

Research on the Treatment of Trauma Spectrum Responses: The Role of the Optimal Healing Environment and Neurobiology

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ABSTRACT

This paper presents a research agenda for the use of optimal healing environments (OHEs) for the treatment (and possible prevention) of the negative effects of exposure to extreme environmental stress or trauma. As background for understanding, this paper starts by briefly introducing the unique perspective of psychiatry in the field of OHEs. It then describes the nature of trauma spectrum responses including the best-known psychiatric response, post-traumatic stress disorder (PTSD), a description of the current accepted treatments for PTSD, and the status of research in alternative and complementary treatments for PTSD. These are followed by a discussion of the emerging role of clinical neurobiology in mental health, specifically the potential for the use of neuroimaging in filling a gap in methods of evaluating OHEs in trauma research. Last, it provides a list of important potential topics of research within the fields of trauma responses, neuroscience and OHEs.

INTRODUCTION

The past 25 years of traumatic stress research has clearly shown that trauma spectrum responses (TSRs) are not universal sequelae to extreme events. Nor is the psychiatric disorder known as post-traumatic stress disorder (PTSD) the only form that a post-traumatic response can take. There are a number of possible TSRs, positive and sometimes referred to as “post-traumatic growth,” as well as negative as represented by several psychiatric and medical disorders including PTSD, depression, substance abuse, somatization disorders, chronic pain syndromes, and others. This paper presents a research agenda for the use of optimal healing environments (OHEs) for the treatment (and possible prevention) of TSRs.

As background for understanding this field, this paper starts by briefly introducing the unique perspective of psychiatry in the field of OHEs. This is followed by a discussion of the nature of TSRs including the best-known TSR PTSD; a description of the current accepted treatments for

PTSD and the status of research in alternative and complementary treatments for PTSD; and the emerging role of clinical neurobiology in mental health, specifically the potential for the use of neuroimaging in filling a gap in methods of evaluating OHEs in trauma research. Last, it provides a list of important potential topics of research within the fields of trauma responses, neuroscience and OHEs.

PSYCHIATRY AND THE OHE

Psychiatry has always been in a slightly different situation with regard to optimal healing approaches than other conventional medical disciplines. Psychiatry has the mind and behavior as its central purview, and has historically taught that the doctor–patient relationship is a primary patient treatment tool via the different types of psychotherapy. Much of this emphasis is because of the reality that the tools for evaluating psychiatric conditions have, until very recently, involved talking with the patient and observing the

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patient's behavior. There have traditionally been no "laboratory tests" or other "mechanical" measures of psychiatric illnesses. In fact, it is only in the last several decades that more biomedical approaches to the brain and psychiatric treatment have emerged within the Western model, and only in the last decade (the "decade of the brain") that this neurobiologic model has started to lead the field. Consequently, in the last several years the doctor-patient relationship and the utilization of psychotherapy have received decreasing attention and emphasis in the average postgraduate psychiatric training program (Donald Ross, M.D., Sheppard Pratt Health Systems; personal communication, 1997).

During the peak years of the psychoanalytic era, the mind with the triune nature hypothesized by Freud (id, ego, and superego)¹ was thought to be the source of all psychiatric symptoms when some actual or imagined "trauma" occurred.² The field was not reductionistic in a biomedical sense, but instead often looked toward the larger social environment (e.g., early life interactions with one's mother or father) for the etiology of mental illness.² The rise of biologic psychiatry might be thought of as reintroducing the brain back into the realm of explanation for psychiatric conditions. Ironically, some may now consider psychiatry as "mindless," holding the view that the pendulum has now swung too far toward the brain to the exclusion of the mind, the social environment and the "spirit." In fact, there is a trend toward removal of psychotherapies and other non-pharmacologic treatments from the psychiatry residency training curricula at many programs across the United States in spite of substantial research evidence demonstrating the efficacy of these modalities (Donald Ross, M.D., personal communication). This trend seems to devalue the published research on the efficacy of psychotherapy as well as limit the research agenda by focusing exclusively on molecular and chemical interactions to the exclusion of environmental, interpersonal and also intrapsychic interactions. The devaluation of the positive effects of social and environmental interactions is particularly concerning in light of much evidence demonstrating the negative effects possible from certain environmental and social interactions.³⁻¹² More research needs to be conducted to isolate and amplify the positive effects possible from environmental and social interactions. The study of OHEs is such research.

