

Pennsylvania State University

Annual Progress Report: 2007 Nonformula Grant

Reporting Period:

July 1, 2010 – June 30, 2011

Nonformula Grant Overview

The Pennsylvania State University received \$3,912,217 in nonformula funds for the grant award period June 1, 2008 through May 31, 2012. Accomplishments for the reporting period are described below.

Research Project: Project Title and Purpose

PATHS to Success. The PATHS to Success program has two overarching goals. The first goal is to understand the physiological and neural markers that differentiate young children who do and do not show early violent/physically aggressive behavior. This will be done using multiple measures including examination of the constructs of reactivity and regulation in both the sympathetic and para-sympathetic nervous system, assessing brain organization and reaction (using EEG/ERP), and by using neuropsychological tests to assess specific areas of brain function (executive functioning and the executive attention system). The second goal is to develop, implement, and evaluate a multi-domain intervention model that will include home visiting and target parenting and parent-child relations, and include a school-based intervention that focuses on the child's social and self-regulatory skills related to emotion regulation and cognition.

Anticipated Duration of Project

6/1/2008–5/31/2012

Project Overview

The project has four aims. The *first aim* is to understand factors related to early violent and aggressive behavior. By identifying children screened for high aggression and comparing them to a low-aggression sample, the study examines differences at multiple levels (behavioral, family processes, stress exposure and environment), focusing specifically on neurobiological factors that characterize young children with high vs. low rates of violent/aggressive behavior. The *second aim* is to implement and evaluate a multi-domain intervention designed to prevent severe and chronic violence/aggression in a sample of children at high-risk upon first entering school. The intervention is guided by a developmental theory positing the interaction of multiple influences on antisocial behavioral development. Five areas of development and functioning are targeted: parenting and healthy socialization in the home; peer relations; child coping and problem-solving skills; classroom atmosphere and curriculum; and home-school relations. The

third aim is to understand factors in successful preventive interventions with these high-risk children. Within the intervention group, individual differences in outcomes are predicted from pretreatment factors at the family level (e.g., demographics and family stressors) and at the child level (gender, baseline problem behaviors, measurement of how neurobiological factors moderate intervention effects, e.g., heart rate, neuro-cognitive/executive functions). The *fourth aim* is to understand how the intervention's short-term effects may mediate its longer-term effects. We examine changes in hypothesized mediators at both the behavioral (attention, behavior, peer relations, parenting practices, family-school relations) and neurobiological levels (heart rate, EEG markers, neuro-cognitive/executive functions).

Principal Investigator

Mark Greenberg, PhD
Professor and Director
Prevention Research Center for the Promotion of Human Development
The Pennsylvania State University
S110 Henderson Building
University Park, PA 16802
(814) 863-0112

Other Participating Researchers

Karen Bierman, PhD; Thomas Farmer, PhD; Lisa Kopp, PhD; Emilie Smith, PhD; Robert Nix, PhD; Sandra Stewart, MS; Jennifer Glenn, MS—all employed at Penn State
Judith Nuss – employed by Harrisburg School District, Harrisburg, PA
Howard Rosen – employed by Hempfield Behavioral Health, Harrisburg, PA

Expected Outcomes and Benefits

The potential benefits to children and parents of participating in the study are substantial. All components of the intervention were selected as a result of extensive research on their potential effectiveness in promoting reduction in aggression and increases in positive behavior and learning. Children in the intervention condition can expect to experience considerable benefits as a result of their participation. Potential benefits to the children and parents in both groups include the opportunity to gain further insight into one's life and functioning as a result of the home-based interviews. The more general benefits to society include the determination of mediating factors related to behavior changes and to behavioral difficulties, and dissemination of the intervention program, if found to be successful.

Children with early aggression and violence often experience severe deficits in multiple aspects of behavior and functioning over time. The research project has carefully considered what those deficits are and has devised intervention strategies that should allow us to ameliorate them. If successful, this intervention addresses a serious public health problem facing our communities and schools. The knowledge to be gained from this project is important for several reasons. First, knowledge gained about the efficacy of this comprehensive intervention and its implementation will inform efforts to disseminate this intervention. Second, knowledge gained about whether the

efficacy of this intervention varies across gender will provide an important guide in the design of subsequent interventions with youth at risk for conduct problems. Third, knowledge gained about mediating and other moderating influences also will contribute to the design of subsequent interventions. Fourth, knowledge that will be gained about the trajectories of youth growing up in high-risk communities will facilitate understanding of resilience of children with “early starting” aggression and of naturally occurring interventions, which can further contribute to the design of subsequent interventions.

Summary of Research Completed

During the previous year (Year 2) we acquired Cohort 2. This year (Year 3) we continue the intervention consisting of home visits and friendship groups with Cohort 1 and 2 children and families; we continue analysis of Cohort 1 data; we began analysis of Cohort 2, pre-test; and we completed post-test (Year 2) data collection for Cohort 2.

We submitted to the Penn State Institutional Review Board a Year 4 renewal of human subjects activities and received approval in early July 2011.

Year 3 Continued Assessment of and Engagement with Cohort 1 and 2 Children

We requested and received permission to have children continue to participate in friendship groups and peer relations assessment, as in Years 1 and 2.

