

Stress, Trauma, and Children's Memory Development

Neurobiological,
Cognitive, Clinical,
and Legal Perspectives

EDITED BY

MARK L. HOWE,

GAIL S. GOODMAN,

AND DANTE CICCETTI

OXFORD

UNIVERSITY PRESS

2008

Contents

Contributors *vii*

Prologue: Turning Science into Practice 1

Mark L. Howe, Gail S. Goodman, and Dante Cicchetti

Part I. Neurobiological Perspectives

1. The Neurobiology of Trauma and Memory in Children 11
J. Douglas Bremner
2. Trajectories of Neurobehavioral Development: The Clinical Neuroscience of Child Abuse 50
Carryl P. Navalta, Akemi Tomoda, and Martin H. Teicher
3. Maltreatment, Event-Related Potentials, and Memory 83
Dante Cicchetti and W. John Curtis

Part II. Cognitive Perspectives

4. Trauma and Autobiographical Memory Functioning: Findings from a Longitudinal Study of Family Violence 139
Andrea F. Greenhoot, Sarah L. Bunnell, Jennifer S. Curtis, and Alisa Miller Beyer

5. Accuracy and Specificity of Autobiographical Memory in Childhood Trauma Victims: Developmental Considerations 171
Christin M. Ogle, Stephanie D. Block, LaTonya S. Harris, Michelle Culver, Else-Marie Augusti, Susan Timmer, Anthony Urquiza, and Gail S. Goodman
6. Talking About Twisters: How Mothers and Children Converse About a Devastating Tornado 204
Patricia J. Bauer, Melissa M. Burch, Dana L. Van Abbema, and Jennifer K. Ackil
7. Children's Memory for Stressful Events: Exploring the Role of Discrete Emotions 236
Elizabeth L. Davis, Jodi A. Quas, and Linda J. Levine

Part III. Clinical and Legal Perspectives

8. Pursuing "the Truth, the Whole Truth, and Nothing but the Truth": Forensic Interviews with Child Victims or Witnesses of Abuse 267
Deirdre Brown, Michael E. Lamb, Margaret-Ellen Pipe, and Yael Orbach
 9. Developmental Trends in Spontaneous False Memory, with Implications for the Law 302
Charles J. Brainerd and Valerie F. Reyna
 10. Translating Research on Children's Memory and Trauma into Practice: Clinical and Forensic Implications 363
Sheree L. Toth and Kristin Valentino
- Author Index 401
- Subject Index 417

Prologue

Turning Science into Practice

MARK L. HOWE, GAIL S. GOODMAN,
AND DANTE CICHETTI

Memory for emotional events captivates writers, scholars, citizens, and scientists. From theories, historic and recent, concerning the unconscious preservation of traumatic memories to those suggesting that traumatic experiences are well preserved in our conscious mind, theorists have tried to unravel the mysteries of emotion and memory. Across the centuries, the most popular belief has been that records of our experiences, particularly emotional and traumatic ones, are preserved with reasonable accuracy in our memory system. Even as recently as the early twentieth century, writers were suggesting that every experience, even the very earliest, “leaves its mark. . . . Nothing of good or evil is ever lost” (Thorndike, 1905, pp. 330–331). Further, it is thought that the earlier these experiences occur in childhood, the more formative they are, and the more likely they are to remain in memory, exerting their influence throughout our lives regardless of whether we can bring these experiences to consciousness (see Howe & Courage, 2004). Such ideas were pivotal in Freudian theory as well as in many other conceptions of social, emotional, and personality development (e.g., Ainsworth & Bowlby, 1991). Adverse early experience

is thought to be at the root of later aberrant adult outcomes regardless of whether these experiences can be remembered (for reviews of these ideas, see Howe, *in press*; Kagan, 1996).

