

## **The Science of Trauma: A Briefing Paper**

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For Witness Justice

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### **What is trauma?**

The APA's *Diagnostic and Statistical Manual (DSM-IV)* defines a "traumatic event" as one in which a person experiences, witnesses or is confronted with an event (s) that involves actual or threatened death or serious injury or threat to the physical integrity of self or others. The person's response involves intense fear, helplessness or horror.<sup>1</sup> Trauma can result from experiences that are private (e.g, sexual assault, domestic violence, child abuse or neglect, the witnessing of violence) or public (e.g, war, terrorism, natural disasters.) Trauma has been increasingly recognized as a significant factor in a wide range of health, behavioral health and social problems.<sup>2 3</sup> Trauma that results from prolonged or repeated exposures to traumatic events is often the most severe.<sup>4</sup>

### **How does trauma alter brain function?**

Trauma, especially when experienced in childhood, has a neurobiological impact on the brain, causing dysfunction in the hippocampus, amygdala, medial prefrontal cortex, and other limbic structures.<sup>5 6</sup> When confronted with danger, the brain moves from a normal information-processing state to a survival-oriented, reactive "alarm state." Trauma causes the body's nervous system to experience 1) an extreme adrenaline rush, leading to

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<sup>1</sup> American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (DSM IV-TR)*, fourth edition. Washington, DC: APA.

<sup>2</sup> Felitti, V. J. (2003). The Relationship of Adverse Childhood Experiences to Adult Health Status. Presented September 2003 at the "Snowbird Conference" of the Child Trauma Treatment Network of the Intermountain West. DVD published by The National Child Traumatic Stress Network.

<sup>3</sup> Felitti, V., Anda, R., Nordenberg, D., Williamson, D., Spitz, A., Edwards, V., Koss, M., Marks, J. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, 14(4), 245-258.

<sup>4</sup> National Child Traumatic Stress Network Complex Trauma Task Force (2003). *Complex trauma in children and adolescents: white paper*. Eds. Cook A., Blaustein, M., Spinazzola, J., vanderKolk, B. Retrieved from [www.NCTSNet.org](http://www.NCTSNet.org)

<sup>5</sup> Hull, A. (2002). Neuroimaging findings in post-traumatic stress disorder. *British Journal of Psychiatry*, 181, 102-110.

<sup>6</sup> Van der Kolk, B., Pelcovitz, D., Roth, S., Mandel, F., McFarlane, A., Herman, J. *Dissociation, affect dysregulation and somatization: The complex nature of adaptation to trauma*. Invited paper in honor of John Nemiah. Supported by NIMH grant #PO1 MH47200-01. Retrieved from [www.trauma-pages.com](http://www.trauma-pages.com). May, 2005-05-24

an inability to stop speeding up or slowing down; 2) a constant state of fear; 3) a breakdown of information processing so that nothing makes sense; and 4) a shutdown of cognitive capacities, leading to a feeling of confusion and defeat. If there are insufficient biological or social resources to assist in coping, the “alarm state” may persist even when the danger has passed, causing Post-Traumatic Stress Disorder (PTSD). Excessive and repeated stress causes the release of chemicals that disrupt brain architecture by impairing cell growth and interfering with the formation of healthy neural circuits. When trauma occurs repeatedly, especially in childhood, permanent changes in the brain may occur, compromising core mental, emotional and social functioning, and resulting in a brain that is focused on surviving trauma.<sup>7</sup> In summary, PTSD is associated with significant alterations in the brain that are consistent with animal studies, basic research on fear conditioning, and studies of acute stress.

These developments in neuroscience show a multi-directional interconnection between the body, brain and mind. Post traumatic stress is not a permanent neuropsychological condition, but a functional and largely reversible distortion in the multi-dimensional somatic and autonomic pathways that meld the mind and body. These discoveries, together with a range of new therapy approaches, are opening new perspectives on healing.<sup>8</sup> New treatments are being explored within this context. For example, cognitive behavioral therapy is thought to bolster cortical function, especially that of the prefrontal cortex. The healing journey is now seen to include biological as well as psychological transformation.<sup>9</sup>

### **What are the impacts of trauma on individuals and society?**

The mental health consequences of trauma can be severe. A history of trauma may cause symptoms such as hallucinations and delusions, depression, suicidality, anxiety, hostility, interpersonal sensitivity, somatization, eating disorders, and dissociation.<sup>10</sup> Studies show that 51% to 98% of public mental health clients diagnosed with severe mental illness have trauma histories<sup>11</sup>; prevalence rates within substance abuse treatment programs and

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<sup>7</sup> Anda, R., Felitti, V., Walker, J., Whitfield, C., Bremner, J., Perry, B., Dube, S., Giles, W. *The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology.* (Submitted for publication) (ACE Study).

<sup>8</sup> Bessel van der Kolk. (2002) *In Terror's Grip: Healing the Ravages of Trauma.* Cerebrum, 4, 34-50. NY: The Dana Foundation.

<sup>9</sup> Peter A. Levine, Ph.D. (1997) *Waking the Tiger: Healing Trauma: The Innate Capacity To Transform Overwhelming Experiences.* Berkeley: North Atlantic Books.

