End Violence Against Women International
(EVAWI)

Understanding the Neurobiology of Trauma and Implications for Interviewing Victims

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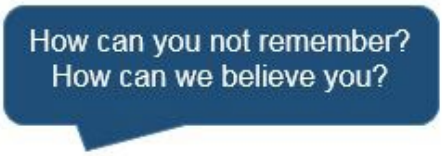
Introduction

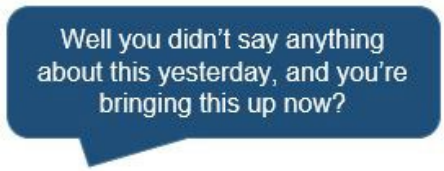
Within the last century, the development of fingerprint technology, and then the discovery of DNA, both revolutionized the way law enforcement investigates crime. Both dictated widespread changes and adaptations in the practice of investigations, specifically with regard to suspect identification. Now new scientific advances have the potential to transform the way law enforcement conducts victim interviews, indeed, how victims are perceived. Specifically, neuroscience suggests that many common victim responses are actually the results of fear and trauma – not deception, as they have frequently been interpreted. Also, the way victims recount their experience often raises suspicion in the minds of investigators, prosecutors, judges, and the general public, including jurors, as well as their own friends and family members.

This can be illustrated with case examples, such as Julie M., a local university student whose sexual assault was included in a report published by Human Rights Watch (2013). She was "forced to perform oral sex by a stranger," and then "went to the hospital the next day and reported to the police" (p. 132). However, when police asked her to describe the assailant, she was unable to describe him in any detail. Julie M. felt like the police did not believe her, in part because she could not provide a specific description. Her case was subsequently closed (Human Rights Watch, 2013).



Or the case of Jane Doe, also described in the Human Rights Watch report, who was sexually assaulted by a stranger after going out with friends. When she could not remember the name of the bar, the police reportedly questioned whether the report was legitimate (2013, p. 132).

Then there is the victim who described to Sgt. Joanne Archambault how her report was handled by the detective assigned to her case. When she remembered a detail the day after her sexual assault, she called the detective to share the information. However, this this raised such suspicion with the detective, she hesitated to offer any more information that came to mind.



The examples go on and on. In too many cases, across the country and around the world, victims of sexual assault and other crimes have been subjected to interview techniques that are at best ineffective – and at worst inappropriate or even abusive. Yet neuroscience research is now fostering a better understanding of the impact that trauma has on crime victims, and this has the potential to yield a number of critical improvements in the way interviews are conducted.

At the same time, attention of policymakers and the public has increasingly focused on the low rates of reporting, investigation, prosecution, and conviction for sexual assault. One critical step in changing this reality is to improve the way victims are interviewed.

Better interviews will result in more thorough investigations that can effectively exclude suspects, and support referrals for prosecution with a better chance to hold more offenders accountable. This training bulletin is designed to assist in this effort.

The material included in this bulletin is drawn from a considerable body of research, including the publications and other resources in the Reference and Resource List at the end of the document. However, it is important to recognize that this list is simply a *representative sample* of publications in the field, not a *comprehensive list*.

Defining Trauma

Before we can make sense of the neuroscience of trauma, and the implications for victim interviewing, we need to define the concept of trauma, understand a little bit more about the brain, and explore how we as humans have evolved to respond to threat and attack. For the purpose of this training bulletin, *trauma* is defined as an event that combines fear, horror, or terror with actual or perceived lack of control. Trauma is often a life-changing event with negative, sometimes lifelong consequences.

In the past, all we had was an experiential definition of trauma. Due to scientific limitations, we were never able to talk about it beyond an individual's subjective experience. With recent advances, however, we are now able to understand changes in the brain that occur both at the time of a traumatic incident, and in many cases in the days, weeks, months, and even years afterward. In other words, we used to be limited to "soft science" (i.e., social science) when describing the nature and impact of trauma. However, we can now have that discussion using "hard science" (i.e., changes in the brain during and following trauma).

At the same time, trauma remains a fundamentally subjective event – what is traumatic to one person may not be for another, because what's fearful or terrifying to me, may not be for you. What I experience as a lack of control, you may not. The distinction lies both in the "hard wiring" or conditioning of our brains, as well as the cumulative impact of learning and life experiences.

Brain Basics

As we begin talking about "hard science" and the brain, there are a few disclaimers worth mentioning. First, when describing particular structures in the brain, we will be simplifying their function considerably. Each structure in the brain is involved in any number of functions, but we're only going to be discussing a limited number of these functions here. To illustrate, you're going to learn about the amygdala's involvement in our response to threat, but the amygdala is involved in a lot more than threat responses.

Second, while we can talk about the brain with more certainty than at any other point in history, we still have to consider that not every brain reacts the same way. Individual differences (including the results of nature as well as nurture) exert a significant

influence on how the brain responds. This is why you'll often see the phrases "for the most part" or "most of the time," rather than more definitive language. What we will be describing are common victim reactions and behaviors, rather than absolutes.

Finally, keep in mind that the discussion becomes even more complicated when you add drugs or alcohol into the mix. As complicated as brains are when they respond to trauma and threat, there are additional factors when substances are involved.

So, with these disclaimers out of the way, let's talk about the brain.

Neural Networks or Brain Circuitry

The brain is made up of billions of cells called *neurons*. These neurons pass information between each other, and then to the rest of our body, chemically and electrically. They often "fire" in groups that can be described as *neural networks* or *brain circuitry,*[1] and as you can imagine, this can be extremely complex at the micro-level. However, there are two main things we want you to understand about brain circuitry for the purpose of this training material.

They're Automatic

First, it's important to understand that many responses to trauma (both during a sexual assault and afterward) are often automatic – the result of neurons firing in patterns that you can't just "wish away" or logically "think away." In fact, many of the circuits that condition our responses to trauma have been ingrained or "baked" into the brain.

They Protect Us from Attack

Second, if you believe in evolution, these circuits can be seen as the result of an evolutionary process developed to protect human beings from attacks by predators, long before we had access to advanced weaponry. If you believe in intelligent design, they can be seen as part of the incredibly intelligent design that is the human brain.

They're Here to Stay

Moreover, the patterns in which brain circuits fire don't just go away. Whether they are patterns developed through evolution, or established through repetitive behaviors (like habits), we often fall back on them even after years of inactivity. Take the story of an 86-year old former paratrooper who stumbled down some stairs on his way to the kitchen. Instead of falling and breaking his hip, he "dropped and rolled" just like he was taught to do 66 years earlier. He didn't think about it, he just did it. In this case, his brain circuitry

[1] People use different terms to describe a number of related concepts, including *neural networks, brain circuitry, neural circuits*, etc. While there may be subtle differences in how these terms are used by scientists, they are used interchangeably for the purpose of this training material. In other words, the terms can be understood as essentially meaning the same things for the purposes discussed here.

served as a blessing. But for those who are sexually assaulted, these circuits and habitual responses can increase their vulnerability and undermine their credibility.

We will talk more about this later, but at this point, suffice it to say that brain circuitry established during a sexual assault will not just "go away," simply because the assault ended. This is true regardless of whether the assault ended minutes ago – or if it was weeks, months, or years before. This is the same reason why veterans are often startled by the sound of a car backfiring, and they react with terror as if shots were fired. This can be seen moments after leaving the battlefield, or years after their combat service – even if they have received treatment for PTSD. Their brain circuitry didn't simply dissolve and go away, just because the battle, or even the war ended.

The same is true for all of us: Brain circuitry that is activated during a traumatic event will often continue to guide our responses for years to come, perhaps all of our lives.

Prefrontal Cortex

Now let's look at some other brain structures that will help you to understand the impact of trauma on human behavior and memory. We'll begin with the prefrontal cortex.

Physical Location

To get a sense of where this region is in the brain, make a fist with your thumb on the *inside* of your fingers and hold your arm up. While it's a rough three-dimensional diagram, it's a pretty good one. Your forearm is your spinal cord. Your elbow is the base of your spine. Your palm just below your thumb is the base of the brain. Your thumb represents something called your limbic system (which we'll discuss in a bit), and the two fingernails of your middle and ring finger are your *prefrontal cortex*.

Logical Thinking and Planning

Most folks who have heard of the prefrontal cortex are aware that it plays a role in our *ability to think logically and plan*. When you thought about what you had to do at work today, you were largely using your prefrontal cortex. When you decided to read this training bulletin, or made plans to get married, prepared to buy a car, etc. ... all those decisions involved a logical decision and some planning, which heavily involve your prefrontal cortex. These are critical functions that are important to understand.

Integrating Memories into "Stories"

The second function has to do with memory. When it comes to memories of events – like the time you took your son to his first fireworks display or hosted a party for your daughter's third birthday – you will tell others about these memories as if they were stories. Granted, the older you get, the less of the story you may remember, but for the most part, our telling of events will typically have a beginning, middle, and end.

So, when you are asked, "What happened at the birthday party?" you may not put everything in chronological order, but you probably could, if the person you were talking to asked you to do that. In fact, you may not even respond to the question with a narrative description at all, but instead offer a basic summary ("It was great!"). That summary will typically be based on your ability to think about the party, evaluate your overall impression of what happened, and then put together a story of the event.

