Article

Panic Attacks and Psychoticism

Renee D. Goodwin, Ph.D., M.P.H.

David M. Fergusson, Ph.D.

L. John Horwood, M.Sc.

Objective: The authors sought to determine the association between panic attacks and psychoticism among young adults in the community.

Method: Data were drawn from a 21-year longitudinal birth cohort study (N=1,265). Negative binomial regression models were used to determine the association between panic attacks in adolescence (age 15–21) and psychoticism during young adulthood.

Results: Having a panic attack in the preceding 3 years was associated with elevated rates of psychoticism at ages 18 (rate ratio=2.81, 95% CI=1.92–4.13) and 21 (rate ratio=3.01, 95% CI=2.10–4.33). These associations were adjusted for differences in previous psychoticism, comorbid anxiety, depression, and substance use disorders and a range of other potential confounding factors by using a generalized estimating equation model. This analysis showed that after adjustment for confounding factors, having a panic attack was still associated with an increased rate of psychoticism (rate ratio=1.51, 95% CI=1.14–2.02).

Conclusions: Panic attacks during adolescence are associated with significantly increased levels of psychoticism among young adults in the community compared with young persons with no history of panic attacks. Much of the relationship between panic attacks and psychoticism appears to be explained by common risk factors and psychiatric comorbidity, yet these data provide evidence of an independent association between panic attacks in adolescence and psychoticism during young adulthood in the community. Replication of these findings is needed, as are future studies that further investigate the mechanism of this association.

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Findings from several studies suggest that panic attacks and psychotic disorders co-occur more often than would be expected by chance (1–11). The mechanism of this association is not known. It may be that panic attacks lead to a heightened vulnerability for the onset of psychotic illness through destabilizing effects of severe anxiety on physical, emotional, and cognitive functioning (2, 4, 5, 11). It is also possible that psychotic symptoms lead to panic attacks, since clinical data have suggested that psychotic episodes can precede and predict onset of specific anxiety disorders (e.g., posttraumatic stress disorder [PTSD]) (12). Alternatively, it could be that a third factor is associated with increased risk of the co-occurrence of panic attacks and psychotic symptoms. Some possible third factors include early environmental risk factors for psychopathology (e.g., low socioeconomic status) and comorbid mental disorders (e.g., major depression) as well as genetic influences.

Previous epidemiological data show that anxiety disorders, especially panic attacks and panic disorder, are more common than expected among individuals with nonaffective psychosis and schizophrenia in the community (6–8). Recent data have also suggested that there is an association between early-onset panic attacks and a greater odds of psychosis relative to the odds associated with later onset of panic attacks (13). Data from community samples also suggest a significant association between panic and symptoms of paranoia among adults in the community (6). Moreover, some data from epidemiological samples suggest that symptoms of schizophrenia at early ages may lead to anxiety disorders (14). Findings from clinical samples suggest that anxiety disorders (e.g., PTSD, obsessive-compulsive disorder, panic disorder) occur more often than would be expected among patients with psychotic illness (2, 5, 9, 11). Moreover, clinical data suggest that panic attacks may be associated with poorer response to treatment and an increase in specific symptoms (e.g., hostility) among psychotic patients (15, 16).

While previous data cumulatively suggest an association between panic attacks and psychosis, several methodological shortcomings have limited the ability of these findings to provide information about the nature of this association. Specifically, previous studies, both epidemiological and clinical, examining the relationship between panic and psychotic disorders have been limited to the exclusive use of cross-sectional data. Therefore, it has not been possible to determine whether and to what degree panic attacks may increase the risk of psychoticism or psychotic symptoms. Second, previous research into the association between panic attacks and psychotic symptoms has come from clinical studies of adults with severe mental disorders for which they are receiving treatment. These findings are therefore not generalizable to the community, since it may be that observed associations result from factors associated with selection into treatment,

