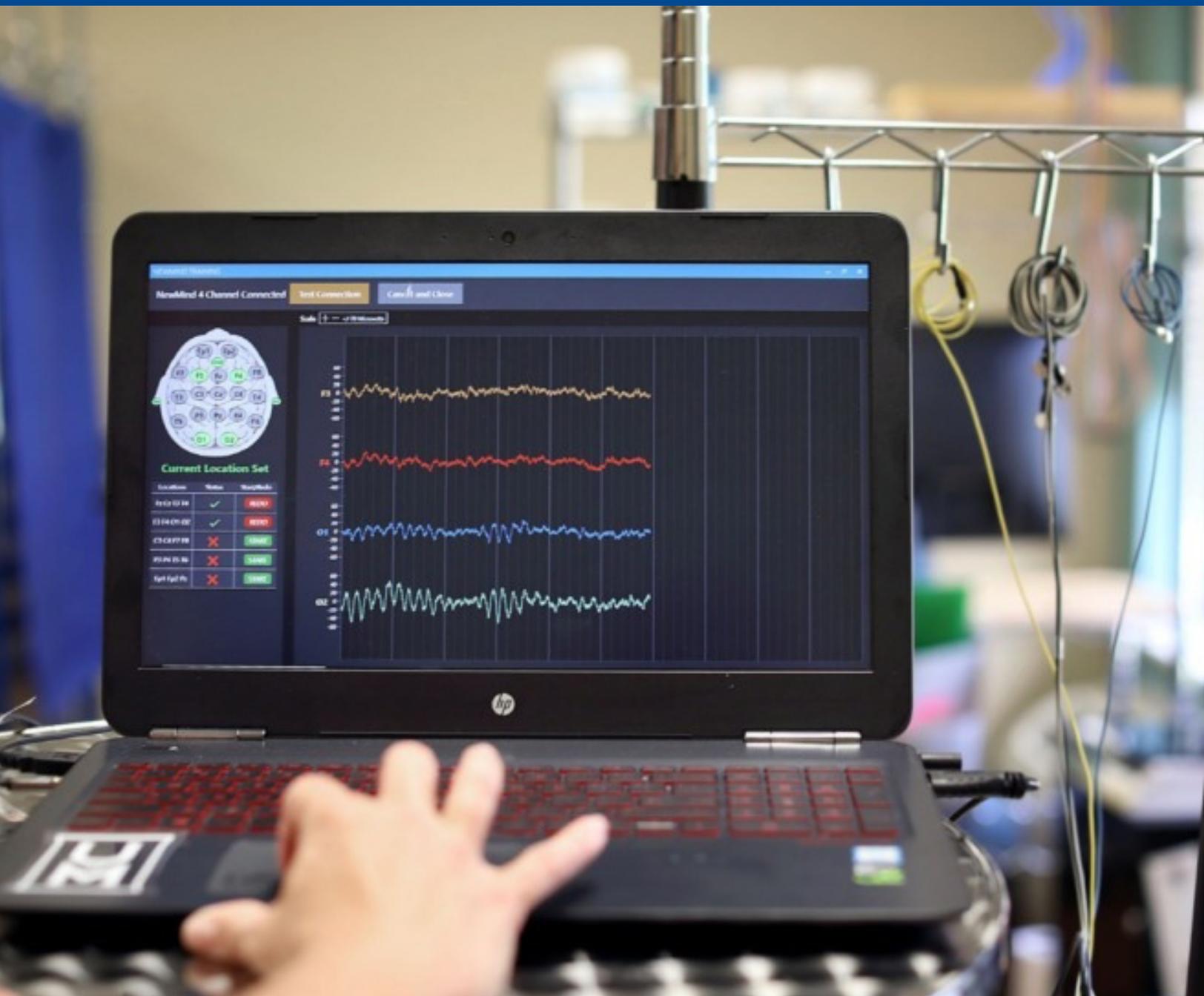


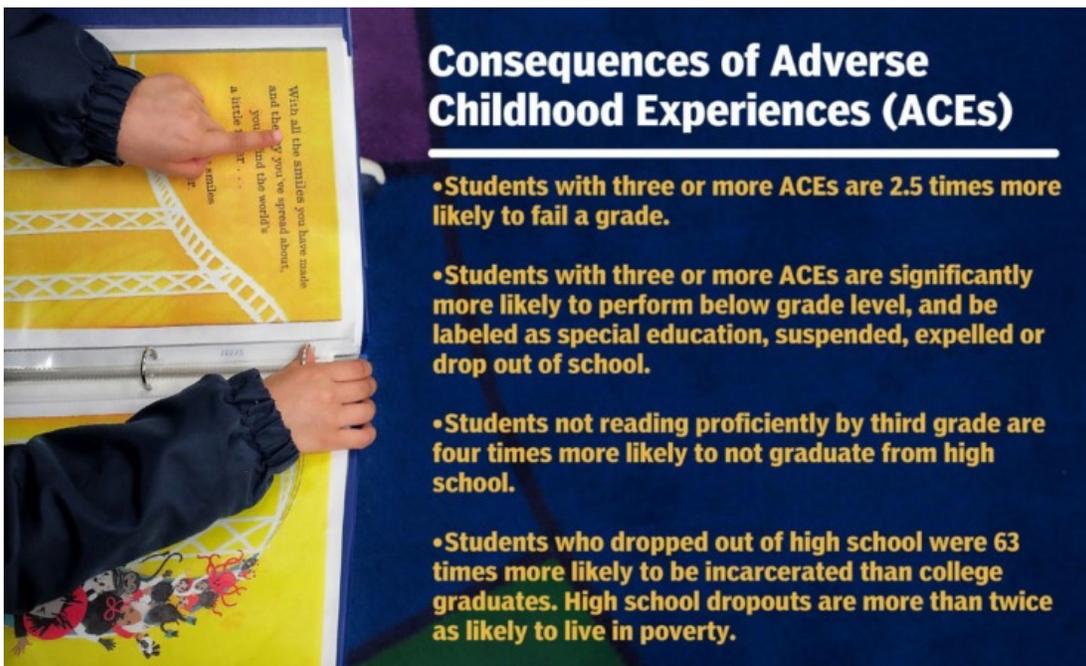
MRC Adverse Childhood Experiences (ACEs) 2019 Progress Report



EXECUTIVE SUMMARY

In FY 18, the Memphis Research Consortium (MRC) requested \$7.5 million over a three year period, from the State of Tennessee, to support biomedical, psychological and sociological studies on the impacts of Adverse Childhood Experiences (ACEs) upon the children of this State. Children exposed to these ACEs have worse outcomes on a number of social and health-related indices, including higher rates of chronic diseases and more frequent involvement with the justice system. Asthma, obesity, diabetes, psychopathology and developmental disabilities are particularly prevalent and under-treated, representing a large unmet need in our community.

We received one year of support totaling \$2.08 million. The groups described in this progress report initiated their studies and the results provided here show the large impact, and return on investment resulting from the monies provided by the State of TN. These studies have already resulted in numerous extramural grants, publications, and National presentations. Most importantly these studies are already improving the health and well-being of the children of our State. The University of Tennessee Health Science Center (UTHSC) Vice Chancellor for Research, Dr. Steven Goodman, and University of Memphis (UM) Executive Vice President for Research and Innovation, Dr. Jasbir Dhaliwal, understanding the importance of this work have created a competitive UTHSC/UM CORNET award in the ACEs research area. The recipients of this CORNET award were Dr. Eraina Schauss (UM) and Dr. Khyobeni Mozhui (UTHSC). Their combined award was for \$100,000.



Consequences of Adverse Childhood Experiences (ACEs)

- **Students with three or more ACEs are 2.5 times more likely to fail a grade.**
- **Students with three or more ACEs are significantly more likely to perform below grade level, and be labeled as special education, suspended, expelled or drop out of school.**
- **Students not reading proficiently by third grade are four times more likely to not graduate from high school.**
- **Students who dropped out of high school were 63 times more likely to be incarcerated than college graduates. High school dropouts are more than twice as likely to live in poverty.**

(Jim Weber / Daily Memphian)

EVALUATING COMMUNITY-BASED, STRENGTHS-FOCUSED INTERVENTIONS FOR CHILDREN AND FAMILIES EXPERIENCING ADVERSITY

Submitted by Kathryn Howell, PhD

Project Summary & Progress

My program of research centers on fostering resilience in individuals exposed to adverse childhood experiences (ACEs). With support from the Memphis Research Consortium (MRC), three projects were conducted that directly align with this research goal. The first project, Resilience Uniting Bereaved Youth (RUBY), examined the impact of grief, ACEs, communication, mental health functioning, parenting, and coping on resilience in youth who have recently experienced the death of a loved one. Quantitative and qualitative data were collected from 85 youth aged 8-17, presenting for treatment at the Center for Good Grief, and one of their primary caregivers. Interviews were conducted at baseline and at 6-month follow-up to gain a comprehensive understanding of youth functioning and factors that promote resilience via treatment engagement.

