Psychological Assessment
2010, Vol. 22, No. 1, 167–179

1040-3590/10/$12.00 DOI: 10.1037/a0018125

Factor Structure and Psychometric Properties of the Injection Phobia Scale–Anxiety

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The present investigation examined the factor structure and psychometric properties of the Injection Phobia Scale–Anxiety (IPS-Anx). Principal components analysis of IPS-Anx items in Study 1 (n = 498) revealed a 2-factor structure consisting of Distal Fear and Contact Fear. However, CFA results in Study 2 (n = 567) suggest that a 1-factor structure may be more parsimonious. IPS-Anx scores demonstrated excellent reliability including test–retest over a 12-week period in Study 3 (n = 195). Supportive evidence for convergent and divergent validity of IPS-Anx scores was also found in Study 4 (n = 319), with strong associations with disgust propensity and sensitivity and weak associations with positive affect. Further evidence of validity was found in Study 5 (n = 1,674) because IPS-Anx scores discriminated those who have experienced fainting symptoms or avoided medical procedures from those without a history of such symptoms. In Study 6, data from Studies 2 through 5 were pooled, and the findings of Study 2 were replicated. The 1-factor model also fit the data well for men and women in Study 6. Lastly, IPS-Anx scores differentiated those with blood-injection-injury phobia (n = 39) from those without this phobia (n = 43) in Study 7. These findings suggest that the IPS-Anx has excellent psychometric properties, making it suitable for use in programmatic research on injection phobia. However, future research examining the validity of a short form of the scale with only the Contact Fear items may further improve the efficiency and utility of the IPS-Anx.

Keywords: IPS-Anx, factor structure, injection phobia, disgust

Phobias are characterized by an excessive or unrealistic fear of specific objects or situations (American Psychiatric Association, 2000). Epidemiological studies have shown that an estimated 10%–12.5% of the people in the United States meet diagnostic criteria for a specific phobia at some point during their lifetime (Kessler, Berglund, Demler, Jin, & Walters, 2005; Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996). Blood–injection–injury (BII) phobia, impacting approximately 3% of the population, is characterized by extreme aversion to seeing blood or injuries, receiving injections, or undergoing invasive medical procedures (Fredrikson, Annas, Fischer, & Wik, 1996). Similar to those with other phobic disorders, individuals with BII phobia experience persistent dread, immediately respond with fear upon exposure, and generally avoid situations in which the phobic stimulus might be encountered. The frequent avoidance of and delay in seeking medical care among those with BII phobia can have serious health consequences (Kleinknecht & Lenz, 1989; Öst, 1992) and in extreme cases can even result in death (Hamilton, 1995).

Although BII phobia is classified as a phobic disorder, many of its clinical features are quite unique. For example, fainting, which occurs in up to 80% of those with BII phobia, is rarely observed in other phobias and anxiety disorders (Connolly, Hallam, & Marks, 1976; Öst, 1992). It has been proposed that the unique fainting response may be partially attributable to the heightened disgust reactivity to BII-related stimuli (Page, 1994). Indeed, a number of studies have shown that measures of disgust and BII phobia are positively associated (e.g., Kleinknecht, Kleinknecht, & Thorndike, 1977) and that those with BII phobia report greater disgust when exposed to blood, mutilation, and surgeries, as well as to a broad range of general disgust elicitors that are not relevant to their phobic concerns, such as foul odors, rotting foods, small animals, and bodily products (Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000; Tolin, Lohr, Sawchuk, & Lee, 1997).

Experimental research suggests that the distinctiveness of BII phobia may also be observed with regard to the physiological and affective responses to blood, injection, or injury stimuli. For instance, individuals distressed by blood and injury are more likely to report symptoms of fainting and disgust than are those fearful of injections (Öst, 1992; Page, 2003). Furthermore, when researchers

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directly assess both disgust and fear, disgust is the dominant reported emotion when exposed to blood stimuli, whereas no differences between disgust and fear emerge when exposed to injection cues (Olatunji, Lohr, Sawchuk, & Patten, 2007). These findings suggest that there may be differences in the emotional mechanisms that contribute to blood phobia versus those that influence injection phobia (e.g., Kleinknecht, Thorndike, & Walls, 1996).

The potential consequences of injection-related avoidance further distinguish this phobia from other phobic conditions. Individuals may delay or avoid screening and maintaining their health, managing chronic medical conditions (e.g., diabetes), caring for others who are ill or in need of medical attention, traveling to areas that require vaccinations, seeking professional training in medicine or allied professions, and participating in leisure time activities that have a higher perceived risk of injury (Öst, Hellstrom, & Kaver, 1992). Given the broad impact of injection phobia, valid and reliable methods of assessment would be of considerable utility. Several self-report inventories of BII fear and phobia have been developed over the years. For example, the Medical Fear Survey (Kleinknecht, Kleinknecht, Sawchuk, Lee, & Lohr, 1999) is a 50-item measure assessing the degree of fear of injections, sharp objects, blood, mutilation, and physical examinations. There is also the more recently developed Multidimensional Blood/Injury Phobia Inventory (Wenzel & Holt, 2003), a 40-item measure of fearful reactions to injections, hospitals, blood, and bodily injury. Despite various available measures of BII-related fear, only the Injection Phobia Scale–Anxiety (IPS-Anx; Öst et al., 1992) was developed exclusively for the assessment of injection phobia.

The brevity of the 18-item IPS-Anx also makes it more practical than other available measures of BII-related fear. Although the IPS-Anx is relatively brief, it is comprehensive in that it contains more items than are found on the injection subscale of available self-report measures of BII fear. Öst et al. (1992) provided initial data on the internal consistency of the IPS-Anx in a sample of 59 patients, noting its positive association with phobic-relevant avoidance and its reactivity to changes in behavioral treatment. Additional studies have shown that the IPS-Anx discriminates analog BII phobia from spider phobia (Sawchuk et al., 2002) and is positively associated with other measures of disgust (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007) and contamination fear (Sawchuk et al., 2000).

Although available data on the psychometric properties of the IPS-Anx are promising, no study has carried out an extensive psychometric evaluation of this measure. This is somewhat concerning because several studies have used the IPS-Anx in research examining the phenomenology (Sawchuk, Meunier, Lohr, & Westendorf, 2002) and treatment (Olatunji, Smits, Connolly, Willems, & Lohr, 2007) of BII phobia. Prior research does suggest that IPS-Anx scores have adequate reliability (Öst et al., 1992) and validity (Olatunji, Smits, et al., 2007); however, data on the test–retest reliability of the scale are absent. Furthermore, no study to date has examined the factor structure of the IPS-Anx. Because of these and other limitations, a series of analyses were conducted across several studies to examine the factor structure, reliability, validity, and clinical specificity of scores on the IPS-Anx. We also examined, as a secondary aim, the feasibility of developing a short-form version of the IPS-Anx. A short form would be particularly ideal as a brief screening tool for primary care and specialty care medical settings where these patients are most likely to receive their care and it is not feasible to do more extensive assessments.

Study 1

Method: EFA

Participants. In this study, 498 participants were recruited from undergraduate courses at a large southern university in exchange for research credit. Participants ranged in age from 17 to 30 years (M = 18.86, SD = 1.17) and were predominantly Caucasian (65%) and female (56%).

Measure. The IPS-Anx (Öst et al., 1992) is an 18-item, 5-point Likert scale in which individuals rate their degree of anxiety if they were to experience a variety of injection and/or venipuncture procedures. The scale ranges from 0 (*No anxiety*) to 4 (*Maximum anxiety*).

Procedure. Participants completed the IPS-Anx in a classroom format as part of a larger study.

