Paths to Panic Disorder/Agoraphobia: An Exploratory Analysis From Age 3 to 21 in an Unselected Birth Cohort

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ABSTRACT

Objective: To evaluate childhood temperamental traits and early illness experiences in the etiology of adult panic disorder with agoraphobia. **Method:** Evaluated temperamental and illness experience factors, at ages 3 through 18, as predictors of panic and agoraphobia at ages 18 or 21 in an unselected sample (N = 992). Analyses were conducted with classification trees. **Results:** Experience with respiratory ill health predicted panic/agoraphobia relative to other anxiety disorders and healthy controls. Also, temperamental emotional reactivity at age 3 predicted panic/agoraphobia in males but did not predict other anxiety disorders, compared with healthy controls. Furthermore, temperament and ill health interacted with gender. **Conclusions:** Results are discussed in terms of cognitive theories of fear of physical symptoms and biological models of respiratory disturbance for panic/agoraphobia. *J. Am. Acad. Child Adolesc. Psychiatry*, 2001, 40(5):556–563. **Key Words:** panic, agoraphobia, health.

Putative etiological factors for panic disorder and agoraphobia can be broadly classified as temperament and life events. Most evidence points to temperament as a broad vulnerability factor for anxiety disorders and mood disorders. For example, multivariate genetic analyses support Eysenck's (1967) contention that neuroticism is a strongly inherited trait that confers vulnerability to anxiety and depression (e.g., Martin and Jardine, 1986). Similarly, Kendler and colleagues find a common genetic basis for anxiety and depression, with differentiation between the two states largely attributable to environmental factors (e.g., Kendler et al., 1987).

Similar to neuroticism is the concept of behavioral inhibition: motor activity, crying, and irritability in early infancy, followed by withdrawal, seeking comfort from a familiar person, and suppression of ongoing behavior when confronted with unfamiliar people or novelty as infants mature (Kagan et al., 1987). Behaviorally inhibited children appear to be at increased risk for multiple anxiety disorders (Biederman et al., 1990), particularly if they remain inhibited over time (Hirshfeld et al., 1992). Moreover, the fact that children of depressed or anxious parents are at increased risk for behavioral inhibition (Rosenbaum et al., 1988) raises the possibility that, like neuroticism, behavioral inhibition represents a generalized vulnerability to anxiety and depression. In fact, some argue that behavioral inhibition is one facet of more pervasive systems such as neuroticism (Turner et al., 1996).

Alongside these broad temperamental risk factors, cognitive theorists posit that dispositions to view bodily sensations as harmful confer a specific vulnerability to panic disorder (Clark, 1988). In support, several longitudinal investigations connect negative beliefs about bodily sensations (i.e., anxiety, sensitivity) with subsequent development of panic attacks (e.g., Schmidt et al., 1999).

Such beliefs may develop from negative experiences with ill health (Craske, 1999), including direct aversive experiences (e.g., significant illness or injury), vicarious observations (e.g., exposure to excessive distress over bodily sensations as might occur with hypochondriasis or to significant illnesses or death, among family members),

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and/or informational transmissions (e.g., parental overprotectiveness regarding physical well being). In accord, Ehlers (1993) found that, according to patients' retrospective reports, parents of patients with panic disorder were more likely to suffer from chronic illnesses that required treatment and physical symptoms typical of anxiety, in comparison with parents of patients with other anxiety disorders and controls. Also, patients with panic disorder observed sick-role behavior related to panic symptoms in their parents more often than did control participants. This was not true for non–panic-related sicknesses. Similarly, Verburg et al. (1995) found more respiratory disorders in histories of panic disorder patients compared with other anxiety groups, in the absence of other medical differences. They elected a biological interpretation by suggesting that history of respiratory disease predisposes toward panic disorder by causing dyspnea, derangement in the respiratory receptor set point, and lowering of the suffocation threshold. Alternatively, respiratory diseases may generate fearful beliefs about respiratory symptoms that in turn contribute to panic attacks. In the current study, we were most interested in illness-related life events that may increase the risk for panic disorder; we did not evaluate the way in which this influence might be exerted (i.e., beliefs or physiology).

In summary, like others (e.g., Barlow, 1988), we propose that neurotic or behaviorally inhibited temperament confers a broad vulnerability to anxiety and mood disorders, and that life events concerning ill health confer a specific vulnerability to panic disorder and agoraphobia (Craske, 1999). Moreover, the impact of life events of this nature is likely to be magnified by an anxious temperament, resulting in an interaction between these two etiological factors.

