Revisiting the Factor Structure of the *White Bear Suppression Inventory* in Adolescents: An Exploratory Structural Equation Modeling Approach

Sarah M. Kennedy *, Rebecca A. Grossman, Jill Ehrenreich-May

University of Miami, Department of Psychology, 5665 Ponce de Leon Blvd., Coral Gables, FL 33146-2510

ABSTRACT

The *White Bear Suppression Inventory* (WBSI; Wegner & Zanakos, 1994), a measure of thought suppression, has been translated into numerous languages and widely used in experimental paradigms and clinical research. However, little is known about the psychometric properties of the measure in adolescents. Further, there is debate as to whether the WBSI is a single-factor measure or a two-factor measure assessing unwanted intrusive thoughts and thought suppression. The current study examined the psychometric properties of the WBSI in a diverse sample of 261 adolescents using exploratory structural equation modeling. Results supported a two-factor structure assessing the correlated factors of Unwanted Intrusive Thoughts and Thought Suppression ($r = .64$), and factors demonstrated adequate to good internal consistency. Structural equation modeling provided evidence of differential patterns of associations between each factor and self-reported symptoms of anxiety, obsessive-compulsive, and depressive disorders, with intrusive thoughts more strongly associated with reported symptoms of psychopathology than thought suppression.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

In 1987, Daniel Wegner and colleagues designed a series of now classic experiments around a quotation from Russian author Fyodor Dostoyevsky: "Try to pose for yourself this task: not to think of a polar bear, and you will see that the cursed thing will come to mind every minute" (Dostoyevsky, pp. 49, 1988). Participants were randomized to two groups, one of which was instructed to spend five minutes suppressing thoughts of a white bear, followed by five minutes of expressing thoughts; the other group completed the conditions in reverse order (Wegner, Schneider, Carter, & White, 1987). Results illustrated what Wegner and colleagues referred to as a "rebound effect:" participants in the initial suppression condition experienced more thoughts about a white bear during the subsequent expression phase than did participants during any other phase. Wegner and colleagues concluded that thought suppression (TS) results in increased preoccupation with suppressed thoughts and consequently developed the 15-item *White Bear Suppression Inventory* (WBSI; Wegner & Zanakos, 1994), a measure of TS developed for and validated in adults that has been widely used and translated.

To date, only a single study has examined the psychometric properties of the WBSI in individuals under age 18. In a study of 203 youth ages 9–13 ($M = 10.7$), Vincken, Meesters, Engelhard, & Schouten (2012) replicated the original single-factor structure of the WBSI using principal components analysis (PCA). They found evidence for high internal consistency (Cronbach's $\alpha = .85$) and adequate test-retest reliability (intraclass correlation $= .64$). However, this study used a Dutch translation of the original WBSI, and no known studies have yet examined the psychometric properties of the English measure in youth. Additionally, Vincken and colleagues did not assess the measure's associations with psychopathology, and they administered the measure to a sample with a restricted age range (9–13) that only included early adolescents.

TS is an important area of research in youth, as its use has been related to various measures of psychopathology (Wegner & Zanakos, 1994), which frequently have their onset in childhood or adolescence (Zahn-Waxler, Klimes-Dougan, & Slattery, 2000). Use of TS is therefore likely to be observed in adolescents, although little work has examined TS in this age group. Given that previous studies have suggested the relationship between use of avoidant emotion regulation strategies and psychopathology may increase during adolescence (e.g., Fialko, Bolton, & Perrin, 2012; Miers, Blöte, Heyne, & Westenberg, 2014), it appears important to examine the psychometric properties of the WBSI in this age group. As such, the aim of this study was to examine the psychometric properties of the WBSI in a community sample of adolescents.

1.1. One vs. Two-Factor Models of the WBSI

In addition to the lack of data supporting the WBSI's psychometric properties in adolescents, it remains unclear whether the WBSI is a single-factor measure of TS or a multi-factor measure of TS and unwanted intrusive thoughts (UIT). Six studies have supported a one-factor

* Corresponding author.
E-mail addresses: skennedy@psy.miami.edu (S.M. Kennedy), rgrossman@miami.edu (R.A. Grossman), j.ehrenreich@miami.edu (J. Ehrenreich-May).

solution, with the majority using PCA (Altın & Gençöz, 2009; Muris, Merckelbach, & Horselenberg, 1996; Spinhoven & van der Does, 1999; Vincken et al., 2012), the original study using exploratory factor analysis (EFA; Wegner & Zanakos, 1994), and one study using item response theory (IRT; Palm & Strong, 2007). The one-factor solution demonstrated internal consistency in the .87 (Wegner & Zanakos, 1994) to .91 range (Spinhoven & van der Does, 1999) across studies, and test-retest correlations ranged from .69 (Wegner & Zanakos, 1994) to .80 (Altın & Gençöz, 2009; Muris et al., 1996). Nearly all studies found significant, positive associations between the WBSI and various symptoms of psychopathology (e.g., obsessions, anxiety, worry, depression, hostility, somatic complaints, anxiety sensitivity), with correlations in the .30 to .50 range.

