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The Temporal Relations of PTSD Symptoms Among Treatment-Seeking Victims of Sexual Assault: A Longitudinal Study

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ABSTRACT

This prospective study assessed the temporal relationships between the symptom clusters of PTSD in two nonprobability samples of treatment-seeking victims of sexual abuse: rape victims and adult survivors of childhood sexual abuse. Both groups were assessed at three time periods using self-report measures of PTSD symptomology. Findings from two cross-lagged panel analyses indicated weak temporal relationships between the symptom clusters of PTSD; however, avoidance and emotional numbing symptoms were found to exert the strongest cross-lagged effects. Avoidance and emotional numbing symptoms were also found to be the strongest predictor of subsequently meeting caseness for PTSD in both samples. Results suggest that there are minimal cross-lagged effects between the PTSD symptom clusters after three months from traumatic exposure.

The symptom profile of posttraumatic stress disorder (PTSD) has undergone revision for the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5: American Psychiatric Association [APA], 2013). In the DSM-IV-TR (APA, 2000), PTSD was characterized by three symptom clusters: (a) reexperiencing, (b) avoidance and emotional numbing, and (c) hyperarousal. This description has now been expanded so that 20 symptoms of PTSD reflect four symptom clusters: (a) reexperiencing, (b) avoidance, (c) negative alterations in cognition and mood, and (d) hyperarousal. Whether based on the DSM-IV-TR or DSM-5 model of PTSD, researchers have generally focused their efforts on understanding risk factors for developing PTSD (Shevlin, Hyland, & Elklit, 2014), its symptom structure (Yufik & Simms, 2010), or its symptom course (Bryant et al., 2015).

Diagnostic nosologies such as the DSM indicate that the symptom clusters of PTSD simply covary and that no specific causal relationships exist between the symptom clusters. This has been reflected in the extensive factor analytic research literature. In contrast, many theoretical models of PTSD indicate temporal ordering of symptoms during the acute traumatic response, although little consensus exists with regard to which symptoms are of primary importance. Some theorists have suggested the dominance of avoidance symptoms (Horowitz, 2001; Keane, Fairbank, Caddell, Zimering, & Bender, 1985), others have argued in favor of reexperiencing symptoms (Creamer, Burgess, & Pattison, 1992), while yet others have suggested the prominence of arousal symptoms (Foa, Riggs, & Gershuny, 1995; Clark & Beck, 2010). Despite the many theoretical models, little empirical work has been conducted to test for temporal relationships between the symptom clusters. Descriptions and understandings of the course of symptom formation, variation, and temporal stability are essential for providing a comprehensive understanding of PTSD and for developing effective clinical interventions. Determining if a particular cluster of symptoms is dominant in the subsequent development of PTSD symptomology, and whether this varies over the course of the traumatic response, would allow clinicians to focus on the most critical symptoms depending upon when a patient presents for treatment.

A number of recent studies have investigated common trajectories of PTSD symptom severity over time (e.g., Bryant et al., 2015; O'Donnell, Elliott, Lau, & Creamer, 2007); however, only two studies have specifically investigated how the symptom clusters of PTSD are temporally associated with one another. Schell, Marshall, and Jaycox (2004) followed a male sample of physical assault victims assessing levels of PTSD at 2 weeks, 3 months, and 12 months posttrauma. Results supported the primacy of arousal symptoms, as these were found to be the strongest predictor of subsequent symptom severity for every cluster of symptoms at both the 3-month and 12-month follow-up assessments. Moreover, results indicated that arousal symptoms were generally not influenced by any other symptom cluster. Marshall, Schell, Glynn, and Shetty (2006) replicated this study among a male sample of physical assault victims. Participants were assessed 1, 6, and 12 months post–trauma exposure. The results were consistent with those of Schell et al. (2004), with arousal symptoms identified as the primary factor in the prediction of reexperiencing and avoidance symptoms at both follow-up periods.

