

Application for funding to the College Academy for Research, Scholarship, and Creative Activity (CARSCA), February 25, 2013

**Project Title:**

Social, Cognitive and Physiological Predictors of Aggressive Behavior in Adolescence

**Applicants:**

Andrea Glenn, Ph.D., Assistant Professor, Department of Psychology, Center for the Prevention of Youth Behavior Problems

Kristina McDonald, Ph.D., Assistant Professor, Department of Psychology

**Arts and Sciences Division:** Social Sciences

**Abstract:**

Peer provocation has been targeted as a particularly difficult social problem for adolescents to negotiate. There are individual differences in the tendency to escalate conflict and aggress against provocation, rather than avoid confrontation and resolve the problem. Recent data collected in the McDonald lab suggests that some youth report feeling angry and upset when provoked, but are able to resist reacting aggressively whereas others are not. The project will test the hypothesis that individual physiological reactivity interacts with social cognitive processes and regulatory abilities to predict aggressive behavior. Adolescents recruited from the local community and from a previously-identified sample of aggressive youth will serve as participants for this study. We will first pilot two different "social threat" paradigms that have proved useful in measuring physiological reactivity. During the second phase, adolescents will participate in the social threat paradigm, and they and their parents will complete a battery of measures designed to assess social and cognitive functioning. This study will help us to better understand why some youth are able to more easily utilize more prosocial techniques to resolve conflict. The combination of physiological, social, and cognitive predictors makes this study unique. These data are expected to produce publishable findings and produce pilot data for an NSF grant application. UA graduate and undergraduate students will be highly involved in the project. The current study can contribute to our knowledge about individual differences in aggressive behavior as well as the development of intervention programs designed to help aggressive youth.

Signatures:



Andrea Glenn



Kristina McDonald



Beverly Thom (Chair, Psychology)

## **A. Project Aims:**

Aggressive behavior and bullying are prevalent problems that children encounter in their everyday lives at school. The 2011 Youth Risk Behavior Surveillance System (Eaton et al., 2012) reports that 32.8% of high school students reported being in a physical fight in the last month. Research has focused on identifying the social-cognitive processes that underlie aggressive behavior (e.g., McDonald & Lochman, 2012). However, effects are typically small, and it is likely that other processes such as physiological reactivity are at play.

The hypothalamic pituitary adrenal (HPA) axis is a system involved in producing the body's response to stress, including psychosocial stressors, in part by releasing the hormone cortisol. Individual differences in cortisol release in response to a stressor have been linked to aggressive behavior (Stadler et al., 2011) and the tendency to approach or avoid (van Peer et al., 2007). Some evidence suggests that cortisol may have an effect on affective, social, and cognitive processes. For example, Putnam et al. (2007) found that oral administration of cortisol reduced an attentional bias toward fearful facial expressions, and increased attentional bias toward angry expressions, essentially increasing hostile, approach-related motivations.

The amount of cortisol that is released in response to a stressor such as a social threat may influence whether an adolescent responds in an aggressive or more prosocial way. We hypothesize that cortisol reactivity may interact with social cognitive processes to predict aggressive behavior. Preliminary data collected in the McDonald lab suggests that some youth report feeling upset and angry in response to provocation, but are able to resist reacting aggressively. One hypothesis is that their cortisol (i.e., stress) levels may return to baseline more quickly than those of youth who tend to react aggressively. Another hypothesis is that social cognitive processes such as social problem solving, outcome expectations, and perceived

competence may help some youth to avoid reacting aggressively despite strong physiological responses. The present study is a supplement to an RGC grant that is currently under review, which would fund the majority of the data collection, including participant payment and collection of heart rate and skin conductance during the social threat. The CARSCA funding would allow us to expand the study to include measurement of participants' cortisol responses.

The proposed research will be conducted in two phases. The goal of the first phase will be to pilot test two laboratory paradigms to ensure that they elicit a significant cortisol response in youth. A small sample ( $n = 20$ ) of adolescents will be recruited from the community. We will test two different "social threat" paradigms: 1) "Cyberball," a computerized ball-throwing game in which participants are told that they are playing an online game with other players and are then excluded (Williams et al., 2000); and 2) a social threat from an unseen "peer" modeled after Williams et al. (2003). During these paradigms heart rate and skin conductance will be collected. Additionally, with CARSCA funding, participant saliva samples will be acquired at six different time-points to examine fluctuations in cortisol levels (cortisol peaks in saliva approximately 20 minutes post-stressor and then slowly returns to baseline). Previous studies have found that laboratory manipulations of social rejection are effective in eliciting cortisol responses.