TRAUMA SPECTRUM RESPONSES

Individuals exposed to traumatic events, events that involve extreme disruptions of the environment and the threat of death and injury, experience exceptional physiologic and psychological demands. Extreme environmental exposures occur as a result of both natural and human-made traumatic events and disasters, including ecological disasters, acts of terrorism, domestic and criminal violence, motor vehicle and

industrial accidents, war, domestic rescue missions, and missions of international humanitarian assistance. Some of the consequences of exposure to these traumatic environments may be positive, such as changed values, improved attachment and enhanced learning and memory.^{13,14} However, other changes may lead to chronic forms of emotional distress and mental illness, negatively affecting health and well-being.¹⁵⁻²⁰ Adverse effects may be short term as well as long lasting, and may alter function and resilience for the duration of the person's life. Cognitive confusion, impaired judgment, altered reaction time, and even temporary paralysis may be seen in the acute response to trauma, while chronic effects can lead to PTSD as well as medical illness, psychosomatic illness, impairments in immune function, alcohol and drug abuse and depression.^{18,21-27} These effects are not the result of direct physical damage to the body, but rather are the indirect effects of environmental events on the functioning of the central nervous system and on behavior.

The traumatizing environment is typically one that induces acutely high levels of fear or terror. The *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition (*DSM-IV*) limits the type of past trauma required for clinicians to make a diagnosis of PTSD to: "a traumatic event in which both of the following have been present: (1) the person experienced, witnessed, or was confronted with an event or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of self or others; and (2) the person's response involved intense fear, helplessness, or horror."²⁸ In these circumstances, the sympathetic nervous system is activated toward a "fight or flight" or in some cases to a "freeze" response. Traumatizing environments induce high levels of sympathetic and other stress hormones that are destructive to many metabolic and immunologic processes in most individuals of most species if they are sustained over time.²⁹⁻³⁸ The acute stress hormones initiate cellular activity that can lead to alteration in gene expression that may last a short time, or for the duration of the individual's life. Although the cascade in humans is difficult to investigate in a single experiment, studies in other organisms indicate that environmental, including social, stimuli can activate immediate early genes that then have an effect on cellular mechanisms and the potential to lead to wide-ranging biologic effects even when life and limb are not under direct threat.^{33,39} While mammalian physiology is fairly well adapted to acute, short-term stressors, long-term or repeated stress of even a mild to moderate nature is often destructive.^{34,40-47}

Possible negative, long-term (longer than 1 month after the event) effects of exposure to extreme environments are as follows: psychiatric disorders, including PTSD, depressive episodes and other mood destabilizations, substance abuse and dependence (alcohol, drugs, tobacco, food, etc.), panic disorder and other anxiety disorders; behavioral changes such as risk-taking, impulsivity, aggression, social

withdrawal; and unexplained physical symptoms such as chronic pain, fatigue, gastrointestinal or urogenital problems, neurologic complaints or a combination of several unexplained symptoms. As a result of this spectrum of possible negative post-traumatic responses, it is extremely important that the study of the effects of exposure to traumatizing environments not be limited to the study of patients with *DSM-IV* criteria for PTSD. In addition, it is important to study those individuals who are particularly “robust” or resilient to exposure to extreme environments, and for whom a traumatizing event leads to post-traumatic growth.⁴⁸ Investigation of both resilience and the response to positive environmental exposures is in contrast with the traditional emphasis of allopathic medicine’s focus on disease, and has not been given much attention in the research or clinical literature. It is of particular relevance to OHE research.

CURRENT TREATMENT FOR PTSD

Mainstream standard of care

There is not yet any systematic study of the outcomes of traumatic exposure not classified as PTSD. There are studies of depression, substance abuse, somatic complaints, and the others listed above, but it is generally not the case that treatment trials for these conditions are considered in the context of prior traumatic exposure. Thus, treatment trials of TSRs in the literature tend to be restricted to those of PTSD. For that reason PTSD will be the focus of this section.

