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Factor structure of the Social Interaction Anxiety Scale and the Social Phobia Scale Short Forms

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ABSTRACT

The study used frequentist confirmatory factor analyses (CFA) and Bayesian CFA (BCFA) (one-factor, two-factor, and bifactor models) for Peters, Sunderland, Andrews, Rapee, and Mattick's (2012) short form Social Anxiety Interaction Scale (SAIS) and Fergus, Valentiner, McGrath, Gier-Lonsway, and Kim's (2012) short form Social Phobia Scale (SPS) Short Forms. Participants ($N = 200$) were adults from the general community who completed the full version of SIAS and SPS measures. For the different models tested, CFA provided moderate support for the two-factor model for Peters et al.'s Short Forms. BCFA showed good support for the two-factor and bifactor models for Peters et al.'s Short Forms, with the bifactor model showing better fit. This bifactor model showed high internal consistency reliability and had a high amount of explained common variance for its general factor. The SIAS and SPS specific factors of the bifactor model showed almost negligible internal consistency reliabilities and explained common variances.

1. Introduction

The Social Interaction Anxiety Scale (SIAS) and the Social Phobia Scale (SPS; Mattick & Clarke, 1998) are self-report questionnaires for measuring social interaction anxiety (anxiety related to the initiation and maintenance of social interactions) and social performance anxiety (anxiety associated with scrutiny or observation by other people while performing a task or action), respectively. The full version of the SIAS and SPS has 20 items each. From these full versions, Fergus et al. (2012), and also Peters et al. (2012) developed different six items versions of the SIAS and SPS. The current study examined support for one-factor, two-factor oblique and bifactor models for these short forms.

Although the factor structure of Mattick and Clarke's (1998) SIAS and SPS measures has yet to be clearly established (Safren, Turk, & Heimberg, 1998), existing studies have shown that they have high internal consistency values, test–retest reliabilities, acceptable discriminant and convergent validities (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992; Mattick & Clarke, 1998), and are able to discriminate individuals with and without social anxiety disorder (Heidenreich, Schermelleh-Engel, Schramm, Hofmann, & Stangier, 2011;

Heimberg et al., 1992). It has however been proposed that with a total of 40 items for the SIAS and SPS together, they pose a high response burden, especially when they are administered with multiple other measures (Fergus et al., 2012; Peters et al., 2012). Consequently, there have been attempts to develop shorter versions. The shortest versions of the SIAS and SPS developed so far are those of Peters et al. (2012) and Fergus et al. (2012). Both have six items each for the SIAS and SPS, thereby making them appealing for clinical use when brief and quick screening for social anxiety is required. Thus a good understanding of psychometric properties of the Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms would be valuable.

When developing the SIAS and SPS Short Forms, Peters et al. (2012) used nonparametric item response theory to select the six best SIAS and six best SPS items that discriminated between those with and without social anxiety along the full range of the SIAS and SPS trait spectrums, respectively. Fergus et al. (2012) focused on readability of items, and selected six SIAS and six SPS items with lowest estimated reading levels. The Peters et al. and Fergus et al. Short Forms are different, with only two items in the SIAS and two items in the SPS being the same. Both Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms have been endorsed as appropriate brief measures of social interaction and social performance anxiety, respectively (Carleton et al., 2014; Le Blanc et al., 2014).

In relation to both Peters et al. and Fergus et al. Short Forms, existing data show strong convergence with their full-length counterparts (correlations exceeding .90), good internal consistency values, convergent and divergent validities, and diagnostic and treatment sensitivities (Carleton et al., 2014; Fergus et al., 2012, Fergus, Valentiner, Kim, & McGrath, 2014; Le Blanc et al., 2014; Peters et al., 2012). Also, confirmatory factor analysis (CFA) studies with community and clinical samples have generally supported the hypothesized two-factor oblique model for Peters et al.'s SIAS and SPS Short Forms (Carleton et al., 2014). For Fergus et al.'s SIAS and SPS Short Forms, support has been found for the two-factor oblique model in community samples (Carleton et al.,

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2014; Fergus et al., 2012). The findings for the two-factor model in clinical samples have been mixed, with one study finding support (Fergus et al., 2012) and another study failing to find support (Carleton et al., 2014).

Although both Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms have shown some support for the theorized two-factor model (especially in community samples), it is argued here that there are good reasons to suspect that the factor structure of these short forms needs further examination. First, past studies have shown that the SIAS and SPS total scores in Peters et al.'s and in Fergus et al.'s Short Forms have similar relations with most of the external correlates that have been examined so far (Carleton et al., 2014; Fergus et al., 2012; Fergus et al., 2014; Le Blanc et al., 2014; Peters et al., 2012). Second, past studies have shown high correlations between the scores of the SIAS and SPS factors in both Peters et al.'s and in Fergus et al.'s Short Forms (Fergus et al., 2012; Fergus et al., 2014; Peters et al., 2012). For example, for a community sample, Fergus et al. (2014) reported correlations of .61 for Peters et al.'s Short Forms, and .66 for Fergus et al.'s Short Forms. They also reported correlations of .69 and .72, respectively, for a clinical sample. These findings indicate high amount of shared variances among the items in the SIAS and SPS measures, thereby raising the possibility that within Peters et al.'s and Fergus et al.'s Short Forms, the SIAS and SPS are measuring highly similar constructs. This also means that when Peters et al.'s or Fergus et al.'s Short Forms are used, they could be providing an overall measure of general social anxiety, and not separate measures of social interaction anxiety and social performance anxiety.

