illness and injury in 2 ways. Directly: In which the survivor is physically harmed by the trauma and then develops health problems related to the trauma, or indirectly: In which the survivor is not physically harmed.

The direct effects are actually less common, most often occurring in motor-vehicle accident survivors, assault victims, prisoners of war, torture victims. The indirect effects are really the much more common presentation that clinicians are confronted with. So for example, a sexual trauma survivor, someone who experienced childhood sexual trauma may present with cardiovascular disease or diabetes later in life, where there’s no direct connection between the nature of the traumatic experience and the actual health outcome.

I would like to note that in cases of direct effects, that is when the survivor is physically harmed, these can be challenging cases to treat because the injury-the illness-can become a badge of honor. It’s a symbol of the traumatic experience and clinicians may need additional supports or guidance in managing these patients.

## **Slide 7: Findings on Trauma and Poor Health**

This slide summarizes the evidence on how traumatic exposure relates to poor health. Looking across various populations and the 4 domains of health outcome that we discussed earlier, the evidence is quite consistent. The most evidence we have is for self-reports, but there’s credible evidence across all of these domains.

## **Slide 8: Health Outcomes as a Function of Childhood Trauma**

Now the next several slides provide examples of the kind of evidence that we have. This first slide depicts data from a study of childhood trauma and health in a sample of over 8,000 HMO enrollees in California. What the slide shows is that across a range of chronic diseases a high amount of trauma; having 4 or more types of childhood trauma; was linked to increased odds of disease. For example, what's depicted on this slide are increased odds of chronic lung problems, of stroke, of cancer, and ischemic heart disease.

### **Slide 9: Health Risk Behaviors as a Function of Childhood Trauma**

This slide is from the same study of HMO enrollees and it's presented here to illustrate a possible mechanism through which childhood trauma-and any trauma-could affect health. This slide depicts the relationship between amount of exposure and health behaviors, and as you can see, a higher amount of exposure is linked to increased likelihood of poorer health behaviors such as not getting exercise, being obese, and smoking. This is a point that we'll come back to later.

### **Slide 10: Wartime Stress and Coronary Artery**

This slide depicts data from a study in Beirut done during the civil war there. The investigators looked at exposure to war events in relation to coronary artery disease. They compared cases of coronary artery disease, which they defined as having stenosis greater than or equal to 70%, to two types of controls: Other patients in the hospital and then visitors of the cases. The latter group provides an especially good control group because the visitors and the cases themselves are more similar than the cases and the other patients.

What the investigators found is that for both of these comparisons, the cases were more likely than the controls to report exposure. That is, the cases were more likely than controls to report more than 2 war events and to report crossing the Green Line more than once a week. The Green Line was the border demarcating the Christian and Moslem sectors that were fighting. It was dangerous and stressful to cross this line.

### **Slide 11: 10-Year Mortality in War-Exposed Civilians**

This slide depicts data from the same group of investigators who looked 10 years later at mortality. What you can see, for both men and women, for both all-cause mortality and mortality due to cardiovascular disease, is that a higher number of war-related events was associated with increased mortality. So again, higher exposure is linked to worse health outcomes.

### **Slide 12: Questions???**

So if exposure is linked to poor health, it's an important question to ask how does this happen?

### **Slide 13: How Does Trauma Lead to Poor Health? The Role of Stress as a Mediator**

Our understanding of how stress effects health is based on the idea that internal distress-some kind of internal distress response triggers the events that effect health. So in the case of a

traumatic stressor, the evidence indicates that PTSD is the crucial link in the pathway between exposure and health.

#### **Slide 14: PTSD as a Mediator of the Relationship Between Warzone exposure and Health in Female Veterans**

Now this slide depicts data from a study of war-zone exposure and health in female Vietnam veterans. We found that exposure was linked to worse health outcomes. For example, in this slide a higher amount of war-zone exposure was linked to a higher number of medical conditions.