Recently, we have seen a steep rise in scientific research concerning the role of stress and trauma in memories for childhood experiences. Psychological science is now, more than ever, grappling with questions about whether traumatic childhood experiences are remembered differently than nontraumatic experiences. Does the fact that one has experienced trauma during childhood affect subsequent memory processing? Can children who have been maltreated remember and report those experiences accurately? Indeed, we are concerned not just with memory for traumatic and stressful events themselves but also with the long-term effects of these experiences on the course of “normal” memory development.

Few questions in developmental psychology have received as much international attention as have those concerning the impact of childhood trauma on memory. Until recently, the lack of scientific research to constrain theory has fueled controversy about such questions as “Does childhood trauma lead to deficits in memory, including a greater propensity for errors of commission (e.g., ‘false memory’) or errors of omission (e.g., ‘lost memory’)?” and “Are the neurohormonal changes that are linked to childhood trauma and stress associated with changes in children’s basic memory processing abilities?” Scientists have also struggled with how to conceptualize and measure distress and other negative emotions—for instance, in terms of discrete emotions (fear, anger, sadness), physiological responsivity (e.g., through cortisol production; functional magnetic resonance imaging), or observer ratings.

To begin to answer these and other questions, the authors of the chapters in this book have focused on neurobiological, cognitive, clinical, and legal areas as they relate specifically to stress, trauma, and memory development. These areas were selected in order to (a) focus attention on the impact of stress and trauma on memory development by showcasing the most recent and innovative work and theories, (b) highlight the consequences of early traumatic experiences for subsequent memory performance, and (c) capture relations of early trauma to other measures of cognitive and clinical functioning in childhood, as well as to the longevity of trauma memories formed early in life.

In approaching these questions, we sought a translational approach, one in which science and practice converge. First, we wanted to provide

a framework in which basic research on memory development can be expanded into the study of childhood trauma and maltreatment (for an overview, see Howe, Cicchetti, & Toth, 2006). Here, authors were asked to examine links between “normal” patterns of memory development and those observed when children had experienced stress and trauma. Second, we wanted to know what science tells us about the cognitive and neurophysiological underpinnings of memory development, trauma, and stress, to inform practice in the clinical and forensic realms. Of course, these latter areas, in turn, provide many of the questions to which basic science needs to attend to fully understand the complexities of stress, trauma, and memory development.

Neurobiological Perspectives

In the first part, “Neurobiological Perspectives,” the authors present state-of-the-art research on the consequences for memory and memory development of the neurobiological changes that accompany childhood stress, trauma, and maltreatment. Specifically, in the first chapter, Bremner examines the interaction between brain development, trauma onset, memory, and the neurobiological consequences of trauma. He proposes a model of how stress-induced changes in brain systems involved in stress and memory mediate changes in traumatic memories in patients with childhood abuse-related mental disorders. The second chapter in this section is by Navalta, Tomoda, and Teicher. These authors take on the challenge of reviewing what is known about the clinical neuroscience of child abuse and providing new findings on the neuroanatomical effects of child abuse and how they are related to changes in memory processes. They conclude that there exists a growing body of evidence suggesting that memory deficits do exist for individuals with abuse histories and that these deficiencies are related to neuroanatomical anomalies. Our third chapter in this section, by Cicchetti and Curtis, uses event-related potentials (ERPs) to study memory functioning in infants and children in normal populations and in children who have experienced maltreatment. The authors suggest how future research using ERPs and memory in samples of maltreated and nonmaltreated infants and children can inform the design and implementation of randomized prevention and intervention trials with children who have experienced maltreatment. Together, the three chapters in this part provide the reader with an up-to-date picture of the neurobiological consequences of stress and trauma and their impact

on the development of children's memory. As well, these chapters alert us to the many complexities of studying changes in neurobiological functioning as a consequence of stress, particularly in populations in which many of the relevant neural structures and systems are still developing. Despite these complexities, there is an emerging consensus concerning the changes that occur due to stress and maltreatment on memory-related neurobiological systems.