From a CFA perspective, for questionnaires like the SPS and SIAS Short Forms, with two primary factors, there are at least two different ways to model a general factor: a one-factor model and a bifactor model. A higher-order factor model with two first-order factors cannot be used because with only two factor loadings as indicators for the higher-order factor, this component of the model is under-identified. As applied to the SPS and SIAS Short Forms, a one-factor model will have all 12 SIAS and SPS items loading onto a single first-order primary factor. The bifactor model will have three first-order orthogonal factors: a general factor (that captures the common variance of all 12 SPS and SIAS items) and specific factors for the SPS and SIAS (unique variances in them or variances after removing the variance allocated to the general factor). Existing data show no support for the one-factor model for Peters et al.'s (Carleton et al., 2014) and Fergus et al.'s (Carleton et al., 2014; Fergus et al., 2012) SIAS and SPS Short Forms. To date no study has examined the applicability of the bifactor model in these measures.

For a bifactor model it is possible to compute the explained common variance (ECV) and the omega hierarchical (Ω_h; McDonald, 1999; Zinbarg, Revelle, Yovel, & Li, 2005) of the general and specific factors. The ECV of a general factor is the common variance explained by the general factor divided by the total common variance, and the ECV of a specific factor is the common variance explained by the specific factor divided by the total common variance. The ECV of the general factor will be high whenever there is little common variance beyond that of the general factor. The Ω_h can be interpreted as an estimator of how much variance in summed (standardized) scores can be attributed to the general factor (McDonald, 1999). It is obtained by dividing the square of the sum of factor loadings on the general factor by the variance of (unweighted) raw scores of the items in the general factor. The Ω_h value for a specific factor, referred to as omega subscale (Ω_s), can be computed by dividing the square of the sum of factor loadings on the specific factor by the variance of (unweighted) raw scores of the items in the specific factor. The Ω_h and Ω_s values can be interpreted as a model-based index of internal consistency reliabilities of the scales representing the relevant factors. Their values range from 0 to 1, with 0 indicating no reliability and 1 reflecting perfect reliability. According to Reise, Bonifay, and Haviland (2013), Ω_h and Ω_s values of at least .75 are preferred for meaningful interpretation of a scale. Overall, therefore, high ECV and Ω_h (>.75) values would indicate presence of a general dimension in the bifactor model (Reise, Bonifay, & Haviland, 2013).

All past studies that have examined the factor structure of Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms have used conventional or frequentist CFA models. In this approach, the theorized major factor loadings are freely estimated, and the unexpected cross-loadings and all residual covariances are fixed to exact zero. Muthén and Asparouhov (2012) have argued that such specifications are generally overly restrictive and could contribute to model misfit. Muthén and Asparouhov (2012) have illustrated the application of Bayesian theory for structural equation models, including CFA models. In brief, in a Bayesian CFA (BCFA) procedure, the exact zero cross-loadings (and if needed, the residual correlations) are replaced with prior values, based on information from previous studies and/or theories, or alternatively, approximate zero values specified in terms of a mean of zero and a small variance. As some degree of cross-loadings can be expected for multi-dimensional measures with high factor correlations, as is the case with Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms, it can be argued that the application of BCFA could provide a more meaningful evaluation of the factor structure of these measures. This is likely to be the case with small sample sizes (Muthén & Asparouhov, 2012), as in this study.

The current study used CFA and BCFA to examine the applicability of the one-factor, two-factor, and bifactor models for the both Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms for ratings completed by a group of adults from the general community. Fig. 1 shows schematic representations of all the CFA models. Based on past findings (Carleton et al., 2014; Fergus et al., 2012) some support for the two-factor model was expected for both Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms. Based on the argument that the items in Peters et al.'s and in Fergus et al.'s SIAS and SPS Short Forms would have considerable shared variance, support for the bifactor model was also expected.

2. Method

2.1. Participants

The sample ($N = 200$) comprised of 150 females (75%) and 50 males (25%). Age ranged from 18 to 65 years ($M = 26.84$, $SD = 11.19$). The majority of participants were first year undergraduate psychology students recruited from the psychology participant pool in exchange for course credit at the University of (withdrawn for blind review). Other participants were members of the general community who were individually approached and invited to participate. For the entire sample, 86.5% of the sample identified themselves as Caucasian, 3.5% as Indigenous Aborigine, 4% as Asian, 2.5% as European, and 2% as other. Regarding employment status, 23% were unemployed, 4% were seeking work, 37% were working on a casual basis, 13.5% were working part-time, 18% were working full-time and 1.5% were on pension. The majority of participants were currently studying with 69.5% on a full-time basis and 13.5% on a part-time basis.

2.2. Materials

2.2.1. Social Interaction Anxiety Scale (SIAS) and the Social Phobia Scale (SPS) Short Forms

Peters et al.'s (2012) SIAS and SPS Short Forms include items 2, 4, 6, 8, 10 and 13, and 4, 7, 8, 15, 16 and 17 from Mattick and Clarke's (1998) 20 item SIAS and SPS, respectively. Fergus et al.'s SIAS and SPS Short Forms include items 3, 6, 8, 16, 18 and 19, and 4, 5, 8, 11, 18 and 19 from the 20 item SIAS and SPS, respectively. For both Peters et al.'s and Fergus et al.'s SIAS and SPS Short Forms, each item is rated on a five-point Likert scale, ranging from "*not at all characteristic of me*" (scored 0) to "*extremely characteristic of me*" (scored 4), with higher scores indicating higher levels of the social anxiety. For this study, the