In the second phase, young adolescents (ages 11-14) will be recruited from the community ( $n = 25$ ) and from a previously-identified sample of aggressive youth ( $n = 25$ ), thus ensuring sufficient variability in aggressive behavior. Participants and their parents will complete measures of their child's social functioning (including measures of aggressive behavior), effortful control, and social cognitive measures (including measures of social attributions and social motivations). In addition to other markers of reactivity, with CARSCA funding we would also gather saliva samples during the social threat (as described above).

A graduate research assistant (GRA), as well as several undergraduate RAs, will be trained to administer the social threat paradigm and collect saliva samples. The GRA will also be trained to assay the saliva samples for cortisol levels in the Glenn lab.

**B. Use of Funds:** CARSCA funds will be used to purchase the chemicals necessary to assay the saliva samples for hormone levels (equipment is already available in the applicants' lab), and to provide funding for students to collect data and assay the saliva samples. These students will also be offered the opportunity to participate in data analysis and to be included in publications.

**C. Future funding:** Data from this study is expected to produce a publication, as well as serve as pilot data for a grant to the National Science Foundation (NSF). The pilot data will be especially useful in demonstrating the feasibility of the social threat paradigm in eliciting physiological responses, and in our ability to recruit participants. The purpose of the NSF grant will be to provide funding to conduct research on the social, cognitive, and physiological processes that predict aggressive behavior in a larger sample of antisocial adolescents. Both applicants are currently participating in Dave Bauer's Grant Writing Seminar.

**D. Enhancement:** Funding from CARSCA will allow us to include cortisol measurements in the study, thus providing a more objective measure of responsivity to social provocation. The grant will also foster collaboration by combining the PIs areas of interest (Glenn: biological bases of aggression; McDonald: social cognitive bases of aggression). In addition, the funding will allow us to train a student in biological data collection and analysis, and in manuscript writing.

**E. Metric:** The success of the project will be measured in three ways, by: (1) the completion of data collection for Phase 1 of the study by the end of summer 2013, and Phase 2 of the study by the end of summer 2014, (2) the completion of data analysis and publication submissions by December 2014, and (3) the submission of a grant proposal by April 2015.

## Budget

### Student Involvement:

One part-time summer GRA \$2,500

*This GRA would lead the undergraduate RAs in data collection, and would be trained to assay saliva samples, and would participate in the publication process. (Salary requested = \$2307.50 + \$192.50 = \$2,500)*

### Physiological Measures:

Cortisol Assay Kits \$1,600

*Phase 1: \$5.00 per sample x 20 participants x 6 samples per participant = \$600*

*Phase 2: \$5.00 per sample x 50 participants x 4 samples per participant = \$1000*

TOTAL COST \$4,100

### **Timeline:**

Phase 1	April 2013	Finalize protocols for pilot testing laboratory paradigms IRB submission Train undergraduate research assistants
	May 2013	Begin recruitment for pilot testing laboratory paradigms Start pilot testing laboratory paradigms
	June 2013	Pilot test laboratory paradigms
	July 2013	Pilot test laboratory paradigms Data entry Assay saliva samples from pilot testing for cortisol levels
	August 2013	Analyze results of pilot testing
Phase 2	September 2013	Finalize protocols
	October 2013	IRB submission for study Train undergraduate research assistants
	November 2013	Begin recruitment
	December 2013- August 2014	Recruitment Collect data (50 families)
	September 2014- November 2014	Assay saliva samples for cortisol levels Data entry
	December 2014-January 2015	Data analysis
	February 2015- April 2015	Finalize grant proposal

## References

- Eaton, D.K. et al. (2012, June 8). Youth risk behavior surveillance- United States, 2011. *Morbidity and Mortality Weekly Report*. Atlanta, GA: Centers for Disease Control and Prevention.
- McDonald, K.L., & Lochman, J.E. (2012). Predictors and outcomes associated with trajectories of revenge goals from fourth grade through seventh grade. *Journal of Abnormal Child Psychology*, 40, 225-236.
- Putnam, P., Hermans, E.J., van Honk, J. (2007). Exogenous cortisol shifts a motivated bias from fear to anger in spatial working memory for facial expressions. *Psychoneuroendocrinology*, 32, 14-21.
- Stadler, C., Kroeger, A., Weyers, P., Grasmann, D., Horschinek, M., Freitag, C., Clement, H.W. (2011). Cortisol reactivity in boys with attention-deficit/hyperactivity disorder and disruptive behavior problems: The impact of callous unemotional traits. *Psychiatry Research*, 187, 204-209.
- van Peer, J. M., et al. (2007). The effects of cortisol administration on approach-avoidance behavior: An event-related potential study. *Biol Psychol* 76(3), 135-146.
- Williams, K.D., Cheung, C.K.T., & Choi, W. (2000). CyberOstracism: Effects of being ignored over the internet. *Journal of Personality and Social Psychology*, 79, 748-762.
- Williams, S.C., Lochman, J.E., Phillips, N.C., & Barry, T. D. (2003). Aggressive and non-aggressive boys' physiological and cognitive processes in response to peer provocations. *Journal of Child and Adolescent Psychology*, 32, 568-576.