Yet these memories do not become stories until the prefrontal cortex gets involved. Initially they're just points of "data" – a collection of sights, sounds, and emotions. While a different part of the brain encodes the data points with context (such as temporal sequence) and associates the various data points with each other, the prefrontal cortex plays a crucial role in integrating those various data points and weaving them into a coherent account or narrative. This narrative is then what we produce when talking about a "memory" of an event, and it is what we expect people to produce when we ask them about an event they may remember. For example, it is what investigators typically expect to hear when interviewing a victim of a sexual assault. This is why they often react with suspicion when a victim doesn't produce this type of memory or "story," with a logical flow and a clear beginning, middle, and end.

Controlling Attention

The third role the prefrontal cortex plays is in helping us to *control attention*. With the assistance of your prefrontal cortex, you are typically able to decide what you want to focus on... whether it is a sunset, a conversation, or a training bulletin on the brain and trauma. This is called *top-down attention*. Why is it important for you to understand this? Because memory itself is a function of attention: If you're not focused on something, it probably won't get encoded into memory, so you won't remember it.

For example, if you're sitting in a training workshop and your phone rings, your prefrontal cortex is involved in the ability to shift your attention from the workshop to make the decision to get up, leave the workshop, and take the call. To be clear, it may be habitual for you to look down at your phone when it rings, but the decision to focus on the call and decide whether to attend to it largely involves your prefrontal cortex.

Summary of the Prefrontal Cortex

So, to summarize briefly, the prefrontal cortex plays a role in three functions for our purposes: (1) Controlling our attention, (2) Integrating memory data into narrative "stories," and (3) Planning/making logical (or rational) decisions.

Limbic System

Now, let's turn our attention to the *limbic system*, which includes a number of brain structures but can roughly be represented by your thumb, if you are still holding your folded fist in the air. In fact, all of the parts of the brain that are located below your fingers are called "sub-cortical," which means they are not part of the "thinking brain."

Defense Circuitry

One primary function associated with the limbic system is our *defense circuitry*. Remember those terms, *neural network* and *brain circuitry*? Well, the limbic system is part of our brain circuitry for defending ourselves against attack, which includes detecting threats in the environment and responding to them.

Whenever you respond to a perceived threat, it's going to involve the limbic system; it may not be something you are able to consciously think about or make logical decisions about. In fact, while we're reacting to a threat, our prefrontal cortex may not even get involved. But, we will talk more about that later. For now, it is enough to know that the limbic system is involved in our defense circuitry, and therefore our responses to threat will often not be logical, reasoned, or thought-out.

Memory Encoding

The second function involving the limbic system is *memory encoding*. Earlier, we described how memory begins as a collection of data points in the form of sights, sounds, smells, or tastes. The limbic system plays a role in encoding those data points with context and associations that make it possible for the prefrontal cortex to later recall the data points in the context of a coherent narrative.

Mess with the limbic system and you mess with the part of the brain that encodes data with the context and associations that help us tell the story of our memories.

Emotions

The final function of the limbic system that we will discuss is its role in *emotion*. You may have heard the phrase, "Emotions have no logic." This saying is not entirely accurate in terms of neuroscience, but it comes from the fact that emotions get traction not in the prefrontal cortex (or logic center of our brains) but in the limbic system.

As Chris Wilson often jokes in trainings, all you have to do is look at any 45-year-old man to know that *having* emotions and *being aware* of those emotions are two very different things! The *having* of emotion has more to do with the limbic system, while the *awareness* of that emotion comes from other brain systems. This is why you can sometimes see another person looking very sad or angry, but when you ask them whether they are feeling this way, they may genuinely say "no." Of course, it is also possible they are lying, but for now, we just want to recognize that people sometimes have emotional experiences without conscious awareness.

Summary of the Limbic System

So, to summarize the limbic system for our purposes, it plays a role in three primary functions: (1) Emotion, (2) Memory encoding, and (3) Defense circuitry.

The Brain and Threat or Fear

Now we will turn our attention to exploring how the brain responds to threat and fear. This is critical for understanding the impact on behavior, memory, and later recall.

Ready State: Vigilance

One primary role of the brain is to protect us by predicting what may or may not happen in the environment and to detect any threat to our survival. The technical term for this is *vigilance*. While many of us associate vigilance with post-traumatic stress and hyper-vigilance, we are all vigilant to some degree, all the time. When you and your kids are walking through a crowded mall, for example, you are more vigilant than when you are sitting at home in your living room. To be clear, you are still vigilant when you are sitting on your couch at home. It's just that you are less vigilant than you might be at the mall.

Similarly, a patrol officer driving on duty will be more vigilant than a civilian driving to the store. Both are still vigilant, it's just that the higher level of vigilance in the officer will likely lead to picking up subtler cues in the environment suggesting the presence of a potential threat. This will lead to a relatively quicker response to the threat, which is why officers are trained to be more vigilant than civilians!

Interestingly, our vigilance isn't conscious most of the time – vigilance is a function of our brain circuitry that gets used so often we don't have to think about it. The brain is constantly scanning the environment to detect anything that does not fit with what is predicted to be there, so we can identify potential threats, take measures to protect ourselves, and remain safe whenever possible.

The Amygdala: Early Warning System

The brain then has an early warning system that detects potential threats in the environment – even before it can determine what to do about them. One way to visualize this early warning system is to remember the old TV show, *Lost in Space*. If you've never seen the show, the plot line is pretty simple: A family flies around in a space ship (which actually appears to be two paper plates, glued together and suspended by a string, with 1960s special effects at their very best). Together, the family lands on various planets, and inevitably their 10-year old son, Will, wanders off and gets himself into trouble. As you may remember, Will had a robot who accompanied him and warned him of potential danger by flapping his vacuum cleaner tube arms and saying, "Danger, Danger, Will Robinson!" Young Will then had a chance to respond to the threat (or in some cases get rescued), thanks to the robot companion who recognized the danger ahead of time.

As trivial as this example may sound, it's a great illustration of what's going on in your brain in the context of a potential threat. Your amygdala is your "Danger, Will Robinson" robot; It alerts the brain to danger in the environment, even before you are consciously

aware of it. Some people also think of the amygdala like a smoke alarm, alerting you to the potential of a fire that could destroy your home and even endanger your life.

In other words, the amygdala plays an important role in the defense circuitry, triggering chemicals to be released into your brain and body, preparing you to react to the threat. (Sometimes this preparation takes place in only a fraction of a second!) We aren't going to focus on those chemicals and the various roles they play here – but there are a number of sources of additional information listed in the Resource Box below. For our purpose here, it is enough to know that the amygdala triggers a cascade of responses to an identified threat in the environment. Where is the amygdala located? In your thumb, which is part of the limbic system, not the "thinking part" of the brain.

Scanning and Response

Once a potential threat has been identified, we scan the environment to allow another part of our brain (*the hippocampus*) to help us compare what's in the environment with what we know are indicators of either safety or danger. Essentially, the hippocampus provides us with "maps" of safety and danger that we can use to assess the threat.

Here's an illustration. When a fire alarm goes off, what do you automatically do? First, you freeze briefly and pay attention. Do you smell smoke? Do you hear a fire truck approaching? Do you see others exiting the building? Or is it simply a false alarm? Of course, you should always exit the building following the safety plan, regardless of whether or not the alarm is real. But chances are, you're going to participate in a routine safety drill with a much lower heart rate than you would if the environment suggested that the threat is real, and there really is a fire.

As an aside, one of the fascinating dynamics of our defense circuitry has to do with this process of freezing and scanning the environment. Imagine you are sitting at home and you hear a noise outside, or a knock on the front door. For most of us, those sounds don't evoke fear or indicate threat, so our reaction is typically to approach to find out more (assuming the knock on the door is not a salesperson). In other words, we head outside to see what the commotion is all about, or we walk to the front door to see who is there. But if the sound we hear is associated with fear or threat, instead of approaching the sound, most of us simply freeze and scan the environment. You can probably remember a time when you had this reaction. It's as though we have a built-in mechanism for not rushing blindly into a potentially dangerous situation.

If our scan of the environment indicates that the threat is legitimate, we respond accordingly – but we do so largely without thinking or planning. This is so we can respond efficiently. To illustrate this point, imagine yourself facing someone you believe to be armed. If you see that person reaching for his/her waistband, it will not be efficient for you to engage in a process of thinking, questioning, or wondering. Efficiency equals instantly reacting – and relying on training that has ingrained brain circuitry and habitual behaviors that allow you to act without thinking. That's why the prefrontal cortex may not be involved when we respond to a threat. It would slow us down and potentially distract

us, placing us in even more danger. This makes sense from an evolutionary standpoint: If a predator is coming at you, and you stop to think, you'll end up as lunch.

Learning from Experience

Once a threat has passed, we can engage our prefrontal cortex to take action and minimize our risk, as well as integrating the experience into our existing maps of safety and danger. This integration allows us to learn from the experience.

Let's explore an example that brings this point to life. Imagine you are at the top of a skyscraper in Chicago, Los Angeles, New York, or any major city in the United States. Just for fun, picture yourself leaning against the glass window to peer down to the street below. As you're looking down and commenting that the people down there look like ants, imagine that you hear a loud BOOM and feel the floor shake. The first part of your defense network to respond to this event is your "Danger, Will Robinson" robot. Your amygdala fires in recognition of a potential threat in the environment, and your defense circuitry responds by triggering a release of chemicals that will help you deal with that threat. Next, you scan the environment to assess the threat, aided by your hippocampus, which compares what you are seeing, smelling, and hearing with your existing maps of safety and danger. You do all of this without thinking.