#### **Slide 15: PTSD as a Mediator of the Relationship Between Warzone Exposure and Health in Female Veterans**

Now in these analyses we used multiple regression with war-zone exposure, age, and education as predictors in our model. When we added PTSD to the regression model the effect of war-zone exposure became significant for this and all of the other outcomes that we looked at. This is classic evidence of mediation. When you add a mediator to a regression model if the original predictor becomes non-significant or less significant, and you have a theory behind you to explain the relationship, you can reasonably conclude that the variable you've added; in this case PTSD; is mediating the association between the two variables you're looking at, in this case the exposure and the health.

#### **Slide 16: Findings on PTSD and Poor Health**

This slide summarizes findings on PTSD and health. As you can see, there are consistent relationships across trauma types and outcomes. There's little evidence of PTSD and mortality, less than we have on exposure and mortality, but this evidence is accumulating.

#### **Slide 17: Odds of Self-Reported Medical Disorder Due to PTSD in Female Vietnam Veterans**

Now the next series of slides is presented to provide examples of the kind of evidence we have showing that PTSD is associated with poor health. So, this slide shows more findings from the study of female Vietnam veterans that we discussed earlier.

In the multiple regression analyses with PTSD, war-zone exposure, age, and education, in the model, a higher amount of PTSD severity was associated with increased odds of a range of disorders and other indicators. So on this slide; you can see that PTSD was associated with cardiovascular disorder, gynecologic disorder, pain, gastrointestinal disorder, and dermatologic disorders.

#### **Slide 18: Adjusted Odds of Self-Reported Medical Disorder Due to PTSD in Vietnam Veterans**

This slide depicts data from a study of a large sample of male Vietnam veterans. The data were collected in the mid 1980s when the men were in their mid-30s to their early 40s. These are the

results of logistic regression analyses that adjusted for numerous demographic and behavioral risk factors such as smoking and substance abuse, even a measure of hypochondriasis, education, and so on.

Despite the adjustment for these possible confounders effects on health, PTSD diagnosis was associated with increased odds of many chronic diseases such as respiratory disorders, nervous system disorders, musculoskeletal disorders, digestive disorders, circulatory disorders, and overall, any disorder.

I would emphasize that these men were relatively young at the time, most of them in their mid-30s. So this suggests that there may be increased onset of disease in individuals with PTSD.

### **Slide 19: SF-36 Scores in Mustard Gas Exposed Veterans**

This slide is presented to illustrate that PTSD and partial PTSD may have effects on health. By partial PTSD I mean individuals who are sub-syndromal, who meet some of the criteria, who have some impairment but do not meet the full diagnostic criteria.

It presents data from a study of World War II veterans who were exposed to mustard gas.

What it illustrates is that both PTSD and partial PTSD can have adverse effects on health. The orange bars indicate what a normative sample should look like on these measures, and then the bars; the green, the blue, and the light blue; show how the mustard gas veterans of similar age compare. And again, you can see that individuals with PTSD or partial PTSD had worse outcomes: More pain, more fatigue, more role impairment due to physical problems, and worse physical function.

### **Slide 20: Predicted Physical Symptoms, Age 65 Retirement**

These are data from a longitudinal study of World War II and Korean Conflict veterans. In it we compared 3 groups: People who were not exposed to trauma, people who had exposure but did not develop PTSD, and people who had lifetime PTSD. The slide presents the results of a regression analysis used to predict symptoms over the longitudinal span of the study and depicts hypothetical data for someone who retired at age 65.

So; although you can see from the early part of the graph, roughly ages 51 -63, that individuals with PTSD, the green bar, were getting worse faster over time. Around the period of retirement they showed a spike in their symptoms so that they were getting worse over time and that trend accelerated with retirement. This suggests that the health effects of PTSD can be accelerated in individuals as they experience non-traumatic stressors.

### **Slide 21: Adjusted Annual Cost Ratios in Female HMO Enrollees**

This slide shows that the effects of PTSD also occur in the economic arena. It presents data from a study of women enrolled in an HMO, and it presents comparisons of people who have moderate or high PTSD levels with people who have low or no PTSD. What it shows is that total costs to the HMO and primary care expenditures were elevated in both of these groups even when the data were adjusted for demographic factors, chronic disease, and mental health problems.