Results

Preliminary analyses. As shown in Table 1, the IPS-Anx total score demonstrated good internal consistency, and each of the 18 items evidenced acceptable corrected item-total correlations on the basis of the recommended criterion of .30 (Nunnally & Bernstein, 1994). IPS-Anx total scores were not correlated with age ($p > .05$) and were significantly higher among women than among men, $t(487) = -7.53$, $p < .001$. Means and standard deviations for the IPS-Anx items are presented in Table 2. Mean scores on 17 out of 18 items were below 2.0 (i.e., *moderate anxiety* agreement with the item), suggesting that the intensity of the content of most IPS-Anx items was generally outside of the experience of most participants.

EFA. Principal components analysis with oblique (Oblimin) rotation was employed to examine the lower order factor structure of scores on the IPS-Anx total. Parallel analysis and factor interpretability were used to determine the number of factors to retain. Parallel analysis is a statistical procedure for determining the break in the scree plot and is one of the more accurate methods for determining the number of factors to retain (Zwick & Velicer, 1986). Parallel analyses were conducted twice, once with the mean eigenvalues and once with the 95th percentile eigenvalues (Longman, Cota, Holden, & Fekken, 1989). The first four eigenvalues were 10.11, 1.88, 0.80, and 0.67. Parallel analysis indicated a clearly interpretable two-factor solution for both the mean and 95th percentile eigenvalues. Table 2 presents the pattern matrix (i.e., factor loadings) and communalities for the two-factor solution. This solution accounted for a substantial portion of the variance in the IPS-Anx items (66.68%), with most explained variance contributed by the first factor (56.19%). The two-factor solution of the IPS-Anx had a good simple structure (Thurstone, 1947). On the basis of the criterion of $|.40|$ as a salient loading, there were no items with loadings on multiple factors, and each factor had an adequate number of items with salient loadings.

Factor 1 was composed of 10 items with salient loadings (M = 7.22, SD = 8.18). This factor was labeled *Distal Fear* because each item involves exposure to injection-related stimuli vicariously or remotely (e.g., “Listening to someone talking about in-

Table 1
Descriptive Statistics for Studies 1–5

Variable	Study 1	Study 2	Study 3 (Time 1)	Study 3 (Time 2)	Study 4	Study 5
n	498	567	195	195	319	1,674
IPS-Anx total						
M (*SD*)	19.74 (15.00)	21.96 (14.55)	20.80 (16.51)	18.45 (15.99)	20.26 (16.69)	18.75 (14.56)
α	.95	.94	.96	.96	.95	.93
Item-total *r* (range)	.51–.83	.38–.79	.59–.85	.53–.88	.49–.86	.39–.81
r with age	−.03	−.15**	−.15*	−.16*	−.12*	−.08**
Women: *M* (*SD*)	24.02 (16.04)	24.74 (15.03)	23.03 (16.81)	21.62 (16.62)	24.15 (17.58)	21.65 (15.23)
Men: *M* (*SD*)	14.25 (11.42)	18.15 (12.81)	15.58 (14.64)	11.02 (11.50)	14.14 (13.10)	14.60 (12.43)
Contact Fear						
M (*SD*)	—	14.09 (7.90)	12.42 (8.27)	11.48 (8.46)	12.55 (8.98)	11.91 (8.09)
α	—	.92	.93	.95	.94	.89
Item-total *r* (range)	—	.53–.89	.60–.91	.67–.92	.62–.92	.53–.87
r with age	—	−.13**	−.15*	−.19*	−.13*	−.09**
Women: *M* (*SD*)	—	15.75 (7.84)	13.79 (8.19)	13.48 (8.38)	14.84 (9.13)	13.44 (8.21)
Men: *M* (*SD*)	—	11.92 (7.41)	9.23 (7.58)	6.70 (6.61)	8.99 (7.51)	9.68 (7.39)

Note. Dashes indicate that these values were not computed for Study 1. IPS-Anx = Injection Phobia Scale–Anxiety.
* $p < .05$. ** $p < .01$.

jections”). Factor 2 was composed of eight items with salient loadings ($M = 12.55$, $SD = 8.05$), each of which assesses the fear of actual contact with injections (e.g., “Having a shot in the upper arm”). Accordingly, this factor was labeled *Contact Fear*. The two subscale scores showed good internal consistency (α values for Factors 1 and 2 are .93 and .92, respectively). The Distal Fear factor ($r = .92$) and the Contact Fear factor ($r = .92$) scores were highly correlated with the IPS-Anx total score ($ps < .001$). The two factor scores were also highly correlated with each other ($r = .70$, $p < .001$). A varimax (orthogonal) rotation of these data was also examined. Although a similar two-factor structure emerged, Table 1 shows that two items had loadings on multiple factors on the basis of the criterion of |.40| as a salient loading. On the basis of a more relaxed criterion of |.30| as a salient loading, 12 items had loadings on multiple factors.

Discussion

The findings from Study 1, based on an oblique transformation of the data, suggest that the IPS-Anx may be composed of two lower order factors assessing distal fear of injections and contact fear of injections. The two factor scores demonstrated good internal consistency. The two factor scores were also highly correlated with each other and the IPS-Anx total score. However, from an examination of the means and standard deviations of each item of the IPS-Anx (see Table 2), it appears that the emergence of the two factors may reflect a severity artifact, with the Contact Fear factor items being rated consistently as more anxiety provoking than the Distal Fear factor items. Indeed, an orthogonal rotation of the data suggests that the two-factor solution might blend into a single-factor injection fear factor. Study 1 has important implications for

Table 2
Descriptives and Principal Components Analysis of the Injection Phobia Scale–Anxiety (IPS-Anx)

IPS-Anx item	DF	CF	h^2	*M*	*SD*	Range
10. Listening to someone talking about injections	**.87 (.84)**	.05 (.30)	.79	0.64	0.99	0–4
12. Watching a film about a person getting a shot	**.86 (.84)**	.06 (.34)	.81	0.62	0.96	0–4
9. Looking at a picture of a person getting a shot	**.82 (.81)**	.08 (.34)	.77	0.71	1.02	0–4
11. Looking at and touching veins in the crook of the arm	**.82 (.76)**	−.06 (.20)	.61	0.49	0.96	0–4
3. Looking at a picture with a syringe and needle	**.78 (.77)**	.07 (.32)	.70	0.66	1.00	0–4
14. Watching a person in a nurse uniform	**.76 (.67)**	−.16 (.08)	.45	0.12	0.40	0–3
4. Sensing the smell of a hospital	**.72 (.70)**	.02 (.25)	.54	0.71	0.98	0–4
18. Watching another person having a finger pricked in reality	**.68 (.71)**	.19 **(.40)**	.67	0.65	0.99	0–4
13. Watching another person getting a shot in reality	**.64 (.66)**	.16 (.36)	.56	1.17	1.38	0–4
7. Watching another person having a venipuncture in reality	**.57 (.65)**	.34 **(.51)**	.68	1.41	1.34	0–4
2. Having a shot in the upper arm	.07 (.30)	**.82 (.81)**	.77	1.53	1.18	0–4
17. Getting an intravenous injection	.09 (.34)	**.81 (.81)**	.77	1.75	1.32	0–4
6. Having a venipuncture (needle inserted into vein)	.11 (.36)	**.81 (.81)**	.78	2.09	1.31	0–4
16. Getting a vaccination	.10 (.35)	**.81 (.81)**	.78	1.22	1.18	0–4
5. Having an anesthetic injection at the dentist’s	.01 (.25)	**.76 (.73)**	.58	2.04	0.86	0–4
15. Having one’s ears pierced	−.17 (.07)	**.75 (.67)**	.45	1.12	1.12	0–4
8. Getting an injection in the buttock	.05 (.28)	**.73 (.71)**	.58	1.71	1.30	0–4
1. Giving a blood sample by having a finger pricked	.14 (.35)	**.71 (.72)**	.64	1.37	1.19	0–4

Note. Factor loadings inside parentheses pertain to a varimax rotation. Factor loadings ≥ |.40| are listed in boldface type. DF = Distal Fear; CF = Contact Fear.

the validity and utility of the IPS-Anx scores in nonclinical samples. However, given that this is the first study to report on the factor structure of the IPS-Anx, confirmation of the factor structure in an independent sample would bolster reliability confidence. Accordingly, we elected to conduct confirmatory factor analysis (CFA) of the IPS-Anx items in a second large-scale sample.