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### **PUBLICATIONS (RELEVANT)**

1. **Glenn, A.L.**, Raine, A., Schug, R.A., Gao, Y., Granger, D.A. (2011). Increased testosterone-cortisol ratio in psychopathy. *Journal of Abnormal Psychology*, *120*, 389-399. (Impact factor: 5.235)
2. **Glenn, A. L.** & Raine, A. (in press). "Psychopathy: A Guide to Biological Findings and Their Implications." New York: NYU Press.
3. **Glenn, A.L.** (2011). The other allele: Exploring the long allele of the serotonin transporter gene as a potential risk factor for psychopathy: A review of the parallels in findings.
4. **Glenn, A.L.**, Raine, A., Yaralain, P., Yang, Y. (2010). Increased volume of the striatum in psychopathic individuals from the community. *Biological Psychiatry*, *67*, 52-58. (Impact factor: 8.674)
5. **Glenn, A.L.**, Raine, A., Venables, P. & Mednick, S.A. (2007). Early temperamental and psychophysiological precursors of adult psychopathic personality. *Journal of Abnormal Psychology*, *116*(3), 508-518. (Impact factor: 5.235)

### **PUBLICATIONS (OTHER)**

6. **Glenn, A.L.** & Yang, Y. (2012). The potential role of the striatum in antisocial behavior and psychopathy. *Biological Psychiatry*, *72*, 817-822. (Impact factor: 8.674).
7. **Glenn, A.L.**, Yang, Y., Raine, A., Colletti, P. (2010). No volumetric difference in the anterior cingulate in psychopathic individuals. *Psychiatry Research: Neuroimaging*, *183*, 140-143.
8. **Glenn, A.L.**, Koleva, S., Iyer, R., Graham, J., Ditto, P.H. (2010). Moral identity in psychopathy. *Judgment and Decision Making*, *7*, 497-505. (Impact factor: 1.632)
9. **Glenn, A.L.**, Iyer, R., Graham, J. & Haidt, J. (2009). Are all types of morality compromised in psychopathy? *Journal of Personality Disorders*, *23*, 384-398. (Impact factor: 1.968)
10. **Glenn, A.L.** & Raine, A. (2009). Psychopathy and instrumental aggression: Evolutionary, neurobiological, and legal perspectives. *International Journal of Law and Psychiatry*, *32*, 253-258. (Impact factor: 1.215)

## **PRIOR EXTERNAL FUNDING**

F31 MH086288 Ruth L. Kirschstein National Research Service Award (NRSA), National Institutes of Health, "Endocrine correlates of psychopathic traits in children: a multi-system approach," 2009-2011. PI.

AXA Research Fund Postdoctoral Fellowship, "The role of brain factors in predicting treatment outcomes in a nutritional and social skills intervention on conduct disorder and hyperactivity," 2011-2012. PI.

## **SYNERGISTIC ACTIVITIES**

### Chaired Symposia

Glenn, A.L. (2012, November). *Peripheral biological correlates of antisocial behavior and psychopathic traits*. Symposium to be presented at the American Society of Criminology annual conference, Chicago, IL. *Speakers: Yu Gao, Jill Portnoy, Olivia Choy, Anna Rudo-Hutt.*

### Invited Talks

Testosterone Moderates the Relationship between Cortisol Reactivity and Psychopathy, American Society of Criminology annual conference, Philadelphia, PA, November, 2009.

Biological Research on Antisocial Behavior and Its Implications for the Law. American Society of Criminology annual conference, Chicago, IL, November, 2012.

The Anatomy and Physiology of Clinical Research. Institute of Mental Health Research Bento, Singapore, April, 2011.

### Conference Presentations

Glenn, A.L., Raine, A., Mednick, S.A., & Venables, P. (2007, April). Early temperamental and psychophysiological precursors of adult psychopathic personality. Poster presented at the Society for the Scientific Study of Psychopathy Conference, St. Petersburg, FL.

### Teaching

Abnormal Psychology

### Other

Ad hoc reviewer for:

*Archives of General Psychiatry, Biological Psychiatry, Biological Psychology, Journal of Abnormal Child Psychology, Journal of Abnormal Psychology, Journal of the American Academy of Child and Adolescent Psychiatry, Journal of Clinical Child and Adolescent Psychology, Neuropsychologia, Neuroscience & Biobehavioral Reviews, Neuroscience Letters, PLoS ONE, Psychiatric Research, Psychiatry Research: Neuroimaging, Psychological Bulletin, Psychology of Addictive Behaviors, Social Neuroscience, Social Cognitive and Affective Neuroscience*

## **Kristina L. McDonald**

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### **Position**

August 2012 – Present

Assistant Professor, Department of Psychology, University of Alabama

### **Relevant Publications**

**McDonald, K.L.**, & Asher, S.R. (in press). College students' revenge goals across friend, romantic partner, and roommate contexts: The role of interpretations and emotions. *Social Development*.