### **Slide 22: PTSD and Hazard of Physician-Diagnosed Disease in Older Veterans**

Now we're turning to physician diagnosed disorders. This is a longitudinal study of World War II and Korean Conflict veterans that I presented earlier in relation to retirement. These men were initially healthy when they entered the study. They were screened for good physical health which permits you to look at incidence-the onset of disease.

We looked at how lifetime PTSD severity related to the incidence of a variety of chronic diseases, and what we found is that even after we adjusted for age, obesity, smoking, and alcohol consumption, that a higher amount of PTSD symptoms accelerated the onset of several types of disease: Arterial disorders such as peripheral vascular disease, lower GI disorders such as colitis and irritable bowel, dermatologic disorders such as eczema and psoriasis, and musculoskeletal disorders such as arthritis and rheumatism.

The next slide that I want to show you graphically depicts some of our findings.

### **Slide 23: PTSD and Arterial Disorder in Older Veterans**

This is a plot of the cumulative incidence of arterial disorder in groups defined as having low, moderate, or high PTSD. The high group consists of individuals who have partial or full PTSD, and this increased incidence is quite dramatic. You can see by 30 years of study that 60% of the people with partial or full PTSD had developed arterial disorder, in contrast with the roughly 20% of the people in the other groups.

### **Slide 24: Odds of Physician-Diagnosed Disorder as a Function of PTSD Diagnosis**

Here's another study looking at physician diagnoses. This looks at the odds of physician-diagnosed disease in VA patients. These investigators also found that PTSD, in this case the diagnosis of PTSD, was associated with an increased likelihood of disorder.

Something I'd like to point out here is that the effects were similar for both men and women. I would add that this is what the evidence to date suggests, that the effect of PTSD on health is constant for both men and women.

### **Slide 25: Mortality Due to PTSD in Vietnam Veterans**

In the last slide in this section I'm turning now to mortality. As you may remember from my earlier statement, there's very little evidence linking PTSD to mortality. The studies simply have not been done. However, this one study that was published in '94 looked at veterans who were enrolled in the Agent Orange registry-individuals who served in Vietnam and were predominantly male. These are data only for the males.

What the investigators found is that PTSD was associated with all-cause and accidental mortality. The effect on digestive disorders was almost significant but was not quite. So the question is still open there. I would like to say that there are data soon to be published indicating that PTSD in Vietnam veterans is associated with increased likelihood of both cancer and cardiovascular disease. So there is accumulating evidence that PTSD effects not only physical health and well-being but actual mortality.

### **Slide 26: Questions???**

So; we've been reviewing evidence showing that PTSD affects health. The next question that's important to address is whether the effects of PTSD are unique from the effects of any other mental disorder. For example, depression is comorbid with PTSD. Maybe it's just the depression.

### **Slide 27: Effects of PTSD and Depression on SF-36 Physical Component Scores in Female Veterans**

This slide depicts the effects of PTSD on self-reported quality of life in a group of female veterans. The bars represent the differentials between each group and the group that had no disorder, essentially the amount of decline or decrement in physical health-related quality of life associated with each category.

Now you can see from the green bar that depressed people have worse quality of life, but the orange bar, which is PTSD alone; PTSD without depression; also has reduced quality of life associated with it. And you can further see that the effects are additive. This is consistent with the idea that it's not just the depression in PTSD, but the PTSD itself, that's having effects.

### **Slide 28: Odds of Cardiovascular Problems in Vietnam Veterans with PTSD**

These are data from a cardiovascular exam done in Vietnam veterans in the mid 1980s. The investigators analyzed the effects of PTSD with and without adjustments for other Axis-1 disorders, specifically anxiety and depression. The green bars depict the effect of PTSD including anxiety and depression. The orange bars depict the effect of PTSD after adjustment for anxiety and depression.