severity of illness, or treatment-related factors rather than true exposure-disease relationships. Third, studies to date have not included data on early environmental risk factors, which may be responsible for a general increase in all types of psychopathology, as well as the risk for both panic and psychotic symptoms. Fourth, previous studies have been limited to adult samples, yet the period of greatest risk of psychosis onset is during late adolescence and early adulthood. The goal of the current study is to determine the association between panic attacks during adolescence and level of psychoticism among young adults in the community. First, the study will determine whether panic attacks are associated with an increased level of psychoticism among young adults in the community. Second, the study will determine the specificity of this association (i.e., whether the relationship persists after adjusting for comorbid mental disorders at baseline) and whether the association is independent of the effects of early environmental risk factors for psychopathology. We hypothesized that panic attacks during adolescence would be associated with increased psychoticism during young adulthood. On the basis of previous data, we expected that this association would persist independent of comorbid mental disorders and other early environmental risk factors for psychopathology.

Method

Participants

The data described in this report were gathered during the course of the Christchurch Health and Development Study. The Christchurch Health and Development Study is a longitudinal study of an unselected birth cohort of 1,265 children (635 male and 630 female subjects) born in the urban region of Christchurch, New Zealand, in mid-1977. This cohort has now been studied at birth, 4 months, 1 year, at annual intervals up to age 16 years, and again at ages 18 and 21 years. The present analysis is based on a sample of 1,053 individuals for whom information on panic attacks and psychotic symptoms was available at age 18 or 21 years. This sample represented 84% of the original birth cohort. However, since not all participants were assessed at both ages, the observed sample numbers vary between age 18 (N=1,025) and age 21 (N=1,011).

Psychoticism

At ages 18 and 21 years, sample members were administered a comprehensive mental health interview designed to assess a number of aspects of the individual's mental health and psychosocial adjustment. As part of this interview, participants were questioned on current (over the past month) psychoticism using items from the SCL-90 (17). A series of 10 items were extracted from the SCL-90 to provide a measure of psychoticism. These items related to hallucinations, delusions, and alienation and were drawn from the paranoid ideation subscale of the SCL-90, which has been shown to differentiate between psychotic and nonpsychotic men at a statistically significant level (18). The items are shown in Table 1. As previously reported (19), the fit of the items to a unidimensional scale was tested by using methods of confirmatory factor analysis. This analysis showed that at each age, the items formed a single scale. For the adjusted model, the model scale scores were estimated by using the unweighted sum of items. An unweighted sum was used because 1) the scale had a clear interpretation and 2) the unweighted sum was highly correlated (r>0.95) with the least-squares estimate of the factor score. The reliability of the scale score was estimated by using coefficient alpha, and the scale was found to have moderate internal consistency (at age 18: alpha=0.76; at age 21: alpha=0.73).

TABLE 1. Psychotic Symptoms in Past Month Endorsed by Subjects From a Longitudinal Birth Cohort Assessed at 18 and 21 Years of Age

	Subjects Assessed at Age 18 (N=1,025)		Subjects Assessed at Age 21 (N=1,011)	
Psychotic Symptom[a]	N	%	N	%
The idea that someone else can control your thoughts	37	3.6	48	4.7
Hearing voices that other people do not hear	20	2.0	17	1.7
Other people being aware of your private thoughts	89	8.7	66	6.5
Having thoughts that are not your own	28	2.7	29	2.9
Having ideas or beliefs that others do not share	186	18.1	180	17.8
The idea that something is seriously wrong with your body	79	7.7	89	8.8
Never feeling close to another person	75	7.3	78	7.7
The idea that something is wrong with your mind	65	6.3	71	7.0
Feeling that other people cannot be trusted	154	15.0	159	15.7
Feeling that you are watched or talked about by others	154	15.0	197	19.5

[a] Extracted from the paranoid ideation subscale of the SCL-90 (19).