Cognitive Perspectives

In the second part, "Cognitive Perspectives," the authors examine memory for traumatic experiences and whether those experiences result in fundamental changes in children's memory development. In Chapter 4, Greenhoot, Bunnell, Curtis, and Beyer examine autobiographical memory for family violence using longitudinal data. These authors examine what is known about changes in autobiographical memory development and memory functioning that may be brought about by chronic exposure to stressful events such as abuse. Following this review, Greenhoot and colleagues present findings from their own research on these issues, integrating findings from their longitudinal study of children exposed to various forms of domestic violence and using these data to disentangle competing explanations concerning the mechanisms underlying these memory dysfunctions.

Chapter 5, by Ogle, Block, Harris, Culver, Augusti, Timmer, Urquiza, and Goodman, examines the claim that childhood trauma leads to a specific type of autobiographical memory functioning, namely "overgeneral memory." The authors provide a comprehensive review of scientific theory and research on autobiographical memory development, memory for trauma-related and nontrauma-related information in traumatized individuals, and autobiographical memory in nontraumatized and traumatized adolescents and adults. Finally, they present preliminary findings from an ongoing study that examines autobiographical memory development in documented child sexual abuse victims versus matched comparisons with participants who have no known history of child sexual abuse. Contrary to the overgeneral memory hypothesis, the authors conclude that individuals with child maltreatment histories, especially those with post-traumatic stress disorder (PTSD), may overfocus on trauma in their lives and in their pasts, and this focus may make their

autobiographical memories particularly accurate, especially for trauma-related information.

Chapter 6, by Bauer, Burch, Van Abbema, and Ackil, examines children's memory for a naturally occurring disaster (a tornado). Specifically, these authors tackle the deeply rooted assumption that highly stressful and traumatic events are remembered differently relative to events that are more affectively neutral or positive. The authors evaluate this assumption using data from a study of children's reports of the experience of a tornado that devastated the town of St. Peter, Minnesota, in March of 1998. The evaluation is multidimensional, including analyses of the amount children remembered, the type of information remembered, and the extent to which their reports were affected by their conversational partners, namely their mothers. The authors conclude that although there are some differences between children's reports of traumatic and nontraumatic events (e.g., conversations about the tornado were longer and had greater breadth than those about the nontraumatic events), there are some very important similarities (e.g., the level of detail provided about the traumatic and nontraumatic events did not differ).

Chapter 7, by Davis, Quas, and Levine, looks at the role of discrete emotions and children's memory for stressful experiences. The argument here is that if we are to understand children's memory for stressful events, we need to look beyond "distress" as a unitary construct and begin to evaluate children's understanding or appraisals of stressful events as well as children's discrete emotional experiences and emotion regulation techniques. The argument continues that with development, children appraise situations and regulate their emotions in increasingly complex ways. Younger children, with similar but simpler appraisal processes than adults and limited emotion regulation strategies, are likely to have a more narrow focus.

Together these chapters provide an up-to-date exegesis of the study of children's memory for traumatic experiences and the consequences of stress, trauma, and maltreatment on subsequent memory development. Although in many circumstances traumatic experiences are remembered better than nontraumatic experiences, the two kinds of memories exhibit many similarities, including, but not limited to, susceptibility to interference, suggestion, forgetting, and false recollection. These chapters also alert us to the need to refocus some of our research efforts by focusing on the impact of events on the children who experience them, including the types of appraisals children make about these events as well as

whether there are emotional sequelae associated with these experiences. Like those in the first part, these chapters remind us that a truly comprehensive understanding of stress, trauma, and memory development requires a multifaceted approach to research, one that benefits from interdisciplinary collaborations.