The second project supported with MRC funds is the Pregnant Moms' Empowerment Program (PMEP). This project focuses on pregnant women who are experiencing intimate partner violence (IPV). With MRC funds, I developed an intervention for pregnant women exposed to IPV and I conducted an initial evaluation of the program's effectiveness with 75 participants. Using a multi-method longitudinal design, assessments were conducted at pre-intervention, post-intervention, 3 months postpartum, and 12 months postpartum. Results showed that women who participated in the program had reduced rates of depression and enhanced resilience as compared to women who did not participate.

The final project supported with MRC funds is an evaluation of Camp HOPE, which is a free, one-week summer camp that uses a resilience-focused lens to assist youth exposed to ACEs in developing positive coping mechanisms that will help them thrive in difficult environments. Over the past three years, 125 youth aged 7-12 have participated in the camp, with results indicating that campers show enhanced emotion regulation, self-efficacy, and coping skills as compared to youth not attending camp. In total, these three projects serve over 200 youth and families in Memphis who are experiencing adversity.

All three projects have a strong community focus, provide intervention services, and aim to enhance resilience. Thus, they closely align with the mission of the Memphis Research Consortium to promote the health and wellbeing of youth in Memphis.

The data generated from this series of studies has led to two manuscripts published in peer review journals and nineteen presentations at national conferences (see details below). Data from these MRC-funded studies have been integral to obtaining competitive funding to continue building empirically-based programs that aid youth in Memphis exposed to adversity. At the local level, I have secured nearly \$200,000 in funding from the Urban Child Institute to enhance the scope of the Pregnant Moms' Empowerment Program. At the national level, findings have been used to support an R01 application to the National Institutes of Health (NIH). This is a highly competitive, multimillion-dollar grant that will provide five years of funding to conduct a randomized clinical trial of the Pregnant Moms' Empowerment Program. The most recent iteration of this grant was scored at the 11th percentile, indicating that it will likely be funded this grant cycle. Thus, the data I have collected as part of MRC has positioned me well to obtain substantial external funding.

Grant Support And Activity

Current Support

Promoting health and well-being in children and families: Evaluating a prenatal intervention program (PI).

The Urban Child Institute. *Award Amount = \$190,923.* Funding period 7/2019-6/2020.

Adapting the Pregnant Moms' Empowerment Program for use in Monterrey, Mexico (Consultant; PI: Miller-Graff, L.E.).

Notre Dame International, Mexico Faculty Grant Program. *Award Amount = \$13,475.* Funding period 7/2019-6/2020.

Empowering Pregnant Women in Lima, Peru (Consultant; PI: Miller-Graff, L.E.). Kellogg International Institute for

International Studies and the Ford Program in Human Development Studies and Solidarity. *Award Amount = \$40,000.*

Funding period 4/2018-7/2021.

Submitted (Pending)

PA-18-480: Intervening during the prenatal period with women exposed to intimate partner violence to improve

maternal functioning and infant adjustment (MPI). Eunice Kennedy Shriver National Institute of Child Health and Human

Development. NICHD, R01.

Evaluating the effect of prenatal intervention for intimate partner violence (IPV) on infant health and development

(Consultant; PI: Miller-Graff, L.E.). Help for Children (HFC) Global Foundation.

Publications

Schaefer, L.M., **Howell, K.H.**, Sheddan, H.C., Napier, T.R., Shoemaker, H.L., & Miller-Graff, L.E. (in press). The road to resilience: Strength and coping among pregnant women exposed to intimate partner violence. *Journal of Interpersonal Violence*.

Hasselle, A.J., **Howell, K.H.**, Bottomley, J.S., Sheddan, H.C., Capers, J.M., & Miller-Graff, L.E. (in press). Barriers to intervention engagement among women experiencing intimate partner violence proximal to pregnancy. *Psychology of Violence*.

Conference Presentations

Howell, K.H., Miller-Graff, L.E., Napier, T.R., & Scheid, C.R. (2019, November). *Identifying assets across the social ecology associated with resilience in pregnant women experiencing intimate partner violence*. Poster to be presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.

Napier, T.R., Hasselle, A.J. & **Howell, K.H.** (2019, November). *Psychometric evaluation of the Connor-Davidson Resilience Scale in a sample of bereaved youth*. Poster to be presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.

Hasselle, A.J. Napier, T.R., & **Howell, K.H.** (2019, November). *Exploring the ecological resilience model: Associations between resilience resources and trait resilience*. Poster to be presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.

Schwartz, L.E. & **Howell, K.H.** (2019, November). *The influence of co-occurring parent and child prolonged grief on parent-child communication, parenting practices, and children's emotion regulation*. Poster to be presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.

Miller-Graff, L.E., **Howell, K.H.**, Paulson, J., & Jamison, L.E. (2019, November). *Examining how internal and external forms of resilience protect against different types of psychopathology in pregnant women exposed to IPV*. Poster to be presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Boston, MA.

Schaefer, L.M., & **Howell, K.H.** (2019, August). *Building resilience after bereavement: Protective factors associated with resilience among bereaved youth*. Poster to be presented at the annual meeting of the American Psychological Association (APA), Chicago, IL.

Sheddan, H.C., Hasselle, A.H., & **Howell, K.H.** (2019, April). *The relationship between social support and school engagement in children exposed to adversity*. Poster presented at ResilienceCon 2019, Nashville, TN.

Hasselle, A.J., **Howell, K.H.**, & Shoemaker, H.L. (2019, April). *Promoting self-perception and resilience among siblings exposed to intimate partner violence via a camp-based intervention: A familial case study*. Paper presented at ResilienceCon 2019, Nashville, TN.

Schaefer, L.M., **Howell, K.H.**, Jamison, L.E., & Napier, T.R. (2019, April). *Meaning making and resilience among bereaved youth: A qualitative study*. Paper presented at ResilienceCon 2019, Nashville, TN.

Howell, K.H., & Miller-Graff, L.E. (2019, March). *Intervention with violence-exposed women during the prenatal period improves the functioning of their infants*. Paper presented at the biennial meeting of the Society for Research in Child Development (SRCD), Baltimore, MD.

Hasselle, A.J., **Howell, K.H.**, Schwartz, L.E., & Schaefer, L.M. (2018, November). *Coping after loss: Associations with prolonged grief and posttraumatic stress*. Poster presented at the annual meeting of the Association for Behavioral & Cognitive Therapies (ABCT), Washington, DC.

Schwartz, L.E., **Howell, K.H.**, & Hasselle, A.J. (2018, November). *The differential impact of parenting on bereaved children's posttraumatic stress and grief symptomatology*. Poster presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Washington, DC.

Hasselle, A.J., & **Howell, K.H.** (2018, November). *A longitudinal study examining how coping impacts posttraumatic stress symptomatology among bereaved youth*. Poster presented at the annual meeting of the International Society for Traumatic Stress Studies (ISTSS), Washington, DC.

Schaefer, L.M., **Howell, K.H.**, Sheddan, H.C., Schwartz, T.R., Shoemaker, H.L., & Miller-Graff, L.E. (2018, July). *The road to resilience: Themes of strength and coping among pregnant women exposed to intimate partner violence*. Paper presented at the International Family Violence and Child Victimization Research Conference, Portsmouth, NH.

Schwartz, L.E., & **Howell, K.H.** (2018, April). *Event centrality's role in posttraumatic growth after a death*. Paper presented at ResilienceCon 2018, Nashville, TN.

Howell, K.H., Hasselle, A.J., & Murry-Drobot, O. (2018, April). *The development and implementation of a camp-based intervention for youth exposed to domestic violence*. Paper presented at ResilienceCon 2018, Nashville, TN.

Hasselle, A.J., **Howell, K.H.**, Sheddan, H.C., & Harrell-Williams, L.M. (2018, April). *Changes in self-perception and resilience among domestic violence-exposed youth participating in a camp-based intervention*. Paper presented at ResilienceCon 2018, Nashville, TN.