These studies provide empirical support for theoretical models suggesting that arousal symptoms influence the subsequent formation of other PTSD symptoms during the early phase of the traumatic response. Furthermore, such findings are generally consistent with results from the wider trauma literature regarding the role of physiological arousal (e.g., Coronas et al., 2011) and psychological arousal (e.g., Shevlin et al., 2014) in the prediction of subsequent PTSD diagnoses. While the existing literature suggests that

arousal symptoms are critical to the subsequent development of other PTSD symptoms, a number of salient limitations should be considered. For example, the Marshall et al. (2006) and Schell et al. (2004) studies first assessed these temporal relationships between the PTSD symptom clusters within the first month of the psychological response to the trauma. Importantly, in both studies the temporal pathways were constrained to be equal across the entire study period. While arousal symptoms were found to be the strongest predictor of subsequent symptom clusters of PTSD, the method of constraining temporal pathways to be equal across the study means that the initial temporal effects will be maintained at subsequent assessment periods. In other words, the results of these studies indicate that, within the first month following traumatic exposure, arousal symptoms are dominant in the prediction of subsequent PTSD symptoms. However, the temporal relationships between the PTSD symptom clusters after this period remain largely unknown. A further limitation associated with the existing literature is the use of predominately Hispanic and African-American male victims of physical assault. The generalizability of these findings to victims of other types of traumatic exposure, to other cultural groups, and to female victims is problematic. Finally, the samples included in these studies were non–treatment-seeking victims of trauma. The manner in which symptoms are temporally related to one another among victims who seek treatment is also unknown.

Studying the temporal relationships between PTSD symptoms over the longer-term course of the traumatic response is important in light of findings regarding the trajectory of PTSD symptom severity. O'Donnell et al. (2007) followed a largely male sample of trauma victims over the course of the first 12 months of the traumatic response and reported that arousal symptoms increased considerably within the first 3 months before stabilizing. Contrastingly, avoidance and emotional numbing symptoms only began to emerge at 3 months and continued to increase strongly over the following 9 months. It is possible, therefore, that after the early phase of the traumatic response has passed, arousal symptoms become less important and other symptom clusters become prominent in determining the subsequent formation of PTSD symptomology. It is critical, therefore, that longitudinal assessments of the relationship between the PTSD symptom clusters be conducted once the early phase of the traumatic response has passed.

The current study, which utilized cross-lagged panel analyses (Mayer & Carrol, 1987), was conducted in order to address this deficiency in the literature. The first aim of the current study was to assess the temporal relationships between the PTSD symptom clusters across three assessment periods (3, 6, and 15 months posttrauma) among a predominately female, treatment-seeking sample of Danish rape victims. The current study also explored the nature of the temporal relationships (baseline, 6 months, and 12 months) between the PTSD symptom clusters decades after traumatic exposure among
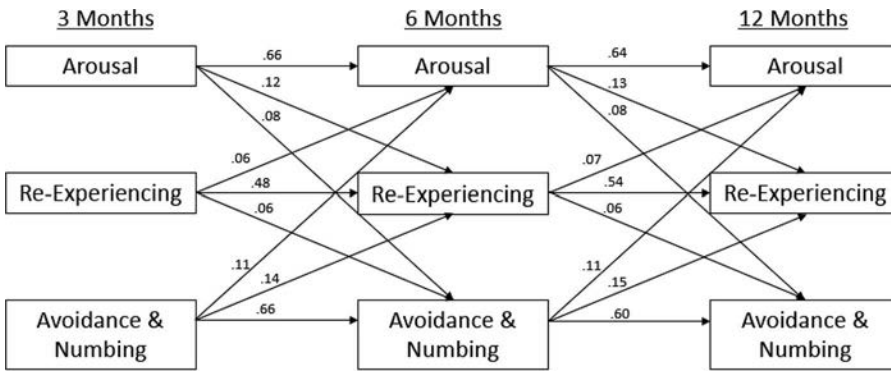
Figure 1. Final cross-lagged panel model for sample of rape victims. All cross-lagged paths in the model are constrained to be equal. Model includes standardized path coefficients and all are statistically significant ($p < .001$).
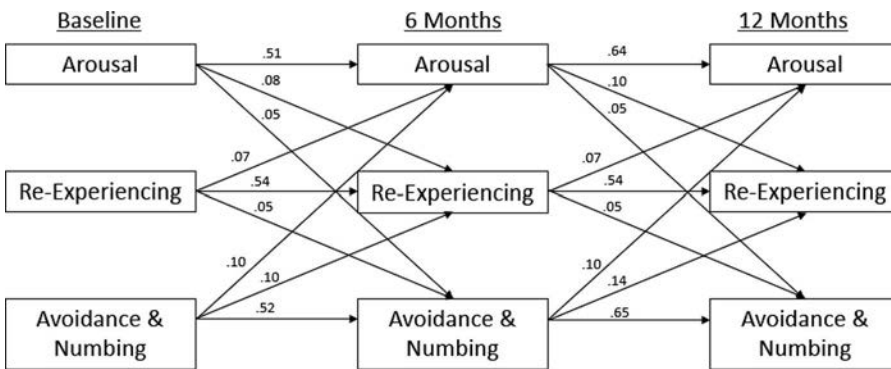