For the purpose of this example, let's say that you don't hear any alarms or smell any smoke, and when you look at the people around you, they all appear to be calm. In fact, they are continuing to engage in conversations that have nothing to do with the noise you heard. At this point, your brain determines that this is an environment consistent with a map of safety, thanks in large part to your hippocampus. So, the chemicals that were released begin to re-absorb into your system, and your prefrontal cortex can take action based on your conscious processing of the event.

Most of us are very well aware of the events of September 11, 2001, so we might respond to this situation by heading down the stairs to the street, in an effort to minimize our risk. It is a particularly poignant aspect of 9/11 to realize that most of the people who were in the floors above the first plane did not have a map of danger that alerted them to the risk. This is because they had no similar experience to learn from; nothing like that had ever happened before, so many of the people on the floors high above the impact of the first plane didn't find out about the situation until they heard it on the news or were called by a loved one. On the other hand, *we* will never forget the events of that day, so we are likely to head for the stairs, just in case. That's one role of the prefrontal cortex: To learn from experience and take action to minimize risk.

Summary: Response to Threat

So, before we move on, let's summarize what we have covered with respect to threat and fear. First, the brain is constantly vigilant, trying to detect potential danger and anything that doesn't fit with our predictions of what will happen in our environment. The

specific level of vigilance will depend on our previous experiences as well as the environment, but even in the safest environments, our defense circuitry remains vigilant to some degree. Then, when a threat is perceived by the brain, our amygdala signals "Danger Will Robinson!" In other words, our internal smoke alarm goes off.

We respond by freezing and scanning the environment, and thanks to the hippocampus, we compare what's in the environment with our existing maps of safety and danger. If the environment is consistent with a map of danger, we respond to the threat largely without thinking or planning. If the environment is consistent with a map of safety, however, we can engage our prefrontal cortex and either take action to minimize risk and/or integrate the experience into our maps of safety and danger to continue learning.

Ramifications for a Traumatized Brain

Now let's examine the impact of trauma on the brain. Inherent in the definition of trauma is the requirement that something about the event is threatening, so our defense circuitry takes control over how we react. This dynamic has a number of important ramifications.

Prefrontal Cortex Impaired

First, think back to how the brain deals with threat in general – it senses danger, often freezing briefly while scanning the environment, assessing the threat, and then reacting or responding to that threat. In particular, remember that the prefrontal cortex often doesn't come into play until the threat has passed (depending how severe the threat is, and how long it lasts). This fact is supported by research, but it also makes sense anecdotally.

For example, most of us have experienced periods of extreme stress at some point in our lives, so we are familiar with the struggle we might have experienced when trying to think clearly. The research shows a significant difference between a situation that is highly stressful and a situation that is both stressful and involves threat, danger and/or fear. The difference is that you can sometimes use stress reduction techniques to regain your ability to think clearly in a high stress situation, if it is not dangerous. Introduce threat or fear into that situation, however, and the dynamic changes dramatically.

Chris Wilson gives a concrete example:

> *In the fall of 2015, I was invited to give a talk on this very subject of the neurobiology of trauma, at a conference in Texas. When I give these talks, I bring my own computer, and I try to make sure I have enough time before my presentation to test whether the videos and audio clips will play on their system. Unfortunately, for this particular talk I didn't have that opportunity. So, when I went to play my first video, it started without any audio.*
>
> *As my stress level began to rise, I figured I would do my best to describe what folks would be hearing, using a bit of humor. Then a voice came over the sound*

system, and said, "Dr. Wilson, will you please restart your computer?" I remember thinking in my head, "Well, see, I'm sort of in the middle of something," but I also realized this might actually work. So, I restarted my computer, and within a few seconds, I was asked to enter my password. It's a password I knew well. Very well. And for the life of me, I could not retrieve it from memory. That's how stressed out I was. My prefrontal cortex, which is used to deliberately search for and retrieve information from memory, was gone.

Fortunately, I was able to face away from the audience, close my eyes, go to my "happy place," and remember my password. That's the difference between a highly stressful situation and a traumatic situation. Had there been a threat present in the environment that was activating my defense network, I would not have been able to close my eyes and regain the functioning of my prefrontal cortex. If there had been a real threat in that environment (e.g., someone holding a gun to my head while I tried to retrieve my computer password), I would have likely continued to struggle to recall my password, and lost my ability to think logically, plan or problem solve the situation.

Keep in mind that an impaired prefrontal cortex also means that we lose the ability to control our attention and encode memory data into an integrated narrative. But for now, we will focus on the ramifications of not being able to plan and think logically.

Habitual Behavior

So, what are we left with when our prefrontal cortex is impaired, and we've lost the ability to plan and think logically?" One answer is habit.

The power of habit can be demonstrated by any number of examples, but one comes from law enforcement. At a recent training, Chris Wilson was speaking with two Minnesota State Troopers who informed him that their procedures for the use of tasers had changed over the years. They explained that initially they were taught to discharge their tasers upon starting their shift, with a short one-second burst, just to confirm that they were operational. However, at the time, a taser needed to be triggered for about five seconds in order to operate properly. When those officers went into the field, and their prefrontal cortex was impaired in the face of a serious threat, their habitual behaviors kicked in from their training, and they attempted to trigger their tasers using the same one-second burst they had been repeating at the start of every shift. Once the administration realized this was happening, they changed their officers' training, so they had to discharge their tasers at the start of each shift for a full five seconds. That solved the problem because it instilled a new, more effective habitual behavior

Since that time, taser technology has continued to evolve, so they now only need a one-second burst to fully function. However, the example illustrates the power of habit in determining our behavior. When we find ourselves in a traumatic situation, we often respond to a threat without the benefit of our prefrontal cortex, so our brain reverts to behaviors that are habitual and ingrained, rather than those based on logical planning or

thought. In addition, our brain may respond with a variety of survival reflexes, which are often characterized as “fight or flight,” but are better described as a “defense cascade.”

The Reaction Formally Known as Fight or Flight

If you ask people how human beings respond to threats in the environment, many will use the phrase “fight or flight.” Unfortunately, as popular as the saying is, it doesn’t accurately represent the full range of possible responses.

In fact, research now suggests that our response can be categorized as a *defense cascade*, which very often begins with a freeze response (Kozlowska, 2015). This freeze response can be confused with two survival reflexes (called tonic immobility and collapsed immobility), where the victim is literally unable to move part or all of their body (including the parts that are needed to speak). But, being unable to move is not part of the freeze response we are describing here. With this more typical freeze response, we have the ability to move, and in fact, part of this response is about preparing to move (e.g., take some sort of action, in order to protect our survival).

Hiding from Detection

The freeze response developed through evolution serves two primary purposes. The first is to prevent detection by a predator. Just think of the proverbial deer in the headlights. The reason the deer freezes is because the car is identified as a threat, and the deer’s response was developed to respond to their primary threat, which is a predator. If that deer was in the forest, and a mountain lion entered the vicinity, the frozen deer may not be seen by the mountain lion. The mountain lion’s attention might even be drawn to a deer that has not yet frozen, because predatory instincts evolved to detect movement. Unfortunately, this “freeze” response that evolved to protect the deer from the mountain lion leaves it completely unprotected against the threat of a car approaching at 60 mph.

You can even see this freeze reflex reflected in conscious responses to threatening situations. If you think back to a time when you were afraid as a child that the “boogeyman” was in your closet, what did you do? Most of us instinctively held very still, so the boogeyman wouldn’t see us. This can be a conscious strategy, in which case it is *not* the freeze response we are talking about here – because the freeze response originates in your thumb and doesn’t involve the thinking part of the brain. However, it is interesting that the conscious strategy reflects this instinct.

We see this very same freeze response across many different species, and it makes a lot of sense on the most fundamental level: If the predator can’t see the prey, the predator won’t attack.

Assess and Respond

The second purpose of the freeze response is to provide an opportunity to assess the threat and potentially spring into action. Think of it as a stance of readiness to respond. To illustrate, picture a rabbit eating grass in a park when approached by a child. Most often, the rabbit freezes, and the child moves closer thinking, "Wow, the bunny is going to let me touch him!" However, if the child continues to approach, the rabbit will take off, and the child will be disappointed. But if the child then sees a squirrel and wanders away, the rabbit will notice the threat has receded and likely go back to eating grass. In humans too, our defense circuitry detects a threat and our bodies automatically freeze, so our brains can take a moment to assess the environment in the same basic way the rabbit does: It primes the five senses to compare what's in the environment with our existing mental maps of safety and threat. Then, if our appraisal suggests that the environment is safe, we continue going about our business. However, if our appraisal indicates an attack, our brain responds by continuing to involve our defense circuitry – and our prefrontal cortex is left out of the equation, for the most part, until the threat passes.

Not Really "Fight or Flight"

This is where the common misconception of "fight or flight" comes into play. People tend to assume that we get to choose one option or the other, and we think we know what we would choose if we found ourselves in a threatening situation. However, based on our understanding of the brain's functioning in trauma, it is now clear that there is often no choice involved – at least on a conscious level. Why? Because when the defense circuitry takes over, the part of the brain that makes logical choices is impaired.

It's not that human beings *can't* think in such a situation – it's just that our thoughts are often habitual and/or simplistic (e.g., "He's gonna kill me," "I'd rather be dead," or "I just want this to be over"). Few people have habitual thoughts or behaviors that will be of any use to them when they might have an option to flee an assault.

Not "Either/Or"

Second, it is not a matter of "either/or" when it comes to our defense circuitry. Instead, research indicates that we have a cascade of responses, which very often involve freezing first (if only very briefly), and then fleeing or fighting, depending on the context.