Howell, K.H., & Miller-Graff, L.E. (2018, March). *The development of an intervention for pregnant women exposed to intimate partner violence*. Paper presented at Psychology & Peace 2018, Notre Dame, IN.

Miller-Graff, L.E., & **Howell, K.H.** (2018, March). *The Pregnant Moms' Empowerment Program: Preliminary results from a two-site pilot trial*. Paper presented at Psychology & Peace 2018, Notre Dame, IN.

A COMBINED ENVIRONMENT AND EPIGENETICS STUDY (ACES): IMPACT OF NEUROFEEDBACK THERAPY ON THE HEALTH AND BEHAVIOR OF ADOLESCENTS

Submitted by Eraina Schauss, PhD., LPC-MHSP, ACS; Rob Williams, Ph.D.;
Khyobeni Mozhui, Ph.D., Byron Jones, Ph.D.

Project Summary & Progress

A Combined Environment and Epigenetics Study (ACES): Impact of Neurofeedback Therapy on the Health and Behavior of Adolescents is a cutting-edge, transdisciplinary and interinstitutional treatment intervention that examines the effectiveness of neurofeedback as an evidence-based and neuroscience-informed treatment for adverse childhood experience-exposed children and adolescents in residential treatment for mental health, substance use and behavioral disorders. This project represents the first randomized control trial to examine the relationship between genetics, environmental exposures, neuroplasticity following mental health treatment intervention and subsequent epigenetic outcomes. The ACES project is a partnership between the University of Tennessee Health Sciences Center Departments of Genetics, Genomics and Informatics and the Department of Preventive Medicine and the BRAIN CENTER (Building Resilience across Ages through Integrative Neuroscience, a Consortium of Education Neurofeedback Therapy, Epigenetics and Research), at the University of Memphis. The BRAIN CENTER at the University of Memphis was established with MRC funding and is a partnership between the Clinical Mental Health Counseling Program, the Department of Public Health and the Department of Criminology and Criminal Justice. The ACES Study received IRB approval from UTHSC & UM and received a Certificate of Confidentiality from NIH.

Preliminary Findings

We have partnered with COMPASS Intervention Center, to pilot the provision of neurofeedback training to residents since January 2019. We have since enrolled and randomized 34 participants into the study, 12 males, 22 females, 19 % African American, 26 % bi or multiracial, and, 55% Caucasian with an average ACE score of 4. Seventy percent of our participants have a documented history of substance abuse and 50% have juvenile justice involvement. Based on preliminary analyses run on pilot sample, participants receiving neurofeedback therapy performed better in tests of cognitive processing, a neuropsychological assessment of attention and ADHD. In addition, impulsivity decreased while self-control increased with statistical significance at a 95% confidence interval. Participants completing treatment also reported statistically significant decreases in reported depressive symptoms from baseline assessment. Participants also reported increased resilience scores from pre-post intervention.

Participants completing full treatment saw a 21.3% decrease in overall metabolic rate score. The higher an individual's metabolic rate score, the more likely they are to deal with chronic health conditions such as hypertension, diabetes, gastrointestinal, and cardiovascular concerns, as well as kidney, adrenal, and pituitary conditions. The more we are able to decrease metabolic rate for an individual, the more likely we are able to prevent long term physical health outcomes and disease, disability, and premature death – all of which are common long-term health outcomes related to adverse childhood experience exposure.

Another key finding of our participants has been with regard to positive changes in sleep habits. Poor sleep is linked with a plethora of mental and physical health problems such as a weakened immune system and increased metabolic rate. Participants completing treatment reported significant changes in sleep. More specifically, it took on average 19 minutes less to fall asleep from pre- to posttest. On average, participants reported 2.6 more hours of sleep per night from pre- to posttest. The frequency of nights participants could not get to sleep within 30 minutes decreased from pre- to posttest. The frequency with which participants woke up in the middle of the night or early morning decreased from pre- to posttest.

State-wide Interest

Interest and funding now must turn to identifying and employing interventions that not only mitigate the damage caused by environmental and trauma-induced toxins but that also have the potential to reverse the biological (epigenetic) expression of that damage. Our preliminary findings indicate that neurofeedback may be such an intervention.

On July 26th, 2019, Marie Williams, the State Commissioner for Mental Health and Substance Abuse and Jennifer Nichols, State Commissioner for the Department of Children's Services, visited our clinical trial site. The Commissioners were impressed with the findings of our pilot study and are interested in rolling out our program state-wide. Both Commissioners presented our research partnership and preliminary findings to Governor Bill Lee at his Cabinet meeting on Tuesday August 19th. Our findings have significant policy implications with regard to funding Juvenile Justice, Education and Mental Health Treatment services.

INTEGRATIVE EPIGENETICS AND THE EXPOSOME

The biological and molecular mechanisms by which adverse events have a long-lasting impact on health and behavior remains undefined. Epigenetics, viewed as an intermediary between the genome and environmental exposures, may contribute to the sustained effects. As part of the genotyping and biorepository effort, we will create epigenomic datasets for the participants in one or more tissues (i.e., DNA isolated from saliva and/or blood). Specifically, we will perform microarray-based assays of DNA methylation at multiple time-points that will generate a longitudinal methylomic resource. Unlike the genome, the methylome is dynamic and changeable, and the methylome will be analyzed in the context of gene-environment interactions, its modification over time, and whether CpG markers are predictive of stress susceptibility and treatment response.

ASSESSING THE IMPACT OF EXPOSURE TO TOXICANTS AND IRON STATUS ON SOCIAL ADVERSE EVENTS IN CHILDHOOD AND ADOLESCENCE

Iron deficiency during neurological development can produce symptoms that mimic ADHD and other behavioral problems. Iron deficiency can also exacerbate the deleterious effects of exposure to heavy metals on the brain. Iron status and exposure to heavy metals have long been suspected to act in concert on the developing brain with social toxic stress as might be experienced in a dysfunctional family setting, or other adverse environment. Our role in the ACES project is to assess iron status and exposure to elemental toxicants such as lead, mercury, arsenic and others and evaluate their impact on cognitive, affective and other central nervous system parameters in children and adolescents. Assessment of iron status and exposure to elemental toxicants will be accomplished by measurement of these elements in toenails and by a relatively new technology, total x-ray reflection fluorescence. Measures are expressed in micrograms per gram of sample and all measures will be evaluated by correlation analysis against the cognitive/affective/neurological parameters obtained from our target population individuals.

Publications & Features

Schauss, E., Horn, G., Ellmo, F., Reeves, T., Zettler, H., Bartelli, D., Cogdal, P., & West, S. (2019). Fostering Intrinsic Resilience: A Neuroscience Informed Model of Conceptualizing and Treating Adverse Childhood Experiences. *Journal of Mental Health Counseling*, 41, 242-259. doi: 10.17744/mehc.41.3.04

Schauss, E., Williams, R., Jones, B., Bartelli, D., Zettler, H., Horn, G., Ellmo, F. & Hawes, K (2019). Preliminary Findings of BRAIN CENTER Clinical Research Trial White Paper.

Waters, D. "Memphis wired for advanced exploration of trauma on young brains". *The Daily Memphian*. 13 Sep. 2019, https://dailymemphian.com/section/special-projects/article/6914/memphis-wired-for-advanced-exploration-of-tra?utm_source=email_edition&utm_medium=email&utm_campaign=morning_2019-09-13

Conference Presentations

Schauss E., Horn, G., Hawes, K., Ellmo, F., & Reeves, T. (2019). *Fostering Resilience through Neuroscience: A Clinical Application of Neurofeedback Therapy for the Treatment of ACEs*. University of Memphis 7th Annual Social Work Symposium.

Schauss, E., Brasfield, M. & Ellmo, F. (2019). *Neurocounseling for Resilience*. American Counseling Association, Annual Conference, New Orleans, LA.

Schauss, E. (2018). *Neurocounseling for Resilience*. American Counseling Association Conference, Atlanta, GA.

Nobbman, K., Horn, G., Ellmo, F., Reeves, T., & **Schauss, E.**, (2017) *Neurofeedback: Its Process, Uses, Benefits and Limitations for Youth with ACEs within a Reciprocal Determinism Framework*. Tennessee Counseling Association, Nashville, TN.

Ellmo, F., Reeves, T., Nobbman, K., Horn, G. & **Schauss, E.** (2017). *A Study of Neurotherapy on the Effects of Childhood Trauma*. Tennessee Counseling Association, Nashville, TN.