Clinical and Legal Perspectives

In our third and final part, "Clinical and Legal Perspectives," science is beautifully translated into practice in three unique chapters: one on forensic interviewing; one on the law and false memory; and our final chapter, on translating findings on memory development, stress, and maltreatment into good clinical technique. Chapter 8, by Brown, Lamb, Pipe, and Orbach, examines the problem of how best to question children in a forensic context. In this extensive review, the authors discuss how the quantity and quality of information elicited in forensic interviews with children reflects the behavior and capacities of both the child witness and the adult interviewers. They outline how even quite young children are capable of providing reliable testimony about abusive experiences when questioned appropriately. At the same time, because children need help retrieving, structuring, and reporting their experiences, there is a clear need to provide that support without degrading the quality of children's accounts. Guidelines for doing so are elaborated on in this chapter.

Chapter 9, by Brainerd and Reyna, provides an exhaustive review of children's spontaneous false memories and what these errors mean for the law. Research on developmental patterns in spontaneous false recollections (e.g., increases with age) is reviewed and the findings are linked to cases of child sexual abuse and the ensuing legal complications. The authors conclude by suggesting ways in which we might avoid eliciting false recollections, especially in cases where abuse has occurred.

In Chapter 10, Toth and Valentino use the literature on trauma and memory, particularly child maltreatment and memory, as the foundation for examining the clinical and social-policy implications of this research for children who have been victimized by abuse and neglect. Based on this review, the authors note that more research is still needed before the efficacy of trauma-specific versus more symptom-focused interventions for children who have been maltreated can be properly evaluated. That is, although for adults attention to trauma has been shown to increase the

effectiveness of the intervention, there is considerably less research favoring this approach with maltreated children. Future investigations will require careful attention to the age at which the trauma occurred, the time between the trauma and the provision of treatment, and the developmental period during which the intervention is initiated.

Together, these chapters provide a state-of-the-art snapshot of how the findings from neuroscience and the cognitive and developmental sciences of stress, trauma, and children's memory development can be effectively translated into legal, clinical, and social policy. Documents containing specific prescriptions for investigating child maltreatment, questioning child witnesses, and treating children who have been maltreated continue to be drafted and continue to be informed by science. Thanks to a translational focus, science has been put into practice and practice has informed science about some of the problems still in need of rigorous inquiry.

Conclusion

So, what have we learned about the two very broad questions posed at the beginning of this prologue? First, can children remember traumatic experiences? The answer is yes, especially if they occur after the period known as infantile amnesia (Howe, *in press*) and care is taken with the manner in which children attempt to recollect this information (including the manner in which others pose questions). However, memories for these experiences are not immune to processes that affect nontraumatic memories, namely suggestion, false memories, interference, and normal forgetting.

Second, can stress, trauma, and maltreatment affect the course of normal memory development? The growing consensus is yes. In particular, evidence from the neurobiological chapters suggests this might be so, as do the chapters in the cognitive and clinical and legal sections. Although far from over, the story that is emerging is one in which maltreated children may be more hypersensitive to emotional stimuli, possibly due in part to heightened amygdala reactivity following high-intensity trauma exposure. These effects can have far-reaching consequences for memory functioning, including how information is encoded, stored, and consolidated, and even how it is retrieved (also see LaBar, 2007).

Although children who have been maltreated may not have less specific autobiographical memories than children who have not been maltreated, maltreated children may nevertheless experience greater memory errors.

However, as the chapters in this book attest, such memory errors are by no means commonplace or typical of much of maltreated children's remembering. Indeed, when seen, these effects depend jointly on individual difference factors such as neuroendocrine regulation, trauma symptoms, and dissociative experiences (also see Cicchetti, Rogosch, Howe, & Toth, 2007; Eisen, Goodman, Qin, Davis, & Crayton, 2007; Howe, Toth, & Cicchetti, 2006).