When we are prey, our defense circuitry is more likely to select the flee response. This response was selected by evolution (or designed) to keep us alive, back in a time when human beings were more often prey than predator. Without a gun or other weapon, you might have today, how effective would it be to "fight" a grizzly bear? Answer: Not very.

In fact, for most people, our instinct in this situation would be to flee. This is why hikers in Alaska are told *not* to flee if they come across a grizzly bear. Instead, they are taught to avoid eye contact by looking down and slowly backing away, waving their arms and speaking softly, to make it clear that they are wholly uninteresting and unappetizing

human beings. This strategy has more to do with bears than humans, but what is important for our purpose is that the instinct is for humans to run or flee, not to approach and fight against a grizzly bear. This is all about survival, and it is based on our history as prey, back when weapons weren't available to level the playing field.

Trauma Response and Sexual Assault

This is where we will begin applying what we've learned about the neurobiology of trauma to the specific context of sexual assault. Some of the implications will also apply to other forms of traumatic experience, including intimate partner violence, crimes against persons (e.g., assault with a deadly weapon), and officer-involved shootings.

Victims Often Don't "Choose"

The first point is that victims of sexual assault, as well as other traumatic crimes, often don't get to "choose" between fight or flight. Sexual assault victims are often questioned about their "decision" not to flee when others perceive that there was an opportunity to do so. However, without the ability to think logically and analyze options rationally, what may appear to be an "easy" escape route (for example, when the perpetrator goes to the bathroom) might not be as easy as it seems. Remember, the part of the brain that would do that work for the victim is most likely impaired by the traumatic response.

Some victims will also become immobilized by one of three automatic reflexes that prevent them from fleeing. In other words, they are often gripped by a reaction that is beyond any conscious control.

Three Survival Reflexes

Sexual assault victims are also often asked why they didn't "fight back." To consider the question is natural, but a better way to make sense of a victim's response is to think about offender dynamics and how they impact the brain. We know most offenders (and certainly those who are acquainted or even intimate with the victim) do not announce their intention to commit a sexual assault. Instead, they "play nice" and work hard to initially avoid giving any indication that they represent a threat. This process activates what we call our *attachment circuitry*, which allows us to connect emotionally with other human beings. What's crucial to understanding the dynamic of most sexual assaults is that activating this attachment circuitry both *creates confusion in the brain* and *suppresses our defense circuitry.*

So, when the perpetrator begins to push the victim's boundaries and engage in behaviors that activate the victim's defense circuitry, it creates a neurobiological conflict that is literally confusing to the brain. The same person who activated the victim's attachment circuitry is now also activating their defense circuitry. Furthermore, the combination of the defense circuitry being dampened, and the sense of confusion

victims experience, can often intensify the experience of fear when the victim realizes, "This is really happening to me."

This terrifying realization, if not necessarily reflected in words, is experienced at a visceral or gut level. This combination of confusion and fear often triggers a powerful sense of mental defeat, where the victim's brain appraises the sexual assault as inevitable and escape as impossible. Remember, the logical part of the brain isn't active at this point, so this *perception* of inescapability is all that matters.

Essentially, the perpetrator has spun a psychological web that entangles the victim and can trigger survival reflexes – some of which allow victims to "flee" mentally when their brain perceives that they cannot flee physically. Reflex is a key concept here; these responses take place automatically, in the same way your leg kicks forward when the doctor taps your knee with the little hammer. We will describe three of them here.

Dissociation

The first of these three survival reflexes is *dissociation*. This is a coping mechanism that involves the brain "disconnecting" from the circuitry that keeps us aware of what's happening inside our bodies.

We all have brain circuitry that helps us recognize physical sensations. This is what allows us to detect when we have tension in our neck, or tightness in our chest, for example. However, when our defense circuitry is running the show, and our brain does not perceive any way to escape a threat, dissociation is a way of disconnecting from this experience. This makes sense on a fundamental level, because one way for the brain to cope with the experience of being sexually assaulted is to shut off the circuit that allows us to be aware of what is happening to our bodies.

Dissociation is seen in many victims of trauma, not just sexual assault victims. In fact, it was first observed and documented among soldiers. It is a survival mechanism, and it can look like someone is "spaced out." During an interview, for example, a victim may simply stare off into space while being either non-responsive, or minimally responsive, to questions or other stimuli. This is a potential indicator of trauma, but it can be easily misinterpreted as intoxication, belligerence, deception, or an unwillingness to cooperate.

Tonic Immobility

The second of these survival reflexes is called *tonic immobility*. This response was first studied in the animal kingdom, and scientists believe it emerged a very long time ago in the evolutionary process. It can be seen in sharks, for example. If you turn a shark upside down and immobilize it, it will become frozen with fear (though we wouldn't recommend trying this on your next trip to Hawaii). With people, it essentially involves being unable to move or talk. The person might still be alert and aware, or they might be experiencing dissociation at the same time, which disconnects them from being aware of what is happening with their bodies. In the context of a sexual assault, this means

that some victims will describe being unable to move, talk or cry out during the assault, even though they were aware of what was happening to their body.

This is a particularly important dynamic to understand because many victims who experience tonic immobility are totally "present" for, and tormented by, the horrifying bodily sensations and emotions of being sexually assaulted. While some dissociate while in a state of tonic immobility, and thus mentally "flee" the experience of the assault, many do not. This must be clear, because it explains some of the memories and narrative accounts victims give that do not otherwise "make sense." For example, the victim who can recall being sexually assaulted and adds, "I tried to scream, but I couldn't" or "I couldn't move. I tried to push him away, but I couldn't move." Without understanding tonic immobility, these responses can be difficult to understand and then inaccurately interpreted as consent. It also helps to foster simple human compassion, to recognize how terrible it must be for victims to be physically helpless while they are being sexually assaulted with no understanding of why their body is responding that way.

Four specific conditions are known to trigger tonic immobility: (1) Extreme fear, (2) Physical contact with the perpetrator, (3) Physical restraint, and (4) The perception of inescapability. The state of tonic immobility involves a "waxy mobility" in the limbs, where the person's limbs are rigid or stiff, but still able to be positioned. The person may also experience periods of fixed or unfocused staring, sensations of coldness, and numbness or insensitivity to pain. They may have intermittent periods where their eyes are closed. While the person in a state of tonic immobility may initially have an elevated heart rate and high blood pressure, this tends to progressively decrease over time.

Episodes of tonic immobility usually occur after a failed struggle or an attempt to flee. They can last anywhere from seconds to hours, and they often terminate rather suddenly. Research suggests that tonic immobility occurs in anywhere from 12-52% of sexual assaults (Galliano, Noble, Travis, & Peuchl, 1993; Heidt, Marx, & Forsyth, 2005).

Collapsed Immobility

The third survival reflex is called *collapsed immobility.* It is also seen in the animal kingdom and is often described as "playing possum," which erroneously suggests a conscious choice that is not actually available to the person (or animal) at the time.

While some victims may consciously "play possum" by remaining still as a strategy, collapsed immobility describes a reflexive response that is not under the person's conscious control. For example, child victims often explain that they pretend to be asleep in their bed while being molested by a family member. However, this could either be a conscious strategy on their part (truly "pretending"), or they could actually be experiencing tonic or collapsed immobility and simply calling it "pretending" as their best attempt to make sense of what happened.

The same four conditions that can trigger tonic immobility may also trigger collapsed immobility: (1) Extreme fear, (2) Physical contact with the perpetrator, (3) Physical

restraint, and (4) The perception of inescapability. Also, like tonic immobility, it has a sudden *onset,* but the *offset* is usually more gradual. In general, the individual experiencing collapsed immobility cannot speak or move and will exhibit a general loss of muscle tone. Heart rate and blood pressure will also decrease, which results in less oxygen getting to the brain. This can produce faintness or even passing out.

This response of immobility and loss of muscle tone originally evolved to deprive a predator's brain of the stimuli that trigger the killing and eating of prey; resistance is needed in order to stimulate these responses. However, among human beings this immobility and loss of muscle tone is unlikely to alter a person's motivation to sexually assault, and will almost certainly make it easier for the perpetrator to commit the crime. In fact, the victim's physical response may later be framed as an indication that he/she consented to the sexual acts, and this is true not only for the suspect, but also by others making determinations (investigators, prosecutors, judges, jurors, even the general public). The response is also confusing to many victims, who do not understand why they reacted the way they did, and they often blame themselves for not physically resisting or attempting to escape during the sexual assault.

Some victims who experience collapsed immobility may even describe it as "blacking out." This is because they are trying to explain responses they do not understand, and a blackout may be the best way they can think of to describe their confusing experience. Unfortunately, this might only further confuse investigators who, without the type of training provided here, may logically assume the victim is referring to a blackout induced by drug or alcohol use. This information on its own might be used to challenge a victim's credibility, but their credibility may be damaged even more if the statement is challenged by evidence such as a negative toxicology report indicating that the victim could not have experienced a substance-induced blackout.

Summary of Survival Reflexes

So, to summarize, some people respond to a traumatic event, when they perceive escape as impossible and resistance as futile, with one of three extremes but relatively common survival reflexes: (1) Dissociation, (2) Tonic immobility, or (3) Collapsed immobility.

Self-Protection Habits

At this point, we would like you to think back to the discussion about habitual behavior. Remember the examples of the taser and the former paratrooper? Keep both in mind for this next section. In particular, we would like you to remember that behaviors we engage in repeatedly create neural pathways that are at the root of habitual behavior; this is behavior we engage in without thinking about it. It's also the behavior we fall back on when under stress or attack.

