

News from the Gunnar Laboratory

Summer, 2002

Greetings from Professor Gunnar

During the last year or two, you and your child(ren) helped us with one (or more) of the studies described in this newsletter. This letter is a way of thanking you and keeping you abreast of our results. Our research group studies the social regulation of stress hormones during childhood. When a child experiences challenge or stress it can result in increases of adrenaline and cortisol, both stress hormones. These changes help the body and mind manage challenge. We measure adrenaline indirectly by taking measures of heart rate apart to find the portion affected by adrenaline. We measure cortisol in saliva because a small amount of this blood-borne hormone seeps into our saliva.



Peer Relations Project: During the preschool years, children get very interested in other children. They begin to develop friendships and being liked becomes important. Previous work in the lab has shown that children who are not well-liked by other children in their preschool class have higher stress hormone levels when they are at school. The Peer Relations Project is designed to help us and preschool teachers understand how “not being liked” translates into stress for preschool children. Hopefully, once we understand more, we will know how best to intervene.

Although it might seem obvious why not being liked is stressful, it actually isn't that clear. Our measure of being liked comes from sociometric interviews with the children. During these interviews each child identifies three children with whom they especially like to play and three with whom they don't like to play. A child's score is determined by the number of times children choose them as a preferred playmate minus the number of times they were chosen as a non-preferred

playmate. Now, if you ask most preschoolers whether other kids like them, the answer is usually “yes.” Preschoolers often aren't very good at seeing themselves as other people see them. So, it seems unlikely that they are being “stressed” because they know that others don't like them.

Of course, other children may tell them they don't like them and frequently push them away. These children might also have friendships that are full of conflict and tension. We can learn about their social interactions by observing what happens in the classroom and on the playground. Another possibility, though, is that children who aren't liked may end up at the bottom of the heap or back of the line whenever there are good things happening. That is, their behavior may be low in dominance. Indeed, research shows that in monkey troupes this is what happens; the low dominant animal is the one with the high stress hormone levels. Unfortunately, there wasn't an established method for measuring dominance that we thought would work with the preschool classrooms. This is what we spent the past school year developing: a way of measuring dominance.

The teachers and children in the Shirley G. Moore Laboratory School helped us. The idea was to see how children sorted themselves if they had to line up to receive tickets to a fun activity. Who would get the first tickets, and who would get the last ones? Children were invited to attend fun events including a carnival, a birthday party, and a scavenger hunt. “Mo” the monkey was the mascot for these events. So if you heard about “Mo”, you heard about these events. After being read a story introducing the idea that the first children in line would go to the event the first day whereas the middle and end of the line would have to wait a day or two, the children formed a line to receive the tickets. There were 3 events spread out over a few months of the preschool year.

The children, of course, then got to go to the events, which were a lot of fun for everyone! They also learned how to line up, a skill they will need in kindergarten. And, we got our measure of dominance. What did we find? Children who were

first in line one time tended to be first the 2nd and 3rd time as well. We had a measure that didn't vary. As expected, being liked was a factor in where you ended up in line. Children who were well liked got near the front of the line. This was partly explained by age, however. Older children tended to be more preferred playmates in multi-age classrooms, and they were also more likely to get in the front of the line. Is dominance related to stress hormone levels? We will find out this year as we begin the full-scale study. This project will continue through the spring of 2005. For more information, please see our website at <http://www.education.umn.edu/icd/PRP/> or contact Shanna Mliner at 612-626-8949.



Evening Activities and Stress Hormone Levels at Bedtime. Recently, there has been growing concern that children's lives are becoming "overscheduled." Over the past two decades, children's overall free time has dropped dramatically. Children are spending more time in school, child care and structured activities such as sport and art activities and less time in unstructured leisure activities such as playing in the neighborhood and participating in family conversations. These demographic changes appear to be related to changing social views that value structured activities as skill-learning opportunities for children's development and school advancement. Increasingly tight schedules along with pressure to excel in extracurricular activities, however, may be a source of stress for children and may stimulate stress-sensitive physiological systems in the body.

In this study, we were interested in determining two things: first, whether evening activities affect children's bedtime cortisol levels; and second, whether certain children may be more likely to respond physiologically to these activities than others. We recruited parents to record the evening activities of children aged 7-10 and to collect saliva samples on two evenings when children were home in the evening, and on two evenings when they had scheduled activities. Parents also reported on the children's typical behavior, sleep patterns and

emotionality. We found that children participated in many different types of structured activities in the evenings, including soccer, skiing, dance class, tutoring lessons and scouts. The number of *structured* activities per week ranged from 0 to 11, with *most* kids participating in 1 to 3 structured activities per week. We also found that evening activities didn't elevate cortisol, unless they involved sports. Playing competitive team sports in the evening, or even practicing for a game seemed to increase cortisol levels around bedtime. Other activities like lessons, scouts, or classes in the evening didn't have this effect.