Additional Funding Support

A Combined Environment and Epigenetics Study (ACES): Impact of Neurofeedback Therapy on the Health and Behavior of Adolescents Research Clinical Trial. University of Memphis, College of Education, Faculty Research Grant 2019-2020.

THE FAMILY RESILIENCE INITIATIVE CLINICAL AND RESEARCH PROGRAMS

Prepared by Sandra Arnold MD, MSc; Jason Yaun MD; Marion Hare MD, MS;
Lisa Rogers MSW; Sandra Madubonwu RN, PhD

Project Summary and Progress

Since May 2018, UT Le Bonheur Pediatric Specialists and Le Bonheur Community Health and Well-Being, Maternal Child Department, have started the Family Resilience Initiative (FRI) Clinical Program in the ULPS General Pediatrics Clinic. This clinical program screens children 9 months to less than 5 years of age for Adverse Childhood Experiences (ACEs) and Social Determinants of Health (SDH) at the time of presentation for well child checks. There are two outreach coordinators who screen and enroll children attending clinic for a well-child check during morning clinics 4-5 days per week. Children with positive screens for ACEs and/or SDH, and their adult caregivers, receive community resource referrals with warm handoffs to vetted organizations. In addition, if indicated, psychological services are offered for children based upon the presence of one or more of ACEs and current health and behavioral problems.

Through June 30, 2019, coordinators have approached 367 families: 87 (24%) declined participation and did not have screening performed. Among the 280 patients screened, 219 (78%) had exposure to one or more ACEs and/or SDH; 47 (21%) have had ACEs identified, 65 (30%) with SDH and 107 (49%) with both ACEs and SDH. Coordinators have made 58 referrals for psychological counseling. The coordinators have continued to follow enrolled patients and have performed over 2500 follow up activities including rescreening and new assessments of patients enrolled a year ago.

Overall, 311 referrals have been made to organizations including Neighborhood Christian Center (food, household items, etc.), First Congregational Church (food), FRI Psychologists, Shelby County CSA, and to MCHiLD (the Le Bonheur- U of M medicolegal partnership). We have also been able to refer to additional Le Bonheur Community Outreach programs such as Early Intervention and Development and Healthy Families America, resulting in enrollments in those programs.

FRI has also been successful in offering additional programs to clinic families, such as LENA Start and Positive Parenting Program (PPP). FRI Outreach Coordinators completed two separate LENA Start trainings with 11 total families enrolling, and 10 families successfully graduating. In addition, FRI program staff, as well as some clinic personnel, other staff across the Maternal Child program, and three community partner staff have been trained in PPP, being accredited to offer individual and/or discussion trainings to address typical child behavior issues.

These group activities have the added benefit of meeting some of the families' social needs by allowing interaction with other families and enhancing their support systems.

The FRI Research Program has been designed to systematically study the impact of the clinical program and compare it to usual care. FRI Research Program subjects are between 18-36 months of age presenting for care with their biological mother. Patients in the experimental arm are enrolled in morning clinics following enrollment in the FRI Clinical Program. Patients in the control group are enrolled during afternoon clinics when the FRI Clinical Program is not offered. The FRI Research Program began subject enrollment on July 17, 2019. As of July 30, 2019, 4 subjects have been enrolled in the experimental group and 5 in the control group. It is expected that it will take approximately 18 to months to enroll all the needed study subjects (400 mother-infant pairs, 200 in each group). It will then take 4 years to complete 3 yearly follow up visits for all enrolled subjects. There are three main objectives of the FRI Research Program.

1. Determine the effect of the FRI clinical program on mental health, development and school readiness of children in the program compared to controls. The hypothesis for this aim is that helping families deal with unmet social needs and exposure to ACES through the FRI clinical program will lead to improvements in child development with age appropriate attainment of developmental milestones (measured with the [Ages and Stages Questionnaires, ASQ](#)), and scores on early, school-based testing (MAP) scores obtained through Seeding Success. We also hypothesize that there will be reduced rates of physician-diagnosed early behavioral disorders such as ADHD. Improvements in behavioral problems will be assessed by measuring changes before and after inclusion in FRI using the validated Child Behavior Checklist (primary endpoint). We will compare pre- and post-treatment scores on the validated Parenting Stress Index as a measure of stress and potential stress reduction in the mother.

2. Determine the effect of the FRI clinical program on the physical health and healthcare utilization of children in the program compared to controls. The hypotheses underlying this aim are that the FRI clinical program, through addressing unmet social needs and sources of toxic stress, will prevent or ameliorate the adverse health effects linked to stress including asthma and other atopic conditions, obesity and hypertension. We will compare changes in weight (underweight, overweight, normal weight, obese) categories as defined by Body Mass Index (BMI) percentiles, and blood pressure percentiles at enrollment and at the end of the study. We will compare the number of unscheduled healthcare visit for illness for children in the FRI clinical program to controls receiving standard of care. Healthcare visits include visits

to the clinic and visits to the Le Bonheur Emergency Department. We will compare the proportion of new diagnoses of asthma and obesity as well.

3. Determine the effect of the FRI clinical program on methylation of DNA from blood and saliva of children and mothers enrolled in the FRI clinical program compared to controls. The hypothesis for this aim is that, again due to addressing unmet social needs and sources of toxic stress, there will be differential changes in methylation between FRI clinical program subjects and controls over the three years of the study. Participation in the biorepository and blood and saliva contribution for DNA extraction and methylation studies is an optional component of the FRI Research Program.

Grant Support And Activity

The Family Resilience Initiative Research Program (PI: Hare, Marion). Child Institute (UCI). *Award Amount = \$493,323.* Funding period 7/1/19-6/30/20.

Training in Positive Parenting Program (PI: Sandra Madubuonwu, RN, PhD). State of Tennessee Building Strong Brains Innovation Grant. *Award Amount = \$55,000.* Funding period 7/1/18 to 6/30/19.

Presentations

Overview of the Family Resilience Initiative. Building Strong Brains (State of TN training). Quarterly Gathering of MD-LICC TEIS Group, 2/4/2019.

Family Resilience Initiative Clinical & Research Program Overview/Building Strong Brains. ULPS staff at quarterly FRI Lunch & Learn Trauma Informed Training, 4/12/2019.

Adverse Childhood Experiences: Impact and Treatment. MLH Living Well Network Breakfast. Memphis, TN. March 6, 2018.

Improving Community Health: The Physician's Role. Le Bonheur Children's Hospital Grand Rounds. Memphis, TN. February 27, 2019.

Family Resilience Initiative: Addressing Adverse Childhood Experiences and Social Determinants of Health in Primary Care. UTHSC Health Systems Research Conference. Memphis, TN. June 5, 2019.

Family Resilience Initiative: Addressing Adverse Childhood Experiences and Social Determinants of Health in Primary Care. Nurse Family Partnership National Symposium. Nashville, TN. September 18, 2019.

Family Resilience Initiative: Addressing Adverse Childhood Experiences and Social Determinants of Health in Primary Care. Connecting for Children's Justice Conference. Murfreesboro, TN. October 30, 2019.

MEMPHIS LAW ACES PROJECT - JUVENILE JUSTICE

Submitted by Amy Campbell, JD, Demetria Frank, JD

Project Summary and Progress

The Memphis Law ACEs Project: Juvenile Justice sought to address the negative impact of ACEs as experienced through youth involvement in the justice system via case-based and policy strategies. Case-based (“legal intervention”) support primarily flowed through Children’s Defense Clinic, in which supervised students provided legal representation to youth facing delinquency charges in juvenile court proceedings in the Shelby County Juvenile Court. The Clinic also engaged in systemic reform through policy advocacy, and assisted in training and programming in best practices in representation of these youth. MRC support specifically allowed the Clinic to expand its work to pre-adjudication assessment of child clients and enhanced expert advising, with the intent to seize upon interdisciplinary opportunities with other MRC entities.

Policy strategies flowed through the Institute for Health Law & Policy and the Office of Diversity and Inclusion, with the intent to support upstream change work of MRC initiatives across institutions, but starting with juvenile justice policy work built on connections of the Director of Diversity & Inclusion. For both efforts, MRC support specifically funded hiring of two post-graduate legal Fellows to support case-based and policy strategies.

During the initial year of funding, work of the Fellows proceeded after hiring in the winter of early 2018. Unfortunately, the Clinic faced personnel issues, which were then negatively impacted by the lack of receipt of a second year of funding. The latter necessitated the early release of the two Fellows. The money was to be reallocated to support funding for the Juvenile Justice Clinic director (coalescing all efforts into direct clinical service and related research) for one additional year, but the Director left the Law School that summer, necessitating a reexamination of vision and goals. During the fall and winter, the School successfully developed a revised funding strategy that also pooled leftover monies from a civil rights event (under the leadership of Professors Campbell and Frank).