Study 2

Method: CFA

Participants. In this study, 567 participants were recruited from undergraduate courses at a large southern university in exchange for research credit. Participants ranged in age from 18 to 56 years ($M = 21.21$, $SD = 4.99$) and were predominantly Caucasian (85%) and female (56%).

Measure. The IPS-Anx (Öst et al., 1992) as described in Study 1 was used.

Procedure. Participants completed the IPS-Anx in a classroom format as part of a larger study.

Data analyses. All analyses were conducted with LISREL 8.80 (Jöreskog & Sörbom, 2006). The factor structure of the IPS-Anx was determined with LISREL CFA techniques. A LISREL system file containing the polychoric correlation matrix served as the input data. The models were tested with the asymptotic covariance matrix as a weight with the weighted least squares (WLS) method of estimation. WLS estimation is the only method of estimation that produces an asymptotically correct chi-square test of model fit with ordinal indicators (Byrne, 1998; Marcoulides & Schumacker, 1996).

CFA overview. To determine the best fitting model for the sample, two competing models of interest were estimated. The first indicator for each latent variable was constrained to a factor loading of 1 to serve as a reference variable and to set the metric. The following criteria were used to test the models' fit: the root-mean-square error of approximation (RMSEA), with values less than .08 indicating reasonable errors of approximation in the population and values less than .05 indicative of a good fit (Byrne, 1998; McDonald & Ho, 2002); the 90% confidence interval for the RMSEA, with a wide confidence interval indicating an imprecise estimate of the degree of fit in the population (MacCallum, Browne, & Sugawara, 1996); the comparative fit index (CFI), with values greater than .90 indicative of an acceptable fit (Hu & Bentler, 1999); and the adjusted goodness of fit index (AGFI), with values greater than .95 indicative of a good fit (Byrne, 1998). Comparisons of competing models were examined via inspection of the fit statistics and the Akaike (1987) information criterion (AIC). The AIC is a modification of the standard goodness-of-fit chi-square statistic that adjusts for the complexity of the model and can be used to compare models that are not hierarchically related (i.e., nonnested). The AIC criterion is frequently used in model selection. When comparing two competing models, the model with the lowest AIC is considered the preferred model (Burnham & Anderson, 2002).

The first model tested was the unidimensional model of injection phobia, in which all 18 IPS items were loaded onto a latent injection phobia variable. The next model tested was the two-factor model, in which Items 3, 4, 7, 9, 10, 11, 12, 13, 14, and 18 were loaded onto a distal fear latent variable, and Items 1, 2, 5, 6, 8, 15, 16, and 17 were loaded onto a contact fear latent variable.

Results

Descriptive statistics. As shown in Table 1, the IPS-Anx total score demonstrated good internal consistency. The Distal Fear (Cronbach's $\alpha = .92$; $M = 7.87$, $SD = 8.07$) and Contact Fear (Cronbach's $\alpha = .92$) subscale scores based on the EFA in Study 1 also showed good internal consistency. IPS-Anx total scores were mildly correlated with age in this sample and were significantly higher among women than among men, $t(547) = -5.36$, $p < .001$. As shown in Table 3, Pearson correlations were computed among the items, and all items were significantly correlated with each other. Each of the 18 items evidenced acceptable corrected

Table 3
Pearson Correlations Among the Injection Phobia Scale–Anxiety Items

Item	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	**.70**	.47	.32	**.44**	**.61**	.46	**.54**	.48	.45	.38	.44	.39	.27	**.38**	**.67**	**.65**	.60
2	—	.50	.34	**.54**	**.73**	.52	**.72**	.52	.50	.36	.48	.47	.29	**.32**	**.79**	**.75**	.49
3		—	**.49**	.35	.46	**.57**	.42	**.71**	**.69**	**.50**	**.64**	**.55**	**.41**	.21	.51	.47	**.57**
4			—	.31	.34	**.42**	.32	**.44**	**.52**	**.34**	**.45**	**.39**	**.44**	.16	.35	.36	**.43**
5				—	**.57**	.40	**.49**	.36	.38	.23	.32	.34	.19	**.25**	**.55**	**.54**	.34
6					—	.66	**.62**	.46	.48	.39	.48	.46	.22	**.32**	**.68**	**.80**	.45
7						—	.43	**.63**	**.65**	**.47**	**.63**	**.67**	**.29**	.20	.50	.58	**.59**
8							—	.46	.43	.29	.41	.39	.24	**.36**	**.68**	**.68**	.39
9								—	**.72**	**.47**	**.78**	**67**	**.37**	.24	.55	.49	**.61**
10									—	**.53**	**.72**	**.64**	**.46**	.26	.53	.53	**.64**
11										—	**.54**	**.40**	**.39**	.23	.36	.37	**.52**
12											—	**.75**	**.36**	.21	.53	.50	**.60**
13												—	**.32**	.18	.45	.46	**.58**
14													—	.21	.32	.27	.41
15														—	**.48**	**.37**	.33
16															—	**.78**	.54
17																—	.52

Note. All correlations are significant at $p < .001$. Correlations in boldface type are between items on the same factor.

item–total correlations on the basis of the .30 criterion (Nunnally & Bernstein, 1994).

CFA models. The one-factor model of injection phobia provided a good fit to the data, $\chi^2(135) = 424.67$, $p < .001$, RMSEA = .062, RMSEA 90% CI = .055–.068, CFI = .99, AGFI = .99, AIC = 496.47. The two-factor model of injection phobia also provided a good fit to the data, $\chi^2(134) = 343.69$, $p < .001$, RMSEA = .053, RMSEA 90% CI = .046–.059, CFI = .99, AGFI = .99, AIC = 417.69. Table 4 contains the standardized values for both the one- and two-factor model solutions. Direct comparison of the one-factor model with the correlated two-factor model revealed that the two-factor solution fit the data significantly better than did the one-factor model, as indicated by an improvement of 78.78 on the AIC. However, the difference in goodness of fit between the two models, although statistically significant, is quite small. The correlation between Distal Fear and Contact Fear in the two-factor model was .87.

Fit of Distal Fear versus Contact Fear. Closer examination of the item content reveals that all of the Contact Fear items share the common attribute of receiving a needle injection, whereas all but three of the Distal Fear items involve watching someone receive an injection or viewing needles. Therefore, the Contact Fear factor may have more clinical utility than does the Distal Fear factor. Therefore, two competing one-factor models were then tested. The first model tested was the Distal Fear one-factor model, in which Items 3, 4, 7, 9, 10, 11, 12, 13, 14, and 18 were loaded onto a distal fear latent variable. The next model tested was the Contact Fear one-factor model, in which Items 1, 2, 5, 6, 8, 15, 16, and 17 were loaded onto a contact fear latent variable. The Distal Fear one-factor model of injection phobia provided a good fit to the data, $\chi^2(35) = 108.43$, $p < .001$, RMSEA = .061, CFI = .99, AGFI = .99, AIC = 148.43. The Contact Fear one-factor model also provided a good fit to the data, $\chi^2(20) = 106.37$, $p < .001$, RMSEA = .087, CFI = .99, AGFI = .98, AIC = 138.37. Although the difference in goodness of fit is relatively small, AIC fit statistics indicate that the Contact Fear one-factor model had a better fit than did the Distal Fear one-factor model.