Figure 2. Final cross-lagged panel model for sample of childhood sexual abuse victims. All cross-lagged paths are constrained to be equal. Model includes standardized path coefficients and all are statistically significant ($p < .001$).

a Danish treatment-seeking sample of adult survivors of childhood sexual abuse (CSA; see Figures 1 and 2). For both samples, data was gathered in line with the DSM-IV-TR model of PTSD symptoms (reexperiencing, avoidance and emotional numbing, and arousal). While not consistent with the updated model of PTSD in DSM-5, the current study offered valuable data, given that it is consistent with existing findings in this area, and assesses the core PTSD symptom categories outlined in established theoretical models.

Method

Participants

Sample 1 was a convenience sample recruited from a total of 1,127 female rape victims who contacted the Centre for Rape Victims (CRV) at the University Hospital of Aarhus (Denmark) during 2002–2012. Upon first contact with the CRV, all individuals were interviewed and offered a meeting with

a counseling psychologist. Two weeks after initial contact, individuals who returned could attend one therapy session with a counseling psychologist where demographic information was obtained, along with a battery of questionnaires that included measures of acute stress disorder and perceived social support ($n = 536$). All participants who indicated that they were willing to participate in research completed their first assessment of PTSD approximately 3 months after their initial contact with the CRV (T1: $n = 355$). They were then assessed again at 6 (T2: $n = 154$) and 12 months (T3: $n = 130$). The majority of participants were female (97.5%) and were of Danish origin (85.5%). The average age of the sample was 22.55 ($SD = 9.42$, range 10–71). Most participants (61.5%) had experienced an assault that involved penetration, followed by attempted rape (12.3%), molestation (8.7%), or were unable to recall the specific nature of the assault (9.2%). The majority of the sample indicated that they had only been raped by one person (91%). The offender was most commonly indicated to be a friend or acquaintance known to the victim (63%), followed by a partner or spouse (12%).

Sample 2 was a predominately female (86%) convenience sample of adult treatment-seeking victims of CSA. Participants were recruited from four Danish treatment centers for victims of CSA. The centers are supported by the Ministry of Social Affairs, and exclusion criteria were (a) evidence of intoxication at the time of visit, (b) a diagnosis of a psychotic disorder, (c) self-harming behavior, (d) engagement in treatment elsewhere, and (e) diagnosis of a personality disorder. During their second treatment session, participants were first assessed for PTSD (T1: $n = 476$). The participants were reassessed again at 6 months (T2: $n = 294$) and 12 months (T3: $n = 156$). The participants were all offered an unmanualized eclectic form of psychotherapy tailored to their individual needs. The mean age of the sample was 36.62 years ($SD = 10.74$, range 18–70) and the majority of the participants (51%) were either married or cohabiting. Almost all (91%) had experienced CSA before the age of 15 committed by a person at least five years older than they and on an average of 23.71 years ago ($SD = 12.34$). The mean age for CSA onset was 7.12 years ($SD = 4.03$), and the average age at which the abuse ended was 13.44 years ($SD = 4.42$). The average duration of abuse was 7.05 years ($SD = 6.75$) and the mean number of abuse acts experienced was 3.34 ($SD = 1.33$).

