Biopsychosocial Trajectories of Children with Dysregulated Fear

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Goal of Today’s Talk

- Research Questions and Conceptual overview
- Previous Literature
  - Fearful temperament risk
  - Effects of Context
- Results from 2 Longitudinal Studies
  - Dysregulated Fear and Links to Anxiety Symptoms
  - Physiological Correlates of Dysregulated Fear
  - Maternal Protection
- Future Directions
  - How to intervene
Overview of Research Question

• Substantial number of children and adolescents develop internalizing behaviors that are associated with anxiety disorders
  • -- Anxiety disorders prevalent in childhood
  • -- Social anxiety symptoms of particular interest

• Understanding the developmental process from early childhood emotionality to anxiety symptoms
  • Etiological research has focused, in part, on fearful temperament as one precursor or risk factor
  • Which fearful children become anxious?

• How? The exact mechanisms are still largely unknown
  • Complex interaction of behavioral and biological systems, both in terms of reactive and regulatory systems

• Under what conditions do fearful children develop social anxiety
  • Environmental factors including parenting and family processes
Temperament and Psychopathology

• Theoretical model suggesting temperament as critical component of the development of psychopathology and maladjustment (e.g., Rothbart et al., 1995; Nigg, 2000; Frick & Morris, 2004)

• Developmental psychopathology approach acknowledges the importance of temperament for identification of individual developmental pathways including typical and atypical cases (Rutter, 1987)
Previous Literature: Fearful temperament

• Behavioral inhibition/extreme fearful temperament shows moderate stability over time, higher stability at extremes

• Risk for Social Anxiety Disorder Symptoms
  – 17-30% of inhibited children develop clinically significant symptoms of social anxiety (Biederman et al., 2001; Schwartz et al., 1994)

  – It remains unclear, however, who is at particular risk
Reasons to examine new model

- Identification of fearful children often focuses on
  - observation in a limited set of contexts – all high threat
  - aggregation across contexts (traditional temperament measures)
  - the intensity (e.g., frequency, duration) of fear behavior and distress

- The dominant approach of focusing on intensity of behavior may increase the number of “false positives” and “false negatives”

- Heterogeneity in identification of at-risk children
  - Are we missing fearful children in need of intervention?
Alternative Approach *Using* Context

- Examination of the role of the eliciting context on fear behavior may help in prediction of risk.
  - How children regulate/modulate behavior in different contexts may be a key component of risk.

  - When fear *is* observed in multiple contexts, behavioral aggregates are often created, which may obscure meaningful individual differences.

  - Moreover, dysregulation (emotional distress outside the eliciting context) is a key defining feature of anxiety disorders in the *DSM*.

  - Previous work has suggested that examining changes or consistencies in behavior across multiple contexts may yield important information about *dysregulated* behavior (Buss et al., 2004).
Context-inappropriate freezing was associated with greater physiological reactivity

\[ r = 0.41, \ p < 0.01 \]

\[ r = -0.36, \ p < 0.01 \]
When is fear Dysregulated?

• Experience of threat/stress can be modulated by incentive properties of situation: novelty, predictability, controllability and availability of coping resources

• Ability to recognize these properties results in regulation of fear across contexts – flexibility of fear responses
  • Rigidity of response in different situations, dynamic inflexibility

• Dysregulation = *Mismatch* between incentive properties of or coping resources available in the situation AND the child’s behavioral response
  • **Context inappropriate level of fear**
Studies 1 & 2 Goals
Validation of Dysregulated Fear

• Replicate the dysregulated fear approach to identify risk by focusing on the fit, or lack of fit, between behavior and eliciting context

• Expand previous study to look at multiple contexts designed to vary in level and type of threat or novelty

• Look at behaviors and anxiety symptoms in a multi-method, longitudinal design
Two Longitudinal Cohorts 1 & 2
Dysregulated Fear and Risk for Emerging Social Anxiety Symptoms

• Study 1/Cohort 1 \((n = 111)\)
  • Unselected community sample

• Study 2/Cohort 2 \((n = 128)\)
  • Oversampled for maternal-reported high fear as toddlers
    \((\sim50\% \text{ of sample, } 66 \text{ toddlers})\)
Cohort 1 Method Overview

- Participants
  - 111 children and parents (55% boys)
- Phase 1 (24-month) Procedure
  - Observed during 7 situations designed to elicit varying amounts of withdrawal behaviors (also had 5 non-threat episodes)
  - Risk Room, Conversation with Male Stranger, Female Stranger Working, Clown, Puppet Show, Robot, and Remote Controlled Spider
- Phase 2 (Ages 3 & 4)
  - Questionnaire packets including temperament and behavior problem symptom measures
- Phase 3 (Kindergarten, ages 5-6)
  - Questionnaire packets in fall and spring to parents and teachers
  - Two lab visits
    - Fear assessment and Peer visit
  - ADIS interviews with mothers summer
Cohort 1 Research Questions

• Effects of contexts on fear behaviors
  – Can we identify children with dysregulated fear profiles?
  – How to model this pattern?