Discussion

Although the CFA results from Study 2 suggest that scores on the IPS-Anx may consist of two lower order factors assessing Distal Fear of injections and Contact Fear of injections, the high correlation between the two factors suggests that the two factors are not independent. Indeed, the one-factor model of the IPS-Anx did provide a good fit to the data. In addition, the incremental fit of the two-factor model over the one-factor model was rather small. These findings suggest that a one-factor model of the IPS-Anx may be more parsimonious than the two-factor model. Subsequent analyses did show that a one-factor model consisting of the Distal Fear items and a one-factor model consisting of the Contact Fear items yielded a good fit to the data. However, specified fit statistics suggest that a one-factor model, consisting of the Contact Fear items, fit the data better than did a one-factor model consisting of the Distal Fear items. This pattern of findings suggests that the use of the IPS-Anx as a one-dimensional scale may be appropriate. Furthermore, the IPS-Anx could potentially be improved into a briefer and more clinically focused measure by eliminating the Distal Fear items and retaining only the Contact Fear items. Accordingly, we sought to examine the test–retest reliability of an abbreviated version of the IPS-Anx consisting of the Contact Fear items in a third sample. We also aimed to examine how this abbreviated version compares with the IPS-Anx total score.

Table 4
Standardized Values for the One- and Two-Factor Models of the Injection Phobia Scale–Anxiety (IPS-Anx)

One-factor model			Two-factor model		
IPS-Anx item	λ	δ	IPS-Anx item	λ	δ
1	.94[a]	.10	1 → Contact Fear	.95[a]	.10
2	.97	.05	2 → Contact Fear	.97	.06
3	.97	.05	3 → Distal Fear	.96[a]	.09
4	.82	.32	4 → Distal Fear	.82	.33
5	.75	.43	5 → Contact Fear	.75	.44
6	.96	.07	6 → Contact Fear	.97	.06
7	.95	.08	7 → Distal Fear	.95	.10
8	.87	.23	8 → Contact Fear	.87	.24
9	.99	.01	9 → Distal Fear	.99	.02
10	.99	.01	10 → Distal Fear	.99	.02
11	.93	.12	11 → Distal Fear	.92	.15
12	1.00	.00	12 → Distal Fear	1.00	.00
13	.95	.08	13 → Distal Fear	.96	.08
14	.90	.18	14 → Distal Fear	.89	.21
15	.57	.66	15 → Contact Fear	.61	.63
16	.98	.02	16 → Contact Fear	.98	.04
17	.97	.04	17 → Contact Fear	.98	.04
18	.99	.00	18 → Distal Fear	.98	.04

Note. All loadings (except those fixed to 1.00) are significant at $p < .05$. λ = factor loading; δ = residual variance.
[a] Unstandardized factor loading was fixed to 1.00 to set the factor scale.

Study 3

Method: Test–Retest Reliability

Participants. In this study, 195 participants were recruited from undergraduate courses at a large southern university in exchange for research credit. Participants ranged in age from 18 to 42 years (M = 20.28, SD = 2.97) and were primarily Caucasian (75%) and female (69%).

Measure. The IPS-Anx (Öst et al., 1992) as described in Study 1 was used.

Procedure. Participants completed the IPS-Anx on two occasions, spaced 12 weeks apart, in a classroom setting as part of a larger study.

Results

Descriptive statistics. Descriptive statistics for the IPS-Anx total score and the Contact Fear factor at the two assessment points are provided in Table 1. The IPS-Anx total score and scores on the abbreviated Contact Fear factor demonstrated good internal consistency at Time 1 and Time 2. IPS-Anx total scores also correlated highly with scores on the Contact Fear factor at Time 1 (r = .93, p < .001) and Time 2 (r = .93, p < .001). IPS-Anx total scores and the Contact Fear factor were mildly correlated with age in this sample and were significantly higher among women than among men at Time 1 and Time 2. Each of the 18 items also evidenced acceptable corrected item–total correlations at Time 1 and Time 2 on the basis of the .30 criterion (Nunnally & Bernstein, 1994).

Test–retest reliability. As shown in Table 5, the 12-week test–retest reliability of the IPS-Anx total score in the total sample was high, with an intraclass correlation coefficient (ICC) of .88. The ICC for the abbreviated Contact Fear factor was comparable to that of the total score (.87). ICCs did appear to be generally higher for women (.91 and .88) compared with those for men (.71 and .75) for the IPS-Anx total score and scores on the abbreviated Contact Fear factor. Calculation for the test of the difference between two independent correlation coefficients (Cohen & Cohen, 1983) confirmed that the ICC for the IPS-Anx total score was significantly larger among women than among men (z score = 4.05, p < .001). The ICC for the Contact Fear factor was also significantly larger among women than among men (z score = 2.55, p < .01).

Table 5
Intraclass Correlation Coefficients (ICCs) for the IPS-Anx Total and Contact Fear Factor Over a 12-Week Period

Sample and measure	ICC	95% CI	p
Total sample			
IPS-Anx total	.88	.84–.91	<.001
Contact Fear	.87	.83–.91	<.001
Women			
IPS-Anx total	.91	.87–.94	<.001
Contact Fear	.88	.84–.92	<.001
Men			
IPS-Anx total	.71	.51–.83	<.001
Contact Fear	.75	.58–.86	<.001

Note. IPS-Anx = Injection Phobia Scale–Anxiety; CI = confidence interval.

Discussion

The data from Study 3 indicate that the IPS-Anx total score has adequate test–retest stability, and therefore scores on the scale during a single assessment are likely to be representative of an individual's injection phobia level on other occasions. Importantly, test–retest stability for scores on the abbreviated Contact Fear factor was comparable to that for the IPS-Anx total score. There was also some evidence suggesting that gender may moderate test–retest stability of scores on the IPS-Anx because reliability coefficients were generally stronger among women than among men. These findings suggest that the self-reported fear of needles may be more stable over time for women than for men. Having established comparable test–retest reliability, we then examined the convergent and divergent validity of the IPS-Anx total score and how it compares to the scores on the abbreviated Contact Fear factor in a fourth sample. Specifically, we examined the extent to which scores on the IPS-Anx and the Contact Fear factor correlate with theoretically related (i.e., disgust) and unrelated (i.e., positive affect) variables.

Study 4

Method: Convergent and Divergent Validity

Participants. In this study, 319 participants were recruited from undergraduate courses at a large southern university in exchange for research credit. Participants ranged in age from 18 to 46 years (M = 19.57, SD = 2.68) and were primarily Caucasian (86%) and female (61%).

Measures. The IPS-Anx (Öst et al., 1992) as described in Study 1 was used.

The Disgust Propensity and Sensitivity Scale–Revised (DPSS-R; van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006) is a 16-item measure designed to assess the frequency and emotional impact of disgust experiences. Participants rate their agreement with each item on a scale ranging from 1 (*never*) to 5 (*always*). The DPSS-R demonstrated good internal consistency in the present study (α = .90).

The Padua Inventory–Contamination Fear Subscale (PI; Burns, Keortge, Formea, & Sternberger, 1996) consists of 10 items assessing contamination fear. Items are scored on a 5-point scale ranging from 1 (*Not at all*) to 4 (*Very much*). The PI demonstrated good internal consistency in the present study (α = .89).

The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is conceptualized as a trait measure of general mood/affect. It consists of 20 descriptive adjectives of various positive and negative affective states, divided into two 10-item subscales: Positive Affect (PA) and Negative Affect (NA). Individuals indicate how much each mood descriptor applies to them on a 5-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). The PANAS demonstrated adequate internal consistency in the present study (α = .71).