While the administrative hurdles took longer to address than anticipated, budgets were approved for reallocation of MRC funds for the juvenile justice/ACEs project in late spring 2019. This work will more fully align efforts into the policy realm, building on a growing ACEs policy initiative portfolio, and coordinate with related campus efforts to address civil rights, social justice and poverty (under the leadership of Dr. Elena Delavaga, and with input from the National Civil Rights Museum).

The goal will be to develop a community-based research agenda to prevent or ameliorate juvenile justice involvement via earlier intervention and a focus on ACEs, with the initial MRC-supported efforts focused data collection and coalition-building and engagement. This work will be led by Professors Frank (data collection, Countywide Juvenile Justice Consortium) and Campbell (ACEs policy research, policy-actionable data, community engagement, income/racial inequality research). Funding is also supporting part of a new postdoc position in the School of Public Health (also funded by the United Way of the Mid-South, with an anti-poverty focus), who will help coordinate and align data to support research needs for this project (under the supervision of Dr. Debra Bartelli).

While we share frustration with the unexpected obstacles that emerged, we are heartened by this new direction, the new collaborations that have emerged, and the stronger University-level administrative support.

2017-2018 Policy Work Outcomes:

- With expert advising assistance from Dr. Haley Zettler (U of M Criminal Justice), developed criteria for questionnaire to assess social and environmental risk factors for trauma.
- With assistance of Policy Fellow, LaChina McKinney, organized incubator committee to prioritize youth voice in developing policy solutions responsive to ACEs in Shelby County Youth. The incubator developed two ideas:
 - Develop a Youth Action Network of Memphis as a platform for promoting youth advocacy, organizing, and events/ programs related to issues challenging Memphis youth (youthactionmemphis.com/community-service.html)
 - Host a Youth Action Network Event (YANE) to promote the Youth Action Network and other youth events and youth advocacy projects in Memphis.
- Held initial Youth Action Network Event (YANE) conference on December 15, 2018 at Bridges, USA (chalkbeat.org/posts/tn/2018/12/19/what-memphis-students-say-can-help-reduce-suspensions-expulsions/ for information about the initial conference).

- The second YANE will be held on December 14, 2019. Youth cohorts will present policy ideas to local leaders to address ACEs-related issues, such as poverty, the school-to-prison pipeline, transportation, and sexual assault ([chalkbeat.org/posts/tn/2019/04/05/once-in-juvenile-detention-themselves-memphis-students-give-school-officials-strategies-for-keeping-others-in-school/](https://www.chalkbeat.org/posts/tn/2019/04/05/once-in-juvenile-detention-themselves-memphis-students-give-school-officials-strategies-for-keeping-others-in-school/)).

2019-2020 Anticipated Policy Work Outcomes:

- Build data platform to aggregate data on trauma facing select youth in Shelby County, including from Countywide Juvenile Justice Consortium
- Strengthen community voice via a needs assessment—and identification of assets—of community members on systemic barriers to healthy youth/family development, highlighting areas for (more) effective policy engagement.
- Continue to strengthen youth voice, building on earlier work with the Youth Action Network and YANE.
- Build research team, broadly inclusive of key stakeholders, to facilitate development of needed data and research, and develop critical action items to act upon what data reveals.
- Host community forum to reveal, discuss next steps building on existing and newly-obtained assessment data.

A CASE FILE REVIEW FOR PREVALENCE OF TRAUMA AND ACES IN DETAINED YOUTH

Submitted by Altha J. Stewart, MD

Project Summary and Progress

The Center for Health in Justice Involved Youth conducted a retrospective case file review of records of youth in juvenile detention during calendar year to expand the current knowledge of the prevalence of trauma in justice-involved youth. Graduate student research assistants were trained on the review instrument, the Child and Adolescent Needs and Strengths (CANS) Trauma Comprehensive tool, to assess Adverse Childhood Experiences (ACEs), adjustment to trauma, daily life functioning, and strengths using the legal and social case files and the data in the Juvenile Court administrative database. Study results and the findings will be used to make recommendations to the Court and policymakers regarding policies, procedures, trauma-informed treatment practices, and funding decisions related to local juvenile justice reforms.

Records were reviewed for 359 youth in juvenile detention during calendar year 2017 (a total of 700 youth were detained during the study period); most of the youth were Black males between 16-18 years old.

75% had a prior referral/complaint and 25% had a prior Dependency & Neglect case with the Court, with 28% having placement out of home. At least 1/2 of the youth had been suspended from school (53%) and 26% had been expelled. Results showed that 41% had four or more Traumatic or Adverse Childhood Experiences; 71% had at least one documented Traumatic or Adverse Childhood Experience. Over half of the youth had experienced some disruptions in caregiving situations and/or had parents involved in criminal activity, and the prevalence of sexual abuse was about twice as high among girls compared to boys (31% vs. 15%). Almost all traumatic stress symptoms were significantly higher for youth with 4 or more traumatic experiences.

Data and results from this study have been used to apply for local, state, and federal funding. Locally, the Center was awarded a \$500,000 contract to pilot an assessment center to divert youth from entering the juvenile justice system through early intervention, comprehensive assessment, and referral to supportive services and positive strategies tailored to address each youth and family's individual needs.

The Urban Child Institute awarded \$288,000 to work with Shelby County Schools and local community providers to create a trauma-informed wraparound approach to deliver services, screening, and supports that improve school attendance. At the state level, the State of Tennessee Department of Children's Services funded \$150,000 to continue and expand the work of Protecting Children From Abuse and Trauma (PCAT) in schools, partnering with providers in the community that offer evidence-based, trauma-informed training, screening, and services, including Wraparound and TF-CBT, and the Certified Family Support Specialist model in trauma-informed service delivery. The State of Tennessee Commission on Children and Youth awarded the Center \$60,000 to address the racial and ethnic disparities present in the juvenile justice system in Shelby County by providing a training curriculum that addresses relationships, roles and actions between law enforcement and youth at the point of initial contact in the community. At the federal level, the Center submitted a grant with Shelby County government to the U.S. Department of Health and Human Services Substance Abuse and Mental Health Services Administration to create the service delivery infrastructure needed for improved access to mental health services and supports for youth using high fidelity wraparound as the primary intervention.

The results of this project were presented at the July 2019 National Council of Juvenile and Family Court Judges Conference and we were invited to submit the summary of our work to two juvenile and family court judge association publications.

Grant Support And Activity

Current Support

Youth Assessment Center for Youth and Families in Shelby County, Tennessee (PI). Shelby County Government. *Award Amount = \$500,000.* Funding period 1/2019-6/2019.

Wraparound Frayser (Reducing Chronic Absenteeism Using a Trauma-Informed Family and Community Approach) (PI). Urban Child Institute. *Award Amount = \$288,000.* Funding period 7/2019-6/2020.

Protecting Children From Abuse and Trauma in Schools (PCAT-S) (PI). State of Tennessee, Department of Children's Services. *Award Amount = \$150,000.* Funding period 7/2019-6/2020.

Reducing Racial and Ethnic Disparities in Memphis (RRED Memphis) (PI). State of Tennessee, Commission on Children and Youth. *Award Amount = \$60,000.* Funding period 10/2018-9/2019.

Submitted (Pending)

Wraparound Shelby (PI). U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. *Budget request: \$999,724 (annually for total of 5 years).*

Evaluating the effect of prenatal intervention for intimate partner violence (IPV) on infant health and development (Consultant; PI: Miller-Graff, L.E.). Help for Children (HFC) Global Foundation.

Conference Presentations

Stewart, A.J. & Harris, L. (2019, July). *Best Practices in Standardized Records Keeping in Justice Involved Youth.* Session presented at the National Council of Juvenile and Family Court Judges Conference in Orlando, FL.

