

Brief report

# Evaluation of diagnostic criteria for panic attack using item response theory: Findings from the National Comorbidity Survey in USA

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## Abstract

**Background:** The dichotomous diagnostic systems such as the Diagnostic and Statistical Manual of Mental Disorders (DSM) and International Classification of Diseases (ICD) lose much important information concerning what each symptom can offer. This study explored the characteristics and performances of DSM-IV and ICD-10 diagnostic criteria items for panic attack using modern item response theory (IRT).

**Methods:** The National Comorbidity Survey used the Composite International Diagnostic Interview to assess 14 DSM-IV and ICD-10 panic attack diagnostic criteria items in the general population in the USA. The dimensionality and measurement properties of these items were evaluated using dichotomous factor analysis and the two-parameter IRT model.

**Results:** A total of 1213 respondents reported at least one subsyndromal or syndromal panic attack in their lifetime. Factor analysis indicated that all items constitute a unidimensional construct. The two-parameter IRT model produced meaningful and interpretable results. Among items with high discrimination parameters, the difficulty parameter for “palpitation” was relatively low, while those for “choking,” “fear of dying” and “paresthesia” were relatively high. Several items including “dry mouth” and “fear of losing control” had low discrimination parameters.

**Limitations:** The item characteristics of diagnostic criteria among help-seeking clinical populations may be different from those that we observed in the general population and deserve further examination.

**Conclusions:** “Paresthesia,” “choking” and “fear of dying” can be thought to be good indicators of severe panic attacks, while “palpitation” can discriminate well between cases and non-cases at low level of panic attack severity. Items such as “dry mouth” would contribute less to the discrimination.

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**Keywords:** Panic attack; Item response theory; Diagnostic and Statistical Manual of Mental Disorders; International Classification of Diseases

## 1. Introduction

Panic attack is one of the most common mental health problems, with over a quarter of the general population

experiencing at least one panic attack in his/her lifetime (Kessler et al., 2006). In diagnosing panic attack, the criteria of Diagnostic and Statistical Manual of Mental Disorders (DSM) and International Classification of Diseases (ICD) systems have been used frequently so far. Because the primary function of both the DSM and ICD diagnostic systems is to discriminate cases from non-

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cases and they therefore collapse information regarding each symptom into dichotomous presence or absence of a disorder, it is difficult to determine the disease severity and we lose much important information concerning what each symptom can offer when we diagnose according to these systems. This kind of dichotomy could produce misleading results (MacCallum et al., 2002), and therefore we should pay attention to each of the constituting symptoms as well as their endorsement pattern.

The items of the diagnostic criteria for panic attack are very similar between the DSM-IV (American Psychiatric Association, 1994) and the ICD-10 (World Health Organization, 1992), with the former containing 13 symptoms and the latter including one additional item of “dry mouth.” Because in essence any four of these 13 or 14 symptoms constitute the diagnosis of panic attack, the symptomatological configuration may greatly vary even under the same diagnostic rubric of panic attack.

Studies of individual symptoms constituting a disorder can be analyzed using the classical test theory (Blashfield and Livesley, 1991). However, results that are analyzed with classical test theory have been known to be unstable, being affected by the uniqueness of subjects in each study. This limitation is called “group dependency” (Lord and Novick, 1968). On the other hand, results that are analyzed with item response theory (IRT) are stable because they are not affected by the uniqueness of subjects. For this reason, the number of studies using IRT is increasing. However, as far as the current authors are aware, there has not been any such study in relation to panic attack symptoms.

The purpose of this study is therefore to analyze item characteristics of each diagnostic criteria symptom using IRT and to examine the relationship between the severity of panic attack and the performance of individual symptoms. Our data analysis consists of two phases. First, we confirm the unifactorial nature of diagnostic criteria of panic attack in DSM and ICD systems since IRT require the basic assumption of the coherency among items to analyze. Second, we apply the two-parameter IRT model that provides difficulty and discrimination parameters for each item.

## 2. Methods

### 2.1. Samples

The data are taken from the public domain archive at the Inter-University Consortium for Political and Social Research (ICPSR) of the National Comorbidity Survey (NCS), whose participants constitute a national proba-

bility sample of non-institutionalized United States individuals aged 15 to 54. A total of 8098 respondents participated in this survey, with an overall response rate of 82%. More details on NCS sampling and weights are reported elsewhere (Kessler et al., 1994).

From the 8098 original respondents in the NCS, we selected 1213 individuals (15.0%) who had responded yes to a probe question regarding a lifetime panic attack and also answered all 18 questions corresponding with the diagnostic criteria of panic attack.

### 2.2. Diagnostic assessment

The analyses in this article focused on lifetime diagnostic data based on criteria of both DSM-III-R (American Psychiatric Association, 1987) and ICD-10. Interviews were conducted using the University of Michigan Composite International Diagnostic Interview (UM-CIDI), a modified version of the CIDI (World Health Organization, 1990). Although the UM-CIDI employed the DSM-III-R, because the list of diagnostic criteria items of the DSM-III-R is the same as that of the DSM-IV, in the following, we will refer to these symptoms as DSM-IV items.

### 2.3. Data analysis

We converted the 18 questions corresponding with the diagnostic criteria of panic attack in the NCS dataset into 13 criteria items according to DSM-IV and 1 criteria item according to ICD-10. For example, the 2 questions (“Were you short of breath or having trouble catching your breath?”, “Did you feel like you were smothering?”) in the NCS dataset were converted into 1 criteria item (sensation of shortness of breath or smothering), when either of the two was rated positive. In total, 14 criteria items were used for analysis of this study.

The IRT assumes that the responders have a dimensional latent trait. The latent trait is the constructive concept that is expected to be measured by a test, and therefore represents the severity of panic attack in this study. The probability of response is expressed in the form of monotonically increasing function of the latent variable which is called theta ( $\theta$ ). In this case, the more severe the degree of panic attack is, the higher the probability of positive response to the question asking about the diagnostic criteria symptoms. The  $\theta$  at which half of the sample answer yes to a particular item is called the difficulty parameter of this item. The two-parameter IRT model has another index, which is known as the discrimination parameter. It indicates the slope of the item response at the trait value. So the higher the

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