We then looked at whether certain children might be more likely to have elevated cortisol levels. Boys showed higher cortisol levels on evenings including activities than on evenings spent at home; girls did not. This gender difference was not surprising, since many studies find boys' cortisol levels to be more reactive to environmental challenges, while girls' cortisol levels tend to be more stable. In addition, both boys and girls who were highly sociable (for example, children who make friends easily and do not often feel lonely) had higher cortisol levels on evenings during which they were out for structured activities than on evenings spent at home. Perhaps children who may be more socially engaged during structured activities may be "activating" physiological systems in the body to meet the challenges of that activity.

While children's cortisol levels were higher on evenings with structured activities than on evenings at home, *on average*, these differences were quite small and likely pose no risk for the child. Of course, each child's physiological responses are different. When deciding how many and what kind of activities to enroll children into, parents need to be sensitive to their children's personality and interests.



Retest Study: This study was conducted to see if the presence and strength of preschool children's stress reactions are the same from one time to the next, and whether their reactions to risk or challenge are also stable and related to their stress reactivity. In this study we had two measures of reaction to risk. First, we observed how children reacted to a room full of "risky" challenges like hopping off stairs onto a mattress, walking a balance beam, approaching a scary gorilla mask. Second, we examined increases in children's startle response during a scary video (e.g., the dinosaur chase in *Land Before Time*) compared to their startle reactions during one neutral and one pleasant video. To examine stress we measured heart rate and cortisol levels. Two months later we brought the children back and did the same things. We are still analyzing the results, but we have some preliminary findings to share with you.

First, reactions to the "risk room" were stable from one time to the next. Although all the children took more risks when they came back the second time, those who were more cautious the first time were more cautious the second time. Likewise, the ones who were bolder the first time were bolder the second time.

Second, children did show increases in startle reactions during the scary video. This is viewed as a measure of "fear potentiated" startle, even though the children weren't really scared for themselves, but for the baby dinosaurs who were being chased in the video clip. We are still analyzing the data to see if the ones who startled more the first time were the ones who startled more the second time.

Third, we found that children's heart rates and cortisol levels were quite stable from one time to the next. And, we found some evidence that heart rates predicted how much startle reactions increased to the scary video.

These findings tell us that our behavioral and physiological measures weren't just getting at how the children reacted that day. Instead, they are telling us something about how these children typically react. That is important for the studies we are planning using these procedures.

Finally, we also found some things that we didn't expect and don't understand. Although coming to

the laboratory can be seen as a bit challenging or stressful, children's stress hormone levels fell rather than rose when they came in for testing. This isn't what happens for adults or older children. We don't know why this happened, but we have seen effects like this before with infants and young children. It may mean that coming in for testing is interesting for young children, they feel safe overall because their parents are with them, and thus stress hormone levels fall rather than rise. Whether this is the right explanation or not, it means that when young children show a rise in stress hormones in the lab, they usually don't produce levels that are really elevated compared to their typical levels. This may have some protective effects for children. The Family Child Care Research Project will act as the follow-up to this study. You can read more about this project below.



The Family Child Care Research Project: For the majority of young children in the United States, childcare is where much of early development takes place. Child care is the setting in which most children first learn to interact with other children on a regular basis, establish relationships with adults other than their parents, and learn skills such as sharing, waiting, and working together. Not surprisingly, many of these experiences can be challenging for some children.

Through a grant provided by the National Institute of Health, the Family Child Care Research Project (FCP) will investigate how children with different temperaments and emotional needs adapt to the challenges of child care. Having previously investigated this question for children in center-based childcare, we now hope to expand our knowledge to children in family-based childcare settings.

The Family Child Care Research Project will begin in September of 2002 and continue through September of 2005. Children who enroll in the FCP will be

observed at their child care setting on 2 separate occasions as well as visit our study site at the University of Minnesota with their parent(s) 2 times. Both parents and child care providers will be compensated \$100 for their participation in this research project. If you are interested in having your child participate in the FCP or would like more information about the project, please contact Erin Ahern at (612) 624-0321 or visit our website at <http://www.education.umn.edu/icd/FCP>.



International Adoption Survey: As part of our efforts to understand the development of children adopted internationally, we were funded by the National Institutes of Health to conduct the first major survey of the health and well-being of internationally adopted children in the U.S. Over 2500 parents who adopted in Minnesota between 1990 and 1998 returned the survey (approximately 62% return rate). The survey covered pre-adoption experiences, the families' experience of the adoption process, the children's health at adoption and currently, behavioral development and behavior problems, children's experiences at school, and issues of racism that some of these children and families must learn to negotiate. In addition to our research group, the survey reflects the work of the International Adoption Clinic, the Family Social Science Department, and the School of Public Health.