SPACES: SEMANTIC PLATFORM FOR ADVERSE CHILDHOOD EXPERIENCES SURVEILLANCE

Submitted by Arash Shaban-Nejad, PhD

Project Summary and Progress

We have developed the Semantic Platform for Adverse Childhood Experiences (ACEs) Surveillance (SPACES). It facilitates the access to the relevant integrated information, enables discovering the causality pathways and assists researchers, clinicians, public health practitioners, social workers, and health organizations in studying the ACEs, identifying their trends, as well as planning and implementing preventive and therapeutic strategies. SPACES will act as a basis for a recommender system tasked with simplifying data collection, access, and reasoning related to ACEs. The recommender system uses both semantic and statistical methods to enable content and context-based filtering. A formal ontology has been implemented (ACEO: ACEs Ontology) to allow the mental health community to facilitate data integration and knowledge modeling and to improve ACEs' surveillance and research. The goal of the ontology is to provide a uniform structure to represent current and future studies on the causes and effects of, and ways to prevent and mitigate, ACEs. We have made ACEO, the first ontology in the domain, freely available to the community through the National Center for Biomedical Ontologies (NCBI) BioPortal: bioportal.bioontology.org/ontologies/ACESO.

Publications

Brenas JH, Shin EK, and **Shaban-Nejad A**. Adverse Childhood Experiences Ontology for Mental Health Surveillance, Research, and Evaluation: Advanced Knowledge Representation and Semantic Web Techniques. *Journal of Medical Internet Research (JMIR) Mental Health*. 2019 May 21;6(5):e13498. doi: 10.2196/13498. PMID:31115344

Brenas JH, Shin EK, and **Shaban-Nejad A**. A Hybrid Recommender System to Guide Assessment and Surveillance of Adverse Childhood Experiences. *Stud Health Technol Inform*. 2019 Jul 4;262:332-335. doi: 10.3233/SHTI190086. PMID: 31349335.

Brenas JH, Shin EK, and **Shaban-Nejad A**. An Ontological Framework to Improve Surveillance of Adverse Childhood Experiences (ACEs). *Stud Health Technol Inform*. 2019; 258:31-35. PMID:30942708.

Brenas JH, Shin EK, and **Shaban-Nejad A**. A Semantic Platform for Surveillance of Adverse Childhood Experiences. *Online J Public Health Inform*. 2019; 11(1): e270. Published online 2019 May 30. doi: 10.5210/ojphi.v11i1.9694. PMID: PMC6606087.

Grant Support And Activity

In Progress

We are working towards submitting a grant application in response to:

- **Initiation of a Mental Health Family Navigator Model to Promote Early Access, Engagement and Coordination of Needed Mental Health Services for Children and Adolescents.** PAR-18-428. (R01- Clinical Trial Required)
- **Complex Technologies and Therapeutics Development for Mental Health Research and Practice.** PA-18-566.

THE MUSIC CLUB: A TRAUMA HEALING CLUB

Prepared by Gregory Washington, PhD and Susan Elswick, PhD

Project Summary and Progress

Drs. Gregory Washington and Susan Elswick from the University of Memphis School of Social Work developed an evidence-based prevention and intervention program that infused Pyramid Mentoring and culturally responsive practices to reduce risk for youth exposed to trauma. This important work focused on providing the following: evidence-based culturally responsive direct interventions to youth exposed to trauma, providing capacity building opportunities, and supporting the needs of the community and caregivers.

The team successfully developed partnerships with four local community partners (Refugee Empowerment Program, Knowledge Quest, CMI Healthcare Services, and Juvenile Court) where the interventions are being implemented. Results were gathered through pre and posttest measures on instruments that monitor participant reported effects of trauma on self-regulation, daily ability to function, levels of distress, and their perceptions of the intervention as being helpful.

During the initial screening to identify participants that are appropriate for the intervention, 100% of the potential participants were screened, and 98% of these children met the criteria (across all cohorts) for the intervention group based on life experiences and previous adverse childhood experiences. From that data we were able to see that 70% of the participants who met the criteria had experienced 3 or more life events and 20% of the participants who met the criteria indicated having 5 or more life events that would qualify them for the intervention. This data alone shows the need for this type of intervention within the community.

Thus far there have been 6 cohorts of participants (N=74) of youth ranging in ages 12-18. Preliminary findings of this work and research have indicated that after the intervention 95% of the participants reported feeling more in control, capable of managing their feelings and needs, and having a better ability to regulate when overwhelmed. This was a self-report via the self-regulation scale. Additionally, on the posttest results on the Child PTSD Symptom Scale (CPSS), 75% of the participants showed dramatic improvements and ended at below threshold reports for PTSD symptoms. For the social validity measures, 100% of the respondents indicated that the intervention was very helpful, their peers and teachers were very supportive, and they indicated that they would recommend the intervention to their peers.

During this work, Drs. Washington and Elswick supported the use of the identified, evidence-based intervention by embedding culturally relevant expressive arts activities to engage the youth in these services. The creative use of African Drumming as an expressive arts activity was utilized based on Dr. Washington's Pyramid Mentoring model, his previous work and research in this area. The expressive arts increased the positive affiliations with the group and received much positive feedback from the participants. Participants who completed the 10-week intervention graduated to a peer mentor level which allows them to assist and support future participants in the intervention. We had 7 individuals complete the Pyramid Mentoring portion of the program. Participant examples of the impact African Drumming had on their experience are indicated in the following quotes: **"I enjoyed the drumming because it took my stress away;" "I enjoyed the Trauma Healing Club because it was a lot of fun;" "The drumming was my favorite because I got to learn new skills, I also got to see friends who are far away from me;" "I enjoyed making my own beat because it made me happy and to feel your own energy."**

The second focus of this work aimed at building capacity of local programs and practitioners within the community to provide evidence-based and supportive, trauma-based interventions. One way in which capacity building programming was offered through this grant work is by hosting a national trainer to train the community in a 10-week trauma-informed group intervention known as Cognitive Behavioral Interventions for Trauma in Schools (CBITS). Over 100 local practitioners have participated in this training since the initial instruction began, and these participants now can provide the intervention in schools and within the community. Additionally, Drs. Washington and Elswick were trained as local/regional trainers in the nationally recognized intervention (CBITS) so that they can continue to meet the needs of the local community through continuous professional development and on-going supervision of local practitioners providing these services. Dr. Washington has trained approximately 15 charter schools and local practitioners.

In addition to CBITS training for the community, Dr. Elswick also provided TN Building Stronger Brains Training to the parents and community partners in the region. To date Dr. Elswick has trained over 200+ individuals in the community on ACEs and the impact on child development.

The final focus of this grant was to support the needs of the community and caregivers by offering parent support groups for both female and male caregivers connected to our community partners.

Publications

In Progress

Washington, G., Elswick, S., Watson, J., Mangrum, H., Peterson, C., & Barnes, E. (2019). Trauma Healing Club: Enveloping Culturally Responsive Processes in the Development and Implementation of a Group Intervention to Address Trauma.

Presentations

Washington, G. & Elswick, S. (2019). *The Music Club: A Trauma Healing Club*. The University of Social Work, 5th Annual Social Work Symposium. (April 2019)

Washington, G. & Elswick, S. (2019). *The Music Club: A Trauma Healing Club*. Hope in Action: Faith Based Initiative to Addressing ACEs in the Community. (May 2019)

Washington, G. & Elswick, S. (2019). *The Music Club: A Trauma Healing Club*. Council on Social Work Education Annual Program Meeting (CSWE APM). (October 2019)

Grant Support And Activity

Submitted & Awarded Grants

Washington, G. & Elswick, S. (2019). The Urban Child Institute.

Washington, G. & Elswick, S. (2019). The University of Memphis, Department of Research and Innovation.

David Waters [✉](#)

David Waters is Distinguished Journalist in Residence and assistant director of the Institute for Public Service Reporting at the University of Memphis.

Memphis wired for advanced exploration of trauma on young brains

SPECIAL REPORT: Researchers believe neurofeedback impacts learning, communication, behavior, coping

By [David Waters](#)

Updated: September 17, 2019 1:00 PM CT | Published: September 13, 2019 4:00 AM



Dr. Eraina Schauss fills a syringe with electro gel which is then inserted into small holes in the qEEG cap. (Patrick Lantrip/Daily Memphian)

The process begins with a teenage boy or girl sitting in front of a computer screen wearing a red or blue nylon cap.

The cap isn't a fashion statement. It's embedded with 19 button-size sensors, each attached by wire to a brainwave amplifier. Dr. Eraina Schauss or another mental health counselor injects a pasty conductive gel into a tiny hole in each sensor.

"We tell them they get some free hair gel with every treatment," joked Schauss, who is on the faculty at the University of Memphis and the University of Tennessee Health Science Center.

Since January, Schauss and her colleagues from the U of M's BRAIN CENTER have been measuring, recording and training the brain waves of nearly three dozen adolescents at Compass Intervention Center. It's called neurofeedback training. Schauss believes neurofeedback can be used to treat developmental trauma, a sort of childhood version of PTSD.