As you can see, PTSD was associated with increased likelihood of atrial ventricular conduction defects, infarction, and overall ECG abnormalities. When PTSD was adjusted for anxiety and depression, the AVC defects and the infarction were still significant. In fact, PTSD is even more strongly associated with infarction when you take depression and anxiety into account.

### **Slide 29: Medical Service Utilization in Male Vietnam Veterans**

This slide shows that the unique effects of PTSD also occur for utilization. In this study we looked at PTSD, other Axis-1 disorders, and substance abuse in a multiple regression analysis that adjusts each disorder category for the other disorders, and we found that even with adjustment for substance abuse and other Axis-1 disorders, PTSD increased the odds of all outcomes except recent inpatient hospitalization.

### **Slide 30: Questions???**

So we've covered evidence proposing that PTSD mediates the effect of traumatic exposure on health and showing that the effects of PTSD are unique from the effects of comorbid conditions. The question now is how PTSD could promote poor health.

### **Slide 31: Case-Control Study of How High v. Low VA Healthcare users**

These are data from a study of VA patients at the Boston VA. It shows that although PTSD had direct effects on increasing the number of medical conditions, that some of the effects of PTSD were also mediated through depression. So PTSD has effects that are unique from depression, but that are also mediated through the increased likelihood of depression in people who have PTSD.

### **Slide 32: Effects of PTSD and Depression on Health Status in Peacekeepers**

These are similar findings for a study of U.N. peacekeepers who were younger than the veterans studied at the Boston VA. Nonetheless, PTSD still had direct effects and indirect effects mediated through depression.

### **Slide 33: Possible Ways PTSD Could Affect Health**

There are many possible ways that PTSD could effect health. Many of the correlates of PTSD have known effects on health in their own right. So for example depression, hostility and coping, smoking, poor diet, lack of exercise-all of these have been linked to worse health outcomes. In the biological realm, increased cardiovascular reactivity, autonomic hyperarousal, disturbed sleep, adrenergic dysregulation, enhanced thyroid function and altered HPA activity. Again, all of these could effect health.

But there's an important caveat. And the caveat is that many of these changes, especially the biological changes, are subtle. For example, in terms of the altered HPA axis, where we sometimes see elevated cortisol and we sometimes see low cortisol, these differences occur within the normal range. So it's reasonable to ask, "How could such a small difference have such a big effect?"

### **Slide 34: Dynamic Regulation of Body Systems**

To answer this question, we need to consider how our bodies regulate themselves-how they regulate the numerous systems that need to interact to keep us alive. There is increasing understanding that most body systems actually work through the principle of allostasis rather than homeostasis.

Now, by homeostasis what I mean is an attempt to maintain constancy within a very tight range. It's the case that most systems actually have more variable range that responds to environmental demands. That they have a target set point, but that they vary, sometimes substantially, in response to what the body's doing. For example blood pressure can change dramatically as a function of sitting down versus stranding up.

### **Slide 35: A Unifying Mechanism: Allostatic Load**

McEwen and Stellar have proposed a very helpful way to build on this understanding of allostasis and to help us understand how PTSD could promote poor health. The idea is allostatic load. The basic idea behind allostatic load is that small changes cumulatively, repetitively over time can add up. So the definition of load is the strain on the body produced by repeated ups and downs of physiologic response, as well as the elevated activity of physiological systems under challenge and the changes in metabolism and wear-and-tear on a number of organs and systems. Essentially, it's the small stuff over time repeatedly that can matter.

### **Slide 36: Allostasis and Allostatic Load**

This slide depicts the concept of allostatic load graphically. Remember, the principle is that our bodies are trying to regulate within a range in response to environmental demands. If you look at the top panel of the slide, allostasis is balanced between the demand and what the system is doing to meet the demand. In the case of load, when the demand has increased, the wear-and-tear; what the body has to do; also increases.

