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Factor mixture modeling of the Penn State Worry Questionnaire: Evidence for distinct classes of worry

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ABSTRACT

Worry, the anticipation of future threat, is a common feature of anxiety and mood psychopathology. Considerable research has examined the latent structure of worry to determine whether this construct reflects a dimensional or taxonic structure. Recent taxometric investigations have provided support for a unidimensional structure of worry; however, the results of these studies are limited in that taxometric approaches are unable to assess for the presence of more than two classes of a given construct. Given the complex nature of worry, it is possible that worry may actually reflect a latent structure comprised of multiple classes that cannot be assessed through taxometric approaches. Thus, it is important to utilize newer statistical techniques, such as factor-mixture modeling (FMM), which allow for a more nuanced assessment of the latent structure of a given psychological construct. The aim of the current study was to examine the latent structure of worry using FMM. It was predicted that worry would reflect a three-class structure comprised of (1) a class of low, normative levels of worry, (2) a class of moderate, subclinical worry, and (3) a class of high, pervasive worry. The latent class structure of worry was assessed using FMM in a sample of 1337 participants recruited from the community through a research clinic. Results revealed a three-class structure of the PSWQ comprising low, moderate-high, and high classes of worry. We also provided convergent and discriminant validity of the worry classes by demonstrating that the high worry class was most associated with GAD and that the low worry class was the least associated with GAD. The clinical utility of the worry classes, including the creation of empirically based cut-scores, and the implications for future research are discussed.

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1. Introduction

Worry, the anticipation of future threat, has been recognized as an important construct of interest in a variety of mental health disorders. Worry has generally been conceptualized as dimensional (Olatunji, Browman-Fulks, Bergman, Green, & Zlomke, 2010; Ruscio, Borkovec, & Ruscio, 2001) ranging from low to high levels of worry. At lower levels, worry tends to be mild and transient, helps us identify potential future threat, and assists with solving problems (Barlow, 2002; Borkovec, Shadick, & Hopkins, 1991). However, at high levels, worry becomes problematic in that it becomes excessive and uncontrollable, leads to difficulty with problem solving, and can interfere significantly with daily functioning (American Psychiatric Association; APA, 2013).

Worry is a common feature of most anxiety and mood psychopathology (Barlow, Blanchard, Vermilyea, Vermilyea, & DiNardo, 1986; Brown, 1997) and pathological levels of worry is associated with elevations in underlying vulnerability factors such as neuroticism (Barlow, Ellard, Sauer-Zavala, Bullis, & Carl, 2014) and intolerance of uncertainty (Dugus, Buhr, & Ladouceur, 2004). In its most extreme form, "pathological worry" is the cardinal feature of generalized anxiety disorder (GAD). Since the addition of GAD as a principal diagnosis in the *DSM*-III-R (American Psychiatric Association, 1987), this diagnostic category has received considerable criticism. Some critiques of GAD have spurred a debate in how to best define the boundaries between normal and pathological worry. While normal worry is viewed as an adaptive response in the general population, pathological worry is attributed to a subset of individuals who are presumed to be experiencing anxiety psychopathology (Borkovec et al., 1991) and has become synonymous with a diagnosis of GAD. Whereas most research presumes only two classes of worry (i.e., normal and pathological worry), Ruscio (2002) argued for an additional subgroup of individuals with high

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worry that do not meet criteria for a GAD diagnosis. By comparing worry features among high worriers who did not meet diagnostic criteria for GAD in comparison to a GAD group, Ruscio found significant differences in the frequency and severity of GAD symptoms in these groups. Therefore, this group of worriers appear to be distinct from individuals with low levels of worry and those with pervasive, pathological worry, which would be consistent with worry reflecting a multi-class structure.

1.1. Person-oriented approaches to worry

The assumptions of categorical diagnostic systems such as the *DSM*-5 is that worry is viewed to be normal at low levels and problematic once one develops an excessive, "pathological" level of worry (Borkovec et al., 1991) as observed in GAD suggest that individuals may be classified into distinct classes based on their levels of worry using hybrid, person-oriented approaches. There are several analytic approaches that one might use to assess for multiple class of worry. One such approach, coherent cut kinetic (CCK) taxometrics (Meehl & Yonce, 1994; Meehl, 1999) which assess whether a latent construct is a dimensional or categorical structure (Meehl, 1999; Schmidt, Kotov, & Joiner, 2004). To date, there have been two taxometric investigations examining whether normal and pathological worry exist as a dimensional structure or if they are better classified as taxonic. Ruscio et al. (2001) performed the first taxometric investigation of worry in a large sample of undergraduate students. Results from this investigation provided support for a dimensional structure of worry. More recently, Olatunji et al. (2010) performed a second taxometric study of worry using a composite measure of worry in two samples with one sample comprised of community participants and the other sample comprised of undergraduate participants. Consistent with the findings from Ruscio et al. (2001), the results from this study supported a unidimensional structure of the worry.