The study followed the Nordic ethical guidelines set for psychologists. According to the regional Helsinki committee, practices that are primarily used as part of the treatment program, such as questionnaires used for monitoring, do not need to be considered by regional ethics boards. This is the case for the present study. Furthermore, the participants gave informed consent, were secured full anonymity, and were not compensated for their participation.

Materials

PTSD symptom presence and severity was assessed at each time period, and among both samples, using the Harvard Trauma Questionnaire, Part IV (HTQ-IV: Mollica et al., 1992). The HTQ-IV is a 31-item self-report measure that assesses the DSM-IV-TR's (APA, 2000) Criteria B, C, and D requirements for a diagnosis of PTSD. Criteria E (duration) and F (functional impairment) could not be assessed based by the HTQ. The first 16 items of the HTQ assess the 17 DSM-IV-TR symptoms (the HTQ assess psychological and physiological reactions to events with one item). Each symptom is rated on a 4-point Likert scale (1 = not at all, 2 = a little, 3 = quite a bit, 4 = all the time). Four items were used to measure intrusions (score range 4–16), seven items measure avoidance and emotional numbing symptoms (score range 7–28), and five items were used to measure arousal symptoms (score range 5–20). To establish diagnostic rates for each sample, the HTQ items were recoded such that a symptom was rated as present if the item corresponding to the symptoms was scored 3 or greater (Elklit & Shevlin, 2007). Meeting caseness for PTSD was assumed if participants reported at least one intrusion symptom, at least three symptoms of avoidance and emotional numbing, and at least two symptoms of arousal. The Danish version of the HTQ has been used in a wide range of trauma populations with reports of good reliability and validity (Bach, 2003). Mollica et al. (1992) reported 88% concordance between those reporting symptoms consistent with PTSD diagnostic criteria based on the HTQ and a diagnostic interview to assess PTSD. The reliability of the total scale and subscales was satisfactory in the victims of rape sample ($\alpha = .77$–$.84$). Slightly poorer internal consistency was observed for the CSA sample ($\alpha = .66$–$.82$).

Analysis

Cross-lagged panel analysis was implemented to determine the temporal relationships between the symptom clusters of PTSD. All cross-lagged panel analyses were specified and estimated in Mplus 7.1 (Muthén & Muthén, 1998–2013) using robust maximum likelihood estimation (Yuan & Bentler, 2000). This method allowed parameters to be estimated using all available information and has been found to be superior to alternative methods of dealing with missing data such as list-wise deletion (Schafer & Graham, 2002).

The cross-lagged panel analysis proceeds in three steps. First, a model is tested that includes no cross-lagged paths (only lagged effects or autoregressions). Within-wave residual correlations are included. The second step compares the fit of this model to a model in which cross-lagged effects are introduced. If the model with no cross-lagged effects provides better model fit, this is evidence that the variables in the model (PTSD symptom clusters)

have no meaningful influence on each other. Alternatively, if the model with cross-lagged paths is supported, the analysis proceeds to a third step. In step 3, cross-lagged paths in the model are constrained to be equal and this model is compared to the model where the cross-lagged paths are freely estimated. If the model with freely estimated cross-lagged paths provides superior fit, this suggests there is likely a dominant variable in the model influencing other symptom clusters. Alternatively, if the model with constrained cross-lagged effects is supported, this suggests that there is likely no dominant variable in the model (Schell et al., 2004).

Model fit was assessed using standard procedures: a nonsignificant chi-square (χ^2) test; Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) values greater than .90; Root-Mean-Square Error of Approximation with 90% confidence intervals (RMSEA 90% CI) and Standardized Root-Mean-Square Residual (SRMR) values of .08 or less reflect acceptable model fit. Furthermore, the Akaike Information Criterion (AIC), the Bayesian Information Criterion (BIC), and the sample-size-adjusted Bayesian Information Criterion (ssaBIC) are used to evaluate alternative models, with the smaller value in each case indicating the best-fitting model. There is evidence of good performance of correct model selection for the ssaBIC (Enders & Tofighi, 2008). In addition to testing for cross-lagged effects, binary logistic regression analyses were also conducted to investigate the relative importance of each symptom cluster (measured at T1) for meeting PTSD caseness at the T3 assessment periods.