Generally, it is agreed that early treatment after the onset of persistent (greater than 1 month) symptoms is better and leads to a higher rate of symptom remission.⁴⁹ However, a therapy that was once accepted as a standard of care for prevention for PTSD and involved a psychosocial intervention, debriefing, has been shown by standardized clinical trials to actually be potentially harmful for some individuals.^{50–53}

The current standard of care for the treatment of PTSD includes medications such as antidepressants^{54–64} and other centrally acting agents such as α_1 antagonists,⁶⁵ antipsychotics,⁶⁶ α_2 agonists,⁵⁹ and anticonvulsants.⁶⁷ However, clinical practice demonstrates that polypharmacology can be ineffective in completely resolving symptoms in many patients with chronic, complex PTSD. Other accepted treatments for PTSD include cognitive behavioral therapy,⁶⁸ exposure or stress inoculation,⁶⁹ and expressed emotion.⁷⁰ Although some of this research appears in the complementary and alternative medicine (CAM) literature, there also are numerous studies of cognitive behavioral, exposure therapy and psychosocial interventions for the treatment of PTSD published in the conventional literature.^{71–78}

Complementary and alternative therapy

Published research in CAM for PTSD is scant, but includes studies of the use of eye movement (eye movement desensitization and reprocessing [EMDR] and others)^{75,79–83}; imagery^{84–88}; and psychodrama.⁸⁹ In addition, there are recent studies of internet interventions,^{90,91} group interventions,⁹² and “writing” therapy⁹³ for PTSD in the conventional literature. There also are some data on the use of transcranial magnetic stimulation in the treatment of PTSD.^{94–97} Some work has been done in the area of “thought field therapy”⁹⁸ and acupuncture,⁹⁹ and the use of art and art therapy in healing from trauma has some precedent in the research literature.^{100–106} There are some papers describing the role of religion and spirituality in healing from trauma,^{107–110} but no clinical trials utilizing spiritual or religious interventions. At present, there do not seem to be any published treatment trials of manual manipulation or of dietary modification.

NEUROBIOLOGY AND THE BRAIN IN PSYCHIATRY

Several approaches to understanding the predisposing and sustaining factors of psychiatric illness have developed within the social, behavioral, and neurobiologic sciences, and are used in our efforts to understand environment–gene interactions resulting in acute and chronic stress responses. These investigatory approaches span many species from yeast to humans, and many levels of observation from the atomic and molecular to the behavioral and the societal. Understanding the relationship of a behavioral effect from a behavioral intervention is an advance, but understanding the cellular effects of that behavioral intervention is a more wide-reaching advance. The latter facilitates understanding of how the very disparate levels of behavior and cellular function interact, and thereby provides a more extensive understanding of both these areas of study.

The extant research on PTSD treatment involves several investigational levels in the process of administering an intervention, and then assessing the effect of the intervention with an outcome variable. For example, a research clinician dispenses a medication, which is an intervention at the molecular, intrapsychic, and interpersonal level, and then evaluates the effects at the level of subjective experience and behavioral function utilizing psychiatric and functional assessment instruments. Alternatively, the psychotherapeutic interventions are administered at the interpersonal and intrapsychic levels, and are evaluated at the subjective, behavioral, and hopefully, the biologic levels. Unfortunately, many aspects of psychologic health have not been fully investigated at the biologic or the intrapsychic levels. If there were a valid and reliable biologic measure of subjective

qualities such as well-being, happiness and a feeling of wholeness, it would greatly expand the repertoire of psychiatric research and hasten the discovery of effective treatment and prevention strategies for TSRs.

There is great promise in discovering valid biologic outcome variables for subjective experiences with the recent advances in functional neuroimaging. Not only has this technology allowed for previously unfathomable views of psychopathology in diseases such as schizophrenia,^{111–113} mood disorders,^{114–117} and attention deficit disorder,^{118,119} it has also allowed scientists to observe the physiology of a variety of “brain states” in healthy individuals performing cognitive tasks.^{120–124}

With the use of single-photon emission computed tomography (SPECT), positron emission tomography (PET), functional magnetic resonance imaging (fMRI), and quantitative electroencephalography (qEEG), it is now possible to discover brain areas of increased or decreased functioning within the neuronal circuitry associated with feeling states such as happiness, sadness, anger,^{125–132} and even moral appraisal.¹³³

There also have been functional imaging studies of meditators from various disciplines.^{134–138} Thus, psychiatry and neuroscience are developing ways of looking deeply into the neurobiologic underpinnings of brain and “mind” phenomena and discovering neurobiologic outcome variables for subjective, “intrapyschic” states. The bridge between the levels of subjective experience and cellular brain processes is being spanned. By utilizing functional brain imaging, researchers can create a link between the level of “lived experience” and neurobiology as has never before been available.