1.2. Hybrid mixture models: the use of factor mixture modeling to assess the class structure of worry

There are several limitations to taxometrics that make it less than ideally suited to examine whether worry is categorical or dimensional within individuals. Taxometric procedures are limited in that they only assess for the presence or absence of a two-class taxonic structure. Thus, this statistical approach is not equipped to assess for the presence of more than two latent classes of a construct. This is problematic as there is some evidence that worry may actually reflect more than two classes (e.g., Ruscio, 2002; Ruscio & Borkovek, 2004).

A more recent development in this area is use of hybrid mixture modeling techniques that allows for examination of more complex models. Factor mixture modeling (FMM; Bauer & Curran, 2004; Lubke & Muthén, 2005; Muthén, 2008) is one such hybrid approach. Unlike taxometric approaches, FMM is able to detect the presence or absence of more than two distinct classes of a given construct (Lubke & Tueller, 2010). Moreover, FMM provides detailed model fit indices and has performed better than taxometrics for determining class assignment in simulation studies (Lubke & Tueller, 2010).

1.3. The current study

The purpose of the present study was to extend the existing literature examining the latent structure of worry. The present study had several aims. First, we examined the latent structure of worry using FMM on the PSWQ in a large community sample containing a high percentage of individuals with DSM Axis I diagnoses. It was hypothesized that the PSWQ would reflect a three-class structure comprised of the following classes: (1) a low worry class comprised of "normal" levels of worry, (2) a subclinical class comprised of moderate levels of worry, and (3) a high worry class. To provide convergent and discriminant validity of the worry classes, we examined the relations between worry classes and clinical diagnoses of GAD, MDD, other anxiety disorders, and other Axis I disorders. We hypothesized that the high worry class would be most associated with GAD, MDD, and other anxiety disorders. We also hypothesized that the moderate worry class would be more strongly associated with the anxiety and mood disorders than the low worry class but that this association would be lower than that observed in the high worry class. Further, we hypothesized that the low worry class would be the least associated with GAD, MDD, and other anxiety disorders. Due to the high level of comorbidity among anxiety and mood disorders (Brown & Barlow, 1992; Brown, Campbell, Lehman, Grisham, & Mancill, 2001) and the high levels of worry observed across anxiety and mood disorders (Brown, 1997), we expected that the high worry class would have the highest levels of comorbidity, the moderate worry class would have the second highest level of comorbidity, and the low worry class would demonstrate the lowest levels of comorbid anxiety and mood disorders. Regarding discriminant validity, we hypothesized no differences between classes in their relations to other Axis I disorders. Finally, we established empirically based upper and lower bound cut-off scores using receiver operating characteristic (ROC) curve analyses for the PSWQ that correspond to the classes extracted from the FMM analyses.

2. Method

2.1. Participants

The sample consisted of 1337 participants recruited from the community through an anxiety research clinic at a large southeastern university. A majority of the participants were Caucasian (72.3%) females (56% female) with a mean age of 35.99 (SD_{age} = 15.12; $Range_{age}$ = 13–88 years. The remainder of the sample was comprised of 15.4% African American, 1.7% Asian, .4% Native American/American Indian, .1% Pacific-Islander and 9.3% Other (e.g., Hispanic, mixed race/ethnicity). Approximately, 93% of the sample identified as heterosexual and approximately 7% indentified as gay or lesbian, or bisexual. Fifty-four percent of the sample were married, 25% were single, 17% were separated or divorced, 2% cohabiting, and 2% widowed. Approximately 30% of the sample had a college education or graduate degree, 50% had "some college," a two year degree, or a degree from a technical school, approximately 12% had a high school diploma, 4% had less than a high school education. Average family income was diverse with 35% of the sample having an annual family income of less than $25,000, 16% with an income of $25,000–$40,000 per year, 23% reported an annual income between $40,000–$75,000, 11% reported an annual income between $75,000–$100,000 and approximately 13% reported an income of greater than $100,000.

Participants were recruited through a variety of sources including billboard and flier advertisements posted throughout the community, postings in local newspapers, informational interviews with local news and radio stations and referrals from medical and mental health personnel throughout the community. Participants were comprised of both treatment seeking and nontreatment seeking individuals interested in participating in research studies at the Anxiety and Behavioral Health Clinic (ABHC) at Florida State University. Specifically, approximately 26% of the present sample were treatment seeking, 70% were interested in participating in the anxiety clinic's ongoing research studies, and an additional 4% indicated an interest in both treatment and research. Participants were excluded from participation if they met diagnostic criteria for

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