Results

Descriptive statistics

The means and standard deviations for the reexperiencing, avoidance and emotional numbing, and arousal symptom clusters are presented in Table 1. Using the self-report HTQ, the proportions of the sample of rape victims meeting caseness for DSM-IV-TR PTSD at each assessment period were 51% (T1), 47% (T2), and 36% (T3). Among the sample of CSA victims,

Table 1. Means and standard deviations for each PTSD symptom cluster at three points in time for rape victims and victims of childhood sexual abuse (CSA).

	T1		T2		T3	
PTSD cluster	M	SD	M	SD	M	SD
Rape victims						
Reexperiencing	9.61	2.90	9.49	3.07	8.65	2.91
Avoidance and emotional numbing	16.05	4.90	15.36	4.84	14.76	4.85
Arousal	13.14	3.98	13.06	4.31	12.06	4.02
CSA Victims						
Reexperiencing	10.55	2.81	9.20	3.03	8.41	2.68
Avoidance and emotional numbing	19.61	4.10	17.10	4.66	15.94	5.43
Arousal	15.50	2.95	13.92	3.30	12.90	3.70

the proportions meeting DSM-IV-TR PTSD caseness were 77% (T1), 61% (T2), and 47% (T3).

Cross-lagged panel analysis for rape victims

The results of the cross-lagged panel analyses for the rape victims are presented in Table 2. Improvements in model fit were observed when cross-lagged effects were introduced, compared to the model with no cross-lagged effects. Additionally, when all cross-lagged effects were constrained, equal model fit improved relative to when cross-lags were freely estimated. These findings suggest that there are cross-lagged effects occurring within the model; however, there is likely no dominant variable (see Figure 1).

The cross-lagged effects from 3 to 6 months, and from 6 to 12 months, were generally weak (standardized path coefficients ranged from .06 to .15). Avoidance and emotional numbing symptoms demonstrated the strongest cross-lagged effects (.11–.15), followed by arousal symptoms (.08–.13), and finally reexperiencing symptoms (.06–.07). Autoregression effects were substantially stronger for each symptom cluster (.48–.66). Within-wave correlations between the three symptom clusters are presented in Table 3. Overall, the findings suggest that beginning from 3 months and extending to 12 months posttrauma, the PTSD symptom clusters of reexperiencing, arousal, and avoidance have little influence on each other, and each symptom cluster is best predicted by scores on the same variable at the previous assessment period.

We further assessed the relative importance of each symptom cluster by conducting a binary logistic regression analysis in which reexperiencing, arousal, and avoidance and emotional numbing scores at 3 months were used to predict the likelihood of meeting PTSD caseness at 12 months. The strongest odds ratio (OR) was observed for avoidance and emotional numbing symptoms (OR = 1.32, 95% CI = 1.13–1.54, $p < .001$), followed by arousal

Table 2. Model fit results for the sample of rape victims and CSA victims.

	χ^2	df	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	BIC
Rape Victims								
No cross-lagged paths	72*	21	.93	.88	.08 (.06–.10)	.15	9232	9361
Freely estimated cross-lagged paths	28*	9	.97	.90	.08 (.05–.11)	.04	9207	9382
Cross-lagged paths constrained equal	43*	20	.97	.95	.06 (.03–.08)	.05	9202	9334
CSA Victims								
No cross-lagged paths	74*	15	.94	.87	.09 (.07–.11)	.12	13004	13166
Freely estimated cross-lagged paths	48*	9	.96	.86	.10 (.07–.12)	.05	12992	13180
Cross-lagged paths constrained equal	52*	20	.97	.95	.06 (.04–.08)	.05	12974	13116

Note. χ^2 = chi square goodness of fit statistic; *indicates χ^2 is statistically significant ($p < .001$); df = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root-Mean-Square Error of Approximation; SRMR = Standardized Square Root Mean Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

Table 3. Within-wave correlations between DSM-IV symptom clusters for rape victims and childhood sexual abuse (CSA) victims.