However, a considerable number of studies have established support for a two-factor structure, using confirmatory factor analysis (CFA; González Rodriguez, Avero Delgado, Rovella, & Cubas Leon, 2008; Luciano et al., 2006; Schmidt et al., 2009), PCA (Höping & de Jong-Meyer, 2003; Rassin, 2003), and IRT (Schmidt et al., 2009). Internal consistency has ranged from .84 (Luciano et al., 2006) to .87 (González Rodriguez et al., 2008) for the UIT factor and from .80 (González Rodriguez et al., 2008) to .83 (Luciano et al., 2006) for the TS factor. Good test-retest reliability has been established for both the UIT (.70) and the TS factors (.60; González Rodriguez et al., 2008). Most two-factor solutions have supported distinct associations between each factor and psychopathology. Several studies have found that UIT is a significant predictor of increased trait anxiety and obsessive/compulsive symptoms, while TS is not (Höping & de Jong-Meyer, 2003; Rassin, 2003; Schmidt et al., 2009). Additionally, some studies have found that only TS is associated with increased depressive symptoms (Schmidt et al., 2009), others have found that only UIT is associated with increased depressive symptoms (Rassin, 2003), and some have found that both are associated with increased depressive symptoms (Höping & de Jong-Meyer, 2003). This pattern suggests that associations between the WBSI and psychopathology may be driven upward by the presence of a separate UIT factor.

1.2. Statistical Limitations of Previous Studies and a New Approach

In sum, there have been conflicting findings regarding the factor structure of the WBSI, and settling this question is important because one- and two-factor solutions differ with respect to their implications for psychopathology. As mentioned previously, studies supporting a single factor solution have primarily used a PCA approach, while studies supporting a two-factor solution have used more varied approaches (e.g., EFA/CFA in addition to PCA); these differences in statistical approach may help to explain the discrepant results. EFA is a hypothesis-driven latent variable modeling approach that accounts for communalities among observed variables, while PCA is a data reduction strategy (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Norris & Lecavalier, 2010). This distinction has several important implications. First, EFA models estimate the variance of common factors, unique factors, and measurement error that is uncorrelated with other factors in the model, while PCA assumes that all variance is shared and communalities are equal to one (Fabrigar et al., 1999; Norris & Lecavalier, 2010). Because self-report psychological measures, such as the WBSI, are measured with error, PCA likely overestimates the amount of variance accounted for by the model. Second, PCA does not allow for comparison of fit among nested models, making decisions about the relative merits of competing models subjective. Finally, a number of studies on the WBSI–regardless of whether they have used PCA or FA–have performed orthogonal rotations, which assume uncorrelated factors, rather than oblique rotations (e.g., Höping & de Jong-Meyer, 2003; Muris et al., 1996; Spinhoven & van der Does, 1999). The assumption of uncorrelated factors is often untenable with research on psychological variables, particularly in the case of the WBSI.

Exploratory structural equation modeling (ESEM), which combines features of EFA and CFA, overcomes limitations of PCA and affords advantages over the traditional CFA approach. Often, a factor structure that has been well-supported through EFA is difficult to confirm using CFA, which requires that all item cross-loadings be constrained to zero. Indeed, several studies that have conducted CFAs on the WBSI have yielded poor model fit, despite high, significant factor loadings (e.g., González Rodriguez et al., 2008; Luciano et al., 2006). Constraining cross-loadings is often impractical in applied clinical research, where psychometrically sound multifactor measures often have cross-loadings that can be supported by theory, method effects, or measurement error (Marsh, Morin, Parker, & Kaur, 2014). ESEM is a flexible alternative to CFA because it permits features of EFA (e.g., cross-loadings), confers many of the advantages of CFA (e.g., correlated residuals, extension into SEMs), and generally yields superior fit (Asparouhov & Muthén, 2009; Marsh et al., 2014).

Given these advantages, the current study examined the psychometric properties of the WBSI in a community sample of adolescents using ESEM. Our first aim was to gather much-needed data on the psychometric properties in adolescents. Our second aim was to clarify the measure's factor structure by using an ESEM approach. Finally, because there is little data on the WBSI's associations with symptoms of psychopathology in individuals under age 18, we examined convergence between the WBSI and symptoms of anxiety, obsessive-compulsive disorder, and depression.

2. Materials and Methods

2.1. Participants

Participants were 261 adolescents in grades 6–12 recruited from public schools in an ethnically diverse urban area in the Southeastern United States. The mean age was 14.73 years (SD = 2.22; range = 11.39–19.62), and the sample consisted of 161 girls (61.7%). Participants were primarily Caucasian ($n = 233$; 89.3%), with 86.7% of participants identifying as Hispanic ($n = 202$). Other racial groups represented included Black/African American ($n = 13$, 5.0%), Asian ($n = 7$; 2.7%), Biracial ($n = 3$; 1.1%) and Other ($n = 5$; 1.1%).

2.2. Measures

2.2.1. White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994)
The WBSI is a 15-item measure of the tendency to suppress unwanted, negative thoughts. Respondents indicate their level of agreement with a number of statements on a 5-point scale. Total scores range from 15 to 75, with higher scores indicating greater suppression. Psychometric properties of the measure have been reviewed in earlier sections of the current manuscript.

2.2.2. Revised Child Anxiety and Depression Scales (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000)
The RCADS is a 47-item self-report measure containing six subscales assessing separate DSM-IV diagnostic categories: separation anxiety disorder (SAD); social phobia (SOC); generalized anxiety disorder (GAD); panic disorder (PD); obsessive compulsive disorder (OCD); and major depressive disorder (MDD). Respondents indicate how often each item is true of them on a 4-point Likert-type scale. Each subscale has demonstrated good internal consistency and convergent validity in normative (Chorpita et al., 2000) and clinical samples (Chorpita, Moffitt, & Gray, 2005). In the current sample, each subscale demonstrated adequate to good internal consistency (α range = .74–.88).

2.3. Procedure

Approval for this investigation was obtained from the university's Institutional Review Board (IRB). All participants provided written assent and parent consent and were provided with a small, non-contingent remuneration (a $2 bill) for returning parent consent