To take this out of the realm of trauma, consider whether you know anyone who still drives a car with a standard transmission (a stick shift). If you ask them what happens when they rent a car for the weekend – which will inevitably have an automatic

transmission – they will tell you that their left foot spends the weekend reaching for a clutch that isn't there. This is habitual behavior.

With that in mind, let's think about habitual behaviors victims might have for dealing with being sexually assaulted. Here are a few possibilities: Maybe the victim was physically or sexually abused in childhood and developed a habitual response of dissociating or entering a state of tonic or collapsed immobility. Or perhaps the person observed his or her parents fighting on a regular basis, and developed a pattern of becoming incredibly quiet or, as one person described, "invisible." The victim may even have played the role of peacekeeper in the family, learning to say and do anything to try to "smooth over" potential conflict. Alternatively, the victim may have been living with an abusive spouse for years and consequently developed habitual responses for protection that include becoming submissive and complying with whatever demands are made by the abuser.

Of course, the victim may have also grown up being taught never to act rudely, for fear of "upsetting the apple cart" or making others feel uncomfortable. These are all examples of habitual behaviors that victims may use on a daily basis to navigate threatening situations at home or work, particularly for women. As researchers have long noted, girls in most societies are raised to be wives and mothers, and to preserve relationships, almost at any cost to themselves (e.g., Chodorow, 1978).

In fact, girls and women are typically socialized to respond to unwanted sexual advances with various forms of polite resistance, without actually coming out and saying "no." These habitual responses may be effective if the other person accepts the implicit refusal, but they will not work with someone who does not care about the victim's experience or needs in that moment. The bottom line is this: When faced with the threat of a sexual assault, victims cannot simply cancel out habitual responses developed over the course of a lifetime to defuse conflicts and preserve relationships. It is impossible for the brain to relay that this time you won't use the techniques you've been using all your life to deal with fear, threat, or potential conflict.

Attachment vs. Defense Circuitry

Now let's go back to the confusion and trauma often experienced during a sexual assault, because there is a complicated process involved worth highlighting. We already mentioned that many victims experience confusion when they suddenly transition from thinking that everything is fine to realizing that they are being sexually assaulted. However, in many scenarios this switch isn't actually sudden – it is the result of a process not unlike the grooming of children by sexual predators.

You may already know that people who sexually abuse children often groom them over a period of time, in order to normalize their sexualized behavior. This may happen over weeks, months, or even years before any significant sexual contact takes place. Yet the same type of general process often takes place among those who sexually assault adolescents and adults. It is just more of an accelerated process, which may take place over the course of a single evening.

For example, the perpetrator may start by touching the victim, which might be perfectly fine, or it could be uncomfortable for the victim. This could include the perpetrator brushing up against the breast of the victim to judge her response, or even "innocently" putting an arm around the victim's shoulders. If this action is comfortable for the victim, it activates the attachment circuitry, and dampens the defense circuitry. This makes it more difficult for the victim to perceive that the behavior is actually threatening.

Then as the behavior escalates, and moves into more uncomfortable territory, the defense circuitry is eventually activated, and the prefrontal cortex largely gives way to habitual behaviors to try to manage the interaction. This may not include explicitly setting a boundary or saying "no" outright – because this may feel uncomfortable, if not impossible, for some victims. Plus, implicit refusal may be more the norm than the exception in sexual situations, where people often communicate "no" using nonverbal behaviors such as pushing the other person away with their hands.

This type of habitual response may be particularly likely among those who were abused or witnessed abuse as children. Although some people may be skeptical that experiencing or even witnessing abuse in childhood can determine the way a person responds to being sexually assaulted later in life, this is exactly what happens, based on how the brain works. As described earlier, you can't simply turn off habitual responses – even when you want to. Those who have been abused, or witnessed abuse as children, very often have deeply ingrained, passive responses to conflict, consistent with a child's inability to fight back against an adult perpetrator. Remember the example of the paratrooper who still rolled when he fell at the age of 86? A habitual response that hasn't been used in years, even decades, can suddenly emerge and take over during a sexual assault, just as it can in other traumatic or threatening situations.

Habitual Speech Patterns

One more note about habitual behavior and trauma: The part of the brain that helps us plan our speech is called Broca's Area. It's located in the prefrontal cortex, and research shows that it becomes impaired during traumatic events, sometimes to the point of being essentially "offline." This makes sense given what we have already learned. However, it is particularly relevant here, because many victims can only express simple statements or "habitual speech" during a sexual assault, when their prefrontal cortex (particularly Broca's area) is impaired by trauma. So, they may make simple exclamations like, "no," "stop," or "quit it," but then again, they may not. Remember that habitual behaviors in a sexual situation frequently relate to implicit refusals (e.g., nonverbal behaviors) rather than explicit refusals (e.g., saying "no").

A great example of this is seen at the conclusion of the film "Captain Phillips," where the character played by Tom Hanks is rescued after having been kidnapped, held captive, and subjected to various forms of abuse by Somali pirates. Despite the terror he experienced over a period of many hours, he nonetheless managed to remain calm and make a number of strategic decisions to keep himself, and his shipmates, alive. When he is finally safe, he is examined by a trauma nurse who asks, "What's going on?" He

says, “I’m okay,” but then emerges from the dissociative state and collapses into sobbing. His verbal response was likely a habitual one, because he could not express the impact of trauma until his brain appraised the situation as safe, and then he let go.

Another illustration is seen in a case that Chris Wilson worked on clinically. It involved a woman who was anally raped by her intimate partner. In therapy, she was deeply disturbed by the fact that throughout the rape, she only uttered the phrase, “Are you sure this is okay?” She never said anything like, “Stop, you’re hurting me,” or “No, I told you I don’t want to,” to make it clear that she did not want to have anal sex. Over the course of therapy, she realized this was a phrase she used frequently, in childhood and adolescence, whenever she was in a situation where friends or siblings were engaging in misbehavior. It took learning about the neurobiology of trauma for her to realize that this was just her brain doing what brains do when we experience a traumatic situation and revert to habitual speech.

Other examples include cases where victims have said things like, “You’re married,” or “I have to be home soon.” As noted above, these types of statements may be effective if the other person is willing to listen to the polite, implicit, “no.” However, when the other person is not willing to listen or respect the refusal, for any number of reasons, this habitual response will be utterly ineffective.

To summarize, when logic shuts down, and the ability to plan speech has been turned off, all we may be left with are old patterns of habitual speech. Those patterns rarely include verbal protests or explicit boundary setting while being sexually assaulted. Unfortunately, this is exactly the opposite of what many expect. Many people think that a victim of sexual assault will protest vociferously and resist to the utmost, if it is “really a rape.” If not, many people question whether the victim consented and “wanted it” after all.

It is important to keep all of this in mind when trying to make sense of how victims respond verbally to being sexually assaulted. A victim’s verbal response may not make sense “logically,” unless you consider the fact that Broca’s Area often isn’t available to help victims plan their speech, and the habitual speech they fall back may be ineffective with someone who doesn’t care about a polite or implied “no.”

Trauma, Attention and Memory

We have now described responses that sexual assault victims often experience. This can include extreme yet relatively common survival reflexes such as dissociation, tonic immobility, or collapsed immobility. It can also include habitual self-protection behaviors and/or habitual speech patterns that may have developed from a lifetime of socialization or victimization in childhood and/or adulthood. While gender socialization often inhibits assertive responses among girls and women, it also harms men and boys who often believe they could have prevented their sexual assault if only they were “man enough.”

At this point, we will continue this discussion by exploring the impacts of trauma on attention and memory.

Bottom-Up vs. Top-Down Processing

One key effect of the defense circuitry has to do with attention. When we are not dealing with a threat, and our prefrontal cortex is fully functioning, we generally have conscious control of where we place our attention. If your phone rings across the room while you are reading this training bulletin, you will instantly be faced with a choice. You can either choose to get up, walk across the room, and answer the phone – or you can ignore it and continue reading this material. The prefrontal cortex is intimately involved in this decision. We call this *top-down processing or top-down attention*.

However, if you encounter a threat, the chemicals released to deal with the threat will impair your prefrontal cortex. You will therefore lose the ability to consciously control your attention; it will be focused, by the defense circuitry, on surviving or coping with the threat. This makes sense, because our brains deal with major threats in very rapid, hard-wired or habitual ways, not with the relatively slow reasoning processes of the prefrontal cortex. This defense circuitry-controlled attention is an example of *bottom-up attention.*

When we cannot control our focus of attention, the defense circuitry typically has us focus on one of two things: (1) Things that will allow us to survive the threat, or (2) Things that will help us cope with or withstand the threat. Whatever they are, the things we focus on are called *central details.* Everything else is called *peripheral details.*

Weapon Focus Effect

In the case of a crime involving a weapon, we often see bottom-up attention manifest as a central focus on that weapon. This is referred to as the *weapon focus effect*. The victim or witness may be able to give you an enormous amount of detail about the weapon, but little or nothing about anything else, including information that might help identify a suspect or determine exactly what happened. What color was the perpetrator's jacket? No idea, but the knife was huge. What direction did he go when he left the scene? Not sure, but I remember that knife was really long. Clearly, the weapon was a central detail. Just about everything else was peripheral. When we think about it, this makes sense because keeping track of the weapon may be crucial to survival.