Variables	T1	T2	T3
Rape Victims			
Reexperiencing with avoidance and emotional numbing	.66	.36	.46
Reexperiencing with arousal	.69	.46	.44
Avoidance emotional numbing with arousal	.72	.39	.53
CSA Victims			
Reexperiencing with avoidance emotional numbing	.42	.60	.44
Reexperiencing with arousal	.43	.59	.53
Avoidance emotional numbing with arousal	.49	.68	.60

Note. All correlations are statistically significant ($p < .0001$). Correlations at T2 and T3 for both samples are residual correlations after the effects of the predictors have been adjusted for.

(OR $= 1.23$, 95% CI $= 1.00$–1.50, $p = .05$), and reexperiencing (OR $= 0.99$, 95% CI $= .78$–1.25, $p = .94$).

Cross-lagged panel analysis for CSA victims

The results of the cross-lagged panel analyses for the sample of CSA survivors are also presented in Table 2. A similar pattern emerged within this sample as the model with cross-lagged effects provided superior fit compared to the model with no cross-lagged effects. When cross-lagged effects were constrained to be equal, model fit improved substantially. Such results indicate that cross-lagged effects between the PTSD symptom clusters are present within the model; however, there is likely no dominant symptom cluster in the model (see Figure 2).

Among the CSA sample, cross-lagged effects were found to be of a weak magnitude (standardized path coefficients ranged from .05 to .14). Avoidance and emotional symptoms displayed the strongest cross-lagged effects (.10 to .14), followed by arousal symptoms (.05–.10) and reexperiencing symptoms (.05–.07). The autoregression effects were of a much stronger magnitude than the cross-lagged effects (range from .51 to .65). Within-wave correlations for this sample are also presented in Table 4. The results of the cross-lagged panel analysis suggest that decades after traumatic exposure, the symptom clusters of PTSD continue to influence one another, but only to a small degree. Each symptom cluster is best predicted by scores on the same variable at the previous assessment period.

As with the sample of rape victims, we further assessed the relative importance of each symptom cluster by conducting a binary logistic regression analysis in which reexperiencing, arousal, and avoidance and emotional numbing scores at T1 were used to predict the likelihood of meeting caseness for PTSD 12 months later. Among this sample of adult survivors of CSA, the strongest odds ratios (OR) was observed for avoidance and emotional numbing (OR $= 1.47$, 95% CI $= 1.26$–1.72, $p < .001$), followed by arousal

(OR = 1.06, 95% CI = .89–1.25, p = .53), and reexperiencing (OR = 1.06, 95% CI = .90–1.24, p = .51).

Discussion

The current study was carried out to examine the temporal relationships between the symptom clusters of PTSD both in the short- and long-term course of the psychological response to trauma. The extant research literature suggests that, during the very early phase of the traumatic response (first month post–trauma exposure), arousal symptoms are likely of primary importance in predicting the latter development of additional PTSD symptoms (Marshall et al., 2006; Schell et al., 2004). While there are research findings that suggest that alternative symptoms clusters may be of greater importance later in the traumatic response (e.g., O'Donnell et al., 2007), there currently exists no evidence that has directly assessed the temporal relationships between the symptom clusters of PTSD beyond this early phase.