Panic Attacks

As part of the assessment at ages 16, 18, and 21 years, subjects were questioned about their experience of panic attacks and related symptoms with items from the Composite International Diagnostic Interview (20). To diagnose panic attacks, participants were asked on how many occasions, if any, they "had a spell or attack in which you all of a sudden felt frightened, anxious, or uneasy in a situation where most people would not be anxious or afraid," since the previous assessment. Those who reported an attack were questioned about the symptoms associated with their most severe attack(s); Composite International Diagnostic Interview items were used to assess DSM-IV symptom criteria. Specifically, at least four out of 13 DSM-IV panic symptoms were required to meet criteria for a panic attack. After an affirmative response to this inquiry, additional questions about the setting and circumstances of the panic attack were used to gather information needed to determine the clinical significance of the panic attack (e.g., eliminate those that did not include panic symptoms or were in response to real life-threatening situations). From this information, DSM-IV panic attack criteria were assessed in sample members during two intervals: when subjects were 15–18 and 18–21 years of age. These assessments showed that 6.8% of the sample met DSM-IV criteria for panic attack during the interval from 15–18 years and 6.4% during the interval from 18–21 years. These prevalence rates are consistent with previous epidemiological data (21).

Confounding Factors

The following measures were selected from the database of the study to control for the association between panic attacks and psychoticism for both fixed and time-dynamic sources of confounding.

TABLE 2. Number of Psychotic Symptoms Experienced in Preceding Month Among Subjects From a Longitudinal Birth Cohort Assessed at 18 and 21 Years of Age, by Panic Attack History in the Preceding 36 Months

	Number of Psychotic Symptoms Experienced in Preceding Month						
	No Panic Attacks in Preceding 36 Months[a]		One or More Panic Attacks in Preceding 36 Months[b]		Analysis		
Age at Assessment (years)	Mean	SD	Mean	SD	Rate Ratio	95% CI	p
18	0.77	1.38	2.17	2.38	2.81	1.92–4.13	<0.0001
21	0.82	1.41	2.49	2.41	3.01	2.10–4.33	<0.0001

[a] N=955 at the 18-year assessment, N=946 at the 21-year assessment.
[b] N=70 at the 18-year assessment, N=65 at the 21-year assessment.

Prior psychoticism. Psychoticism at the time of the preceding assessments was included as a confounding factor. Thus, at the 18-year assessment, we controlled for psychoticism at age 15, and at the 21-year assessment, psychoticism at age 18 was controlled.

Other time-dynamic confounders. As part of the mental health interview at ages 18 and 21, standardized symptom criteria for major depression, anxiety disorders (including generalized anxiety disorder, specific phobia, social phobia, and agoraphobia) and substance use disorders were assessed in sample members based on the relevant sections of the Composite International Diagnostic Interview. This information was used to classify participants according to DSM-IV diagnoses for anxiety disorders, major depression, and alcohol and illicit drug dependence in the preceding 12 months. In addition, parallel to questions on mental health, information was also obtained on other time-dynamic aspects of the individual's lifestyle, including exposure to adverse life events and the extent of affiliations with deviant peers.

Fixed factors. A wide range of measures of social, family, and individual functioning that were assessed before age 18 and were correlated with either panic attack or psychoticism were considered in the analysis. These factors included measures of family sociodemographic background (parental ages, parental education levels, family socioeconomic status, and family living standards); family functioning (parental conflict, adverse family life events, quality of parental attachments, exposure to childhood sexual and physical abuse); parental adjustment (parental depressive and anxiety disorders, alcohol problems, criminality, illicit drug use); and individual characteristics (gender, childhood neuroticism, child IQ).

Statistical Analysis

In the first stage of the analysis, mean levels of affirmative responses to psychoticism items were compared for those reporting and not reporting panic attacks. The strength of association between panic attacks and psychoticism was described by the incidence rate ratio and corresponding 95% confidence interval (CI). In the second stage of the analysis, the association between panic attacks and psychoticism was adjusted for confounding factors by using a negative binomial generalized estimating equation model (22). The model fitted was

$$\log(Y_{it}) = B0 + B1X_{it} + B2Y_{it-k} + \Sigma B_j Z_{ijt} + \Sigma B_l Z_{il}$$

where Y_{it} was the rate of psychoticism items for the ith subject at time t, X_{it} was the corresponding measure of panic attack for subject i at time t, Y_{it-k} was a measure of psychoticism at the preceding assessment, Z_{ijt} were a set of time-dynamic confounders (e.g., depression, anxiety disorders, substance use disorders), and Z_{il} were a set of fixed confounders (e.g., family, social, and individual characteristics). The fitted model assumed an unstructured correlation matrix of residuals across time. Model fitting was conducted with STATA 6.0 (23). From this model, the estimated adjusted incidence rate ratio and 95% CI for the effect of panic attacks on psychoticism were obtained.