• Predicting risk for anxiety with the dysregulation of fear
  – Is dysregulated fear behavior associated with anxiety symptoms concurrently, in preschool years, and upon entry to kindergarten?

• Predicting adjustment and anxiety symptoms across kindergarten year
  – Is dysregulated fear behavior associated with more social wariness, less engagement with peers and more anxious symptoms?
Typical Pattern of Fear and Approach

Buss, 2011
Patterns of Fear Across Episodes

Buss, 2011
Statistical Approach to Identifying Dysregulated Fear

  • Create a continuous measure of dysregulated fear which will increase power (Snijders & Bosker, 1999).

– Latent profile analysis (Muthen, 2001)
  • Create extreme groups to maximize power to detect effects
### Study 1. Anxiety Symptoms
Dysregulated Fear v. Inhibition

<table>
<thead>
<tr>
<th></th>
<th>Dysregulated Fear</th>
<th>Inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 2 General Anxiety</td>
<td>-.32**</td>
<td>.34**</td>
</tr>
<tr>
<td>Age 3 General Anxiety</td>
<td>-.31**</td>
<td>.11</td>
</tr>
<tr>
<td>Age 4 Anxiety</td>
<td>-.35**</td>
<td>.30**</td>
</tr>
<tr>
<td>Kindergarten Soc With</td>
<td>-.41**</td>
<td>.38**</td>
</tr>
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</table>

#### Final Model

<table>
<thead>
<tr>
<th></th>
<th>ΔR2</th>
<th>ΔF</th>
<th>β</th>
<th>t</th>
</tr>
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<tbody>
<tr>
<td>Final Model</td>
<td>.04</td>
<td>5.90**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 2 Anxiety</td>
<td>.14</td>
<td>1.54</td>
<td>.14</td>
<td>1.54</td>
</tr>
<tr>
<td>Inhibition</td>
<td>.17</td>
<td>1.52</td>
<td>.17</td>
<td>1.52</td>
</tr>
<tr>
<td>Dys Fear</td>
<td>-.27</td>
<td>-2.43*</td>
<td>-.27</td>
<td>-2.43*</td>
</tr>
</tbody>
</table>

\[ F(3, 107) = 9.82, p < .001, R^2 = .22 \]

Buss, 2011
At age 5, parents rated children in the normative profile ($M = .50, SE = .03$) as being less Socially Withdrawn than children in the high fear profile ($M = .95, SE = .07$), $t(95) = 4.69$, $p < .001$. 
Cohort 1. Adjustment Across Kindergarten

• Dysregulated fear (slope) was associated with observed social wariness
  – with adult stranger ($r = -.21$)
  – with peers ($r = -.29$) – moderated by social competence
  – *Longitudinal stability, dys fear was not associated with wariness in high threat situation*

• Examination of teacher-report social skill development and teacher relationship
  – On average teachers report increasing prosocial behavior and increasing closeness with children from fall to spring of kindergarten.
  – Dysregulated fear with prosocial behavior, and teacher closeness interacted to predict peer wariness

*Buss et al., under review*
Dysregulation and Prosocial Behavior

Figure 1. Interaction of age 2 dysregulated fear and teacher-reported change in prosocial behavior during kindergarten predicting social wariness in peer free play.
Dysregulated Fear and Teacher Closeness

Figure 2. Interaction of age 2 dysregulated fear and teacher-reported change in teacher closeness during kindergarten predicting social wariness in peer free play.
Adjustment Across Kindergarten

• Dysregulated fear slope was associated with observed social wariness

• Dysregulation interacted with social competence to predict wariness with peers

• ADIS interviews with mothers on the most shy/fearful half of sample
  – The odds of having more than four social anxiety symptoms were 3.67 times higher for children with fear dysregulation at age 2 (O.R. = 3.67, 95% confidence interval: 0.97 to 13.90).

Buss et al., under review
Highlights of Cohort 1 Findings

– High fear in high threat was not associated with anxiety symptoms

– Dysregulated fear responses were associated with anxiety symptoms concurrently, during preschool (ages 3 & 4), at the transition to kindergarten

– Even within a subsample of fearful children, those with greater fear dysregulation at age 2 were more likely to have more SAD symptoms at age 6
Cohort 2

• Screened ~500 toddlers at 18-months
  – Identified 121 high fear targets (> 1SD on fear, anxiety scales)

• 125 families (63 high fear targets)
  – Participated in 24-month visit identical to Study 1
  – Identical longitudinal design with assessments at age 3, 4, and kindergarten

• Collected ambulatory ECG/ZCG at 24 months and Kindergarten
  – HR
  – RSA
  – PEP
Cohort 2 Research Questions

- Replicate the dysregulated fear profile at 24-months and replicate longitudinal findings
- Did the oversampling of fearful toddlers increase number of toddlers with dysregulated fear profile?
- Can we identify biomarkers for dysregulated fear that will improve prediction to anxiety in childhood?
Fearful temperament: Putative Biomarkers

• There is some evidence that presence of physiological “profile” strengthens the prediction (i.e., diathesis model)

• Biological Sensitivity to Context models support central role of physiological reactivity as potential mechanism

Physiological markers...