"Chronic trauma reorganizes the brain," Schauss said. "With neurofeedback, we can help the brain regain its balance, teach the brain to self-regulate and become more resilient to trauma."

Compass is a secure facility on a quiet suburban street not far from TPC Southwind golf club. Counselors there provide various forms of therapy, including trauma-focused cognitive behavioral therapy, to adolescents who have been admitted by their parents, referred by children's services, or assigned by a judge, after being hospitalized.

The neurofeedback training, being conducted with the consent of the teenagers and their caregivers, is new.

"We're definitely seeing positive results," said Lisa Smith, Compass CEO. "The kids are sleeping better, they have better self-control, less aggression and impulsivity. And they're more able to talk about their trauma."

The neurofeedback training is one example of the cutting-edge brain science research being done in Memphis.

Schauss and other brain scientists at work here believe the research will have a profound impact on children and adolescents who struggle to learn, communicate, behave and cope.

They hope it will have a lasting impact on a community struggling with the high cost of poverty, violence, addiction, obesity, and mental and physical illness. But brain researchers like Schauss face medical, political and financial obstacles that could prevent their work from being widely accepted and applied.

LOOKING INSIDE THE BRAIN

Neurofeedback training isn't as futuristic as it might seem.

The first recording of the brain's electrical activity was made in 1924, a development that helped physicians study epilepsy, dementia and brain tumors.

Since the neurotechnology revolution began in the 1990s, neurofeedback has been used successfully to treat everything from sleep disorders and seizures to traumatic brain injury and post-traumatic stress disorder, or PTSD.

“Neurofeedback has made a big difference for a good number of people,” said Dr. Katherine Veazey Morris, a polytrauma psychologist for the Memphis Veterans Medical Center.

“We don't know where PTSD ends and traumatic brain injury begins. Neurofeedback is not a panacea, but I can't imagine treating either without it.”

Eight in 10 children who have suffered trauma don't meet the diagnostic criteria for PTSD. So children of trauma often are diagnosed with — and medicated for — one or more other behavior disorders such as attention deficit/hyperactivity, oppositional defiance, generalized anxiety, or conduct disorder.

The National Institute of Mental Health says such diagnostic categories are dated and imprecise.

“Currently, the diagnosis of mental disorders is based on clinical observation,” NIMH declared in 2013.

“Neurofeedback has made a big difference for a good number of people.

We don't know where PTSD ends and traumatic brain injury begins.

Neurofeedback is not a panacea, but I can't imagine treating either without it.”

Dr. Katherine Veazey Morris, *polytrauma psychologist*

“The present diagnostic system does not incorporate current information from integrative neuroscience research, and thus is not optimal for making scientific gains through neuroscience approaches.”

In recent years, NIMH has encouraged new research that integrates neuroscience, genetics and brain imaging studies into behavioral and clinical approaches to mental health. They want researchers to do more than observe behavior. They want researchers to study the brain and its genes, cells, neural circuits and brainwave patterns.

“Mapping the cognitive, circuit, and genetic aspects of mental disorders will yield new and better targets for treatment,” NIMH said.

That’s what Schauss and her colleagues are trying to do with their neurofeedback study.

TRAUMATIZED BRAINS

More than half of the kids at Compass have become involved with the juvenile justice system. Two-thirds have substance abuse problems.

All are struggling to overcome the destructive effects of early and chronic trauma — significant abuse, neglect, loss, or exposure to violence. Such adverse childhood experiences, or ACEs, can have a profound and lasting impact on developing bodies and brains.

Brain imaging technologies have shown that chronic stress and trauma can rewire or dysregulate a child’s brain.

Good stress rapidly increases glucose levels, speeding the heart rate, and increasing blood flow to the body and the brain. That allows young minds to respond to threats. When the threat passes, the brain and body calm down.

But when stress becomes chronic, it becomes toxic. The system is amped up all the time. Young brains and central nervous systems get locked into a constant state of high alert (fight, flight or freeze mode).

Prolonged stress can strengthen neural connections to the brain’s “fight or flight” center and weaken those to the brain’s “self-control” center.

And it can shrink areas of the brain associated with the regulation of emotions, metabolism, memory, and learning. Children of chronic stress and trauma often become more anxious, impulsive, aggressive, hyperactive. They often exhibit lack of empathy and poor problem-solving skills.

They become more prone to violence, aggression, depression, substance addiction, suicide, illness and disease, not to mention academic failure. The problem is especially acute in high-poverty urban areas such as Memphis.

Adults in Shelby County are much more likely than those elsewhere to have experienced adverse childhood experiences, according to a survey conducted five years ago by the ACE Awareness Foundation. The survey found that 20 percent of adults here had been sexually abused as children, 22 percent said they were regularly exposed to violence between adults, and a mind-boggling 37 percent said they had witnessed a stabbing or shooting.

“These kids are here for different reasons — addiction problems, behavior problems, psychiatric problems,” said Kimberly Jones, clinical program director and supervisor of trauma-focused cognitive behavior therapy at Compass.

“But what they all have in common, every child here has experienced some form of chronic trauma. Trauma not only hurts, it affects a child’s ability to heal.”

FLEXING YOUR BRAINS

The teenagers in the nylon caps sit quietly and still, but often their brains and body are racing.

Their metabolic scores — assessments of their physiological health measured by the software — are often two or more times higher than normal. One teenage girl, for example, had a metabolic score of 42, double what it should have been for a girl her age.

She was suffering from anxiety and depression. She had trouble controlling her impulses and emotions. She became aggressive and she self-medicated with alcohol and marijuana, which got her into trouble. The sexual abuse and other forms of chronic stress and trauma she’d endured had taken their toll, Schauss said.

Chronic stress and trauma can be especially hard on a young, developing brain. The brain makes up about 2 percent of the body's weight but requires about 15 percent of its cardiac output, 20 percent of its oxygen, and 25 percent of its glucose to power billions of neurons and trillions of synapses.

A traumatized brain often produces an overabundance of higher frequency brainwaves, or beta waves, which require even more energy.

“Kids with trauma have overactive brains,” Schauss explained. “Their brains are on hyperalert, even when they're no longer in real danger.”

The purpose of neurofeedback is to help the brain calm and stabilize itself, and to repair the dysregulated brain patterns created by trauma.

“When the fear patterns relax, the brain becomes less susceptible to automatic stress reactions and better able to focus on ordinary events,” Dr. Bessel Van Der Kolk, one of the world's leading experts on trauma, wrote in “The Body Keeps the Score.”

“Neurofeedback simply stabilizes the brain and increases resiliency, allowing us to develop more choices in how we respond to stress and trauma.”

Neurofeedback training assumes that the brain wants to work more efficiently and effectively, to be more balanced and healthier.

It also assumes the brain's neuroplasticity — that the brain can and will auto-correct itself, given enough positive reinforcement.

“It's sort of like flexing a muscle,” Schauss explained. “Neurofeedback flexes certain brainwaves to make them stronger. That allows certain other brainwaves to become weaker.”

A BILLION MINI COMPUTERS

Before neurofeedback training can begin, the teenagers in the nylon caps must complete several physical, social, emotional, behavioral and cognitive assessments.

Among the hundreds of issues:

- I have trouble filtering out background noises.
- People tell me I do or say things that I don't remember doing or saying.
- I feel like my past is a puzzle and some of the pieces are missing.
- I find myself doing something I know is wrong, even when I really don't want to do it.
- Sometimes I will take a risk just for the fun of it.
- Their responses helped researchers assess their states of mind as they develop treatment plans.

But the questionnaires and other records only give them a general sense of the direction of treatment.

To develop a neurofeedback treatment plan specifically designed for each teenager, they need a map — a brain map.

Dr. Eraina Schauss is the director and founder of the Brain Center at the University of Memphis. (Patrick Lantrip / Daily Memphian)



“If you’re going to treat someone for a headache, you need to know whether it’s being caused by the weather or a tumor,” Schauss said. “New technologies now allow us to actually study the organ we are treating.”

Those new technologies include quantitative electroencephalography (qEEG), a quick, safe and non-intrusive way to measure and record the electrical activity of your brain.

It’s similar to an electrocardiogram, or ECG, which measures and records the electrical activity of your heart through small electrode patches attached to your chest, arms and legs.

A qEEG traces and analyzes brain waves millisecond by millisecond through 19 button-size electrodes embedded in nylon caps.