### **Slide 37: Effect of Allostatic Load on Incidence of Cardiovascular Disease**

Now that's a nice theory. The question is does it work. And the answer is yes, there is evidence that, if you can measure allostatic load, you can predict disease.

In this study, the investigators looked at the onset of cardiovascular disease in a group of older individuals spanning a 2 ½ year interval. They created an allostatic load scale. It was an index counting how many indicators a person had. These might be indicators such as sub-clinical hypertension and not true disease indicators. What they found is that a higher amount of allostatic load was associated with increased incidence of disease.

### **Slide 38: PTSD and Allostatic Load**

So this slide graphically depicts a hypothetical case to illustrate how PTSD could increase allostatic load. Assuming that we all have some genetic risk factors for at least some disease, PTSD is associated with increased sympathetic elevation that might increase the risk of disease, but not sufficiently if you assume that there's a certain threshold that one has to cross, as depicted in the orange line on the side. Perhaps an individual's risk alone and the sympathetic elevation in PTSD would not be sufficient to push the person over that threshold.

But then assume that the person smokes and drinks in order to manage the sympathetic activation. In fact many PTSD patients do this. The consequences of the smoking and drinking could tip the balance. And finally, the load could be greater than the body could respond to and disease could occur.

You could further look down the road at the consequences of the smoking, and especially the drinking—a person might lose a job or a marriage and be stressed and smoke more and drink more, and their body would be even more aroused and that could further increase the likelihood of disease. So this is a hypothetical example, but it's a plausible one. And what I want to do in the remaining slides is give you a way of thinking about how to put all of this together to understand how PTSD could lead to poor health.

### **Slide 39: Multifactorial Model of Trauma, PTSD & Health**

This is a model that I have evolved in collaboration with Matt Friedman, Kay Jankowsky and Bonny Green to explain how traumatic exposure and PTSD promote disease. There are 3 basic ideas in the model.

### **Slide 40: (1) Exposure affects health primarily through PTSD and other distress reactions**

First of all, the effects of traumatic exposure are mediated primarily through PTSD and other distress reactions. I've spoken most about PTSD because most typically, people develop PTSD as a result of trauma, if they develop any disorder. It's relatively rare in most contexts-most trauma types, that people will develop another Axis-1 disorder and not PTSD. But since depression and other such disorders have known health effects, we should presume that anyone who develops a post traumatic depression and no PTSD would also be at increased risk.

**Slide 41: (2) PTSD and distress reactions affect illness behavior by altering symptom perception**

The second idea in this model is that the effects of PTSD on health behaviors are partially mediated due to an exaggeration of symptom perception, of attentional processes that focus on the symptoms, essentially to somatization. So, where as PTSD may have biologically mediated effects, for example some of these effects are simply due to the increased attention that individuals with PTSD and other psychiatric disorders pay to their physical symptoms.

**Slide 42: (3) Effects of PTSD on disease are mediated through interdependent psychological, biological and behavioral mechanisms.**

And lastly, the third idea in this model is that the effects of PTSD on disease are mediated through interdependent psychological, biological, and behavioral mechanisms-that there's no single cause. That it's all of these factors together that work through the principle of allostatic load to promote disease.

**Slide 43: Summary**

So let me summarize. First of all, traumatic exposure is related to poor health. There's abundant evidence showing that all types of traumatic exposure are related to increased likelihood of disease, increased service utilization, poorer self-reported health, and even increased mortality.

Secondly, that it's the person's reaction to the exposure they've had. It's not merely the exposure, but rather the reaction that matters, and that PTSD is the primary mediator of the effects of exposure on health.

And last of all, that there are plausible mechanisms through which PTSD could promote poor health.

**Slide 44: Treatment Issues: Two Scenarios**

Now in considering the implications of the evidence on trauma, PTSD, and poor health, it's important to remember that trauma intersects with medical settings in two ways. You may see trauma problems in medical patients if you are a medical provider. If you're a mental health provider you may see medical problems in trauma patients. In either case, mental health providers and medical providers need to collaborate in the care of these patients.