We tested these hypotheses in a longitudinal data set from the Dunedin Multidisciplinary Health and Development Study. Specifically, we examined the degree to which temperament and illness in self and in family members, from ages 3 to 18, predicted the diagnosis of agoraphobia or panic at ages 18 or 21. We hypothesized that both sets of factors, and their interaction, would predict panic/agoraphobia. Also, we hypothesized that temperament would predict other anxiety disorders, whereas experience with illness would not. Furthermore, we hypothesized that respiratory illness may be particularly relevant to panic disorder and agoraphobia, given that most panic attack symptoms involve respiratory functioning.

METHOD

Participants

The Dunedin study is a longitudinal investigation of children born in Dunedin, New Zealand, between 1972 and 1973 (see Silva and Stanton, 1996). The sample has been assessed on a wide variety of psychological and medical measures at 2-year intervals from age 3 (n = 1,037) to 15 (n = 976), subsequently at ages 18 (n = 993) and 21 (n = 992), and most recently at age 26. The most recent assessment is not included in the current study. Details have been changed sufficiently so that the individuals described are not identifiable.

Procedure

Health and development assessments were conducted within approximately 1 month of the study member's 3rd, 5th, 7th, 9th, 11th, 13th, 15th, 18th, and 21st birthdays. Testing occurred during one full day and typically took place at the Dunedin Multidisciplinary Health and Development Research Unit. Those unable to attend the Unit were interviewed in their own home or where convenient.

Outcomes

The panic disorder/agoraphobia group (PDA) consisted of those diagnosed with agoraphobia or panic disorder at ages 18 *or* 21 (n = 84). This was the case for 44/930 study members at age 18 (i.e., 4.8% of the sample), and for 42/961 study members at age 21 (i.e., 4.4%). These rates are slightly lower but generally consistent with the 12-month prevalence data from the National Comorbidity Survey (5.1%) (Kessler et al., 1994). Diagnostic instability between ages 18 and 21 resulted in little overlap between the two age groups and explains our rather large n of 84, which resulted from combining those with PDA at either age 18 or age 21.

Most of the PDA group was diagnosed with agoraphobia without panic (n = 70); 10 were diagnosed with panic disorder without agoraphobia, and 4 with panic disorder with agoraphobia. Nevertheless, all endorsed at least one panic attack symptom. Comorbid diagnoses were as follows: major depressive disorder, 66%; dysthymia, 20%; generalized anxiety disorder, 13%; simple phobia, 31%; social phobia, 41%; and obsessive-compulsive disorder, 35% (posttraumatic stress disorder diagnoses were not available).

The other anxiety disorder group (ANX) consisted of study members diagnosed with any anxiety disorder at ages 18 *or* 21, except for PDA (n = 225). As with the PDA group, we combined study members who were diagnosed with an anxiety disorder at either age 18 or age 21; given the instability of diagnoses across this age range, the final cell size was rather large. Nevertheless, the 12-month prevalence rate of 20.3% for any anxiety disorder at age 21 in this data set (Newman et al., 1996) is comparable to the 12-month prevalence rate of 17.2% for any anxiety disorder (excluding obsessive-compulsive disorder) in the National Comorbidity Survey sample, across ages 15 to 54 years (Kessler et al., 1994). Of the ANX group, 10% were diagnosed with generalized anxiety disorder, 42% with simple phobia, 64% with social phobia, and 30% with obsessive-compulsive disorder (note that percentages do not add to 100% because participants often had more than one diagnosis). The control group consisted of study members who did not receive a psychiatric diagnosis at either age 18 or age 21 (n = 415). That is, they were free of psychiatric diagnoses at *both* ages.

Diagnoses were derived from a modified version of the Diagnostic Interview Schedule (DIS) (Robins et al., 1981). The modifications consisted of (1) asking only those questions that pertain to the assessment of *DSM-III-R* criteria (American Psychiatric Association, 1980);

(2) assessing only symptoms experienced within the past 12 months; (3) assessing only more commonly occurring diagnoses for this age group; and (4) limiting options to "no," "yes, sometimes," and "yes, definitely" (see also Feehan et al., 1994, for age 18 and Newman et al., 1996, for age 21). Interviewers with a minimum of bachelor's degree-level education received 2 weeks of DIS training, followed by 2 weeks of pilot assessments under usual study conditions. Reliability of the age 18 and age 21 mental health assessments was good; the average κ coefficient across anxiety, depressive, and substance dependence disorders was 0.70 at age 18 and above 0.85 at age 21 (see Feehan et al., 1994, and Newman et al., 1996, for more details).