To highlight this point, you can listen to this interview with a Green Bay police officer who was involved in a shooting. During the interview, the officer clearly remembers details about the size of the suspect's gun, the motion of the perpetrator's hand while reaching for the gun, and the experience of firing his own weapon as fast as he could. However, he cannot remember other basic details like whether he changed his position during the event or how many shots he fired. Again, this makes sense. Knowledge of the suspect's gun was crucial to survival and therefore a central detail. Firing his weapon as frequently as he could was also crucial to survival, and therefore a central detail. The number of times he actually fired was not as important, so the brain didn't

focus on this in the moment. It focused on getting the job done. Similarly, whether the officer changed positions was perhaps not as crucial to his survival. These were both peripheral details, and as a result, the officer could not remember them.

Central vs. Peripheral Details

Since the majority of sexual assaults do not involve a weapon other than the suspect's hands and body (as well as alcohol and drugs), it's impossible to know exactly what victims will focus on, and therefore we cannot predict in advance what will be central versus peripheral details in their attention and memory. In fact, the victim may not focus on the details of the attack at all, including what sexual acts took place. In an effort to cope with the threat, the victim may focus on something else entirely. A classic example of this is a victim who stares at something (e.g., a painting on the wall) while dissociating during the sexual assault – and can then describe it in great detail later – but can tell you very little about the actual assault itself. This is important to understand, because dissociation can also potentially help to corroborate a lack of consent.

Bottom-up attention may also mean that there are "important" details missing from the victim's account of the sexual assault. For example, a New York detective told Chris Wilson about a stranger rape case involving a suspect who was described by the victim with sufficient detail that officers were able to find and arrest him. Once they did, however, they noticed that he had a large tattoo of the New York Yankees on his face, but the victim had not described any tattoos. The arresting officers called the detective, expressing doubt that this was the perpetrator because, "How in the world could she not notice that he had a huge New York Yankees tattoo on his face?" The detective explained that he didn't know about central and peripheral details at the time, but he knew "in his gut" that this was their guy. He said that after receiving training, he understood why the victim hadn't described the tattoo: It wasn't central to her survival, so her brain didn't focus on it, and therefore it wasn't encoded into her memory. This is an excellent illustration of the power of bottom-up processing and attention. It also brings up important points to consider when interviewing victims: What investigators often believe *should* be central to a victim can, in fact, be peripheral. Moreover, it is critical to understand what the central details are *for each particular victim*, based on what she/he personally experienced during a sexual assault.

Bottom-Up Attention and Memory

Now let's look more specifically at memory and how it is affected by bottom-up attention – the type of attention involved in a traumatic event. Memory starts with attention: What we don't pay attention to, we don't remember. For example, if you're in the car with your kids, having a conversation about school, you will typically switch back and forth between focusing on the road and the conversation. You will do this with the involvement of your prefrontal cortex. But if, all of a sudden, another car cut across your lane directly in front of you, that threat will command your attention – and this won't be a conscious choice by your prefrontal cortex. It will be dictated by your defense circuitry: This is bottom-up attention. In the moment you are slamming on your breaks and

swerving into the emergency lane to avoid a collision, you will not be listening to your kids, and you probably won't remember what they said about their homework. You will only be able to turn your attention back to your children when the threat is over.

All of this has clear implications for sexual assault. It means that the reason victims often fail to remember specific details about their assault is because those details were not central to them, and their survival, at the moment; they were therefore peripheral details. If the detail was peripheral, it wasn't attended to by the victim's brain, and the likelihood of it being encoded into memory drops significantly.

This distinction is very important for law enforcement interviews, because central details are more resistant to change over time. Peripheral details are much more likely to fluctuate as time passes (e.g., the specific color of the sheets, or the exact location of the assault). Peripheral details are also more likely to be influenced (or even created) as a result of leading questions, including questions from investigators not trained to avoid them. This takes training, practice and effort, because we all tend to ask leading questions, even during "normal" conversations. One reason is because they speed up the process: Leading questions "get right to the point." This may not be a concern for everyday conversations, but it can create significant problems during a law enforcement interview. Investigators need to slow down the process to give victims time to respond without feeling rushed.

Even an investigator who avoids leading questions will face the reality that there is no way to know which details of an assault are peripheral or central to the victim. This creates a problem when investigators ask questions about details that were peripheral and therefore less likely to be encoded in the victim's memory. If victims do not know the answer, or if they provide an answer that is later called into question, this can significantly damage their perceived credibility. For example, if a male victim reports that the perpetrator's hand was on his neck, it would be natural to want to know which hand it was, how long it was on his neck, and whether it restricted his breathing. However, none of these may have been central details to the victim, in which case they may not have been encoded in his memory. Yet this can be difficult for investigators to understand: "How could someone not remember such basic details of their assault?"

Unfortunately, when victims do not know the answer to a question, they often feel ashamed of not being able to make a useful contribution to the investigation. They may even feel that they failed the investigator, or worse, that they failed themselves. As a result, many victims "fill in" gaps in their memories based on what they think (must have) happened or even imagined happened as they strain to recall what the investigator is asking for. In this case, it is critical to understand that victims are not lying or deliberately "making things up." They are simply doing what people do all the time when they are sincerely trying to remember things that are not entirely clear or "filled out" in their memory. They are filling in gaps, often without even fully realizing that's what they're doing, because it's such a common thing that people do all the time.

Investigators often inadvertently focus on peripheral details – because, again, there is no way to know up front which details are central versus peripheral. They can then find the investigation derailed by inaccuracies or inconsistencies that surface because they asked for information not sufficiently encoded in the victim's memory. On the other hand, details that were central to the victim's experience are more likely to be strongly encoded in the victim's memory. This is partly because some of the same chemicals that impair the prefrontal cortex during a traumatic experience also help to "burn into memory" whatever was a central detail during the assault. Central details are also more important to understanding the incident from the victim's perspective, and they are less likely to change over time. It is therefore important for investigators to conduct interviews to elicit details that were central to the victim's experience.

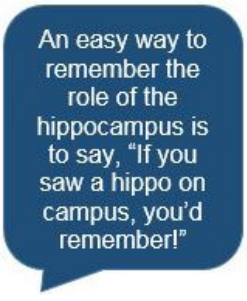
This is illustrated with some notes that were written by a detective, explaining to his commander why he believed a particular victim was lying about her sexual assault. She was later prosecuted for filing a false report.

> *My initial questions to [the victim] were to provide me with a detailed account of the assault. Her response was very abbreviated and when I asked her to be more specific, she would pause and appear to 'retrieve' the answer. She had difficulty in answering my questions when I asked her for specific details. She would appear to pause and or stall and then ultimately provide an answer.*
>
> *Much of my interview turned into a question and answer session where I now believe my questions lead her to an answer.*
>
> *I asked where her legs were during the vaginal assault and if they were out, or wrapped around the suspect, and then she said that he had asked her to wrap her legs around him. **She didn't mention this [earlier]. I asked her, and she said, "yes." WHY?*

Without an understanding of how trauma affects memory, investigators such as this will question the credibility of victim responses, and thus the legitimacy of their reports.

The Hippocampus

Now let's delve into the process of how memories get encoded and try to make sense of situations where a victim can provide numerous details about some aspect of the sexual assault, but very few details about other aspects. This most likely will be due to the functioning of the hippocampus, which plays an integral role in encoding memories.



As mentioned during Brain Basics, memories initially consist of data points (including thoughts, sensations, etc.) that need to be encoded in order to be consolidated and

stored as memories, if they are going to be recalled later. The process is aided by the hippocampus, which normally encodes memory data with contextual and temporal information (like a time stamp); this allows it to be recalled later as a meaningful narrative that has some logical structure as well as a beginning, middle, and end.

Flashbulb Memories

We used to think that the hippocampus essentially shut down during a traumatic event. However, a great deal of research now indicates that the hippocampus goes through two distinct stages during a traumatic event like a sexual assault.

First, when the defense circuitry kicks in, and bottom-up processing and attention take over, it's as though the hippocampus says, "Oh geez, this is really important." It immediately goes into overdrive, to encode as much data into memory as it can. It also gets to work on consolidating or storing away whatever information had already been encoded into short-term memory before the fear kicked in. This information is drawn from a memory "buffer" that lasts about 30 seconds. The phenomenon is sometimes described as a *flashbulb memory*, and it explains why victims will often have a high level of detail in their account of the initial moments of a sexual assault or other traumatic event.

Fragmented Memories

After a while – and the amount of time varies for each person, from just a few seconds to minutes – the hippocampus shifts into a different mode, where it focuses on consolidating everything that was absorbed and was already being consolidated during that initial flashbulb phase. As a result, the hippocampus goes into a *fragmented* or *refractory mode* where it has fewer resources available for encoding new information, especially more complex information associated with context and time sequence.

These fragments are often encoded without contextual details such as the timing of events, which explains why many victims can remember sounds, smells, and other aspects of an assault, but cannot put them in sequential order or tell you when they occurred. Why would the hippocampus do this? Because these memory functioning modes help us *predict and avoid future attacks*, by encoding information about what happened just before and at the beginning of a predatory attack we survived.

Once again, there is a reason why our brains do what they do during trauma, even if it makes it difficult later on – for example, when being interviewed by law enforcement.

Sensing and Tracking Time

In addition to the hippocampus switching modes, there are a few other memory factors to keep in mind. For example, our ability to sense and track time – over a period of seconds, minutes, hours, or even days – is also impaired during a traumatic event. This is because tracking how long a traumatic experience lasts is not typically central to surviving and paying attention to its duration may only make the experience worse. Thus,

the passage of time is not likely to be a central detail, and victims of sexual assault may have a very difficult time accurately judging how long specific events lasted.

Again, this is illustrated with notes from the detective explaining to his commander why he believed a victim was lying in her report of a home invasion and sexual assault.