Some conclusions from this study include:

1) Both the number of pre-adoption risk factors (such as malnutrition, social neglect, and physical neglect) and the age when children reach their adoptive families are related to how well children are doing. 2) International adoption is a powerful intervention in the lives of children. Nonetheless, it doesn't eliminate the burden that many children carry because of what they experienced before they reached their families. 3) Reducing pre-adoption risk, in part by getting children to their families as

early as possible, should be a priority for improving outcomes for these children 4) Risk factors vary with country and area of the world, but they do not remain stable over time. As policies change, particularly those that increase the typical age at placement, we can expect that pre-adoption risks factors will increase.

Over the summer we will be presenting the results from this survey to parents' groups and adoption professionals. If you would like to join us for one of these presentations or join our registry of families created through international adoption please see our website: <http://icd.coled.umn.edu/IAP> or call us at 612-624-9322.



Daytime Cortisol Rhythm in International Adopted Children:

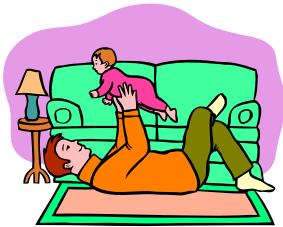
A subset of families who completed our survey or registry card are participating in a study of cortisol levels at wakeup and bedtime.

For this study we were interested in looking at the daily cycle of cortisol in children who come to their families through international adoption. Cortisol is produced every day on a daily, or circadian, rhythm. Its highest levels are around the time we wake up, and its lowest levels are around the time we go to sleep at night. There is some evidence from work on other mammals that early experiences set the tone for this stress hormone system. When early experiences have been challenging or stressful, the system is "toned up" to produce higher levels of the hormone and to react more strongly to new challenges. We do not know whether this is true for human children. If it is true, we do not know whether this "toning up" relates to how children grow and develop, and this is what we are trying to find out.

Some internationally adopted children lived under challenging conditions before they were adopted, where as others lived under less challenging

conditions or were adopted very young and thus spent less time without the care of a loving family. By sampling cortisol in small amounts of saliva over several days, we hope to learn whether early experiences influence these everyday levels and whether the levels children have early in the morning and late in the evening are associated with their current emotional reactions and behavior.

Over the coming months, we plan to complete the collection phase and begin analyzing the cortisol and surveys. We hope to have our findings available to families by early 2003. If you would like more information about this study please contact Darlene Kertes at kert0006@tc.umn.edu or IAP at 612-624-9322.



Joint Attention Skills in Internationally Adopted Children: Early in life, the human infant is dependent on adults in order to regulate stimulation. It has been suggested that appropriate social stimulation may play a critical role in the development of communication skills. Joint attention behaviors refer to a child's skill in using nonverbal behaviors to share an experience with others. Internationally adopted children may experience a conglomerate of adverse experiences prior to adoption including social deprivation. This study looked at a group of 78 internationally adopted children 8 to 25 months of age that came to the University's Internationally Adoption Clinic. Within 3 months of adoption, children's communication skills were assessed. Six months after adoption, children and their parents were invited for the second visit. Sixty-two families came for the second assessment.

Our preliminary analyses suggest that children who arrive in their families after they are 14 months of age are delayed in the development of these preverbal skills and that their scores predict how much English they have learned by 6 months after

adoption. We are still analyzing whether these preverbal joint attention skills are related to cognitive development and emotional behavior. The joint attention tasks are easy to administer and are fun for children. Thus, their use might be a technique that health professionals could use with adopted children when they first arrive to identify those who may need extra help learning to communicate with their families. In our next newsletter we will be able share more of the results from this study with you.

If you would like more information about this study please contact Maria Kroupina at 612-624-6609 or kroup003@tc.umn.edu .

Thanks from All of Us: It takes many staff and graduate students to conduct all these studies. For the students the work comprises their masters and doctoral thesis research. It also takes the help of research assistants and undergraduate students (too numerous to name). They all would like to thank you and your children, without whom we could not even begin. Thanks from: Jackie Bruce, Maria Kroupina, Darlene Kertes, Carol Cheatham, Bonny Donzella, Nikki Madsen, Meg Bale, Nicole Talge, Erin Ahern, Shanna Mliner, Meaghan Gustafson, and Holly Eibs. And, my special thanks to you as well.

-Professor Megan Gunnar

If you would like to contact us, please write to: The Gunnar Lab, 51 East River Rd, Institute of Child Development, University of Minnesota. Call us at 612-624-0321 or e-mail to Gunnar@tc.umn.edu.

You may also add your name to the list of families willing to participate in research by contacting us.