**McDonald, K.L.**, Baden, R.E., & Lochman, J.E. (2013). Parenting influences on the social goals of aggressive children. *Applied Developmental Science*, 17, 29-38.

Wang, J., **McDonald, K.L.**, Rubin, K.H., & Laursen, B. (2012). Peer rejection as a social antecedent to rejection sensitivity in youth: The role of relational valuation. *Personality and Individual Differences*, 53, 939-942.

**McDonald, K.L.**, & Lochman, J.E. (2012). Predictors and outcomes associated with trajectories of revenge goals from fourth grade through seventh grade. *Journal of Abnormal Child Psychology*, 40, 225-236.

**McDonald, K.L.**, Wang, J., Menzer, M.M., Rubin, K.H., & Booth-LaForce, C. (2011). Prosocial behavior moderates the effects of aggression on young adolescents' friendships. *International Journal of Developmental Science*, 5, 127-137.

### **Other Publications of Interest**

**McDonald, K.L.**, Dashiell-Aje, E. N., Menzer, M.M., Rubin, K. H., Oh, W., & Bowker, J.C. (in press). Contributions of racial and socio-behavioral homophily to friendship stability and quality among same-race and cross-race friends. *The Journal of Early Adolescence*.

Rubin, K.H., Bowker, J.C., **McDonald, K.L.**, & Menzer, M. (2013). Peer relationships. In P. Zelazo (Ed.), *Oxford handbook of developmental psychology, Vol 2*. Oxford, UK: Elsevier.

**McDonald, K.L.**, Bowker, J.C., Rubin, K.H., Laursen, B., & Duchene, M.S. (2010). Interactions between rejection sensitivity and supportive relationships in the prediction of adolescents' internalizing difficulties. *Journal of Youth and Adolescence*, 39, 53-574.

**McDonald, K.L.**, Putallaz, M., Grimes, C.L., Kupersmidt, J.B., & Coie, J.D. (2007). Girl talk: Gossip, friendship, and sociometric status. *Merrill-Palmer Quarterly*, 53, 381-411.

Asher, S.R., & **McDonald, K.L.** (2009). The behavioral basis of acceptance, rejection, and perceived popularity. In K.H. Rubin, W. Bukowski, & B. Laursen (Eds.), *The handbook of peer interactions, relationships, and groups*, (pp. 232-248). New York: Guilford.

### **Prior External Funding**

2010 The Jacobs Foundation, “*Understanding how values contribute to productive and unproductive youth development in five cultural groups: An examination of the associations between values, behavior, and peer acceptance in Israel and the United States*,” Principal Investigator (with Dr. Maya Benish-Weisman), Funded, \$51,971, January 2011-December 2011.

2007-2008 The Kenan Dissertation Fellowship in Ethics, The Kenan Institute for Ethics at Duke University.

2007-2008 Predoctoral Fellow at the Center for Developmental Science, University of North Carolina at Chapel Hill, Funded by NICHD.

### **Other Relevant Activities**

**McDonald, K.L.**, & Asher, S.R. (2011, March). Forsaking revenge in the face of peer provocation: The role of children's goals and beliefs. In M.A. Dirks & K.L. McDonald (Co-chairs), *Children's social-cognitive reactions in emotionally charged situations: Lessons for externalizing and internalizing problems*. Symposium conducted at the biennial meeting of the Society for Research in Child Development, Montreal, Canada.

**McDonald, K.L.**, Wang, J., Rubin, K.H., Rose-Krasnor, L., & Booth-LaForce, C. (2009, April). Friendships of aggressive youth before and after the transitions to middle school. In K.H. Rubin & K.L. McDonald (Co-chairs), *The friendships of aggressive youth: Characteristics and potential influences*. Symposium conducted at the biennial meeting of the Society for Research in Child Development, Denver, CO.

**McDonald, K.L.**, & Asher, S.R. (2009, April). *Interpretations and beliefs associated with revenge goals in conflict and provocation situations*. Poster presented at the biennial meeting of the Society for Research in Child Development, Denver, CO.

**McDonald, K.L.**, & Asher, S.R. (2007, May). Vengeful reactions to minor conflicts of interest with friends, roommates, and romantic partners. In S.R. Asher (Chair), *Overreacting to interpersonal events: Why people make mountains out of molehills*. Symposium conducted at the annual meeting of the Association of Psychological Science, Washington, DC.