Procedure. Participants completed the paper-and-pencil measures as part of a larger study in a classroom format.

Results

Descriptive statistics. Descriptive statistics for the IPS-Anx total score and the Contact Fear factor are provided in Table 1. The IPS-Anx total score and scores on the Contact Fear factor had good internal consistency in this sample. The IPS-Anx total score also correlated highly with scores on the Contact Fear factor ($r = .93$, $p < .001$). IPS-Anx total scores and the Contact Fear factor were mildly correlated with age in this sample and were significantly higher among women than among men ($ps < .001$). Each of the 18 items also evidenced acceptable corrected item–total correlations on the basis of the .30 criterion (Nunnally & Bernstein, 1994).

Trait correlates of the IPS-Anx and the Contact Fear factor. Table 6 presents the descriptive statistics and intercorrelations between the IPS-Anx total score, as well as the abbreviated Contact Fear factor score, and the DPSS-R, the PI, and the PANAS. Good convergent validity was evident for scores on the IPS-Anx, with strong correlations with the DPSS-R ($r = .42$) and moderate correlations with the PI ($r = .26$) and the NA ($r = .27$). As evidence of divergent validity, relatively weak associations were observed between the IPS-Anx total score and the PA ($r = –.11$). Table 6 also shows that a comparable pattern of correlations was found between scores on the abbreviated Contact Fear factor and scores on the DPSS-R, the PI, and the PANAS.

Specificity of trait correlates. A series of multiple linear regression analyses was conducted to examine the extent to which the DPSS-R, the PI, and the PANAS uniquely predicted IPS-Anx total scores and scores on the abbreviated Contact Fear factor. In each regression equation, these measures were simultaneously entered as predictor variables. In the first analysis predicting the IPS-Anx total score, all three predictor variables explained a significant portion of the variance ($R^2 = .19$, $p < .001$; see Table 7). After controlling for the other variables, scores on the DPSS-R (partial $r = .30$, $p < .01$) and the NA (partial $r = .18$, $p < .01$) accounted for unique variance. In the second regression predicting scores on the Contact Fear factor, the predictor variables accounted for 19% of the total variance ($p < .001$), with scores on the DPSS-R (partial $r = .27$, $p < .01$) and the NA (partial $r = .21$, $p < .01$) explaining significant, unique variance after controlling for the other predictors.

Table 6
Pearson Correlations Between IPS-Anx Total, Contact Fear Factor, and Trait Predictors

Measure	*M* (*SD*)	IPS-Anx total	Contact Fear
DPSS-R	36.19 (9.93)	.42**	.40**
PI	9.57 (7.95)	.26**	.27**
NA	20.83 (6.08)	.27**	.28**
PA	35.08 (5.88)	−.11*	−.12*

Note. IPS-Anx = Injection Phobia Scale–Anxiety; DPSS-R = Disgust Propensity and Sensitivity Scale–Revised; PI = Padua Inventory–Contamination Fear Subscale; NA = Negative Affect subscale of the Positive and Negative Affect Schedule (PANAS); PA = Positive Affect subscale of the PANAS.
* $p < .05$. ** $p < .01$.

Discussion

Study 4 provides supportive evidence for the convergent and divergent validity of the IPS-Anx total score and scores on the Contact Fear factor. The IPS-Anx total score demonstrated significant and unique associations with the DPSS-R as well as the NA. The DPSS-R and the NA also yielded comparable associations with scores on the abbreviated Contact Fear factor. Thus, the tendency to experience disgust and negative affect appear to be strong predictors of fear of physical contact with needles. However, given that this is the first study to examine the comparable validity of scores on the IPS-Anx and an abbreviated version of the scale, additional data along these lines are warranted. Accordingly, we elected to further examine the validity of scores on the IPS-Anx and the abbreviated Contact Fear factor in a fifth sample. Specifically, we examined the extent to which the IPS-Anx total score and scores on the abbreviated Contact Fear factor discriminated those with a history of fainting and avoidance of medical procedures from those without such a history.

Study 5

Method: Predictive Validity

Participants. In this study, 1,674 participants were recruited from undergraduate courses at large southern university in exchange for research credit. Participants ranged in age from 17 to 46 years ($M = 19.23$, $SD = 2.16$) and were primarily Caucasian (53%) and equally distributed across the genders (female = 50%).

Measures. The IPS-Anx (Öst et al., 1992) as described in Study 1 was used.

Participants were asked to respond to two items assessing historical instances of fainting and avoidance in the context of injection situations. Fainting was assessed by the following question: “Have you ever fainted, almost fainted, or felt dizzy during medical procedures such as giving blood or receiving injections?” Avoidance was assessed by this question: “Have you ever avoided, delayed, or put off medical procedures because you were afraid of blood, needles, injections, etc.?”

Procedure. Participants completed the paper-and-pencil measures as part of a larger study in a large classroom format.

Results

Descriptive statistics. Descriptive statistics for the IPS-Anx total score and the Contact Fear factor are provided in Table 1. The IPS-Anx total score and scores on the Contact Fear factor demonstrated good internal consistency in this sample. IPS-Anx total scores also correlated highly with scores on the Contact Fear factor ($r = .91$, $p < .001$). The IPS-Anx total score and scores on the Contact Fear factor were also mildly correlated with age. Lastly, scores on the IPS-Anx total score and the Contact Fear factor were significantly higher among women than among men ($ps < .001$). Each of the 18 items evidenced acceptable corrected item–total correlations on the basis of the .30 criterion (Nunnally & Bernstein, 1994).

A one-way analysis of variance (ANOVA) was conducted comparing four groups on the IPS-Anx total score: fainting history only, avoidance history only, fainting and avoidance history, nei-

Table 7
Specificity of Trait Variables in the Prediction of IPS-Anx Total and Contact Fear Factor

Measure	*B*	*B SE*	β	*t*	*p*	Partial *r*
IPS-Anx total[a]						
DPSS-R	0.58	0.12	.34	4.70	<.01	.30
PI	0.06	0.14	.03	0.42	.67	.03
NA	0.46	0.17	.17	2.67	<.01	.18
PA	−0.04	0.16	−.01	−0.24	.81	−.01
Contact Fear[b]						
DPSS-R	0.28	0.07	.30	4.13	<.01	.27
PI	0.05	0.07	.05	0.68	.49	.04
NA	0.29	0.09	.20	3.08	<.01	.21
PA	−0.04	0.09	−.03	−0.52	.60	−.03

Note. IPS-Anx = Injection Phobia Scale–Anxiety; DPSS-R = Disgust Propensity and Sensitivity Scale–Revised; PI = Padua Inventory–Contamination Fear Subscale; NA = Negative Affect subscale of the Positive and Negative Affect Schedule (PANAS); PA = Positive Affect subscale of the PANAS.
[a] $R^2 = .19$, $F(4, 210) = 12.49$, $p < .001$. [b] $R^2 = .19$, $F(4, 205) = 12.25$, $p < .001$.

ther fainting history nor avoidance history, with post hoc analyses using the Tukey honestly significant difference procedure. Means and standard deviations on the IPS-Anx total score for the four groups are presented in Table 8. The one-way ANOVA was statistically significant, $F(3, 1670) = 286.33$, $p < .0001$. As depicted in the left panel of Figure 1, those with a fainting history only, an avoidance history only, and a fainting and avoidance history scored higher on the IPS-Anx than did those with neither a fainting history nor an avoidance history (*p*s < .001). Those with a fainting and avoidance history scored higher on the IPS-Anx than did those with only a fainting history and those with only an avoidance history (*p*s < .001). Those with an avoidance history only also scored higher on the IPS-Anx than did those with only a fainting history ($p < .001$).