<sup>10</sup> Mueser, KI., Rosenberg, S., Goodman, L., & Trumbetta, S. (2002). Trauma, PTSD, and the course of severe mental illness: an interactive model. *Schizophrenia Research*, 53, 123-143

<sup>11</sup> Mueser, K., Goodman, L.A., Trumbetta, S.L., Rosenberg, S.D., Osher, F.C., Vidaver, R., Auciello, P., & Foy, E.W. (1998). Trauma and posttraumatic stress disorder in severe mental illness. *Journal of Consulting and Clinical Psychology*, 66, 493-499.

other social services are similar.<sup>12</sup> In children, trauma may be incorrectly diagnosed as depression, attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), conduct disorder, generalized anxiety disorder, separation anxiety disorder, and reactive attachment disorder.<sup>13 14</sup>

Disruptions in neurobiology caused by trauma may also lead to social, emotional and cognitive impairments, adoption of health risk behaviors (eg, substance abuse, self-injury, suicidal behavior), disease, disability, serious social problems and premature mortality.<sup>15</sup> The ACE study, which examined the health and social effects of adverse childhood experiences over the lifespan (with 18,000 participants) has documented that trauma is far more prevalent than previously recognized, that the impacts of trauma are cumulative, and that unaddressed trauma underlies a wide range of health problems (including heart disease, cancer, chronic lung disease, liver disease, skeletal fractures, HIV-AIDS, etc) and social problems (including homelessness, prostitution, delinquency and criminal behavior, inability to sustain employment)<sup>16 17 18</sup>

(Insert ACE Study pyramid here)

### **What are the costs to society?**

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<sup>12</sup> Center for Substance Abuse Treatment. (2000). *Substance abuse treatment for persons with child abuse and neglect issues Treatment Improvement Protocol (TIP) series.* (DHHS Publication No. SMA 00-3357, Number 36. Washington, DC: U.S. Government Printing Office.

<sup>13</sup> *The Science of Early Childhood Development: Closing the Gap Between What We Know and What We Do.* Jack P. Shonkoff, Dean of the Heller School for Social Policy and Management, and Chair of the National Scientific Council on the Developing Child. Presentation to the 15<sup>th</sup> National Conference on Child Abuse and neglect, Boston, MA April 19, 2005. Powerpoint: National Scientific Council on the Developing Child.

<sup>14</sup> Cook, A., Blaustein, M., Spinazzola, J., and van der Kolk, B. (2003). Complex trauma in children and adolescents: White Paper from the *National Child Traumatic Stress Network: Complex Trauma Task Force.* [www.NCTSNet.org](http://www.NCTSNet.org)

<sup>15</sup> Anda, R., Felitti, V., Walker, J., Whitfield, C., Bremner, J., Perry, B., Dube, S., Giles, W. The enduring effects of abuse and related adverse experiences in childhood: A convergence of evidence from neurobiology and epidemiology. (Submitted for publication) (ACE Study).

<sup>16</sup> Felitti, V., Anda, R., Nordenberg, D., Williamson, D., Spitz, A., Edwards, V., Koss, M., Marks, J. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine*, 14(4), 245-258.

<sup>17</sup> Felitti, V. J. (2003). *The Relationship of Adverse Childhood Experiences to Adult Health Status.* Presented September 2003 at the "Snowbird Conference" of the Child Trauma Treatment Network of the Intermountain West. DVD published by The National Child Traumatic Stress Network.

<sup>18</sup> See [www.ACEstudy.org](http://www.ACEstudy.org)

The financial costs to society of undiagnosed and untreated trauma are staggering. Trauma increases the use of health care and behavioral health services, decreases productivity in the workplace, increases reliance on public welfare, and increases incarceration rates. In one study, the projected economic costs of alcohol and drug abuse alone was estimated to be \$160.7 billion in 2000.<sup>19</sup> The estimated cost to society of child abuse and neglect is \$94 billion per year, or \$258 million per day.<sup>20</sup> The long-term sequelae of severe child abuse (psychiatric and medical health care costs) cost \$100 billion per year.<sup>21</sup>

### **What are the mental health consequences of disasters like hurricane Katrina?**

Research on the consequences of recent public disasters, including the 1995 Oklahoma City bombing, the Challenger disaster, and 9/11 demonstrates that disasters can have severe and long-term impact, particularly on people with prior histories of mental health problems, addiction, or trauma.<sup>22 23 24</sup> All disaster victims are likely to experience some form of trauma. While the majority of people recover from grief and shock after a few months, 25-30% of those directly affected may eventually develop full-blown PTSD.<sup>25 26</sup> People with severe mental illnesses, addictions, and previous histories of trauma are particularly vulnerable to the psychological impact of disasters.<sup>27 28</sup> People with prior

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<sup>19</sup> The Economic Costs of Drug Abuse in the United States 1992-1998. Report prepared by The Lewin Group.

<sup>20</sup> Prevent Child Abuse America. (2001). *Total estimated cost of child abuse and neglect in the United States: Statistical evidence*. Report funded by the Edna McConnell Clark Foundation.