Predictors

We restricted variables to measures of temperament at age 3 and verbal report of ill health/good health at ages 3, 15, and 18. We excluded measures for which more than 15% of the data at any given assessment were missing for our smallest group (PDA group). In addition, measures with limited variability or high redundancy with other measures were excluded.

Anxious Temperament. At age 3, children participated in a 90-minute set of cognitive and motor tasks (e.g., picture vocabulary tests, fine and gross motor coordination). Their behavior was rated on a 5-point scale in terms of emotional reactivity (1 = extremely flat, 5 = extreme lability); general fearfulness (1 = none, 5 = very fearful); shyness (1 = very shy/withdrawn, 5 = extreme friendliness, reverse scored); and separation anxiety when separated from the mother (1 = no concern, 5 = very upset/cries/won't separate). Independent behavioral observations from medical and psychological personnel were averaged.

Illness Experiences. Personal experience with illness was measured by (1) clinician's rating of neurological state at age 3 (0–2; 0 = normal, 1 = suspicious, 2 = abnormal); (2) measles, mumps, whooping cough, and chicken pox up to age 3 (0–4; 0 = none of these illnesses, 4 = every one of these illnesses at least once); (3) total number of coughs, colds, and ear infections over the past year at age 3; (4) loss of consciousness, attendance at an emergency room, hospitalization, or poisoning by age 3 (0–4; 0 = none of these events, 4 = every one of these events at least once); (5) mother's rating of child's health at age 15 (1–4; 1 = very good, 4 = poor); (6) medical evaluator's rating of respiratory status at age 15 (1–6; 1 = normal, 6 = moderate to severe asthma); and (7) self-report of ever having had asthma at age 18 (yes, no).

Family illness experience was measured by (1) mother's self-rating of overall physical health at age 15 (1–4; 1 = very good, 4 = poor); (2) mother's rating of father's overall physical health at age 15 (1–4; 1 = very good, 4 = poor); (3) heart attack, stroke, or high blood pressure in mother or father at age 15 (0–1; 0 = neither parent had any condition, 1 = at least one parent had at least one condition); and (4) asthma, emphysema, or chronic bronchitis in mother or father at age 18 (0–1; 0 = neither parent had any respiratory disorder, 1 = at least one parent had at least one respiratory disorder).

Exploratory Statistical Approach

We chose a classification tree methodology (Answer Tree 2.0) (SPSS Inc., 1998)—a type of nonlinear discriminant function analysis—for three main reasons. First, even though variables were chosen according to a theoretical model, we consider this an exploratory study, given the reliance on verbal report data for physical health outcomes. Second, the classification tree approach is particularly useful for handling variables with missing data (Breiman et al., 1984) and for complex data sets, like ours, that incorporate categorical, ordinal and interval variables over different time periods. Third, classification trees can find complex nonlinear interactions among predictor variables that would not normally be detected in standard analyses. The classification tree is nonparametric, makes no assumptions about the underlying distribution, minimizes the effects of outliers, and is robust (Breiman et al., 1984).

A classification tree looks at all levels of all potential predictors and selects the best level of the best predictor, so that the data are partitioned into one or more subgroups (i.e., nodes) that are as different from each other and as internally homogenous as possible. Child nodes or subgroups are formed from parent nodes. This splitting process is repeated recursively until further splitting does not improve the homogeneity of the child nodes and does not improve the differences among nodes, until the specified node size is reached (in this case, 10 for the parent node, and 5 for the child node), or until the maximum number of hierarchical levels of the tree is reached (i.e., 5). We managed missing data by using predictor split commands, which create separate nodes for cases with missing data.

We chose the chi-square automatic interaction detection, exhaustive type (CHAID-exhaustive) method of splitting, developed by Kass (1989) and refined by Biggs et al. (1991). CHAID is not binary and can create more than two nodes at any level of the tree. The exhaustive refinement computes χ^2 for all possible splits and chooses the split with the largest χ^2 value; thus, with k variables and n observations in a node, there are kn tests per node. Splitting ceased when the p value for the likelihood ratio χ^2 was greater than .05. Note that the p values for the χ^2 are not truly unconditional probabilities and thus are not reported. Given the strong likelihood of type I error with any split, we cross-validated our trees with randomly partitioned samples of the total sample; that is, the tree was developed in 70% of the sample and tested in the remaining 30%.