> *I repeatedly asked [the victim] about the amount of time the suspect was present with her. She said that she was positive that he was there for at least 45 minutes and maybe up to 1 hour. She stated that her alarm clock was set for 4am and that it went off right when the suspect was beginning the assault. She said the suspect hit the snooze alarm repeatedly 5-6 times and the snooze timer is 9 minute increments.*
>
> *Anal assault lasted 30-60 seconds*
>
> *Oral assault lasted 5-6 minutes*
>
> *Vaginal assault lasted 3 minutes*
>
> *In the closet 10-15minutes (?)*
>
> *Total time suspect accounted for approximately 20 minutes. No explanation for the remainder of the 20 -35 minutes that she claims the suspect was present.*

It is critical that investigators not ask victims such questions, which are legally irrelevant and virtually impossible for them to answer: “How long did he have his penis in your vagina?” To further illustrate how ridiculous this question is for victims, it is helpful to compare it to the experience of a police officer involved in a high-speed pursuit.

As Joanne Archambault describes, most officers have been involved in a high-speed pursuit sometime during their career, so it is easy to imagine how they might respond if their sergeant asked them immediately afterward about specific details: “How long did it take you to reach the suspect once you jumped out of your car?” “How long did the foot chase last?” “How long did it take for your cover officer to show up?” Most officers would consider the sergeant crazy for asking such questions or wonder if the sergeant was trying to show that the officer was in violation of department policies (in other words, “out to get them”). The same is true for victims. Questions about how long the assault lasted can be perceived as indicating doubt about whether the assault even occurred and will often “set them up for failure” because the questions are difficult if not impossible for them to answer. This information is simply not available in their memory.

Integrating Memories

When it comes time for the prefrontal cortex to integrate all the cognitive and sensory data encoded during a traumatic event into a narrative account – for example, when a sexual assault victim is being interviewed by a law enforcement investigator – the process is a bit like putting a puzzle together. Think about the process that most of us

follow when we put together a puzzle. First, we look at the box to get a frame of reference: "What's this supposed to look like?" Then we lay out all the pieces on the table in front of us, turn them all right side up, and start looking for edges and corners. If we find a piece that's difficult to place, we can look at the box and use that frame of reference to put the piece in the right place.

Victims of sexual assault do not have the benefit of this type of process. First, they don't typically have a frame of reference to help them remember what happened, even if they have been sexually assaulted before, because no two assaults are identical. Furthermore, the only other person who was typically there – the suspect – describes it in a very different way (either by denying it happened, or saying the victim consented).

Second, because the hippocampus goes from flashbulb to fragmentary mode, victims will not typically have all the pieces of the puzzle at their disposal, and not all the pieces will include time stamping information. As such, there is frequently no narrative available in their memory to help put the pieces together, and there are gaps in the logical sequence of events (in the form of missing or upside-down puzzle pieces).

Third, when victims are asked about peripheral details, they often do their best to answer based on what they can remember – or their assumptions about what happened. While it is considered standard practice for investigators to tell victims, "It's okay if you can't remember something," the reality is that it doesn't feel okay to victims. They typically want to remember, and they want to be able to answer the investigator's questions. This type of question thus unwittingly asks for peripheral details, that can result in inaccuracies and inconsistencies that cast doubt on the victim's credibility.

Finally, it's important to understand that some memories appear to be encoded, not by the hippocampus, but by the amygdala. These memories represent puzzle pieces that have fallen under the table. This means they will not normally be included in the victim's account of the experience, unless the interviewer asks sensory-based questions that could trigger these elements of the experience.

The implications for interviewing are clear: Law enforcement investigators must provide victims with the time, space, and the right prompts to help victims talk about their puzzle pieces without any pressure to put them together. The pieces may eventually come together, particularly when the victim's memory is supplemented with other evidence and information developed during the course of the investigation. However, a skilled interviewer must accept the fact that victims may be left with a collection of pieces they can never put together into a coherent puzzle on their own.

Most critical, an understanding of the neurobiology of trauma means that investigators need to let go of the goal of putting the puzzle together *during the interview*. Trying to accomplish this will lead the investigator to press the victim for peripheral details, which are more likely to be inaccurate or inconsistent. Perceptions about these inaccuracies and inconsistencies will then be used to cast doubt on the credibility of the victim's statement and the validity of the report itself.

Trauma, Memory and Long-Term Impact

Recalling and Relaying Traumatic Memories

When it comes to sexual assault, we must remember that memory is a very complex process. A number of factors affect which elements of an experience are likely to be encoded, consolidated, and stored in memory, along with contextual and temporal information. To be able to produce the type of narrative we typically think of as a memory, a person has to be able to recall the information and place it in some type of meaningful sequence or context. The trauma informed interviewer understands that victims of sexual assault will rarely be able to give an account that matches the type of narrative we typically demand because of the way we think about memory.

We now understand that a traumatic experience constitutes a collection of puzzle pieces that very often cannot be placed together consistently. The initial recall of the experience will often appear disjointed ("all over the place") and as such, may seem hard to believe. However, if we think of the process of recall as peeling away layers of the experience, it may help to understand traumatic memory.

This doesn't mean that memories are actually "layered" in any neurobiological sense. But for victims; it can sometimes feel that they are peeling away layers of their memory, as more puzzle pieces emerge during a trauma-informed interview. While the initial layer may seem incredibly disjointed, helping the victim to access more layers can clarify the experience without asking questions that ask for peripheral data.

"Layers" of Memory: Cues for Recall

When first asked about an incident, for example, many victims will give you a "first layer" account, based on the question you asked, and the elements of their experience associated with that particular question. It is crucial to understand that the victim's response may actually serve as a cue for other memories or elements of the experience. Some of these cues may be smells, sounds, or other sensory data that do not have an obvious association with the information the victim just provided, or the question just asked. This response can thus prompt additional questions from the investigator, which peel back additional "layers" of the victim's memory.

Let's be more concrete. Many investigators ask questions about what sexual assault victims can remember seeing, smelling, hearing, tasting, etc. These questions may sound irrelevant, but they may have been encoded in the victim's memory and associated with other data that may be critical. So, finding out that the victim remembers smelling a specific cologne, or the odor of a particular brand of cigarettes, could in some cases be directly relevant for the investigation (for example, if it helps lead to the identification of a possible suspect). However, the smell might also serve as a cue for the recall of another "layer" of details, such as images, sounds, and/or body sensations that

are associated with the memory of that smell. This explains why such sensory-based questions can be very important.

Implications for Law Enforcement Interviews

An illustration is seen in a case that a detective described to Chris Wilson, where a female victim mentioned seeing a water bottle under the bed. The detective said that if he had this training prior to that investigation, he would have asked her to tell him more about the water bottle. At the time, he suspected that she was dissociating during the sexual assault, but he did not fully appreciate the implications, including the fact that a prompt about the water bottle might have led to other important details being recalled. Instead, the detective said he only treated the water bottle as potential evidence that he was never able to physically obtain or corroborate.

In this scenario, it's natural to follow up on the statement about the water bottle with questions like: "What did the water bottle look like?" or "Exactly where was the water bottle under the bed?" However, these types of questions can be problematic for two reasons. First, the answers may be peripheral to the victim and could change over time. Because the victim proactively offered the memory of the water bottle, we can presume that it was a central detail in the victim's experience, but there is no way to know if the answers to these other questions will also be central details. Second, these questions require the victim to think about the water bottle in a particular way, which may actually get in the way of the victim's ability to retrieve additional memories that might be associated with the water bottle.

To be consistent with the neuroscience, the most effective response would simply be to say, "Tell me more about the water bottle," and then pause and wait for a response. For example, the victim may have a memory of something the suspect said while she was looking at the water bottle, or she may remember seeing it through a kind of tunnel vision (which would suggest a dissociative experience).

Each memory may prompt another memory – from remembering the water bottle, to remembering something the perpetrator said or did. It is impossible to predict what may be associated with any particular memory. Therefore, the skilled interviewer will use simple prompts to keep the victim talking about central details which provides an opportunity to gather puzzle pieces that may not otherwise be collected.

It is important to remember that direct questions may ask about information that was peripheral to the victim's experience and therefore not encoded in memory. As a result, the victim may begin to feel stressed about not being able to answer. Even if they are reassured that it is okay to not remember certain aspects of the assault, many victims believe they *should* be able to remember simple details like the location of a water bottle. This stress can then affect their prefrontal cortex and further hinder their ability to recall other memories. A trauma-informed approach includes asking questions that allow central details to emerge, without pushing the victim for peripheral details that aren't available.

Finally, it is important to think about how it feels for victims to talk with a law enforcement professional about their experience of being sexually assaulted. This can be incredibly stressful, and this factor alone makes recall more challenging, because stress affects the prefrontal cortex. It is crucial for investigators to keep this in mind and work hard to create a safe environment – both physically and emotionally – for the victim interview. Victims need to feel welcomed, accepted, and believed, to feel safe enough to disclose the details of their sexual assault. If stress made it difficult for Chris Wilson to remember a simple computer password, just imagine how much it can interfere with a victim's ability to recall details of their sexual assault.

From Memory to Disclosure

Let's now move beyond memory recall and begin exploring what a victim actually discloses – particularly in the context of a law enforcement interview. In some cases, victims censor details or leave things out because they don't think they are important. In others, they are embarrassed or ashamed by certain aspects of the event. They may believe they will be in trouble if they talk about a particular part of the experience. While this may not seem like part of the memory and investigation process, it is because it won't matter what victims remember if it simply stays in their head.