A brain cell, also called a nerve cell or neuron, is like a mini-computer. It receives, analyzes, coordinates and transmits information that generates thoughts, emotions and behaviors.

Each brain has billions of mini-computers. They communicate with each other by firing electrical impulses. Those impulses can be measured as waves.

Billions of brain cells fire trillions of impulses every second, generating a lot electrical activity. A qEEG measures changes in that activity.

Too much electrical activity in certain brain areas is linked with anxiety disorders, sleep problems, hyper-vigilance, impulsive behavior, anger/aggression, agitated depression and chronic nerve pain.

Too little activity in certain brain areas is linked to depression, attention deficit, chronic pain and insomnia. Combinations of too much and too little are linked to anxiety, depression and ADHD.

Neurofeedback software produces a color map that shows which brain waves are highest and lowest in key parts of the brain. The map also shows which brain waves are working together and which are not.

“Chronic trauma reorganizes the brain. With neurofeedback, we can help the brain regain its balance, teach the brain to self-regulate and become more resilient to trauma.”

Dr. Eraina Schauss, *BRAIN CENTER* founder

Children with long histories of traumatic stress show some common brain wave patterns: For example, too much wave activity in the brain's "fear center" (right temporal lobe), and not enough alpha wave activity in the decision-making "self-control" center (left frontal lobe).

"Our research showed that calming the fear center decreases trauma-based problems and improves executive functioning," Van Der Kolk wrote. "Neurofeedback changes brain connectivity patterns. The mind follows by creating new patterns of engagement."

RELAX AND WATCH

Neurofeedback training is a lot like watching TV.

Each participant chooses an age- and content-appropriate TV show or movie from Netflix. Disney movies and cooking shows are the favorites.

"We tell them to just relax and watch," Schauss said. "Your brain will do the rest."

Each neurofeedback training focuses on two areas of the brain. So instead of the nylon cap with 19 sensors, the teens have two or three sensors pasted directly on her heads.

Every now and then, as they watch the movie or TV show, the screen fades. They can still see the show, but the picture isn't as clear and bright.

In a matter of seconds, the screen brightens again. A few minutes later, it fades again. Then it brightens again. The longer they watch the show, the less frequently the screen fades.

They aren't touching the laptop. Neither is Schauss or her counselors. The screen is being controlled by the teenagers' brain waves, via the sensors connected to neurofeedback software.

"Their brains are learning to control themselves," Schauss explained.

It's a form of operant conditioning — rewarding desirable behavior and punishing undesirable behavior. In this case, it's the behavior of certain brainwaves.

The qEEG identifies dysfunctional brainwave patterns and locations in each patient — which waves are too high and need to be reduced or trained down, which are too low and need to be increased or trained up.

When the neurofeedback software detects dysfunctional and undesired wave patterns — say alphas that are too low or betas that are too high — the movie screen fades.

When the software detects healthy and desired patterns — say alphas or betas that are within normal range — the screen brightens.

“Neurofeedback nudges the brain to make more of some frequencies and less of others, creating new patterns that enhance its natural complexity and its bias toward self-regulation,” Van Der Kolk wrote in “The Body Keeps the score.”

Those gentle, non-intrusive, un-medicated nudges, over the course of 21 neurofeedback sessions — three per week for seven weeks — are generally enough to stabilize and re-regulate the brain’s wave patterns.

So far, the neurofeedback trainings have gone well, Schauss said.

**“Every brain is resilient and beautiful in its own way.
The more individualized we can be with our diagnosis
and treatment, the more effective it will be.”
Dr. Eraina Schauss, *BRAIN CENTER* founder**

For example, after 21 sessions, the teenage girl with the metabolic score of 42 saw it drop to 9. Her impulsivity scores dropped from 4 to 1, her depression from 4 to 0, and her anxiety from 7 to 4.

“Each of us is a unique combination of our genes, environment, experiences and responses,” Schauss said.

“Every brain is resilient and beautiful in its own way. The more individualized we can be with our diagnosis and treatment, the more effective it will be.”

FUNDING THE FUTURE

Last year, the Memphis Research Consortium provided a three-year, \$1 million grant for the BRAIN CENTER.

It's an acronym for Building Resilience across Ages through Integrative Neuroscience, a Consortium of Education Neurofeedback Therapy, Epigenetics and Research.

Basically, it's a collaboration among some of the biggest brains in Memphis — researchers from several departments at the U of M (clinical mental health counseling, public health, and criminology/criminal justice) and at UTHSC (genetics, genomics and informatics, and preventive medicine). The neurofeedback training at Compass is the BRAIN CENTER's primary focus, but it's providing related research opportunities.

Dr. Rob Williams, chair of genetics, genomics and informatics at UTHSC, is analyzing before- and after-treatment blood and saliva samples from the participants. Williams is looking to see if trauma leaves a mark on a child's genes — a mark that can be passed down epigenetically from parents to their children.

“We want to look at the DNA and see what, if anything, changes,” Williams said. “Have these adverse experiences interfered with how genes get turned on and turned off. This study is a unique opportunity and a first step toward more precise treatment of trauma.”

Meanwhile, Dr. Byron Jones of UTHSC is analyzing each participant's toenail clippings for evidence of neurotoxins such as lead, iron, copper and zinc.

“Too much or too little of these elements have deleterious effects on brain function,” Jones said.

Schauss and her colleagues hope to complete testing and treatment of 100 adolescents at Compass by next May. And they'd like to expand their study beyond the friendly confines of Compass.

“This is not the ‘Ivory Tower’ research of old; what she is trying to do is develop practical, evidence-based models of care,” said Dr. Steven West, chair of the counseling, educational psychology and research at the U of M.

“But mental health care is operated on a shoe-string budget when compared to medical care ... Despite the nature and extent of these problems, funding for both the development of evidenced-based care and for care itself is limited.”

**“This study is a unique opportunity and a first step
toward more precise treatment of trauma.”**

Dr. Rob Williams, *UTHSC*

Earlier this year, the legislature eliminated funding for the second and third years of the study.

“Politics,” said Ted Townsend, the U of M’s chief economic development and government relations officer and an MRC board member.

“And it’s a shame. This project was an example of the great potential of the consortium and its mission to drive innovation through collaboration among this city’s leading medical and research institutions. We’re not giving up.”

Townsend and UT officials are discussing the idea of making the BRAIN CENTER the first U of M / UTHSC joint institute. They hope to involve the trauma-related research at LeBonheur’s Family Resilience Initiative and Dr. Altha Stewart’s Youth Advocacy Center.

“It would be amazing for all of us to be in one place working together as a team for the city,” Schauss said.

IMAGINE THE POSSIBILITIES

Next month, Schauss plans to travel to Nashville to present her findings to Gov. Bill Lee and member of his cabinet.

In late July, two members of Lee’s cabinet came to Compass to learn more about the neurofeedback study: Marie Williams, who has been commissioner of the Tennessee Department of Mental Health and Substance Abuse since 2016; and Jennifer Nichols, commissioner of the Department of Children’s Services since January, and a former assistant district attorney and criminal court judge here in Shelby County.

Schauss explained how the project worked, the positive results so far, and the potential. She also noted that qEEG neurofeedback has shown significant results in treating anxiety, depression, mood disorders, post-traumatic stress disorder, traumatic brain injury, attention-deficit/hyperactivity disorder and addiction.

“Not only does the treatment work, but it lasts even when the patient goes back to a stressful or toxic environment,” Schauss said. “It helps the brain become more resilient.”

“That makes sense to me,” Williams said.

“So how does it work?” asked Nichols.

“Why don’t we show you,” Schauss said.

The two state officials followed Schauss to a room that has been turned into a neurofeedback training center. Williams sat at one station, Nichols at the other. Schauss placed a blue nylon cap over Williams’s scalp and injected a pasty conductive gel into tiny holes in the cap’s 19 sensors.

“This might explain a lot of things to the people in Nashville,” Williams joked as the software began mapping her brain waves.

Next, Schauss prepared Nichols for a less-involved form of neurofeedback training called SMR, or sensorimotor rhythm. As SMR increases, the body feels more relaxed.

“I’m going to leave here a better person, but Marie’s going to leave here with gunk in her hair,” Nichols joked as Schauss placed a few sensors along the top of her capless head.

They both left with a bit of gel in their hair. They also left impressed.

“This could really revolutionize what we do and what we fund,” Williams said.

“Can you imagine the possibilities?” Nichols said.

“Yes, we can,” Schauss replied.



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