Because the distribution of the criterion variable (PDA, ANX, CON) was not uniform, the probability of class membership was specified by presuming it to be proportional to that found in the current data set. The results of the analyses are presented graphically as "decision trees," from which rates of misclassification are examined. The proportion of participants in each criterion group was used as the base rate for evaluating accuracy of the classification tree, statistically tested with χ^2. To avoid overcomplexity of interpretation, we divided the analyses into classification trees for PDA versus controls, ANX versus controls, and PDA versus ANX.

RESULTS

PDA Versus Controls

Figure 1 illustrates the CHAID-exhaustive model for predicting membership status in the PDA group (18% of analytical sample) versus the control group (82% of analytical sample). Gender was the first variable to split the sample, with females being at greater risk for PDA. For females, the next splitting variable was personal experience with respiratory disturbance at age 15; experiencing trivial wheeze, mild asthma, or moderate to severe asthma increased the risk for PDA. For those with normal/very limited respiratory disturbance at age 15, parental experience with respiratory disorders at age 18 was associated with increased risk for PDA.

Splitting of the male sample occurred first according to level of emotional reactivity at age 3, with higher levels of

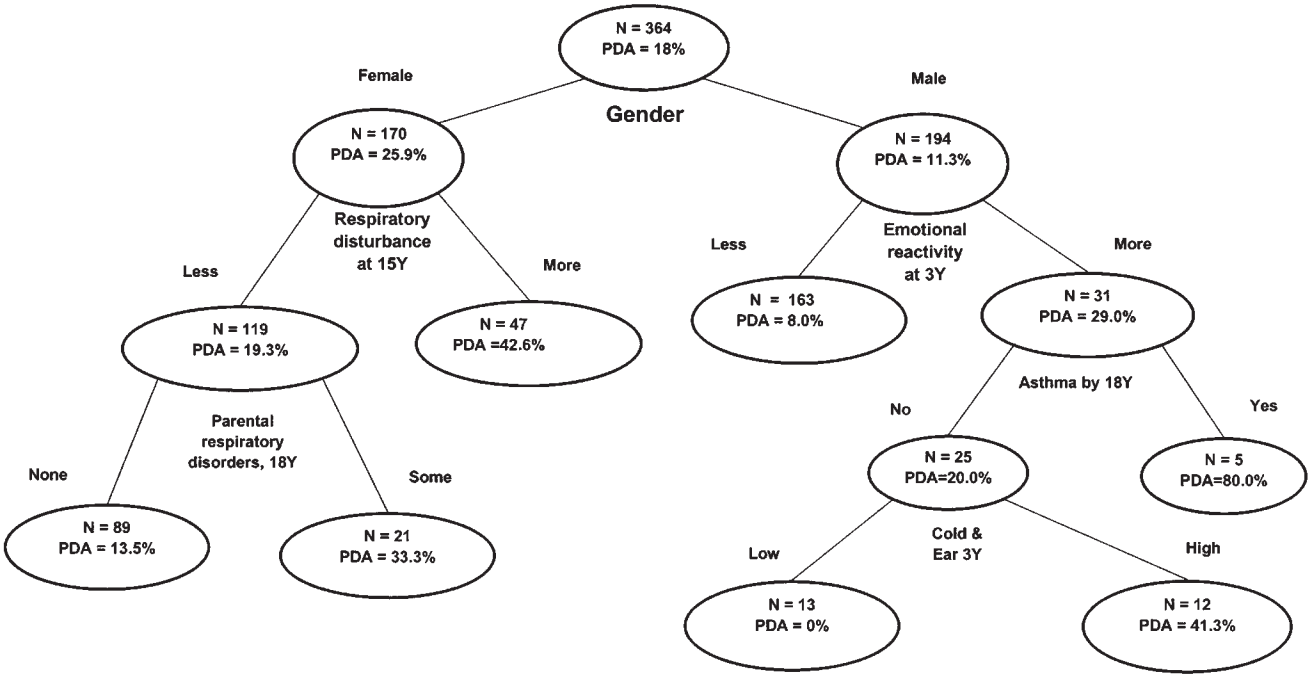

Fig. 1 Chi-square automatic interaction detection, exhaustive type, decision tree for panic disorder/agoraphobia (PDA) versus healthy controls.