Results

Table 2 shows the mean rates of psychoticism at ages 18 and 21 for those with and without panic attacks in the preceding 36 months. The table also reports the incidence rate ratio and corresponding 95% CI for each age. The incidence rate ratio estimates show that at age 18, those reporting a panic attack in the preceding 3 years had rates of psychoticism that were 2.81 times higher than those who did not have a panic attack. Similarly, at age 21, having a panic attack was associated with a threefold increase in the rate of psychoticism items. The results clearly show an association between panic attacks and psychoticism.

To examine the association between panic attacks and psychoticism after adjustment for confounding factors, a generalized estimating equation model was fitted to the data. This approach modelled the relationship between panic attack history and psychoticism taking into account a series of confounding factors: 1) psychotic symptoms at the previous assessment; 2) time-dynamic covariates (comorbid depression, anxiety disorders, and substance use disorders as well as exposure to adverse life events and deviant peer affiliations); and 3) fixed covariates (gender, maternal age, maternal education, family socioeconomic status, family living standards, parental conflict, adverse family life events, quality of parental attachments, exposure to childhood sexual or physical abuse, parental depressive and anxiety disorders, parental alcohol problems, parental drug use, childhood neuroticism, and child IQ).

This analysis provided an estimated model parameter for the effect of panic attack on psychoticism (β=0.416, SE=0.146) and showed that even following the adjustment for confounding factors (including previous symptom levels), the associations between panic attack and psychoticism remained statistically significant, with those reporting a panic attack having estimated rates of psychotic symptoms that were 1.5 times higher than those who did not have a panic attack (rate ratio=1.51, 95% CI=1.14–2.02; p=0.004). These results show estimates of the incidence rate ratio when all covariates were taken into account. Similar results were obtained when a reduced model containing only significant covariates (i.e., depression, social phobia, agoraphobia, alcohol dependence, cannabis dependence, previous level of psychoticism, deviant peer affiliations, family conflict, family socioeconomic status, life events in past 12 months, neuroticism) were included in

the analysis. For this model, the adjusted incidence rate ratio was 1.52 (95% CI=1.15–2.00).

Discussion

The results of this study are consistent with findings from previous clinical and epidemiological research suggesting comorbidity between panic attacks and psychotic symptoms (1, 11). Young people prone to panic attacks had rates of psychoticism that were approximately three times those of young people without panic attacks. In part, this association was explained by other factors that were associated with panic attacks and psychoticism. These factors included depression, social phobia, agoraphobia, alcohol dependence, cannabis dependence, previous level of psychoticism, deviant peer affiliations, family conflict, family socioeconomic status, life events in the past 12 months, and neuroticism. After sources of confounding were controlled, the association between panic attacks and psychoticism persisted, albeit in an attenuated form, with young people prone to panic attacks having rates of psychoticism that were 1.5 times higher than those not prone to panic attacks. These findings provide some evidence that this link is not simply due to a relationship between psychoticism and psychiatric morbidity in general but that there is specificity in the link between panic and psychoticism. These results also extend previous findings by permitting the examination of the nature and strength of how panic attacks, changing over time, are associated with psychoticism over time among young people in the community.

Potential limitations of this study should be considered when interpreting the results. Specifically, it is important to note that the study examines the development of psychoticism rather than the development of specific psychotic disorders such as schizophrenia. Therefore, a potential ambiguity in the present study concerns the interpretation of psychoticism. It is clear that the scale used is a unidimensional measure of symptoms. However, the link between affirmative response to these items and frank psychotic symptoms remains unclear. The items used to assess psychoticism in this study have been shown to differentiate between psychotic and nonpsychotic men (18) at a significant level in a previous validation study. Still, replication of these analyses comparing panic attacks and psychotic symptoms and psychotic disorder is needed in order to draw conclusions regarding the relationship between panic and psychotic disorders, which cannot be determined from the data presented here.