<sup>21</sup> The Ross Institute (<http://www.rossinst.com/TRAUMA.htm>).

<sup>22</sup> Galea, S., Ahern, J., Resnick, H., Kilpatrick, D., Bucuvalas, M., Gold, J., & Vlahov, D. (March 28, 2002). Psychological sequelae of the September 11 terrorist attacks in New York City. *New England Journal of Medicine*, Vol. 346, No. 13, pp. 982-987

<sup>23</sup> Terr, L. C., Bloch, D. A., Michel, B. A., Shi, H., Reinhardt, J. A., & Metayer, S. (1999). Children's symptoms in the wake of Challenger: a field study of distant-traumatic effects and an outline of related conditions. *American Journal of Psychiatry*, 156, 1536-1544.

<sup>24</sup> Breslau, N., Chilcoat, H. D., Kessler, R. C., Davis, G. C. (1999). Previous exposure to trauma and PTSD effects of subsequent trauma: Results from the Detroit Area Survey of Trauma. *American Journal of Psychiatry*, 156:902-907.

<sup>25</sup> North, C.S. (2001). The course of post-traumatic stress disorder after the Oklahoma City bombing. *Mil Med*, 166 (12 Suppl): 51-2

<sup>26</sup> Abenhaim, L., Dab, W., & Salmi, L. R. (February 1992). Study of civilian victims of terrorist attacks (France 1982-1987). *Journal of Clinical Epidemiol*, 45(2);103-9.

<sup>27</sup> North, C., Nixon, S., Shariat, S., Mallonee, S., McMillen, J., Spitzanagel, E., & Smith, E. (1999). Psychiatric disorders among survivors of the Oklahoma City bombing. *Journal of the American Medical Association*, 282, 755-762.

exposure to interpersonal violence (physical or sexual abuse) in childhood or adulthood have significantly heightened susceptibility to severe and chronic PTSD following exposure to any type of traumatic event.<sup>29 30 31</sup> Similarly, refugees who had been previously traumatized in their native countries and who had been diagnosed with PTSD reacted intensely to televised images of 9/11.<sup>32</sup>

For some people with previous trauma histories, PTSD symptoms and substance abuse actually increase as time passes after a disaster. Often they are able to maintain stability during the initial crisis, but after the immediate crisis passes, they may re-experience thoughts, emotions, symptoms and arousal levels associated with their original traumas, causing relapse, increased demand on mental health services, and increased suicide rates.<sup>33 34</sup> In addition, the number of women victimized by domestic violence increases significantly following major disasters (a 46% increase in one study).<sup>35</sup>

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<sup>28</sup> Mueser, K. T., Trumbetta, S. L., Rosenberg, S. D., Vidaver, R. M., Goodman, L. B., Osher, F. C., Auciello, P., Foy, D. W. (1998). Trauma and Posttraumatic Stress Disorder in severe mental illness. *Journal of Consulting and Clinical Psychology*, 66(3), 493-499.

<sup>29</sup> North, C., Nixon, S., Shariat, S., Mallonee, S., McMillen, J., Spitzanagel, E., & Smith, E. (1999). Psychiatric disorders among survivors of the Oklahoma City bombing. *Journal of the American Medical Association*, 282, 755-762.

<sup>30</sup> King et al. (1999). Stretch, Knudson, & Durand (1998). Bremner, Southwick, Brett, & Fontana (1992). Breslau et al. (1998). Green et al. (2000). Nishith, Mechanic, & Resnick (2000). In B. Litz, M. Gray, R. Bryant, & A. Adler. *Early intervention for trauma: Current status and future directions*. A National Center for PTSD Fact Sheet. See [www.ncptsd.org/facts/disasters/fs\\_earlyint\\_disaster.html](http://www.ncptsd.org/facts/disasters/fs_earlyint_disaster.html)

<sup>31</sup> Breslau, N., Chilcoat, H. D., Kessler, R. C., Davis, G. C. (1999). Previous exposure to trauma and PTSD effects of subsequent trauma: Results from the Detroit Area Survey of Trauma. *American Journal of Psychiatry*, 156:902-907.

<sup>32</sup> Kinzie, J. D., Boehnlein, J. K., Riley, C., Sparr, L. (July 2002). The effects of September 11 on traumatized refugees: Reactivation of Post Traumatic Stress Disorder. *J Nerv Ment Dis*, 190(7):437-41

<sup>33</sup> Nader, K. (1998). Violence: Effects of a parents' previous trauma on currently traumatized children. In Y. Danieli (Ed.), *An international handbook of multigenerational legacies of trauma* (pp. 571-583), New York, NY: Plenum Press.

<sup>34</sup> Brewin, C. R., Andrews, B., Valentine, J. D. (2000). Meta-analysis of risk factors for Posttraumatic Stress Disorder in trauma-exposed adults. *J of Consulting and Clinical Psychology*, 68:748-766.

<sup>35</sup> Norris, F. H. *Prevalence and impact of domestic violence in the wake of disasters*. A National Center for PTSD Fact Sheet. See [www.ncptsd.org/facts/disasters/fs\\_domestic.html](http://www.ncptsd.org/facts/disasters/fs_domestic.html)