reactivity (mood more variable than average to extreme lability versus flat to normal mood) relating to increased risk for PDA. Among more emotionally reactive males, positive history for asthma by age 18 increased the risk for PDA. Among those without a positive history for asthma, more colds and ear infections by age 3 contributed to higher risk for PDA. There were no more splits for those with low emotional reactivity. This tree correctly classified 41/66 PDA (sensitivity = 62%) and 241/298 controls (specificity = 81%). The overall misclassification rate, with unequal probabilities taken into account, was 14.1%, and the accuracy of classification was superior to chance alone ($\chi^2_1 = 50.96$, $p < .01$). In the cross-validation sample, this classification tree correctly classified 11/18 PDA (sensitivity = 61%) and 89/117 controls (specificity = 76%), with a misclassification rate of 18.7% ($\chi^2_1 = 10.40$, $p < .01$).

ANX Versus Controls

Figure 2 portrays the decision tree for ANX (33% of analytical sample) versus controls (67% of analytical sample). In contrast to the discrimination between PDA and controls, respiratory disturbance did not figure in this comparison. The first splitting variable was gender, with females being at increased risk for ANX. Among females, absence of high blood pressure, stroke, or heart attack in either parent at age 15 was associated with increased risk for ANX. For males, lower levels of separation anxiety at age 3 increased the risk of ANX. This tree correctly classified 96/158 persons with other anxiety disorders (sensitivity = 61%), and 210/314 of healthy controls (specificity = 67%). The overall misclassification rate, taking into account unequal distributions of the criterion variable, was 19.1% ($\chi^2_1 = 33.00$, $p < .01$). Application of this classification to the cross-validation sample yielded a sensitivity of 61% (41/67) for ANX and a specificity of 61% (62/101) for controls, with a misclassification rate of 20.1% ($\chi^2_1 = 8.40$, $p < .01$).

PDA Versus ANX

Figure 3 portrays the decision tree for PDA (29% of analytical sample) versus ANX (71% of analytical sample). The first splitting variable was gender, with females being at greater risk for PDA and males being at greater risk for ANX. There were no further splits for males. Among females, positive history for asthma by age 18 increased the risk for PDA; among those females, a higher number of colds and ear infections by age 3 also increased risk for PDA. Among females without asthma history, high blood pressure, stroke, or heart attack in either parent by age 15 increased the risk for PDA. This tree correctly classified only 30/65 persons with PDA (sensitivity = 46%), and

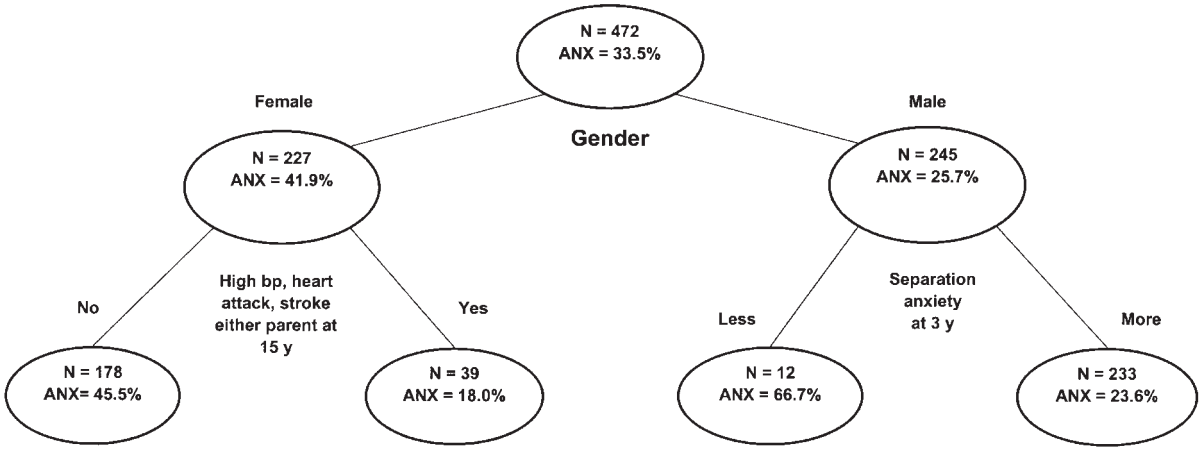

Fig. 2 Chi-square automatic interaction detection, exhaustive type, decision tree for other anxiety disorders (ANX) versus healthy controls.

