Parasympathetic reactivity to fear and toddler inhibition interactively predict preschool inhibition
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Introduction

Behavioral inhibition in early childhood is a risk factor for later internalizing problems, such as anxiety and depression1. Inhibition tends to be stable, but there is also heterogeneity in its manifestation2, which may affect stability. We examined peer-social inhibition3, and reticence and wariness with unfamiliar peers.

Biological factors may characterize children with stable peer-social inhibition3,5. Parasympathetic activity has been linked with behavioral inhibition6. Respiratory sinus arrhythmia (RSA) is an index of parasympathetic influence on the heart via the vagus nerve4.

• Fluctuations in parasympathetic activity allow for adaptive shifting between restful states and engagement with the environment that requires mobilization of energy resources. Thus, both higher RSA at rest and exhibiting dynamic shifts in RSA in response to stimuli have been associated with better self-regulation4.

• Inhibited, reticent and wary children (and children with internalizing problems) show lower baseline RSA5 and less of a decrease in RSA to challenges7. But less RSA decrease is sometimes unrelated to inhibition or internalizing problems8, suggesting that it may only confer risk in combination with other factors9.

• Physiological responding to fear may be particularly relevant for examining inhibition.

Inhibition in toddlerhood may predict the persistence of inhibition more strongly when biological vulnerabilities are also present. Longitudinal designs measuring inhibition and parasympathetic activity at multiple time points are needed to examine the direction of effect between RSA and inhibition.

Hypotheses
1) Peer-social inhibition will be associated with lower baseline RSA and less RSA decrease to fear
2) These patterns of RSA will be associated with greater stability of peer-social inhibition

Methods

Community Sample
108 2-year-olds (54 girls); 88 returned at age 4 (42 girls)

Measures
Inhibition in peer contexts: Composite variables 2 years
Two same-sex unfamiliar peers observed during 25 min free play, with mothers present. Using Toddler Play Observation Scale (POS; Rubin & Stewart, 1984), coded maintenance of contact with own mother, time spent in unoccupied behavior, frequency of anxios behaviors.

4 years
Four same-sex unfamiliar peers observed (without mothers) during 15 min free play, 5 min clean up task, “show and tell” speeches, and ticket sorting task. Coded off-task behavior in clean up and tickets, speech hesitancy (total time talking out of total time of episode), and total from the POS onlooker/unoccupied behavior.

Parasympathetic activity:
2 years
Baseline RSA: Watched a blue video screen (1 min) Fear RSA: Male stranger approached and stared at child (1 min)

4 years
Baseline RSA: Watched an instruction segment of a video introducing “Zudoc, a child from space” (1 min) Fear RSA: Watched segment depicting Zudoc getting lost at a mall (1 min)

Results

Children who increased RSA to fear at 2 years had greater stability in peer-social inhibition, for better and worse:
• Initial levels of inhibition and strong increases in RSA to fear were associated with high levels of inhibition 2 years later

• Peer-social inhibition was only weakly stable over two years
• Baseline RSA was stable over two years
• RSA reactivity was not stable
• RSA baseline and reactivity were unrelated to inhibition within or across time
• Stability of peer-social inhibition was moderated by RSA reactivity to fear

Discussion

This study showed that the stability of inhibited behavior with peers is moderated by RSA reactivity to fear.

Low inhibition at 2 years predicted low inhibition at 4 years, but only for children who increased RSA to the stranger approach
• Increasing RSA may facilitate social engagement10, suggesting that this response may have been adaptive for uninhibited toddlers who are not distressed by novel social situations.

• In contrast, RSA augmentation was less adaptive for toddlers who were highly inhibited.

Patterns of RSA change may be more or less adaptive depending on child characteristics.

References