It is the working hypothesis of the authors that even those phenomena that seem quite different from cellular and molecular function, when considered subjectively at the level of personal experience, do have biologic and/or perhaps electromagnetic correlates that are measurable. This is not to say that phenomena of the mind and proverbial “heart” are reducible to the biologic correlates. Emotions such as happiness, sadness, anger, and others are emergent properties of the human organism,¹³⁹ and they also have been linked with activation of certain brain regions using functional neuroimaging, as mentioned above. They constitute brain “states”¹³⁹ that have emergent “mind” properties or qualities, and behavioral effects. We posit there also are specific biological correlates to “spiritual” states. It is therefore reasonable to expect that various existential phenomena associated with optimal healing for TSRs correspond to neurobiologically measurable outcome variables. These existential phenomena include such feelings as a sense of wholeness, well-being, interconnectedness, and spiritual renewal all of which are highly relevant to the recovery from TSRs. Modern psychiatry and neuroscience present unique opportunities to advance reliable scientific research methods for connecting the levels of neurobiology with the level of personal (subjective) experience, interpersonal events, and healing relationships.

The scientific and mechanistic approach does not preclude, but rather can be used to enhance, the study of some of the most important and interesting psychological, social, neurologic, and spiritual phenomena in human experience provided the important questions are asked and experimental design carefully thought through. The goal is to correlate and therefore connect the various levels of investigation, not replace one with the other. It is possible to test the different complex environments for their healing potential for TSRs, and then expose patients to these environments and assess their well-being, satisfaction, and symptom recovery rate. However, at the subjective level, this may not be the most efficient way to conduct this research, and it might not lead to an unequivocal outcome which would hold for all individuals. For example, if there are multiple components of a potential OHE, all simultaneously implemented and resulting in a positive study outcome, it will not be clear whether one, several, or a combination of those interventions is the effective component. If it is assumed that all must be present, this will require more resources than otherwise, and put such positive outcomes beyond the reach of many health care settings and many societies.

Furthermore, it is probable that there are individual differences in OHEs. Not everyone responds positively to the same things. Using technologies that connect individual neurobiologic responses to interpersonal, intrapsychic, and behavioral interventions, the environment could be individualized to optimize healing for that patient. The use of biologic measures thus provides the potential for clarity of cause and effect not otherwise available. This provides for the most expedient use of resources when altering an environment to support healing in patients. Because of the current economic pressure to reduce health care costs, it is difficult to justify any treatment modality that increases the financial burden to society unless it can be proven more effective, more efficient, or dramatically more satisfying and therefore likely to result in financial savings. For these reasons, as well as the scientific reasons already espoused, it is expedient to move forward to identify neurobiologic correlates in OHE research.

POTENTIAL FOR USING NEUROBIOLOGIC OUTCOME VARIABLES IN OHE TRAUMA RESEARCH: EXAMPLES

Characteristics of an OHE for TSRs

Consensus regarding the definitions of “healing” and “healing environment” are presented in this supplement (see pp. S-1–S-6). These definitions represent a step toward developing systematic investigational methods. They could be even more operationally effective if they facilitated connections between the subjective experience of wholeness, which is the invariable component of healing as defined,

with an objective and measurable neurobiologic outcome variable. Doing so would connect several levels of observation and thus expand scientific understanding of the process of healing.

Developing reliable outcome variables to verify the “healthy” environment is an essential task in the process of research on OHEs for the treatment of TSRs. For the purposes of the treatment of TSRs, we can define an OHE subjectively and behaviorally as one that is reported by the individual as being comfortable and supportive. It is one in which pain is minimal, anxiety is absent or nearly absent, there is an atmosphere of acceptance, hope and optimism, and there is no cause for defensiveness. An OHE is an environment where one can relax, be honest, and feel free to “be oneself.”

Of these qualities, the absence of anxiety may be the easiest to evaluate behaviorally and biologically, and may be a necessary foundation for the others. Anxiety can be measured as a subjective experience with a variety of clinician and self-report instruments, and can be linked physiologically with heart rate, heart rate variability and vagal tone, skin conductance, respiratory rate, and blood pressure. Low anxiety can be defined as a state in which subjective reports of anxiety are low; stress hormones, such as epinephrine and norepinephrine, are low; there is low electrophysiologic responsiveness; and vagal tone is high. There are multiple other biologic correlates to low anxiety such as immune reactivity, other hormone measures, functional brain imaging and gene expression that could also be measured and correlated with subjective reports of low anxiety.