A one-way ANOVA for the abbreviated Contact Fear factor was also significant, $F(3, 1675) = 241.80$, $p < .0001$. Means and standard deviations on the abbreviated Contact Fear factor for the four groups are presented in Table 8. As depicted in the right panel of Figure 1, those with a fainting history only, an avoidance history only, and a fainting and avoidance history scored higher on the Contact Fear factor than did those with neither a fainting history nor an avoidance history (*p*s < .001). Those with a fainting and avoidance history scored higher on the Contact Fear factor than did those with only a fainting history and those with only an avoidance history (*p*s < .001). Those with an avoidance history only also scored higher on the Contact Fear factor than did those with only a fainting history ($p < .001$).

Fainting history discriminant function. A discriminant analysis was conducted to determine whether the IPS-Anx total score could predict fainting history above and beyond gender. The overall Wilks's Lamda was significant, $\Lambda = .85$, $\chi^2(2) = 275.26$, $p < .001$, indicating that gender and scores on the IPS-Anx differentiated fainters from nonfainters. The within-group correlations between the predictors and the standardized weights are presented in Table 9. The IPS-Anx total score demonstrated, on the basis of these coefficients, the strongest relationship with the discriminant function. Those with a fainting history ($M = 0.66$) had higher scores on the discriminant function than did those without a history of fainting ($M = -0.28$). In the prediction of fainting group membership, the model correctly classified 74% of the sample ($\kappa = .30$).

A similar analysis with gender and the abbreviated Contact Fear factor revealed an overall Wilks's Lamda that was significant, $\Lambda = .86$, $\chi^2(2) = 245.89$, $p < .001$, indicating that gender and scores on the abbreviated Contact Fear factor also differentiated fainters from nonfainters. The within-group correlations between the predictors and the standardized weights are presented in Table 9. Scores on the abbreviated Contact Fear factor demonstrated, on the basis of these coefficients, the strongest relationship with the discriminant function. Those with a fainting history ($M = 0.62$) had higher scores on the discriminant function than did those without a history of fainting ($M = -0.26$). In the prediction of fainting group membership, the model correctly classified 73% of the sample ($\kappa = .28$).

Medical avoidance discriminant function. A discriminant analysis was conducted to determine whether the IPS-Anx total score could predict the self-reported history of medical avoidance above and beyond gender. The overall Wilks's Lamda was signif-

Table 8
Differences on the IPS-Anx Total and Contact Fear Factor for Those With and Without Fainting History and Medical Avoidance

Measure	Fainting only ($n = 309$)	Avoidance only ($n = 172$)	Fainting and avoidance ($n = 189$)	No fainting or avoidance ($n = 1{,}004$)
IPS-Anx total	20.65 (13.34)	28.06 (13.10)	38.09 (13.54)	12.94 (10.74)
Contact Fear	13.02 (7.22)	17.19 (7.26)	21.73 (6.09)	8.81 (6.65)

Note. IPS-Anx = Injection Phobia Scale–Anxiety.

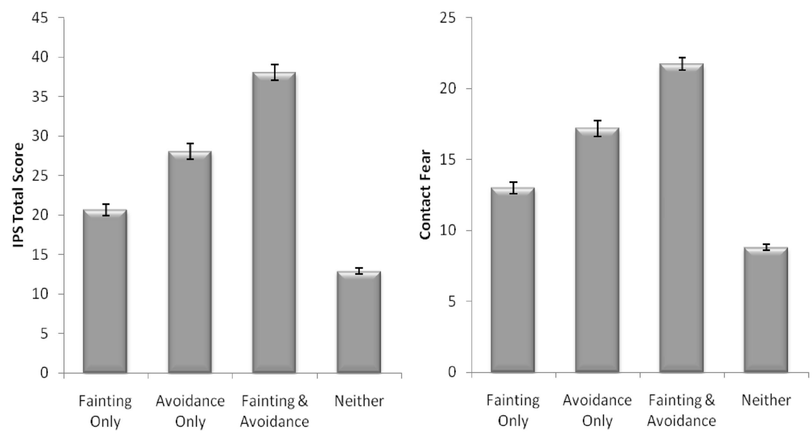

Figure 1. Group differences for those with a fainting history only, avoidance history only, fainting and avoidance history, and neither a fainting history nor an avoidance history on the Injection Phobia Scale–Anxiety (IPS-Anx) and the abbreviated Contact Fear factor.

icant, $\Lambda = .72$, $\chi^2(2) = 542.10$, $p < .001$, indicating that gender and scores on the IPS-Anx differentiated avoiders from nonavoiders. The within-group correlations between the predictors and the standardized weights are presented in Table 9. The IPS-Anx total score demonstrated, on the basis of these coefficients, the strongest relationship with the discriminant function. Those with a history of medical avoidance ($M = 1.18$) had higher scores on the discriminant function than did those without a history of medical avoidance ($M = -0.33$). In the prediction of medical avoidance group membership, the model correctly classified 83% of the sample ($\kappa = .45$).

A similar analysis with gender and the abbreviated Contact Fear factor revealed an overall Wilks's Lamda that was significant, $\Lambda = .75$, $\chi^2(2) = 485.29$, $p < .001$, indicating that gender and scores on the abbreviated Contact Fear factor also differentiated avoiders from nonavoiders. The within-group correlations between the predictors and the standardized weights are presented in Table 9. Scores on the abbreviated Contact Fear factor demonstrated, on the basis of these coefficients, the strongest relationship with the discriminant function. Those with a history of medical avoidance ($M = 1.10$) had higher scores on the discriminant function than did those without a history of medical avoidance ($M = -0.31$). In the prediction of medical avoidance group membership, the model correctly classified 82% of the sample ($\kappa = .42$).

Table 9
Standardized Coefficients and Correlations of the IPS-Anx Total and Contact Fear With Discriminant Function

Variable	Standardized coefficient with discriminant function	Correlation coefficient with discriminant function
Fainting history predictor		
Gender	.31	.47
IPS-Anx total	.90	.95
Medical avoidance predictor		
Gender	.06	.25
IPS-Anx total	.99	.99
Fainting history predictor		
Gender	.38	.50
Contact Fear	.88	.94
Medical avoidance predictor		
Gender	.10	.27
Contact Fear	.98	.99

Note. IPS-Anx = Injection Phobia Scale–Anxiety.

Discussion

Study 5 provides additional supportive evidence for the validity of the IPS-Anx total score. We found that scores on the IPS-Anx significantly discriminated those with a history of fainting from those without a fainting history and those with a history of medical avoidance from those without a history of medical avoidance. In fact, IPS-Anx scores were highest among those with a fainting and avoidance history compared with those with a fainting history only, those with an avoidance history only, and those with neither fainting nor avoidance histories. Discriminant function analyses also revealed that scores on the abbreviated Contact Fear factor were comparable to scores on the total IPS-Anx in identifying those with a fainting history and those prone to medical avoidance. These findings suggest that the IPS-Anx may have some utility as a screening tool in the applied medical setting. The abbreviated Contact Fear factor may be particularly useful in an applied medical setting where quick and efficient assessments are needed. Although these findings further support the validity and utility of the IPS-Anx and the abbreviated Contact Fear factor, the extent to which the IPS-Anx is best represented by a one- or two-factor model remains somewhat unclear. Therefore, participants in Studies 2–5 were pooled into a larger sample, and a new CFA was conducted with the aim of potentially providing a more definitive resolution regarding the factor structure of the IPS-Anx.

Study 6

Method: Reexamining the IPS-Anx Factor Structure

The data from Studies 2–5 were merged to confirm that the one-factor structure of the IPS-Anx fits the data well in a larger sample (N = 2,774). The model tested was the unidimensional model of the IPS-Anx, in which all 18 IPS items were loaded onto a latent injection phobia variable. The results indicated that the one-factor model of the IPS-Anx provided a good fit to this data, $\chi^2(135)$ = 1,310.31, $p < .001$, RMSEA = .056, CFI = .98, AGFI = .99, AIC = 1,382.31. The two-factor model of Distal Fear and Contact Fear also provided a good fit to the data, $\chi^2(134)$ = 1,045.32, $p < .001$, RMSEA = .050, CFI = .99, AGFI = .99, AIC = 1,119.32. Direct comparison of the one-factor model with the correlated two-factor model revealed that the two-factor solution fit the data significantly better than did the one-factor model in the sample, as indicated by an improvement of 262.99 on the AIC. However, the correlation between scores on the Distal Fear and Contact Fear factors remained high (r = .89).

A one-factor model consisting of eight IPS-Anx items (i.e., 1, 2, 5, 6, 8, 15, 16, and 17) loading onto a latent contact fear variable was also examined. The results indicated that a one-factor model of the abbreviated Contact Fear factor also provided a good fit to the data in this larger sample, $\chi^2(20)$ = 302.22, $p < .001$, RMSEA = .072, CFI = .99, AGFI = .99, AIC = 334.22.

Measurement invariance across gender. Given consistent findings that scores on the IPS-Anx total and the Contact Fear factor are significantly higher among women than among men, consecutively more restrictive tests of measurement invariance across gender were conducted. First, a test of configural invariance was conducted—a test that specified that the factor structure (i.e., the pattern of free and fixed factor loadings imposed on the items) of the IPS-Anx be equivalent across gender. Next, this model was compared with the model with factor loadings constrained to be equal across gender using the chi-square difference test. A nonsignificant difference in chi-square suggests equivalent factor loadings and, thus, metric invariance. In other words, if the chi-square is significant, the nested model is considered to have a significantly worse goodness of fit due to the restrictions, and it is determined that the parent model evidences a significantly better fit than does the nested model.

A multiple-group CFA was conducted to determine whether the one-factor structure of the IPS-Anx total is invariant across gender. The merged data set contained responses from 1,646 women and 1,085 men (gender information was missing for 46 participants). As shown in Table 10, configural invariance was found between men and women. Specifically, the pattern of free and fixed factor loadings imposed on the items resulted in a model that fit the data well for men and women, $\chi^2(270)$ = 1,545.92, $p < .001$, RMSEA = .059, CFI = .98. Full metric invariance was not evident when the factor loadings were constrained to be equal across men and women, $\Delta\chi^2(17)$ = 320.65, $p < .001$. Similar analysis on the abbreviated Contact Fear factor also revealed configural invariance between men and women. Specifically, the pattern of free and fixed factor loadings imposed on the items resulted in a model that fit the data adequately for both men and women, $\chi^2(40)$ = 520.31, $p < .001$, RMSEA = .094, CFI = .97. Full metric invariance was not evident when the factor loadings were constrained to be equal across men and women, $\Delta\chi^2(7)$ = 42.93, $p < .001$.

Discussion

These findings were consistent with those of Study 2, suggesting that scores on the IPS-Anx may consist of two lower order factors. However, the correlation between scores on the two factors was high, and the one-factor model in this larger sample provided a good fit to the data. These findings suggest that retaining a more parsimonious one-factor model of the IPS-Anx is indicated. A one-factor model consisting of the abbreviated Contact Fear items also yielded a good fit to the data. This finding further supports the potential utility of the Contact Fear factor as a short form of the IPS-Anx. Examination of measurement invariance across gender on the IPS-Anx total score and scores on the abbreviated Contact Fear factor yield good evidence for configural invariance between men and women. Although these findings further inform knowledge on the factor structure of the IPS-Anx, our examination thus far is limited by exclusive use of a nonclinical sample. Accordingly, we elected to further examine the validity of the IPS-Anx in a clinically relevant sample. Specifically, we examined differences on the IPS-Anx and its factors between those with a clinical diagnosis of BII phobia and nonphobic controls.

Study 7

Method: Clinical Specificity

Participants. The BII phobia group (n = 39; 80% female; mean age = 19.02 years, SD = 0.98) consisted of participants meeting diagnostic criteria for BII phobia according to the Anxiety Disorders Diagnostic Interview Schedule–Revised (ADIS-R; DiNardo & Barlow, 1988). The nonphobic group (n = 43; 78% female, mean age = 19.32 years, SD = 1.14) consisted of participants not meeting diagnostic criteria for BII phobia on the basis of the ADIS-R.

Table 10
Gender Invariance Statistics for the IPS-Anx Total and Contact Fear Factor

Model and constraint	χ^2	df	RMSEA	χ^2_{diff}	Δdf	p
IPS-Anx total model						
1. Baseline two-group model, no constraints	1,545.92	270	.059			
2. Factor loadings constrained to be equal	1,866.57	287	.064	320.65	17	<.001
Contact Fear factor model						
1. Baseline two-group model, no constraints	520.31	40	.094			
2. Factor loadings constrained to be equal	563.24	47	.090	42.93	7	<.001

Note. IPS-Anx = Injection Phobia Scale–Anxiety; RMSEA = root-mean-square error of approximation; χ^2_{diff} = nested χ^2 difference.

Measures. The IPS-Anx (Öst et al., 1992) as described in Study 1 was used.

The ADIS-R (DiNardo & Barlow, 1988) is a structured clinical interview that was developed specifically as a diagnostic assessment of anxiety and related mental disorders.

Procedure. Participants were recruited from a university campus, and interested participants were administered the specific phobia module of the ADIS-R by a research assistant (RA) trained to criterion standards. After completing the interview, the RA presented the assessment data to a Ph.D.-level supervisor. Although formal interrater reliability checks were not conducted, only those for whom both the RA and the supervisor agreed on diagnostic status were included in the study (i.e., 100% interrater agreement). Participants in this study completed the IPS-Anx individually on a computer. In exchange for participation in this study, participants were given research credit and/or were entered into a raffle to win a $50 gift certificate.

Results and Discussion

Descriptive statistics. The IPS-Anx total score ($\alpha = .97$) and scores on the abbreviated Contact Fear factor ($\alpha = .97$) demonstrated good internal consistency in this sample. The IPS-Anx total score correlated highly with scores on the Contact Fear factor ($r = .95$, $p < .001$). The IPS-Anx total score ($r = -.24$) and scores on the Contact Fear factor ($r = -.22$) were also mildly correlated with age (ps $< .05$). Each of the 18 items evidenced acceptable corrected item–total correlations (range = .45–.93) on the basis of the .30 criterion (Nunnally & Bernstein, 1994).

Group differences on the IPS-Anx and its factors. Direct comparisons revealed that individuals with a diagnosis of BII phobia ($M = 44.84$, $SD = 8.86$) scored higher on the IPS-Anx total than did nonphobic controls ($M = 9.20$, $SD = 11.40$), $t(80) = 15.68$, $p < .001$. Those with BII phobia ($M = 23.84$, $SD = 5.07$) also scored higher on the abbreviated Contact Fear factor compared with the nonphobic controls ($M = 6.25$, $SD = 6.76$), $t(80) = 13.20$, $p < .001$. These findings provide supportive evidence for the clinical utility of the IPS-Anx and its factors.

General Discussion

Injection phobia can be a debilitating condition that may have fairly dramatic health consequences if left untreated. Therefore, establishing a brief but reliable, valid, and sensitive assessment of injection phobia is crucial for both research and clinical assessment purposes. Although multiple measures of BII fear exist (Kleinknecht et al., 1999; Wenzel & Holt, 2003), they tend to be long, assess constructs other than injection fear, and may be more suitable within an experimental context. The exclusive focus on injection phobia makes the IPS-Anx ideal as a refined measure of injection-related fears. Available data prior to this study showed fairly good psychometric properties for the IPS-Anx (Öst et al., 1992) and its ability to discriminate those with analog BII phobia from those with spider phobia and nonclinical controls (Sawchuk et al., 2002). However, no study to date has replicated or furthered its psychometric characteristics on larger samples or conducted more comprehensive analyses of its factor structure. Accordingly, the present investigation examined the factor structure and psychometric properties of the IPS-Anx in six independent samples. Across all studies, scores on the IPS-Anx were found to be internally consistent, with all items having moderate to high correlations with the total score.

The present study represents the first factor analysis of the IPS-Anx. EFA with an oblique rotation revealed two lower order factors labeled *Distal Fear* and *Contact Fear*. Although this EFA did not yield a single complex item (i.e., an item with salient loadings on more than one factor), a second EFA with a varimax rotation revealed 12 complex items on the basis of a criterion of |.30| as a salient loading. Such a high number of complex items suggests that a one-factor model may be more parsimonious than a two-factor model. CFAs from Study 2 and Study 6 did show that the two-factor solution provided a better fit to the data than did the one-factor model of the IPS-Anx. However, it is important to note that the fit of the one-factor model was also quite good. Furthermore, the correlation between the two factors was high, suggesting that the lower order factors may be hierarchically organized under a single higher order injection-phobia factor.

Item analysis revealed that participants tended to provide responses that were below the level of “moderate anxiety” on the IPS-Anx. This finding suggests that the experience of those with injection phobia, as assessed by the IPS-Anx items, is relatively far removed from the experience of most nonclinical participants. However, closer inspection of the IPS-Anx revealed that the vast majority of the items that were endorsed less highly than other items loaded on the Distal Fear factor. Although CFA suggests that the Distal Fear and Contact Fear factors may be distinct, it seems likely that the factors reflect an artifact of injection fear severity on the IPS-Anx. One consequence of this is that items that load on the Distal Fear factor (e.g., “Watching a person in a nurse uniform”; “Looking at and touching veins in the crook of the arm”) may have less utility, given that they do not assess fear of contact with injections directly. Preliminary evidence in Study 2 showed that a one-factor model consisting of an abbreviated Contact Fear factor did fit the data better than did a one-factor model consisting of an abbreviated Distal Fear factor.

Across all studies, scores on an abbreviated Contact Fear factor were found to have an internal consistency that was comparable to that of the IPS-Anx total score. Additional examination of the psychometric properties of the IPS-Anx and an abbreviated Contact Fear factor indicated comparable test–retest reliability over a 12-week period. The IPS-Anx total score and scores on the abbreviated Contact Fear factor also demonstrated good convergent and divergent validity, with significant positive correlations with measures of disgust propensity and sensitivity, contamination fear, and negative affect and low negative correlations with positive affect. When controlling for the various predictors, scores on the DPSS-R demonstrated the strongest relationship with injection phobia. This finding is consistent with prior research highlighting the role disgust may play in the development and maintenance of BII phobia (de Jong & Merckelbach, 1998; Sawchuk et al., 2000; Tolin et al., 1997) and how the disgust–injection fear association appears independent of trait anxiety (Olatunji, Lohr, et al., 2007) and negative affect (Olatunji, Cisler, et al., 2007).

Negative affect was also found to be a significant predictor of the IPS-Anx total score and scores on the abbreviated Contact Fear factor when controlling for other predictors, although its contribution was less than that observed with disgust propensity. Negative affect is conceptualized as a higher order risk factor for the development of anxiety disorders (i.e., Zinbarg & Barlow, 1996), and thus its unique association with the IPS-Anx total score and scores on the abbreviated Contact Fear factor may be expected. However, additional research on the convergent validity of the IPS-Anx total score and the abbreviated Contact Fear factor will be needed. Indeed, one limitation of the present investigation is that convergent validity was not examined with another self-report measure of injection fear. Furthermore, divergent validity may be further supported in future research by demonstrating a stronger relationship between scores on the IPS-Anx and scores on another measure of injection phobia than between scores on the IPS-Anx and scores on another measure of a construct that is related but distinct (e.g., a measure of animal phobia). Comparison of the psychometric properties of the IPS-Anx with that of related and distinct measures may provide important insights into the nature of injection phobia.

The IPS-Anx total score discriminated those with a fainting history from those without a fainting history. The IPS-Anx total score also discriminated those with a history of avoiding medical procedures from those without such a history. The abbreviated Contact Fear factor was also found to be comparable to the IPS-Anx total score in the two discriminant functions. The present findings also suggest that those with a history of fainting and medical avoidance tend to be the most fearful of injections. Avoidance and delay in seeking medical care among those with injection phobia can complicate treatment engagement and health care compliance and can result in serious health consequences (Kleinknecht & Lenz, 1989; Öst, 1992). Screening tools that may be helpful in detecting patients vulnerable to avoiding future appointments may allow health care providers to engage in proactive problem solving and motivational enhancement strategies to help bolster treatment engagement and compliance across time. The abbreviated Contact Fear factor may be especially useful in this regard, given its brevity. However, before the IPS-Anx or an abbreviated version of the scale can be used in this regard, additional evidence of its predictive validity will be needed. For example, future research may benefit from examining the extent to which scores on the IPS-Anx predict actual avoidance, fainting behavior, and physiological reactivity during needle exposures.

In accord with previous research (Olatunji, Arrindell, & Lohr, 2005), women consistently scored higher on the IPS-Anx and the abbreviated Contact Fear factor than did their male counterparts. In fact, there was evidence that the test–retest reliability of scores on the IPS-Anx may be moderated by gender. Specifically, test–retest reliability was generally higher among women relative to men, suggesting that injection phobia may be more stable among women relative to men. Although gender differences appear to be present in the severity and stability of injection phobia, the one-factor structure of the IPS-Anx and the abbreviated Contact Fear factor were found to be generally invariant between men and women. Gender differences in the severity and stability of self-reported injection phobia may be attributable to various social learning factors (e.g., being reinforced for gender-appropriate behaviors; Craske, 2003). For example, social-verbal contingencies may reinforce the idea that women can more overtly express fear, whereas for men, social contingencies generally do not support expression of such emotions (Carey, Dusek, & Spector, 1988). Such social learning factors remain important from both a psychometric standpoint and for differential screening within the applied medical setting.

The results of this study offer supportive evidence for a measure of injection phobia that demonstrates initial psychometric strengths and potential clinical utility. Overall, the IPS-Anx shows promise and should be considered an empirically based measure of injection phobia (e.g., Antony, Orsillo, & Roemer, 2001). Indeed, the present investigation showed that the IPS-Anx and its factors discriminated those with BII phobia from nonphobic controls. Despite these encouraging results, however, additional refinement and validation of the IPS-Anx are needed. Specifically, these initial results suggest that the abbreviated Contact Fear factor may have utility as a short-form version of the IPS-Anx. The abbreviated Contact Fear factor may be suitable for use in clinical and research settings where time and resources do not permit administration of lengthy symptom interviews. Furthermore, additional psychometric evaluation of the IPS-Anx is needed to help reduce the total number of items to a valid short form that is predictive of specific outcomes (e.g., fainting, avoidance, noncompliance), thereby increasing the likelihood that such a measure can be used more seamlessly and practically in medical care settings. Future research employing item response theory (IRT) may prove useful in determining the psychometric integrity of items on the Contact Fear factor and the extent to which such items represent an adequate short form of the IPS-Anx. IRT has proven useful in revising measures of other phobias (Olatunji et al., 2009), and it may also have utility in identifying IPS-Anx items that best discriminate along the injection phobia continuum.

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Received April 30, 2009
Revision received August 10, 2009
Accepted October 15, 2009 ■