Current results were largely inconsistent with existing findings from Schell et al. (2004) and Marshall et al. (2006), who reported robust cross-lagged effects for arousal symptoms (standardized path coefficients ranged from .25 to .39), and cross-lagged effects of a greater magnitude than autoregression effects. Among both samples in the current study, the cross-lagged effects were all found to be weak, while the autoregression effects were considerably stronger. Findings from the sample of rape victims indicates that from 3 to 15 months following traumatic exposure, there is no evidence of a dominant cluster of symptoms in the prediction of future PTSD symptomology. It seems that by 3 months post–traumatic exposure, the symptom clusters of PTSD have only weak influences on one another. Of the cross-lagged effects that do remain, the most crucial set of symptoms appear to be the avoidance and emotional numbing symptoms. Interestingly, the very same pattern emerged among the sample of CSA victims who had been exposed to their index trauma more than two decades prior to their initial assessment. Given the overall level of temporal relationships that were observed, these findings may be considered somewhat contradictory to many of the established theoretical models of PTSD (Clark & Beck, 2010; Creamer et al., 1992; Foa et al., 1995; Horowitz, 2001; Keane et al., 1985) and consistent with the DSM models of covarying symptom clusters. However, it should be noted that most theoretical models suggest dynamic influence of one set of symptoms on others during the acute traumatic response and say little about what occurs months, years, and decades after traumatic exposure. This is clearly an area that requires greater theoretical and empirical attention.

Binary logistic regression analyses indicated that among both the rape and the CSA samples, avoidance and emotional numbing symptoms measured at time 1 were the strongest predictor of meeting caseness for PTSD 9 and 12

months later, respectively. In both trauma samples, a 2-point increase in symptoms of avoidance and emotional numbing was found to increase the odds of receiving a diagnosis of PTSD by a factor of 3. This suggests that beyond the acute traumatic response avoidance and emotional numbing, symptoms may be of greatest clinical utility. Furthermore, it was notable that estimates of PTSD caseness were markedly greater among the CSA sample than the sample of rape victims. These observations are consistent with the wider trauma literature regarding the especially pernicious effects of the early onset of sexual abuse (Cloitre et al., 2009). Moreover, the victims in the CSA sample were generally multiply victimized, while the majority of the rape victims were exposed to a single attack. Repeated exposure to traumatic assault has also been shown to increase the severity of the traumatic response (Cloitre et al., 2009).

There are a number of possible explanations for the results of the current analyses. One plausible explanation relates to the time frame in which these trauma victims were assessed. Unlike other studies of the temporal relations of PTSD symptoms (Marshall et al., 2006; Schell et al., 2004), the trauma victims utilized in this study were not assessed during the acute phase of the traumatic response. O'Donnell et al. (2007) obtained results that suggested that a pattern of escalating arousal symptoms within the first 3 months followed by stabilization, and escalation of avoidance and emotional numbing symptoms from 3 to 12 months, may explain the inconsistencies between current and past results. It is possible that during the acute phase of the psychological response to trauma arousal, symptoms are of greatest importance in the determination of subsequent PTSD symptoms (Coronas et al., 2011; Shevlin et al., 2014); however, by 3 months the influence of arousal begins to diminish due to the stabilization of symptom severity, and avoidance and emotional numbing strategies begin to emerge as important maintenance factors in subsequent traumatic responses (O'Donnell et al., 2007). This pattern of temporal relations between PTSD symptoms is consistent with the cognitive processing models of PTSD (Foa et al., 1995; Clark & Beck, 2010), which suggest that avoidance symptoms develop as a consequence of excessive arousal and reexperiencing symptoms. The avoidance strategies help the individual to adapt and cope with the distressing reexperiencing and arousal symptoms, but ultimately prevent habituation to these distressing experiences and consequently maintain the psychopathology.

Although unlikely, another possible explanation for the difference between the observed effects in the current study compared to previous research (Marshall et al., 2006; Schell et al., 2004) relates to the fact that the majority of individuals in both samples were female. There appear to be no sex differences in arousal as a predictor of PTSD, in general, except that physiological arousal symptoms may be a stronger risk factor for PTSD in males compared to females (Christiansen & Elklit, 2012). In the current study it

was not possible to account for sex differences given the composition of the two samples; therefore, it remains unknown if the effects of the current study are specific to females or are generalizable to the male population. Future research that systematically assesses the temporal relationships between the PTSD symptom clusters for both males and females is needed.

