Emotional face processing biases and children’s externalizing and internalizing behaviors in school

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Anxious individuals often display early perceptual-attentional biases towards threatening faces, including enhanced amplitudes of early visual ERPs such as the P1.1 These early perceptual-attentional biases are hypothesized to reflect a lower threshold for threat detection via “quick-and-dirty” information-processing routes. Attention biases toward threat have also been suggested to play a role in reactive aggression,2 but few studies have examined the precise nature or timing of such attention biases in aggression. Moreover, although substantial comorbidity is observed between anxious and aggressive symptoms, very little research has been conducted on attention biases to threatening faces among individuals exhibiting both anxiety and aggression. This study addresses these research gaps to explore the cognitive-affective mechanisms underlying both anxious and aggressive behaviors.

Methods

Participants

• Participants were 1st-grade children recruited in kindergarten from an urban, low-income school district to participate in a longitudinal study, selected according to high (n=207) or low (n=133) aggressive/oppositional screen scores at kindergarten entry.
• 120 children had sufficient data in 1st grade to be included in the analyses.
• Mean age = 7.2 years (SD = 0.4); 73% male; 70% Black, 22% Hispanic

Task

Children completed an emotional Go/No-Go task in which the stimuli were computer-generated faces expressing 4 primary emotions (anger, fear, sadness, and happiness), as well as emotionally neutral faces, all balanced across gender and race.

ERP Measures

P1, N170, and P2 peak amplitudes were scored across correct Go trials, separately for each electrode site, for each emotion (angry, fearful, sad, and happy) vs. neutral faces, as indexed by early and mid-latency ERP amplitude differences?

Internalizing & Externalizing Symptoms

Children were classified into 3 groups based on 1st-grade teacher ratings on the Strengths and Difficulties Questionnaire (SDQ).2

1) Externalizing group (n = 45): Total score ≥ 2 on the 5 symptom conduct problems subscale (i.e., two symptom indicators were rated as “somewhat true” or one was rated as “certainly true”), and total score < 2 on the 5 symptom emotional problems subscale.

2) Comorbidity group (n = 36): Total score ≥ 2 on both subscales.

3) Comparison group (n = 39): Total score < 2 on both subscales (i.e., no more than one symptom indicator rated as “somewhat true” on either scale).

Children scoring high on the Emotional Symptoms subscale and low on the Conduct Problems subscale (n = 10) were excluded from the analyses due to the small group size.

Results

1) Do groups of children with externalizing symptoms, comorbid externalizing and internalizing symptoms, and low levels of both types of symptoms differ in their perceptual-attentional processing of emotional (angry, fearful, sad, and happy) vs. neutral face stimuli?

2) Does the timing of perceptual-attentional processing biases to emotional faces differentiate between these symptom groups?

Analysis Strategy

Separate repeated-measures ANOVAs were conducted for each ERP peak amplitude measure, with emotion and electrode site entered as within-subjects factors and symptom group as a between-subjects factor. Planned contrasts between each emotional face (angry, fearful, sad, and happy) vs. the neutral face, among all three symptom groups, and for the interactions of symptom group with the emotional faces contrasts were examined. All within-subjects tests were evaluated using Greenhouse-Geisser adjusted p-values to correct for non-sphericity.

Conclusions

1) Children with externalizing symptoms, with or without comorbid internalizing symptoms, exhibited an attenuation of the normal P2 amplitude enhancement to angry vs. neutral faces.

• This could reflect deficient perceptual-attentional processing of negative social cues, which may contribute to the continuation of externalizing behaviors.

2) Children with comorbid internalizing and externalizing symptoms exhibited greater right laterality of the P2 angry vs. neutral face contrast compared to both pure-externalizing and comparison children.

• Since the right hemisphere is more closely associated with emotional information-processing and withdrawal motivations, this finding could reflect greater emotional reactivity and withdrawal motivation to a threatening social cue.

3) No symptom group differences were observed in P1 amplitudes to emotional faces, whereas differences were observed for later components.

• This suggests that, at least in this sample of at-risk 1st-grade children, externalizing and comorbid problems are associated with differences in conscious processing of social threats rather than pre-attentive threat detection biases. Thus, this does not support the hypothesis that children with comorbid internalizing symptoms would exhibit pre-attentive threat biases.

References