In Year 3 (2010–2011 school year), numbers for Cohorts 1 and 2 were as follows:

Cohort 1—88 boys, 79 girls; total = 167 (high-risk = 95; low-risk = 72)

Cohort 2—127 boys*; 40 girls; total = 167 (high-risk = 107; low-risk = 60)

Total Participants: 334/215 boys, 119 girls; 202 high-risk, 132 low-risk

*Disproportionate number of boys in Cohort 2 was intended to balance the low-risk sample overall and render it more similar in gender composition to the high-risk sample.

Intervention staff continue to work with Cohort 1 and 2 children.

Year 3—Continued Intervention and Post-test with Cohort 2

We successfully completed intervention activities with Cohort 2 in December 2010. During the spring of 2011, they received their post-test assessments. These assessments included: (1) a home visit assessment involving their mother/caregiver; (2) teacher reports of student behavior; (3) sociometric interviews to assess student friendships; and (4) neurobiological assessments. We have also initiated contacts with families in Cohorts 1 and 2 who have left the school district and remained in the Harrisburg area, in order to continue their involvement in the home and lab visits.

Year 3 Neurobiological Assessment of Children

All procedures for the neurobiology assessment are being carried out with Years 1–2 children as described in earlier annual reports. During this year, we successfully completed post-test assessments on Cohort 2.

During Year 3 we continued the processing and analysis of the neurobiological data collected in

Years 1 and 2. Scoring has been completed for the Year 1 assessments and is nearly complete for the Year 2 assessments. EEG data are currently being scored by Dr. Michelle Jetha, under the supervision and direction of Dr. Sid Segalowitz, a primary consultant. We believe that the Year 3 EEG and autonomic data will be scored more efficiently and quickly given what we learned in Years 1 and 2.

DNA and Agency Records Review

We requested and received a renewal of Penn State IRB approval to collect DNA from children participating in the PATHS to Success project. We have included this facet in the study because prior research has shown that genes, families, neighborhoods, and schools are all related to children's success. We wish to understand better how this works and are particularly interested in gene X environment interactions and how the PATHS to Success intervention (and environmental change) may interact with genes related to behavioral risk. Parents have been asked for their consent to engage in this collection—their decision not to allow DNA collection has not affected continued participation in this project and all information is confidential.

We sought and received a renewal of permission to obtain information from the Dauphin County Department of Human Services on participating parent's and child's involvement with that agency in order to examine whether there are differences between the intervention and control samples at post-test on the receipt of mental or social services. We also have been examining any differences in referrals to Children and Youth for suspected maltreatment. After receiving permission from participating parents, we have asked the Dauphin County Department of Human Services to tell us whether the child is receiving mental health services through their department and if so, for how many hours per week. We also have asked if this child has been referred for suspected maltreatment between the dates of pre-test (entry to the study) and third grade.

Other Activities

As noted in our last report, we have reached the targeted goal of participants for the study (both in the high-risk and low-risk groups). No new subjects have been recruited for this study. We are now longitudinally following all subjects who have been recruited.

Articles for publication on the pre-test findings are under development. Paper presentations on the neurobiological assessments listed below are currently in the manuscript preparation stage.

1. Jetha, M., Segalowitz, S., & Gatzke-Kopp, L. (2009, October). Frontal EEG asymmetry in highly aggressive 5–6 year old girls. Poster presented at the Society for Psychophysiological Research, Berlin, Germany. *Psychophysiology*, 46, s105.
2. Gatzke-Kopp, L., Ram, N., Fortunato, C., Wadlinger, H., & Beeney, J. (2010). The phenotype problem in externalizing behavior disorders. Paper presented at the Association for Psychological Science annual research conference, Boston, MA.
3. Jetha, M. K., Segalowitz, S. J., Gatzke-Kopp, L., & Ly, D. (2010). The nogo-N2 effect predicts externalizing behavior in 5–6 year old children at risk for reduced inhibitory control. Paper presented at the Society for Psychophysiological Research, Portland, OR. *Psychophysiology*.

4. Fortunato, C. K., Gatzke-Kopp, L. M., Ram, N., Wadlinger, H., & Beeney, J. (2010). Relationships among neurobiology, parenting, and children's psychopathology: Implications for early childhood intervention. Paper presented at the 24th Annual Meeting of the Society for Research in Psychopathology, Seattle, WA.
5. Fortunato, C. K., DuPuis, D., Gatzke-Kopp, L. M., & Wadlinger, H. A. (2011). Stability in cardiac and electrodermal activity in normal and aggressive kindergartners: Implications for child adjustment. Poster presented at the Biennial Society of Research in Child Development. Montreal, CA.
6. Willner, C. J., & Gatzke-Kopp, L. M. (2011). Quantifying individual differences in skin conductance reactivity: Unique associations with children's social behavior. Poster session presented at the 51st annual meeting of the Society for Psychophysiological Research, Boston, MA.
7. DuPuis, D., Gatzke-Kopp, L. M., & Molenaar, P. C. M. (2011). Temporal stability of the error related negativity signal as a marker of developmental immaturity. Poster presented at the 51st annual meeting of the Society for Psychophysiological Research. Boston, MA.

Post-test data on Cohorts 1 and 2 are now being scored and we will engage in our next intervention-outcome analyses for this cohort in the fall.