Another possible factor that could explain the current set of results was that both samples were treatment-seeking trauma victims. It is possible that treatment-seekers experience qualitatively distinct symptom manifestations and trajectories from those who do not seek treatment. Additionally, the consistent set of results observed for those who experienced trauma recently (rape victims), and those who experienced trauma decades previously (CSA victims), may suggest that the observed effects were a result of the clinical intervention. We argue that this is unlikely, as estimated diagnostic rates, and symptom levels, remained high across the entire assessment period of the study for both samples, and both groups received an eclectic, nonmanualized form of therapy. The absence of a systematic and consistent therapeutic intervention makes it unlikely that the consistent findings are the result of the clinically treated nature of the sample.

Several limitations are associated with the current study. As described above, many of the unique factors of the samples utilized in the current study (predominately female, victims of sexual assault, and treatment-seeking) may preclude generalizability of the findings to the wider trauma population. Additionally, the use of nonprobability sampling techniques to recruit trauma-exposed participants in both cohorts limits the generalizability of these findings. A further limitation relates to the use of a self-report measure developed for the DSM-IV criteria of PTSD. This limitation was unavoidable given the time frame of the data collection; however, the emergence of new models of PTSD in ICD-11 (Elklit, Hyland, & Shevlin, 2014) and DSM-5 (APA, 2013) means that it is imperative that additional research be performed using contemporary models and assessment methods of PTSD. For example, in the current study, there was some evidence to indicate the clinical utility of avoidance and emotional numbing symptoms. Given the use of the DSM-IV-TR model of PTSD, it was impossible to determine if this observed effect was primarily attributable to the avoidance symptoms or the more nonspecific dysphoria symptoms of this cluster, which have been largely redefined, and expanded, into the negative alterations in cognitions and mood (NACM) cluster in DSM-5. Finally, as with previous studies, assessment periods were spaced months apart. The nature of temporal association over shorter periods of time (days and weeks) still remains unknown and warrants further study.

Despite these limitations, the current study contributes valuable information to an extremely limited line of inquiry within the trauma literature. Current results are important, as they shed light on the temporal relationships

between the symptom clusters of PTSD, both in the short- and long-term course of the psychological response to trauma. Our findings suggest that over the course of the traumatic response, temporal associations between the PTSD symptom clusters are relatively minor. Of the cross-lagged effects that are observable, avoidance and emotional numbing symptoms appear most relevant in the prediction of latter PTSD symptomology. Additional research will be required with more diverse trauma populations to develop a complete understanding of how symptoms of PTSD emerge, influence one another, and develop over time. Such an understanding is imperative as it will provide a more complete theoretical understanding of PTSD, and thus, offer more efficient screening and treatment processes.

Notes on contributors

Philip Hyland is a lecturer in psychology at the National College of Ireland. His primary research interests relate to studying the nature of psychological responses to trauma, the appropriate conceptualization and description of PTSD and complex-PTSD, and the role of dysfunctional cognitions in the prediction of traumatic responses.

Mark Shevlin is a professor of psychology in the School of Psychology at Ulster University and a member of the Psychology Research Institute. His research interest relates to the application of advanced quantitative statistical methods to study the relationship between traumatic life events and psychotic experiences.

Maj Hansen is an assistant professor at the Department of Psychology, National Centre of Psychotraumatology at the University of Southern Denmark. She has a keen interest in psychotraumatology research and the relationship between acute traumatic responses and long-term expression of PTSD.

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Jamie Murphy is a reader in the School of Psychology at Ulster University and member of the Psychology Research Institute. Core branches of his research include the psychosis continuum, childhood sexual abuse and psychosis, social isolation and psychosis, trauma-cannabis interaction and psychosis, and PTSD-psychosis symptom overlap.

Ask Elklit is a professor of clinical psychology in the Department of Psychology, University of Southern Denmark. He is also the director of the National Centre for Psychotraumatology. Professor Elklit was the cofounder of the first Danish center for rape victims and of the experiments with intensive language learning for traumatized refugees. For a decade he had supervised in several Danish rehabilitation centers for torture victims. He has been involved in developing specialist programs in psychotraumatology for licensed psychologists.

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