136/160 with ANX (sensitvity = 85%). The overall misclassification rate, with unequal distributions taken into account, was 12.1% ($\chi^2_1 = 24.53$, $p < .01$). When this classification was applied to the cross-validation sample, it yielded an even lower sensitivity of 21% (4/19) for PDA and a specificity of 72% (47/65) for ANX, with a misclassification rate of 20.6% ($\chi^2_1 = 0.34$, NS).

DISCUSSION

As hypothesized, experience with respiratory disturbance differentiated those who developed PDA by 18 or 21 from healthy controls, with a good level of sensitivity, strong level of specificity, and evidence for cross-validation. The role of respiratory disturbance is consistent with other reports of higher prevalence of respiratory disorders in

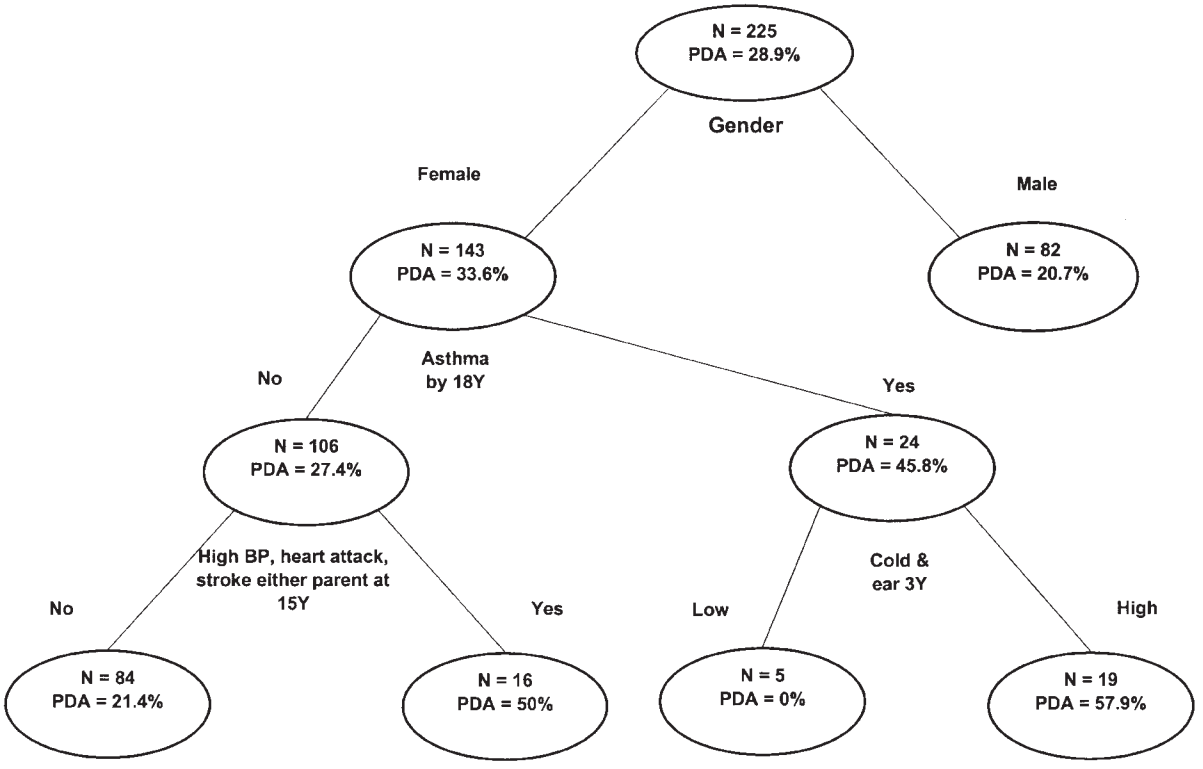

Fig. 3 Chi-square automatic interaction detection, exhaustive type, decision tree for panic disorder/agoraphobia (PDA) versus other anxiety disorders.

panic patients (before panic onset) than in psychiatric control groups (e.g., Verburg et al., 1995). Furthermore, it is consistent with elevated rates of PDA in patients with asthma and chronic obstructive pulmonary disease (e.g., Carr et al., 1992).

As predicted, health and respiratory functioning had little to do with the discrimination between ANX and controls, except that *absence* of parental cardiovascular problems increased the relative risk for ANX. Also as predicted, respiratory disturbance differentiated PDA from ANX, albeit only in females. However, confidence in this finding is limited because sensitivity of the classification was poor, especially in the cross-validation sample, in which the classification was not superior to chance alone.