While our findings provide new information on the nature and strength of the relationship between panic attacks and psychoticism, they do not reveal the mechanism of this association. It is possible that panic attacks lead to increased vulnerability to the development of psychoticism. This could occur through increased perceptual disturbances (e.g., depersonalization) and reality distortion (e.g., fear of dying) associated with severe anxiety. Previous data showing linkages between panic and paranoia, as well as common effects of trauma in increasing depersonalization, which can characterize both panic and psychosis, are consistent with this likelihood (10, 12). Alternatively, it may be that panic attacks occur among persons with psychoticism as an indicator of severity or a marker of extreme difficulty in coping with external (e.g., life events) or internal (e.g., psychiatric symptoms) stressors, as has been previously suggested in major depression (21). Panic attacks may be a reflection of a breakdown in coping with acute stress, as reflected by the rapid, acute onset of both psychological and physiological symptoms among individuals with panic, which could be conceptualized as a preexisting vulnerability to psychoticism. It is also conceivable that panic attacks reflect a prodrome or early phase of psychotic disorders. The onset of a panic attack is often characterized by a fear of going mad or going crazy, which is one of the 13 DSM-IV panic symptoms. Both of these explanations are consistent with previous epidemiological data, which suggest that this panic symptom is significantly more common among adults with panic attacks and schizophrenia, compared with those with panic without schizophrenia, among adults in the community (8). Although previous investigations have examined possible prodromes of psychosis, they have focused on depressive symptoms, cognitive symptoms (e.g., inattention), social withdrawal, and bizarre behavior, but few previous studies have included an examination of panic or other severe anxiety. Another plausible explanation could be that common influences of some substances (e.g., cocaine) on neurochemical processes may influence the onset of both psychosis and panic attacks. Since our data show that the relationship persists independent of the effects of substance use disorders, this is unlikely to be the sole unifying factor, although substance use may still contribute to the association. It is also conceivable that this co-occurrence is a result of common shared genetic or environmental effects. The persistence of the association, using the analytic strategy with adjustment for multiple confounders, suggests that these common influences of the factors examined in this study are not completely responsible for this link. There may be factors that have not been included here, however, that can more comprehensively explain this association.

In some cases, extreme fear, in conjunction with certain inherited vulnerabilities or environmental circumstances, may result in heightened levels of psychoticism. Panic attacks may provide a marker of the initial manifestation, initiation, or a risk factor for the onset of psychoticism in some proportion of cases. It is also possible that panic attacks reflect a marker of severity or breakdown of coping mechanisms in persons with high levels of psychoticism who may be more vulnerable to some forms of stress or may have greater exposure to stressful events. Recent evidence from Craig and colleagues (24) of an excess of panic

attacks at first inpatient hospital admission among psychosis patients is consistent with both of these possible explanations. Future research in several areas that build upon these results may be worthwhile. First, replication of these findings with data that can more definitively address the direction of causality and includes measurement of psychotic disorders is needed. Second, future studies that can improve our understanding of the mechanism of this association may be helpful in identifying strategies for intervention. Finally, studies that investigate whether treatment of panic attacks decreases the risk of psychoticism or psychotic symptoms, as has been suggested with major depression, may be of value in efforts to prevent or delay onset of psychotic illness.

Received Sept. 24, 2001; revisions received July 11 and Nov. 13, 2002; accepted March 17, 2003. From the Department of Epidemiology, Columbia University; and the Christchurch Health and Development Study, Department of Psychological Medicine, Christchurch School of Medicine and Health Sciences, Christchurch, New Zealand. Address reprint requests to Dr. Goodwin, Department of Epidemiology, Columbia University, 1051 Riverside Dr., Unit 43, New York, NY 10032; rdg66@columbia.edu (e-mail).

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