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ABSTRACT

Vagal tone, a measure of the neural modulation of heart rate, has been associated with greater emotional expressiveness during infancy, but with a decrease in facial expressivity in preschool children. This study examined the relationship between vagal tone and the emotion regulation abilities of preschool girls and boys. The study population included 25 girls and 29 boys with a mean age of 67 months. Three minutes of resting cardiac activity was obtained while children listened to an emotionally neutral story, and vagal tone was computed from a measure of cardiac interbeat interval. Spontaneous facial expressions were recorded as the children watched a set of emotion-eliciting films. In general, children with high vagal tone displayed fewer facial expressions while watching the films than children with low vagal tone. Children with high vagal tone exhibited fewer happy expressions and fear expressions than children with low vagal tone. Gender differences were also identified. Girls were more facially expressive and tended to show more fear expressions than boys. Girls with high vagal tone displayed fewer anger facial expressions than girls with low vagal tone, while boys with high vagal tone exhibited somewhat more anger expressions than boys with low vagal tone. Results support the hypothesized relationship between vagal tone and emotion regulation abilities. (AC)

VAGAL TONE AND THE SPONTANEOUS FACIAL EXPRESSIONS OF PRESCHOOL CHILDREN

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ABSTRACT

This study examined the relationship between vagal tone, a measure of neural modulation of heart rate, and the emotion regulation abilities of preschool girls and boys. In general, children with high vagal tone displayed fewer facial expressions while watching emotion-eliciting films than children with low vagal tone. Children with high vagal tone exhibited fewer happy expressions than children with low vagal tone. There was also a tendency for children with high vagal tone to display fewer fear expressions. Gender differences were also identified. Girls were more facially expressive and tended to show more fear expressions than boys. An interaction between gender and vagal tone occurred for angry expressions. Girls with high vagal tone displayed fewer anger facial expressions than girls with low vagal tone. This pattern was reversed for boys. Although not statistically different, boys with high vagal tone exhibited more anger expressions than boys with low vagal tone. Results support the hypothesized relationship between vagal tone and emotion regulation abilities.

Hypotheses and Aims

Children begin to regulate their emotional displays during the preschool period. Gender differences have also been associated with this trend (Shennum & Bugenthal, 1982; Saarni, 1984).

-Because vagal tone has been associated with emotion regulation abilities (Fox, 1989; Wilson, Katz, & Gottman, under review), we hypothesized that children with high vagal tone would be better able to regulate their facial expressions.

-Gender differences were expected to emerge in our data. We expected boys to exhibit fewer sad and fear expressions than girls (Eisenberg, Fabes, Schaller, & Miller, 1989) and girls to display fewer anger expressions than boys (Ekman & Freisen, 1975).

-We also wanted to explore the relationship between vagal tone, gender, and facial expression. If high vagal tone aids children in regulating their facial displays during the preschool period, it may also be associated with the ability to conform to social expectations regarding 'gender appropriate' facial expressions.

METHODS

Subjects

Twenty-five girls and twenty-nine boys served as subjects. Mean age of the sample was 67 months.

Design

Subjects were divided into those high and low in vagal tone using a median split calculated within each gender (girls=15.49, boys=15.79). A 2 X 2 design was used, with subjects grouped according to gender and vagal tone.

Procedures

1. Physiological. Three minutes of resting cardiac activity was obtained while subjects listened to an emotionally neutral story. Vagal tone was computed from a measure of cardiac interbeat interval.
2. Facial expressions. Spontaneous facial expressions were recorded as children watched a set of emotion-eliciting films.

Measures

1. Vagal Tone. Vagal tone was compute using spectral analysis techniques to identify the power densities within the respiratory sinus frequency band of the IBI spectrum.
2. Facial expressions were coded using the EMFACS coding system (Friesen & Ekman, 1983).

RESULTS

1. Main effects.

VAGAL TONE

Children with high vagal tone exhibited fewer facial expressions than those with low vagal tone ($F(1,50)=4.04$, $p=.05$).

Children with high vagal tone display fewer happy facial expressions than children with low vagal tone ($F(1,50)=5.65$, $p=.02$).

There was a trend for children with high vagal tone to exhibit fewer fear expressions than children with low vagal tone ($F(1,50)=3.05$, $p=.09$).

GENDER

Girls displayed more facial expressions than boys ($F(1,50)=4.83, p=.03$).

There was a trend for girls to exhibit more happy expressions than boys ($F(1,50)=3.04, p=.09$).

2. Interaction effects.

VAGAL TONE BY GENDER

A significant vagal tone by gender interaction occurred for anger expressions ($f(1,50)=7.27, p=.01$). Girls with high vagal tone made significantly fewer angry facial expressions than girls with low vagal tone ($t(23)=2.48, p=.02$). An examination of group means indicated that boys with high vagal tone were more likely than boys with low vagal tone to make angry expressions, however, this difference was not statistically significant.

DISCUSSION

-Vagal tone has been associated with greater emotional expressiveness during infancy (Fox, 1989; Stifter, Fox, & Porges, 1989). We found that, in general, vagal tone was associated with a decrease in facial expressivity in preschool children. Children with high vagal tone made fewer facial expressions than children with low vagal tone, a trend that appears to be developmentally appropriate.

-Gender differences in expressiveness were also identified. Girls were more facially expressive than boys and tended to exhibit more happy expressions.

-The relationship between vagal tone, gender, and different facial expressions is also instructive. For example, girls and boys with high vagal tone displayed similar patterns with regard to happy and fear expressions. High vagal tone was associated with a decrease in these expressions.

-The relationship between anger expressions, gender, and vagal tone exhibited a more complex pattern. While girls with high vagal tone showed a significant decrease in their displays of anger when compared to girls with low vagal tone, boys did not follow this trend. Previous research indicates that boys engage in more conflicts and acts of physical aggression than do girls (Goodwin, 1980; Miller, Danaher, & Borbes, 1986). It may be that girls are more likely than boys to encounter socialization processes which discourage the expression of anger.

-Although no significant results were found for the expression of sadness, the pattern of results did conform to gender-appropriate expectations. Girls' displays of sadness remained the same regardless of their vagal tone, while boys with high vagal tone displayed fewer of these expressions than boys with low vagal tone. It may be that the expression of sadness is discouraged by socialization processes more for boys than it is for girls.

-No significant results were found for disgust or contempt expressions. The pattern of results for disgust expressions followed the same pattern as those for other facial expressions, except boys' anger expressions. That is, high vagal tone was related to either no change or a decrease in expressiveness. Boys' level of disgust remained the same regardless of their vagal tone, while girls with high vagal tone displayed fewer expressions of disgust than girls with low vagal tone.

-The expression of contempt by girls did not follow this trend, but was more like boys' expression of anger. Contempt was the second most common facial expression displayed by children in this study (i.e., second only to happy expressions). Boys' level of contempt remained the same

regardless of their vagal tone, while girls with high vagal tone displayed more contempt expressions than girls with low vagal tone. Contempt involves cognitive evaluation and appraisal processes and appears later in development than the other facial expressions examined in this study. It may be that preschool children are just learning to utilize and fine tune the expression of this emotion and feel little reason to inhibit it. It may also be that girls learn that the expression of contempt is a more acceptable way of communicating negative feelings than the expression of anger.

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