Nevertheless, taken together, the findings are consistent with a biological vulnerability model, in which panic is attributed to abnormally low thresholds for suffocation (Klein, 1993; Verburg et al., 1995). Unfortunately, the notion of abnormally low suffocation thresholds has not been supported directly, and PD patients do not show signs of abnormally high respiratory sensitivity to carbon dioxide (e.g., Papp et al., 1995). The findings are also consistent with the cognitive theory of panic disorder cited earlier (Clark, 1988). That is, personal experience with respiratory disturbance or observation of parental respiratory disturbance may have contributed to tendencies to misinterpret bodily sensations in a catastrophic fashion, in turn leading to panic and agoraphobia.

Another possibility is that earlier instances of shortness of breath may have been misdiagnosed as asthma when in fact they were limited-symptom or even full-blown panic attacks (e.g., Shavitt et al., 1993). The converse, that asthmatic symptoms were misdiagnosed as panic attacks, is less likely given that interviewers were trained to give panic disorder diagnoses only when symptoms of panic could not be explained by medical illness or drugs.

Our emotional reactivity measure of temperament was also predictive. According to Kagan (1997), fearful and inhibited behavior has its roots in early display of excessive negative affect, irritability, and motor activity to novel stimuli, a description that is consistent with our measure of emotional reactivity. This index interacted an unexpected way with gender. As already clearly established in epidemiological research (e.g., Kessler et al., 1994), gender consistently emerged as the strongest discriminating variable, with females being at higher risk for PDA compared with ANX and controls. Also, temperament, as indexed by emotional reactivity, appeared to be more important in males than in females; respiratory disturbance (asthma and early experience with colds and ear infections) was only relevant to the diagnosis of PDA in males who were emotionally reactive at age 3. If our measure of emotional reactivity reflects a largely biological vulnerability, then these findings are broadly consistent with findings from multivariate genetic analyses, in which "the impact of dominance genetic factors was much greater in males than females" (Kendler et al., 1995, p. 511).

Using the same data set, Caspi et al. (1996) found no relation between inhibited behavioral style in childhood and anxiety disorders in young adulthood. Two major methodological differences may account for this disparity between studies. First, their operationalization of inhibited behavioral style did not include emotional reactivity. Second, Caspi et al. (1996) did not separate PDA from other anxiety disorders. Our results suggest that emotional reactivity may confer a specific vulnerability for PDA in males. That is, whereas emotional reactivity at age 3 was relevant to PDA versus healthy control status in males, it was not relevant to the discrimination between ANX and controls. Originally, we hypothesized that neurotic temperament, of which emotional reactivity was conceptualized as one measure, would confer vulnerability for all anxiety disorders. Instead, we find that our particular measure of emotional reactivity had a special affinity for PDA. Perhaps emotional reactivity reflects a physiological lability that directly increases the risk for panic attacks or panic-like symptoms. Multivariate genetic variance studies find genetic variance unique to panic symptoms and independent of the genetic variance for the trait of neuroticism (e.g., Kendler et al., 1986).

We found no support for the hypothesis that separation anxiety is a specific precursor to agoraphobia (e.g., Klein, 1980). Furthermore, it was *low* levels of early separation anxiety (at age 3) that increased the risk for ANX in males in comparison with healthy controls, in a classification tree with good sensitivity, specificity, and evidence for cross-validation. However, our measure of separation anxiety was limited to behavioral observations and did not include children's anxious thoughts caused by separation. More comprehensive measures of separation anxiety exist in this data set (e.g., Anderson et al., 1985) but, unfortunately, were missing too frequently to be included in the current analyses. As with separation anxiety, behavioral ratings of general fearfulness and shyness were not signifi-

cant risk factors for the development of either PDA or ANX. Again, inclusion of broader measures of fearfulness or shyness might have yielded different findings.

Study Limitations

There are several limitations that temper the conclusions. First and foremost, our diagnostic groupings, which were based on *DSM-III-R* criteria (American Psychiatric Association, 1980), combined those diagnosed with panic disorder and those diagnosed with agoraphobia. In fact, most were diagnosed with agoraphobia without panic. This is consistent with other epidemiological studies in which rates for agoraphobia without panic disorder tend to far exceed rates for panic disorder with agoraphobia (e.g., Wittchen et al., 1998). It is conceivable that different etiological pathways exist for panic disorder versus agoraphobia, but our sample size was insufficiently large to separate out these subgroups. On the other hand, every study member diagnosed with agoraphobia without panic endorsed at least one panic attack symptom, and their agoraphobic behavior may have been driven by anticipation of these symptoms (see Ballenger and Fyer, 1996). Consequently, theorizing about the role of bodily symptoms is likely to be applicable to many individuals with agoraphobia without panic.