Overall, then, stress, trauma, and maltreatment can affect memory development as well as memory for the traumatic experience(s). The interactions are often complex and depend on a whole host of factors, all of which have been documented in the chapters here. The diversity of topics, viewpoints, and approaches presented in this book underline the intricacy of the problem we are dealing with when studying the effects of stress and trauma on children's memory development and then trying to translate these findings into practice. We hope the readers appreciate this complexity as well as the scientific and practical advances made by the writers of these superb chapters.

References

- Ainsworth, M. S., & Bowlby, J. (1991). An ethological approach to personality development. *American Psychologist*, *46*, 333–341.
- Cicchetti, D., Rogosch, F. A., Howe, M. L., & Toth, S. L. (2007). *The effects of maltreatment on neuroendocrine regulation and memory performance*. Manuscript in preparation.
- Eisen, M. L., Goodman, G. S., Qin, J., Davis, S., & Crayton, J. (2007). Maltreated children's memory: Accuracy, suggestibility, and psychopathology. *Developmental Psychology*, *43*, 1275–1294.
- Howe, M. L. (in press). The nature of infantile amnesia. In J. H. Byrne (Ed.-in-Chief) & R. Menzel (Vol. Ed.), *Learning theory and behavior. Learning and memory: A comprehensive reference* London, UK: Elsevier.
- Howe, M. L., Cicchetti, D., & Toth, S. L. (2006). Children's basic memory processes, stress, and maltreatment. *Development and Psychopathology*, *18*, 759–769.
- Howe, M. L., & Courage, M. L. (2004). Demystifying the beginnings of memory. *Developmental Review*, *24*, 1–5.
- Howe, M. L., Toth, S. L., & Cicchetti, D. (2006). Memory and developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental Psychopathology* (2nd ed.): Vol. 2. *Developmental Neuroscience* (pp. 629–655). New York: Wiley.
- Kagan, J. (1996). Three pleasing ideas. *American Psychologist*, *51*, 901–908.
- LaBar, K. S. (2007). Emotional memory mechanisms in the human brain. *Current Directions in Psychological Science*, *16*, 173–177.
- Thorndike, E. L. (1905). *The elements of psychology*. New York: Seiler.

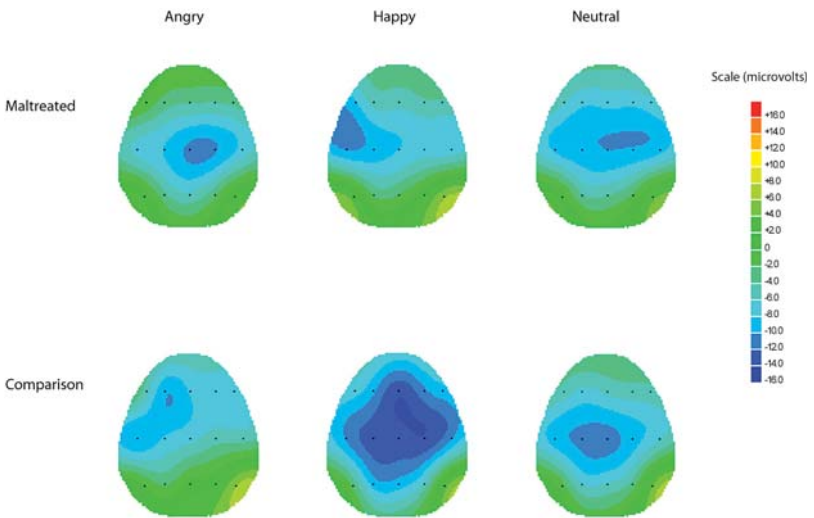


FIGURE 3.4. Topography of the Nc event-related potential (ERP) component across three emotion conditions for the maltreated and nonmaltreated groups. Each map is constructed based on the latency of the negative central (Nc) peak at Cz (midline central scalp region, where Nc was maximal) from the grand average of that group and condition. Because of amplitude variations between groups and across emotions, the scales were adjusted for each condition separately in order to best illustrate the Nc component. *Source:* Cicchetti & Curtis, 2005.