Anxiety is different from excitement in that it is more dysphoric with no sense of a possible positive outcome. In patients who have experienced traumatic environments, the perception of having control over the environment is instrumental in reducing anxiety because that was missing during the traumatic event(s). The treatment of anxiety disorders, including PTSD, often involves the controlled exposure to anxiety causing stimuli. The purpose of this process is to desensitize the stimuli so that they no longer induce this discomfort or physiologic response. In this way, increased anxiety states are used to reduce the negative reaction caused by specific environmental stimuli. The neurobiological differences between controlled anxiety experiences and “traumatic” anxiety remain an area of necessary research for the treatment of TSRs using OHEs.

In part, the success of controlled exposure treatment depends upon the trust the patient invests in the treatment provider and the quality of the therapeutic alliance. Discovering the brain and hormonal correlates of being in a trusting relationship with another, and utilizing this knowledge in studies of the treatment and prevention of TSRs is an important area of research in the field. The effect of stress exposure on the behavior and biochemistry of many animals, including humans, is dependent on social contact and support.^{140–151}

In addition to low anxiety, control, and the therapeutic alliance, another concept important in healing from traumatic exposures and from TSRs is a sense of “agency” or “being an agent” in one’s own life. This is the capacity to choose consciously to engage in some action or activity, carry through that action by one’s own effort, with or without the help of others, resulting in a particular outcome that one has foreseen in part or in whole. We hypothesize that while anxiety, helplessness, hopelessness, happiness, the feeling of wholeness and connectedness and the like involve neurobiologic states, agency is correlated with more complex neuronal circuitry that entails a sequential progression of brain activity over time. This sense of agency and the neurobiology that underlies it are often profoundly disrupted in the course of experiencing a traumatic event. It is probable that restoring agency is critical in creating the feelings of control necessary for healing in the individual. Finding ways to understand the phenomenon of agency and develop practices to increase it may well be instrumental in helping individuals recover from traumatic experiences. It may be that healing in general requires improving a person’s agency whether it is addressed directly or not.

Spirituality in treatment of TSRs

An important consideration of trauma treatment and healing is seen in those individuals who depend heavily on a spiritual practice for their resilience. Such individuals are able to maintain a low anxiety state and a high sense of agency even in the face of profound lack of control over the problems most pressing for them. We propose that such people are actually utilizing considerable agency by “handing over their concerns to a higher power,” focusing their thoughts in a meditative process, or the like. They may well be making conscious decisions to act in particular ways with an intention of clearing the mind, union with God, and so forth, and are able to suspend the need for rapid, easily perceivable positive results. This is a sophisticated exercise of agency based upon faith. Such a process can lead to considerable reduction in anxiety and resultant healing without overt evidence of control over the environment or one’s body.¹⁵² It would seem to depend upon relinquishing, or perhaps transcending, such principles, with a dispersal of the individual ego in favor of a focus on “something greater.”

Given the genuine inability of any individual to control much of the environment, and the very real limitations of human actions, there are clear advantages to fostering this kind of agency in traumatized individuals under certain circumstances. Thus, focusing on such spiritual approaches in treatment trials may prove beneficial. However, there are people who are either not interested or not able to consider the transcendent, spiritual perspective at a particular time. For example, patients with depression are generally not able to achieve this state. Or their agency is so underdeveloped that the sophisticated process involved in such acts of faith

is not immediately accessible. Enhancing the sense of control and agency of such persons would likely be more productive. After developing those basic skills, the transcendent perspective may be more appropriate and attainable.

VARIABLES AND DESIGN FOR NEUROBIOLOGY RESEARCH IN TSRs

The development of reliable outcome variables that represent healing after traumatic exposure is itself an area in need of further investigation. Variables that are already in use to measure effects of traumatic exposure include: subjective level of distress (e.g., the Impact of Events Scale), symptom profile and psychiatric diagnosis (e.g., the Clinician Administered PTSD Scale), social and work function (e.g., the Short Form [SF]-36), cognitive functioning as generally assessed, psychophysiological reactivity (e.g., acoustic startle), hypothalamic-pituitary-adrenal axis function (salivary or 24-hour urinary cortisol, responses to axis challenges), cerebral perfusion and metabolism (assessed via functional brain imaging), and gene expression. These variables span from the level of the whole human organism to the cellular to the molecular. Combining outcome measures from different levels of observation is particularly helpful in advancing the field because it facilitates connections among the levels.