Second, panic and agoraphobia clearly may not develop until a later age (after age 21), and further investigation should replicate these methods in an older sample. Related to this point is the high level of diagnostic instability from ages 18 to 21, which resulted in our rather large cell sizes for PDA and ANX. However, this is consistent with previous analyses of this particular data set, which have high rates of diagnostic instability in adolescence (Poulton et al., 1997) and show that almost 40% of those diagnosed with an anxiety disorder at age 21 did not have a history of anxiety disorders before then (Newman et al., 1996). It appears that although anxiety and fear are likely to persist from childhood to adulthood, the specific anxiety disorder and the clinical versus subclinical status may shift over time (Craske, 1999). Diagnoses of PDA were not recorded at ages earlier than 18, thus we were unable to determine rates of change or whether healthy controls or ANX members had met criteria for PDA before the age of 18.

Third, treatment history may have confounded our results. Approximately 30% of our PDA sample had sought help for an emotional problem in the 12 months prior to ages 18 or 21. However, the reason for seeking help was not ascertained, thus this figure is an overestimate of the percentage who sought help specifically for PDA. Thus, prior treatment is unlikely to have seriously affected the findings.

Fourth, our ANX group, because it combined anxiety disorders, may have introduced confounds; different results may have been obtained by separately comparing our PDA group to each of the other major anxiety groups. Fifth, we struggled with missing data. Even though classification tree methodologies are well suited for missing data, we were left with nodes of missing data that could not be interpreted. Sixth, because of limited sample sizes overall, our cross-validation samples were very small. A final limitation is that the measures were not always precise. For example, we lacked precise measures of parental overprotectiveness regarding children's physical health. Parental modeling of sick behaviors and medical observations would clearly have been superior to mothers' ratings of their own, their child's, or the child's father's health.

Clinical Implications

Diagnostic instability was common, possibly because of temporal or developmental shifts that lead to different symptoms gaining predominance at various points across the child's life span. Clinicians should be aware of greater fluidity of diagnostic status in children versus adults. Treatment may target a broader range of stimuli or situations rather than the more focused approach typically used in adult patients.

Recognition of an elevated risk for PDA in those with asthma is important for physicians and mental health professionals alike, especially given that asthma is one of the most common child health problems, with an increasing prevalence in most developed countries (e.g., Newacheck and Halfon, 2000). Although mild asthma may have little significance in terms of respiratory health, it may be particularly "toxic" for those vulnerable to PDA. Also, enquiry about early respiratory symptoms may be helpful in offsetting an overreadiness to diagnose as asthma what might be a primary panic state. Related to this is the suggested value of routine enquiry about parental health in the assessment for PDA. Maternal history is particularly important because positive maternal history is twice as common as paternal history in children with lifetime prevalence of diseases such as asthma (e.g., Aberg, 1993).

The current findings' implications—that males and females differ in risk profiles and that tailoring of the psychological treatments to gender differences may be warranted—are very important. Although the exact age

at which personal or familial respiratory disturbance elevates risk for PDA in females is unknown, risk factors were present at a very young age for males. Thus, clinicians should be aware that negative experiences with ill health at a very young age may affect vulnerable males in particular.

Finally, these findings point to the value of early identification and intervention to counteract PDA and its associated costs. Given that most who suffer PDA are initially seen by primary care physicians rather than mental health professionals, dissemination of information concerning potential risk factors such as personal/parental experience of respiratory disease will likely improve early detection of the disorder. Increased awareness of potential risk factors may assist in identifying and treating vulnerable children at an early stage, thereby reducing the overall burden on the health care system (Eaton, 1984).

Conclusions

In summary, our findings suggest that ill health and respiratory disturbance may contribute to PDA, although they have relatively little importance for the prediction of other anxiety disorders. Emotional reactivity, whether viewed as a facet of behavioral inhibition or as a direct sign of physiological lability, was predictive of PDA among males. These findings are consistent with cognitive as well as biological models of panic/agoraphobia.

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