– Faster HR, lower baseline RSA, faster PEP (e.g., Kagan et al., 1987; Stifter & Fox, 1990; Buss et al., 2004)

– Suppression of RSA under challenge marker of adaptive regulation (e.g., Calkins; El-Sheikh; Beauchaine)

– Emerging work on RSA augmentation as both adaptive (Hastings et al., 2008) and maladaptive (Skowron, in press) depending on context
Replicated C1 dysregulated fear profile \((n = 40)\) and also identified a low fear group \((n = 22)\).
The adaptive pattern of RSA suppression to the episodes was only present for children in the normative fear profile group. Children in the dysregulated group also showed a dysregulated pattern of RSA change.
Fear Profiles, RSA, and Anxious Symptoms

<table>
<thead>
<tr>
<th>Profile</th>
<th>Age 2 Inhibition</th>
<th>Age 2 Internalizing</th>
<th>Age 2 Separation Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Fear</td>
<td>.79 (.39)</td>
<td>.35 (.15)</td>
<td>.77 (.36)</td>
</tr>
<tr>
<td>Normative</td>
<td>.99 (.56)</td>
<td>.41 (.18)</td>
<td>.91 (.41)</td>
</tr>
<tr>
<td>Dysregulated</td>
<td>1.24 (.54)</td>
<td>.48 (.18)</td>
<td>1.01 (.37)</td>
</tr>
</tbody>
</table>

\[ F(2,119) = 5.11^{**} \quad F(2, 119) = 3.56^{*} \quad F(2, 119) = 2.53^{†} \]

Dysregulated fear profile is associated with more anxiety symptoms than the normative and low fear profiles.

<table>
<thead>
<tr>
<th>RSA Change</th>
<th>Age 2 Anxiety</th>
<th>Age 2 Inhibition</th>
<th>Age 2 Internalizing</th>
<th>Age 3 Internalizing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stranger Approach</td>
<td>.18</td>
<td>.21^{*}</td>
<td>.22^{*}</td>
<td>.12</td>
</tr>
<tr>
<td>Spider</td>
<td>.26^{*}</td>
<td>.01</td>
<td>.01</td>
<td>.21^{*}</td>
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</table>

RSA augmentation is associated with anxiety symptoms.
Dysregulation of Fear and RSA associated with Anxiety Symptom Development

Figure 2.
Parental Influence on Anxiety Development for Fearful Children

- Critical/Hostile
- Overprotection

Child Anxiety Symptoms

LOW  HIGH

Sensitivity, Comfort, Support
Maternal Protective Behavior

- Anxious-Coercive Cycle (Dadds & Roth, 2001)
- Parent-based interventions fearful/anxious children (Rapee et al., 2005; 2010)

- Maternal accuracy in predicting toddler distress and fearful temperament predicts frequency of protective behavior (Kiel & Buss, 2010)

- Maternal protective behavior alters the trajectory of toddler distress during novel situation (Buss & Kiel, 2011)

- Certain contexts more important than others (Kiel & Buss, in press)
Relation of Protection to Risk for Anxiety is Context-Specific

<table>
<thead>
<tr>
<th>Protection in Low-Threat</th>
<th>Fearful Temp</th>
<th>Age 3 Anx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection in High-Threat</td>
<td>.16</td>
<td>-.02</td>
</tr>
</tbody>
</table>

***p < .001  
n = 117  
Kiel & Buss (in press)
Maternal Protection and Dysregulated Fear

Low                  High
Sensitivity, Comfort, Support

Social Anxiety Symptoms

Critical/Hostile
b = .40*

Overprotection
b = .28*

LOW        HIGH
Sensitivity, Comfort, Support
Maternal Protective Beh

Dysregulated Fear

β = 0.40***

β’ = 0.15

Indirect effect: $b = 0.08$
95% CI (.03, .21)

Maternal Protective Beh

β = 0.31***

β = 0.40**

Kindergarten Social Anxiety Symptoms

Protective/Comforting mediates anxiety development
Conclusion

• Assessing behavior across multiple contexts, including low threat contexts, provided a different perspective on risk
  – For instance, high fear in *high threat* episodes was not associated with anxiety symptoms
  – More homogeneous and specific behavioral risk profile

• Why is dysregulated fear behavior an important factor?
  – Even if temperamental tendency is to be fearful, the ability to regulate fear when cues signal low threat and/or promote approach is important for adjustment

• Biomarker approach
  – Aids identification of risk
  – Moderator (e.g., only fearful toddlers with behavioral and physiological profile are at risk)

• Mothers’ protective behavior as a mediator
  -- Target for intervention
Translational Implications

• Early (earlier?) identification of which fearful children are at risk for developing social anxiety symptoms

• Examination of targets for intervention for fearful children and their families
  – Overprotection
  – Hostile/critical

• Peers and social competence
  – Effective regulation of social wariness

• Biased threat processing
  – Attention bias to threat
  – Appraisal/reappraisal
Thank You!