Information can only assist an investigation if the victim shares it with law enforcement (or other professionals connected with the investigation, such as forensic examiners).

In addition, trauma victims often feel very vulnerable in an interview. This vulnerability alone creates a level of stress that can impair one's ability to recall memories. If they do not feel comfortable with the interviewer, or in the interview setting, they will be unlikely to share memories that only increase that sense of vulnerability.

Long-Term Impacts of Trauma

Before we move on to a discussion of more specific techniques for interviewing sexual assault victims, we need to address another topic: the long-term impacts of trauma on human responses and behaviors. This is critical to integrate all of the information we have covered so far. We will therefore cover this topic in the same basic order we initially used to talk about the defense circuitry, starting with the amygdala (your "Danger, Will Robinson" robot).

Amygdala Increasingly Sensitized

When we experience a traumatic event, the amygdala is sensitized, so afterward, it will fire in response to stimuli (like a smell or a sound) associated with that trauma, even if the association is not a close one. The amygdala becomes hyper-sensitive, as if saying, "I'm going to protect you first, and you can ask questions later."

Perhaps you've heard stories about members of the military coming back from combat experiences overseas and finding themselves triggered by a stimulus that their brain associates with mortal danger. For example, men and women who've returned from combat and are walking downtown, only to find themselves suddenly falling to the ground, because a car door slammed shut or a car backfired. In this type of situation, their amygdala says, "That's close enough to the sound of a mortar shell, or an IED, or gunfire, so we're going to take that threat seriously and you can figure the rest out later."

This is the neurobiology of trauma being "triggered." The trigger can be a sensory cue or a contextual cue (e.g., a road that resembles one on which an IED exploded) that needs only to vaguely relate to the initial trauma. One part of the amygdala says, "Close enough!" and sends a signal to another part of the amygdala that sends the signal for how to respond (e.g., hitting the deck), just to be safe.

Trauma essentially blocks the brain's ability to differentiate between the sound of a car door and the sound of a mortar shell, IED, or gunfire. All those sounds are lumped together into the collection of danger signals.

Heightened Level of Vigilance

The brain also becomes more vigilant after a traumatic incident, in an attempt to protect us. It then becomes far more sensitive to any potential indicators of threat in the environment, even things not previously associated with the trauma.

Unfortunately, this can lead to a vicious cycle, where a person becomes more reactive to potential triggers, which means the amygdala has more opportunities to react and over-react in response to more and more stimuli (like the car door) and situations (like a crowded room) that don't actually represent a threat.

Decreased Ability to Assess Safety

Another long-term consequence of trauma can be a decreased ability to access our hippocampus for maps of safety or danger. This explains why some people who become triggered lose their ability to simply look around, recognize that they are not back in the traumatic experience, and calm themselves. For example, when victims are testifying on the stand, and they are triggered by describing the assault, they might not be able to look around, scan all the cues from the courtroom environment, and realize that they are actually physically safe.

In an interview, this can mean that victims who are triggered may not be able to ground themselves in the present and recognize that the interview room is a safe environment and the interviewer is not going to hurt them. This is one of the many reasons why it is important to include victim advocates in the interview process. In this case, it would be best to take a break to give the victim time to talk to the victim advocate in hopes that

the situation can be de-escalated. It's always a good rule for investigators to do whatever they can to prevent additional harm to the victim.

Physical vs. Mental "Reality"

It is also important to remember that the brain doesn't necessarily respond differently to something that is in your mind versus the physical world. For example, we can take a picture of the brain while you describe a photograph you are looking at. Then, we can remove the photo and take a picture of your brain while you describe the photo from memory, essentially seeing it in your "mind's eye." Fascinatingly, the two photos of your brain will be essentially identical. In real life, this is how neuroscience explains why your mouth waters when someone mentions your favorite food: Your brain and body don't always respond differently just because the stimulus is internal versus external. This can include re-living, or re-experiencing, something that happened in the past.

Chris Wilson provides an illustration:

> *I often tell about a dream I had that involved "candy day" as a young child. Each week, my sister and I were given five cents on Saturday morning, to buy five pieces of candy at the Andover Candy Shop – and later CVS. (What a sad day that was when we lost our candy store!) My sister, however, would buy only two pieces of candy, and save her remaining pennies for a periodic Snickers bar. Without fail, she would eat the Snickers bar over the course of the next two or three weeks, letting me know that she would love to share the Snickers bar with me, but unfortunately it had her germs on it.*
>
> *One Friday night, I dreamt that on the way down to the candy store I found ... of all things ... a quarter! The dream fast-forwarded to me holding a Snickers bar while walking out of the CVS. I remember the dream like it was yesterday. The sky had light clouds floating in the sky, and a shaft of sunlight burst through just as I opened the wrapper on the Snickers bar. As you have probably guessed, my alarm went off before I ever got to taste a bite. As I rolled over to turn off the alarm, my cheek met with a puddle of cold drool on my pillow. Obviously, my brain had no idea that the Snickers bar wasn't real, and it notified my salivary glands to prepare for its imminent arrival!*

This is very important to understand because it is possible that a victim is triggered into re-experiencing a traumatic memory during an interview. Just as Chris Wilson's brain acted as if the Snickers bar was real, victims who are triggered experience the current threat as real. They aren't always able to look around, assess the environment as safe, and calm down. This is because the activation of their amygdala (Danger, Will Robinson!) and impairment of the prefrontal cortex has limited their ability to compare what is in the environment with their "maps" of safety and danger.

This is also why, in the moment the victim is triggered, the brain reacts as though the threat is immediate. This is not a sign of weakness or mental illness: It's just the brain

doing what the brain does when an individual has experienced trauma but not yet recovered from that experience. In fact, this phenomenon has been observed in members of the military coming home from combat, back to World War I.

Summary and Conclusion

At this point, we want to summarize what we have learned so far, about the impact of trauma on victim responses, memories, and recall – and connect it with sexual assault.

First, a sexual assault victim is typically operating from the position where the defense circuitry is in control of their responses. As such, the victim's attention and thoughts are generally driven by the perpetrator's behavior, while the victim's behavior is determined largely by survival responses and habits – whether from childhood, adolescence, or adulthood.

This also means that the ability to give an account of the incident will be impaired. Most victims will, at some point, have difficulty talking about "what happened next" during the sexual assault and their interview will include details that they are unable to sequence. Without an understanding of the neurobiology of trauma, an account that includes some or all of these characteristics might be viewed as inconsistent, inaccurate or unreliable. It might even be reasonable to question whether the victim is lying about the sexual assault.

If you don't know anything about dissociation, tonic immobility, or collapsed immobility, for example, you might wonder why a victim did not resist the assault – and question whether the sexual acts were consensual. Similarly, if you don't understand the functioning of the hippocampus and the distinction between top-down versus bottom-up attention, you might question why the victim can't remember what seems like basic or crucial details about the assault. If you don't understand that the hippocampus often lapses into a fragmented or refractory mode after an initial super-encoding (or "flashbulb") mode, it won't make sense when a victim is able to tell you a great deal about the initial moments of the sexual assault, but very little about "what happened next." These dynamics explain victim behaviors that might not otherwise make sense, and this understanding can improve the way professionals respond to sexual assault.

Ultimately, better interviews are essential to improve law enforcement investigations and criminal prosecutions, in sexual assaults as well as other cases involving traumatized victims and witnesses. Just as fingerprints and DNA transformed the way crimes are investigated, an understanding of neuroscience and the impact of trauma can transform the way victims are interviewed. We hope this training material will help to fuel this transformation. With an understanding of how the brain responds to trauma, and an appreciation for how trauma affects memory encoding, storage and recall, we now have the potential to become truly "trauma informed" in our interviewing practices.

Resource: Trauma-Informed

EVAWI offers a number of additional resources to support law enforcement in conducting victim interviews that are "trauma-informed," including the following training bulletins:

- Trauma-Informed Interviewing and the Criminal Sexual Assault Case: Where Investigative Technique Meets Evidentiary Value (February 2020)
- *Becoming Trauma-Informed: Learning and Appropriately Applying the Neurobiology of Trauma to Victim Interviews* (December 2019)

The following webinars on the neurobiology of trauma and trauma-informed interviews are available:

- Forensic Experiential Trauma Interview: A Trauma Informed Experience. In this webinar, Russell Strand explores practical applications of the FETI, reframing questions, and how to close a FETI interview. Mr. Strand also talks about how FETI can be applied to both preliminary and follow-up interviews.
- A two-part series on the *Neurobiology of Sexual Assault* presented by Dr. Jim Hopper of Harvard University. In Part 1, Dr. Hopper focuses on the topic of Experience and Behavior, while Part 2 emphasizes Experience and Memory.
- Another good webinar on this topic is: The Neurobiology of Sexual Assault: Implications for First Responders in Law Enforcement, Prosecution, and Victim Advocacy, with Dr. Rebecca Campbell, and hosted by the National Institute of Justice.
- Finally, we offer an archived webinar on Effective Victim Interviewing, by prosecution expert Roger Canaff and EVAWI's Sergeant Joanne Archambault. While it does not specifically address the impact of trauma on neurobiology, valuable guidance is provided for how to plan and conduct successful interviews with sexual assault victims.

Additionally, The Florida Council Against Sexual Violence (FCASV) created this introductory training video for patrol officers on trauma-informed responses to sexual violence. This video reviews the importance of this type of response, with a basic overview of the effects of trauma and key aspects of a trauma-informed response.

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