

# Research Article

## PROSPECTIVE INVESTIGATION OF MENTAL HEALTH FOLLOWING SEXUAL ASSAULT

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**Background:** *Comorbidity in psychological disorders is common following exposure to a traumatic event. Relatively little is known about the manner in which changes in the symptoms of a given type of psychological disorder in the acute period following a trauma impact changes in symptoms of another disorder. This study investigated the relationship between changes in posttraumatic stress disorder (PTSD), depression, and anxiety symptoms in the first 12 weeks following sexual assault. Methods:* Participants were 126 women who had been sexually assaulted in the previous 4 weeks. **Results:** