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Psychometric properties of the Posttraumatic Cognition Inventory within a Northern Ireland adolescent sample

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Objectives. This study sought to investigate the psychometric properties of the Posttraumatic Cognitions Inventory (PTCI; Foa *et al.*, 1999, *Psychol. Assess.*, *11*, 303) among a cohort of older adolescents and to determine the relationship between post-traumatic cognitions and a variety of psychological outcomes including depression, anxiety, stress, and loneliness.

Methods. The PTCI was investigated among a large sample ($N = 785$) of Northern Irish adolescents. Confirmatory factor analysis and composite reliability analysis were conducted to assess the psychometric properties of the scale.

Results. The familiar three-factor solution of negative cognitions of self, negative cognitions of the world and others, and self-blame was supported; however, it was necessary to remove eight items from the original 33-item scale. The three-factor structure was subsequently demonstrated to be factorially invariant across gender and to possess satisfactory internal reliability. The three PTCI factors were found to correlate with depression, anxiety, stress, and three dimensions of loneliness.

Conclusion. These results provide the first piece of evidence that older adolescents cognitively respond to trauma in a similar manner to adults, that the PTCI is factorially invariant between genders, and that trauma cognitions are correlated with feelings of loneliness. The contextual dependent nature of the structure of the PTCI factors is discussed in relation to future research efforts.

Practitioner points

- The PTCI is a valid and reliable measure of trauma-related cognitions among adolescents and works equally well for male adolescents and female adolescents.
- Trauma cognitions are associated with a range of mental health problems beyond post-traumatic stress disorder including depression, anxiety, stress, and various aspects of loneliness.
- Reductions in trauma cognitions in survivors of trauma will have wide-scale clinical benefits to patient well-being.
- The exact structure and make-up of items in the PTCI may well be dependent on culture, context, and the nature of the trauma.

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- The study is limited due to the fact that the authors could not assess the severity of the trauma experienced by the adolescent sample.

Cognitive models of psychopathology are predicated upon the theoretical proposition that dysfunctional cognitive processing, in the form of distorted representations (Clark & Beck, 2010) or extreme evaluations (David, Szentagotai, Kallay, & Macavei, 2005), is fundamental to the emergence of psychological distress. One of the most widely used assessments of dysfunctional cognitions associated with post-traumatic stress responses is the Posttraumatic Cognitions Inventory (PTCI: Foa, Ehlers, Clark, Tolin, & Orsillo, 1999). Important empirical support for the basic cognitive model of post-traumatic stress disorder (PTSD) was obtained by Kleim *et al.* (2013) who performed a prospective study among an adult sample of patients diagnosed with PTSD undergoing trauma-focused cognitive behaviour therapy. Using the PTCI, Kleim *et al.* produced robust evidence that cognitive change predicted subsequent reductions in levels of PTSD.

A number of randomized control trials (Nixon, Sterk, & Pearce, 2012; Smith, Yule, Perrin, Dalgleish, & Clark, 2007) and prospective studies (Nixon *et al.*, 2010; Punamaki, Palossan, Diab, Peltonen, & Qouta, 2015; Salmond *et al.*, 2011) among children and adolescent samples have demonstrated that post-traumatic cognitions (PTCs) mediate the impact of traumatic life events on symptoms of PTSD. These studies utilized the Child Posttraumatic Cognitions Inventory (C-PTCI: Meiser-Stedman *et al.*, 2009), a 25-item scale adapted from the PTCI and designed for use among children and adolescents.

Important differences between the C-PTCI (Meiser-Stedman *et al.*, 2009) and the PTCI (Foa *et al.*, 1999) ought to be recognized for both clinical and research practices with late adolescent populations. The PTCI assesses three trauma-related cognitive styles: (1) 'Negative cognitions about the self' (SELF – 21 items), the tendency for an individual to hold pervasively negative evaluations of oneself; (2) 'Negative cognitions of the world and others' (WORLD – seven items), the tendency for the individual to hold highly negative evaluations of other people and the external environment; and (3) 'Self-blame' (BLAME – five items), the tendency to blame oneself for the traumatic event. Alternatively, the C-PTCI measures two trauma-related cognitive styles: (1) 'Permanent and disturbing change', perceptions that the individual has been indelibly changed in a negative manner as a consequence of the trauma, and (2) 'Fragile person in a scary world', perceptions that the world is a dangerous place and the individual is weak. Although there is a degree of similarity in the content of both measures, the C-PTCI does reflect distinct cognitive responses to trauma than is reflected in the PTCI. This is not surprising given that it was developed for children, but a problem occurs when clinicians and researchers need to decide on an appropriate measurement tool for older adolescents who have experienced traumatic life events. As the psychometric properties of the PTCI have yet to be investigated within a late adolescent cohort, it is currently unknown whether individuals in this age range display similar cognitive reactions to those observed in adult samples. The need to assess the validity of the PTCI within an adolescent sample is thus required.

Since its initial validation study (Foa *et al.*, 1999) that suggested a three-factor structure of SELF, WORLD, and BLAME, the PTCI has received considerable empirical attention with highly inconsistent findings emerging across a range of adult samples. Beck *et al.* (2004) investigated the factor structure of the PTCI among a sample of 112 motor vehicle accident survivors. Using confirmatory factor analysis (CFA), they found that the three-factor model was an acceptable fit of the data after the exclusion of four items from the SELF factor. Internal reliability for each subscale was satisfactory, and the SELF and

WORLD factors were found to be moderately-to-highly correlated with levels of PTSD, state and trait anxiety, and depression.

van Emmerik, Schoorl, Emmelkamp, and Kamphuis (2006) investigated the underlying factor structure of the Dutch version of the PTCI using principal component analysis. Results supported the three-factor model among two distinct samples (treatment seekers, $n = 185$; and college students, $n = 178$); however, two items from the SELF factor cross-loaded (items 2 and 26) with WORLD and BLAME, respectively. Additionally, internal consistency, test–retest reliability (2 weeks), and convergent validity were all found to be acceptable. Additionally, PTCI scores were found to positively correlate with levels of PTSD and depression.

Su and Chen (2008) investigated the factor structure of the Chinese version of the PTCI among a sample of 240 traumatized college students, using CFA procedures. Their results also found support for the three-factor solution after the exclusion of four misperforming items of the SELF factor.

Muller *et al.* (2010) tested the psychometric properties of the German version of the PTCI using CFA among two samples: Accident-related trauma victims ($n = 213$) and interpersonal trauma victims ($n = 190$). Muller *et al.* investigated all models suggested by previous findings and failed to find acceptable model fit for any model. A 29-item version of the scale was found to be an acceptable fit of the data when a number of items were excluded from both the WORLD and SELF factors. This study also found satisfactory internal consistency and retest reliability. Correlation analysis indicated that the SELF factor was most strongly associated with post-traumatic stress symptoms ($r = .58$), followed by the WORLD ($r = .46$) and BLAME ($r = .28$) factors. Correlations between the PTCI factors and both depression and anxiety followed the same pattern.

Daie-Gabai, Aderka, Allon-Schindel, Foa, and Gilboa-Schechtman (2011) investigated the factor structure of the Hebrew version of the PTCI among a heterogeneous trauma sample of 326 Israeli adults using CFA. Their results supported the three-factor model of the PTCI but again, only after the exclusion of four items from the SELF factor. The analysis found that the SELF factor was most strongly associated with levels of PTSD and depression, followed by the BLAME factor. Correlations between the three PTCI factors and PTSD symptomology again ranged from weak ($r = .12$ for BLAME) to strong ($r = .71$ for SELF), with very similar associations observed for levels of depression. The researchers also examined gender differences in total PTCI scores and found no difference between male adolescents and female adolescents.

The existing literature suggest that the PTCI is likely best explained in terms of three related latent factors; however, a major issue exists with respect to the appropriate number of items that should be included in each factor. Every study has required the removal of items from the SELF factor, and one study has required item exclusion from the BLAME factor. Foa *et al.* (1999) stated that the SELF subscale could be shortened without impacting on the scale's psychometric properties. However, failure to consistently replicate models with the same number of items suggests that existing items in the scale fail to reliably capture cognitive responses across multiple samples and/or multiple trauma types. Moreover, the necessity of item removal in every study thus far performed suggests that accepted models are merely tailored to fit the idiosyncratic nature of the sample used in that particular study, and therefore, observed results are unlikely to be generalizable. This is borne out by the highly inconsistent results that have been observed for the PTCI.

Recent cross-sectional and longitudinal studies have highlighted the role that changes in PTCs can have in the development of various emotional disorders after the experience

of a trauma (e.g., Ehring, Ehlers, & Glucksman, 2008). It is important therefore that researchers investigate the relationship between PTCs and other forms of psychopathology beyond depression, anxiety, and PTSD which have traditionally been assessed. One psychological construct that warrants investigation is loneliness. Loneliness has been shown to be associated with a range of dysfunctional psychological outcomes such as depression, anxiety, and phobias (Heinrich & Gullone, 2006), negative self-concepts and lowered self-esteem (Brage, Meredith, & Woodward, 1993), as well as personality disorders and psychosis (Tarbox & Pogue-Geile, 2008). Research has indicated that repeated exposure to traumatic life events can have detrimental effects on social relationships (Cloitre *et al.*, 2009) and increases in perceived social isolation (Hawthorne, 2008). Palgi, Shrira, Ben-Ezra, Shiovitz Ezra, and Ayalon (2012)examined the relationship between self- and other-oriented potential lifetime traumatic events (PLTE) and loneliness in a sample of older American adults (N = 7,746). Their study found that both self- and other-oriented PLTE were positively correlated with levels of loneliness. Self-oriented traumas that had occurred in early life were found to be the strongest predictors of loneliness in later life. These findings suggest that exposure to traumatic life events may well predict increased levels of loneliness; therefore, it could be expected that PTCs would be associated with feelings of loneliness.

This study was performed with a number of objectives in mind. First, the authors sought to provide the first assessment of the factor structure of the PTCI within an older adolescent sample. The authors hypothesized that the three-factor model would be superior to alternative model conceptualizations; however, consistent with all existing research findings, the authors further hypothesized that it would be necessary to remove a number of items to achieve satisfactory model fit. Second, the authors sought to further assess the PTCI's psychometric properties by testing for the first time whether the scale is factorially invariant between male adolescents and female adolescents. Based on the findings of Muller *et al.* (2010), the authors hypothesized that the scale would be gender invariant. Third, the authors sought to better establish the relationship between the PTCI factors and psychopathological outcomes other than PTSD by investigating whether PTCs are related to levels of depression, anxiety, stress, and loneliness. Based on the previous literature and established theory, the authors hypothesized that the PTCs would positively and robustly correlated with all outcomes. Finally, the authors sought to better establish the internal reliability of the PTCI through the application of composite reliability analysis.

Method

Participants and procedures

Participants were recruited from 10 post-primary schools in Northern Ireland. An overall sample of 785 pupils participated in the study with a response rate of 32.7%. The low response rate was likely due to a variety of factors including unwillingness on the part of certain students to take part in the study, lack of parental consent having been obtained, preference on the part of the students to spend the time of the study in class on other pursuits, as well as absences from school on the day of the data collection. The sample consisted of 345 male adolescents (43.9%) and 440 female adolescents (56.1%) aged between 15 and 18 years. There was a generally even split between those who resided in an urban (n = 397, 50%) and rural (n = 388, 49%) locations. The majority of adolescents came from a family where both parents resided (n = 603, 76%), 21% came from a single

parent household (n = 162), 1% reported being cared for by a guardian (n = 10), and 1% come from some other family dynamic (n = 10). The majority of respondents stated that they did have a best friend (n = 698, 90%), while the remainder reported that they did not (n = 82, 10%). Asked about how many friends they had to share a secret or problem with, the mean was 4.73 (SD = 8.48).

Ethical permission to conduct the study was obtained from the University of Ulster Research Ethics Committee. Written consent from parents was obtained from participants who were under 18 years of age. A member of the research team visited the schools and briefed the students about the nature of the study and how to complete the questionnaires. Participants were assured of confidentiality and instructed that they did not have to take part in the study if they did not want to, and could withdraw at any time. Participants completed the questionnaires using a paper-and-pencil format, in their regular classroom settings. No inducements or incentives were used to recruit volunteers.

Measures

The *PTCI* (Foa *et al.*, 1999) is a 36-item measure designed to assess PTCs. Based on the initial validation study (Foa *et al.*, 1999), three items were excluded. The 33 remaining items are scored on a 7-point Likert scale ('1 = *totally disagree*' to '7 = *totally agree*'). Higher overall scores represent elevated levels of negative cognitions. This measure has previously been shown to produce reliable scores (α = .78–.95) using an adolescent population (Campbell & Morrison, 2007).

The *UCLA Loneliness Scale* (UCLA-LS: Russell, Peplau, & Cutrona, 1980) is the most widely used self-report measures of loneliness. It consists of 20 items that are rated on a 4-point Likert scale. The response format corresponds to the frequency of feelings: *never* = 1, *rarely* = 2, *sometimes* = 3, and *often* = 4. Scores range from 20 to 80 with higher scores reflecting greater feelings of loneliness. Studies examining the psychometric properties of the UCLA-LS have suggested a three-factor structure comprised of the dimensions of Isolation, Relational Connectedness, and Collective Connectedness (Shevlin, Murphy, & Murphy, 2015). The reliability estimates for the multidimensional scale were acceptable in a different sample of Northern Irish adolescents (Cronbach's alpha [α] = .86 for the total scale, α = .85 for the Isolation subscale, α = .74 for the Relational Connectedness subscale, and α = .70 for the Collective Connectedness subscale (Shevlin *et al.*, 2015)). The reliability estimates in this study were satisfactory (total scale, α = .92; Isolation, α = .89; Relational Connectedness, α = .83; and Collective Connectedness, α = .79).

The *Depression Anxiety Stress Scale* (DASS-21: Lovibond & Lovibond, 1995) is a modified version of the original 42-item scale devised by Lovibond and Lovibond (1995) that has been widely used as a measure of psychopathology in both clinical and non-clinical samples. This measure consists of 21 negative emotional statements which are subdivided into three subscales measuring depression, anxiety, and stress. Participants rated their responses on a 4-point scale ranging from 0 to 3 to signify the extent to which symptoms were experienced in the past week. The reliability estimates have previously been shown to be high (α = .88 for depression, α = .82 for anxiety, α = .90 stress, and α = .93 for the total scale; Henry & Crawford, 2005). Cronbach's alpha in this study were high with a total scale α = .93, depression α = .87, anxiety α = .86, and stress α = .86.

Analysis

The dimensionality of the PTCI was investigated through the use of CFA techniques in Mplus version 7.00 (Muthén & Muthén, 2012) with robust maximum likelihood estimation (Yuan & Bentler, 2000). Eight alternative models of the latent structure of the PTCI were specified and estimated. Model 1 is a unidimensional structure. Model 2 is a two-factor model in which the SELF and BLAME indicators load onto one factor and the WORLD items load onto the other. Model 3 is consistent with that of Foa *et al.* (1999) and includes all 33 items. Model 4 is consistent with that of Beck *et al.* (2004) where items 2, 4, 24, and 29 are excluded. Model 5 is identical to that of van Emmerik *et al.* (2006) where item 2 cross-loads on WORLD and item 26 cross-loads on BLAME. Model 6 is a replication of the Su and Chen (2008) model where items 16, 22, 24, and 29 are excluded. Model 7 is a replication of Muller *et al.*'s (2010) 29-item model in which items 12, 28, and 35 were excluded from the SELF factor and item 11 was excluded from the WORLD factor. Model 8 followed the procedures of Muller *et al.* (2010) with model development occurring in a more exploratory fashion by removing items based on modification indices when there was evidence of redundancies due to high cross-factor loadings or residual covariances.

Kline's (2005) suggestions for determination of good model fit were followed for the CFA analyses; a chi-square-to-degrees of freedom (χ^2:df) ratio <3:1; Comparative Fit Index (CFI; Bentler, 1990) and Tucker Lewis Index (TLI; Tucker & Lewis, 1973) values >.90; a root-mean-square error of approximation (RMSEA: Steiger, 1990); and standardized root-mean-square residual (SRMR: Jöreskog & Sorbom, 1981) of .08 or less. Akaike information criterion (AIC; Akaike, 1987) and Bayesian information criterion (BIC; Schwartz, 1978) were used to evaluate alternative nested models, with the smaller value in each case indicating the best fitting model. The CFI, RMSEA, BIC, and AIC all have explicit penalties for model complexity.

Results

Descriptive statistics

The mean total PTCI score (33 items) for the full sample was 89.23 (*SD* = 36.85, median = 80, range = 32–231). Results indicate that levels of PTCs were generally low. Mean levels of depression were 4.77 (*SD* = 4.86, median = 3, range = 0–21); anxiety were 4.62 (*SD* = 4.94, median = 3, range = 0–21); stress were 6.52 (*SD* = 5.21, median = 6, range = 0–21); and loneliness were 37.17 (*SD* = 12.30, median = 35, range = 20–80). These results suggest that levels of each marker of psychological distress were in the low-to-moderate range.

Model fit results

Table 1 reports the fit indices and comparative fit indices of the eight alternative models of the PTCI. The one- and two-factor models were rejected as poor representations of the data and were substantially poorer fits than Foa *et al.*'s three-factor model. As with previous studies, the three-factor model for the full 33-items proved to be an unsatisfactory fit of the data. Examining each of the models identified by previous findings, it can be seen that the Beck *et al.* model, in which four items were removed from the SELF factor, was the best fitting model of those previously identified. Importantly, this model failed to satisfy recommended model fit results on the CFI and TLI and exhibited barely acceptable model fit according to the RMSEA and SRMR values. Model 8 was the only model to demonstrate satisfactory model fit across all indices.

Table 1. Model fit indices for eight alternative models of the PTCI

	χ^2	df	CFI	TLI	RMSEA (90% CI)	SRMR
Models						
1 Factor	2552.519*	495	.771	.755	.073 (.070–.076)	.068
2 Factors	1985.747*	494	.834	.822	.062 (.059–.065)	.060
Foa *et al.*	1803.321*	492	.854	.843	.059 (.056–.061)	.059
Beck *et al.*	1343.482*	374	.873	.862	.058 (.054–.061)	.056
van Emmerick *et al.*	1800.198*	490	.854	.843	.059 (.056–.062)	.059
Su & Chen	1400.075*	374	.862	.850	.059 (.056–.063)	.059
Muller *et al.*	1369.752*	374	.868	.856	.059 (.055–.062)	.057
Current	825.370*	272	.902	.911	.051 (.047–.055)	.049

Note. χ^2 = chi-square goodness-of-fit statistic; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; PTCI, Posttraumatic Cognitions Inventory.
N = 777.
*χ^2 are statistically significant ($p < .001$) .

Based on modification indices, Model 8 included 25 items. One item (11) was removed from the BLAME factor due to a very large residual covariance with item 10. With respect to the SELF factor, seven items were required to be excluded before satisfactory model fit could be obtained. Four items were removed due to high cross-factor loadings with the WORLD factor (items 12, 17, 24, and 26); item 2 was removed due to a high cross-factor loading with the BLAME factor; and items 5 and 9 were removed due to exceptionally high residual covariances with items 4 and 6, respectively. Standardized factor loadings for each of the 25 items on their respective latent factor were all positive, statistically significant ($p < .001$), and >.40. Correlations between factors were moderate-to-strong ranging from $r = .61$ (BLAME and WORLD) to $r = .79$ (SELF and BLAME).

Tests of model invariance for gender

Tests of factorial invariance were conducted between male adolescents ($n = 339$) and female adolescents ($n = 438$) using Model 8 as the baseline model. Following the procedure of Bollen (1989), a hierarchy of increasingly restrictive models were specified and tested. To determine whether the PTCI was gender invariant, Model 8 was first fitted without any invariance constraints (configural model), and model fit was satisfactory indicating that the three-factor model held in both samples. Subsequently, factor loadings were constrained equal and the test of equal factor loadings was supported as was the test of equal factor variances/covariance (see Table 2 for all model results). Satorra–Bentler scaled chi-square difference tests were computed to compare the model with equal factor loadings to the configural model and the model with equal factor variances/covariances to the configural model. In both cases, there was no statistically significant difference observed ($p > .05$). These results suggest that the PTCI performs equally between male adolescents and female adolescents.

Concurrent validity

To assess the concurrent validity of the PTCI, the SELF, WORLD, and BLAME factors were correlated with depression, anxiety, stress, isolation, collective, and relational loneliness,

Table 2. Tests of factor invariance of gender for the PTCI

	χ^2	df	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	BIC	S-B χ^2
Models									
Male adolescents only	530.165*	272	.906	.897	.053 (.046–.050)	.053	n/a	–	–
Female adolescents only	658.064*	272	.898	.887	.057 (.051–.062)	.056	n/a	–	–
Configural model	1196.808*	546	.900	.890	.055 (.051–.060)	.055	69752.677	70469.614	–
Equal factor loadings	1207.163*	566	.902	.896	.054 (.050–.058)	.056	69717.332	70341.161	ns
Equal factor variances/Covariances	1297.060*	597	.893	.892	.055 (.051–.059)	.061	69755.434	70234.944	ns

Note. χ^2 = chi-square goodness-of-fit statistic; df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = root-mean-square error of approximation; SRMR = standardized root-mean-square residual; AIC = Akaike information criterion; BIC = Bayesian information criterion; PTCI, Posttraumatic Cognitions Inventory; S-B χ^2 = Satorra–Bentler scaled chi-square difference test.
*χ^2 are statistically significant ($p < .001$).

Table 3. Correlations between all continuous variables

Variables	1	2	3	4	5	6	7	8	9
1. SELF	1								
2. WORLD	.72	1							
3. BLAME	.79	.61	1						
4. Depression	.69	.54	.55	1					
5. Anxiety	.63	.43	.51	.84	1				
6. Stress	.65	.60	.49	.87	.87	1			
7. Isolation	.60	.62	.43	.54	.43	.58	1		
8. Relational	.49	.42	.37	.42	.34	.42	.65	1	
9. Collective	.50	.42	.36	.44	.39	.47	.69	.69	1

Note. All correlations are statistically significant ($p < .001$).

respectively (all were modelled as latent variables). As can be seen in Table 3, all PTCI factors were robustly correlated with each outcome.

Composite reliability analysis

The use of traditional measures of internal reliability such as Cronbach's alpha has been criticized within a latent variable modelling context given the propensity to over- or under-estimate scale reliability (Raykov, 1998). To provide a more rigorous assessment of the internal reliability of the PTCI factors, composite reliability was performed. Values >.60 are generally considered acceptable (Diamantopoulos & Siguaw, 2000). Current results indicate that the all three factors exhibited satisfactory internal reliability (SELF $\rho c = .79$; WORLD $\rho c = .71$; BLAME $\rho c = .60$).

Discussion

The current study sought to evaluate the latent underlying psychometric structure of the PTCI among a sample of Northern Irish secondary school adolescents using CFA. None of the extant, research-informed factor models, when estimated, resulted in an accurate representation of the adolescent data. Instead, a sample-specific three-factor model, capturing the traditional SELF, WORLD, and BLAME dimensions of the PTCI, was the only model to achieve satisfactory fit. This data-driven model was estimated using item deletion based on a series of modification indices. As expected, strong associations were observed between each of the three identified factors, particularly between the SELF and BLAME dimensions. Each PTCI factor was also strongly associated with the DASS and loneliness dimensional correlates.

Replicating the dimensional structure of the PTCI continues to be challenging. While a general three-factor model characterized by negative cognitions about the self, negative cognitions of the world and others, and cognitions of self-blame seems stable and reflective of multiple groups who experience trauma, the exact composition of these dimensions seems malleable and potentially context dependent. This nuanced variation within dimensions and across samples may reflect discrete differences at multiple levels. For example, item relevance within each of the three dimensions of the PTCI may be dependent upon (1) the nature of the trauma (or particular aspects of the traumatic experience) that informs the cognitive response, (2) distinct individual/group character-

istics of those who are exposed to the traumatic event(s), (3) cultural and or generational variations in the interpretation of and response to the PTCI, or (4) the construct specificity of the items within each dimension; for example, it is possible that some of the PTCI items more accurately reflect general trait-level cognitions rather than reactive maladaptive cognitive responses to experienced trauma (in fact many of the items deleted from Model 8 in the current study could conceivably be included in measures of constructs such as self-efficacy [e.g., items 2, 5, 11, and 26] or self-esteem [e.g., items 9 and 12]).

The diversity of sample characteristics and trauma experience(s) among samples in previous factor analytic studies of the PTCI may therefore have accounted for the observed diversity in the various proposed factor models. In the current analysis, the unique PTCI dimension composition may, once again, have been attributable to distinct characteristics of the sample, for example the focussed adolescent age range; the geographic region; the social, cultural, economic, educational, and political context; or specific details relating to the trauma histories of the individual respondents. It is plausible to assume therefore that this complex constellation of contexts may have significantly influenced the latent structure and composition of the PTCI dimensions in the current analysis.

The importance of the context of traumatic responses has previously been addressed. Shevlin and Elkit (2012) attempted to explain why two competing and conflicting models of PTSD symptomology (four-factor models of PTSD proposed by King, Leskin, King, and Weathers (1998) and Simms, Watson, and Doebbeling (2002)) continued to receive independent empirical support. These researchers demonstrated that the competing models were representative of two distinct population groups and that PTSD should not be conceptualized as a single diagnostic entity for which a single symptom profile could remain constant for all individuals. It is possible therefore that variation in PTCs across samples, evidenced by most studies, may be consequential to similar context-dependent variations that affect the symptom structure of PTSD.

While the precise composition of each of the three dimensions of the PTCI may remain variable, context dependent, and sample specific, the general stability and distinctiveness of each individual dimension seems to be firmly replicated across studies. Three distinct dimensions are repeatedly identified, and each has been shown to demonstrate consistent and comparable associations with a distinct set of psychological correlates. Consistent with previous findings, the PTCI dimensions, modelled on the adolescent data in the current analysis, also displayed strong associations with dimensional representations of depression, anxiety, and stress. Establishing this concurrent variation with alternative measures of psychological distress/dysfunction is important for several reasons.

First, it is vital that PTCs are understood within a more general psychopathological framework of traumatic response (Ehring *et al.*, 2006, 2008). PTCs are rarely likely to emerge in isolation following a traumatic event. In other words, PTCs themselves may often evoke extreme emotional and psychological reactions that become manifest in conditions such as depression, anxiety, or substance use (e.g., Buodo, Novara, Ghisi, & Palomba, 2012; Mills *et al.*, 2014). Conversely, PTCs may also materialize in the context of extant anxiety and depression. In such circumstances, psychological vulnerabilities, present before trauma, may exacerbate PTCs when they surface, or inform and influence the onset and course of PTCs from the very beginning (Bryant & Guthrie, 2007). The strong statistical associations between the dimensions of the PTCI and the DASS therefore observed in successive analyses reflect, not only the validity and clinical utility of the PTCI constructs, but, more importantly, the complexity of the psychological and emotional

response to trauma. While trauma-related cognitions alone may offer some insight into the immediate adaptations to and interpretations of experienced trauma, they are likely to be more meaningfully understood within a broader, more general framework of traumatic response.

Second, anxiety, depression, and stress in the current study were more strongly associated with SELF PTCs than with WORLD and BLAME dimensions. These correlations seemed to discriminate between the items and dimensions of the PTCI in a way that factor analysis alone could not achieve; that is, while each dimension of the PTCI correlated strongly with each DASS dimension, the SELF-DASS correlations suggested a possible PTCI dimensional hierarchy where SELF PTCs reflected the most clinically relevant component of PTC (particularly in relation to established 'internalizing' disorders). Although this hierarchical structure was not explicitly modelled in the current set of analyses, it may be plausible to assume on the basis of the observed correlation matrix that WORLD and BLAME dimensions of the PTCI constitute important aspects of the cognitive response to trauma, but may more meaningfully attend to other aspects of functioning external to the individual (note: PTSD has been shown to be comorbid with a wide array of other psychiatric disorders; given therefore that the DASS dimensions only capture internalizing constructs of psychological distress, it may be possible that some of the PTCI dimensions are more closely related to alternative constructs of psychopathology, for example 'externalizing', 'fear', and 'distress'; Startup, Makgekgenene, & Webster, 2007; Vaidyanathan, Patrick, & Cuthbert, 2009).

In addition to the DASS dimensions, the PTCI factors were also correlated with the three dimensions of the UCLA loneliness scale. Once again, moderate-to-strong correlations were observed between the three PTCI dimensions and each of the three UCLA loneliness dimensions. Interestingly, the Isolation dimension (loneliness characterized by feeling left out, feeling shy, and feeling that others are around you but not with you) displayed the strongest association with each of the PTCI dimensions (particularly with the SELF and WORLD dimensions [$r > .6$]). In the context of the current study, loneliness measurement afforded an opportunity to explore another possible covariate of PTCs. Research has shown that trauma, particularly interpersonal trauma, may create an enduring vulnerability which is accompanied, facilitated, and or compounded by social withdrawal, disconnection, loneliness, and isolation (Cloitre *et al.*, 2009; Palgi *et al.*, 2012), which in turn may facilitate, induce, or exacerbate distressing trauma-related cognitions (Cacioppo & Hawkley, 2009). Current findings have demonstrated that reduced interpersonal contact and stimulation and reduced opportunity for social interaction have been shown to cause severe psychiatric harm (Heinrich & Gullone, 2006). This harm has included self-destructive behaviour, hyper-responsivity to external stimuli, hallucinations, and overt cognitive disorganization (Grassian, 1983; Pierre, 2010). Loneliness therefore, particularly perceived isolation, may help to explain not only the context of traumatic response, but also the complex interplay between traumatic risk, response, and potential recovery.

The study had a number of limitations. First, it was not possible to determine the nature or the severity of the trauma(s) experienced by the adolescent respondents. However, participants were given a brief description of what a traumatic experience may constitute and were asked to think of this when answering the questionnaire. Consequently, the present analysis was unable to identify the type of trauma that may have been responsible for inducing the reported cognitions. Extant research findings suggest that trauma type, duration, and severity are important factors in the conceptualization of traumatic experience and response (Clemmons, Walsh, DiLillo, & Messman-Moore, 2007). Second,

participants were recruited from Northern Ireland and were generally not very symptomatic; therefore, it is unknown whether these results will generalize to other cultural or traumatized populations. Third, this study was based on self-report questionnaires of PTCs and their psychological correlates. Without clinical interview, it was not possible to ascertain whether the traumas or PTCs reported by the participants in the current study were clinically meaningful/relevant. Fourth, although the sample size was large, the response rate to the study was low (32.7%), so it is unknown whether the non-responders differed in any meaningful way to the responders in the study.

In conclusion, the current study has demonstrated for the first time that the adult PTCI (Foa *et al.*, 1999) is a reasonably acceptable method of assessing trauma-related cognitions among an older adolescent sample and performs equally among male adolescents and female adolescents. This data suggests that at least for adolescents between the ages of 15 and 18, the cognitive response to trauma is very similar to that exhibited among adult samples. This affords researchers who wish to study psychological responses to trauma among older adolescents the opportunity to choose between two psychometrically supported scales: The PTCI and the C-PTCI (Meiser-Stedman *et al.*, 2009). Given the different cognitive factors tapped by each scale, determination of which scale to choose should be informed by the specific hypotheses under investigation in any given study. It also points to the need for future research to determine whether one measure is superior among older adolescents or whether there is a way to integrate the two measures to develop a more complete and holistic measure of cognitive responses to trauma.

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