Below is a list of possible neurobiologic research topics that can be pursued in the study of OHEs for the treatment of TSRs. They span from the identification of reliable outcome variables, investigation of mechanisms and pathophysiology, to pharmacological treatment and prevention trials. In addition, a list of different study populations is included to alert the reader to some of the various distinct populations that warrant research investigation. These lists are not meant to be inclusive, but rather are intended to stimulate the readers' interest and critical thought about research in patients with negative TSRs.

Identifying reliable biologic outcome variables

Identifying reliable outcome variables that measure the effects of OHEs in relation to patients suffering from TSRs includes, but is not limited to:

- Biologic consequences of traumatic exposure correlating to the many levels of observation, from gene expression to behavior (vagal tone, electrophysiologic responsiveness, cortical excitability/inhibition, endocrine responses, synaptic plasticity, neurotransmitter and receptor alterations, gene expression)
- Biologic correlates of recovery and resilience that span the levels of observation: the biology and neurobiology of "healing" including reduction in anxiety and increase in agency

- Functional brain imaging as an outcome variable (amygdala probe, anterior cingulate probe using fMRI, PET; EEG activity)
- Outcome variables that recognize and account for the variability of TSRs from the psychiatric to the somatic, and the different stage of illness and recovery (within 6 months after an exposure versus 6 years).

Mechanisms and pathophysiology

Research in the mechanism of how an environmental stimulus can result in alterations across the many levels of observation (gene expression, synaptic functioning, hormonal activity, neuronal activity, behavior, subjective experience) with the goal of understanding how to better prevent and treat TSRs should address questions such as:

- How does severe environmental exposure that involves the experience of intense fear, helplessness or horror alter the functioning of the brain such that behavior and subjective experiences are altered?
- By what mechanism do some people exposed to repeated severe traumatic experiences avoid symptoms of traumatic stress? What are the factors in resiliency and how can they be recreated in individuals not otherwise expressing them?
- What can be done biologically, behaviorally, interpersonally and intrapsychically to activate helpful and healing neuronal circuitry such as that associated with increased agency, wellness, and feelings of wholeness?
- What is the neurobiology of prayerfulness and meditative states, and can these be reliably utilized to facilitate healing from TSRs?
- What is the role of gene expression in resilience and recovery from trauma exposure?

Clinical trials

Clinical trials can proceed regardless of the state of knowledge about pathophysiology, although they are dependent upon choosing appropriate, measurable outcome variables that can be correlated at a variety of observational levels. Needed areas of investigation for clinical trials in TSRs include:

- Somatic approaches and mind-body approaches encompassing, but not limited to: craniosacral technique, acupuncture, herbal remedies, and dietary modifications or supplements, massage, neurofeedback, exercise programs
- Prayer and other spiritual approaches including mindfulness and other meditation
- Art, dance, and music therapies
- Social approaches focusing on healing relationships (spouse/friend interactions), group interactions, and the doctor-patient relationship.

Study populations

The following populations are important for investigating the natural course of TSRs, the variety of responses to extremely stressful environments and the possible role played by physical consequences to trauma exposure:

- Populations looking at the course of the illness over time, from traumatic event to chronic course; treatment interventions at various time points in illness course
- Those diagnosed with PTSD, those traumatized with partial PTSD, and those with depression, substance abuse and physical complaints
- The physically injured (burn victims, amputees, or patients with chronic pain or combat wounds).

To summarize the main points of this paper, the unique perspective of psychiatry offers much to the developing field of OHE research. It is important for OHE research to understand the connections among the neurobiologic and the subjective, interpersonal, and intrapsychic. Because of psychiatry's history of facility with subjective measures and interpersonal observations, together with its more recently burgeoning efforts to combine levels of observation and correlate subjective and interpersonal variables with neurobiologic variables, it is well suited to bring these developments to the field of research on TSRs using OHEs. Developing such research will greatly enhance our capacity to treat and prevent the damaging effects of exposure to traumatic experiences.

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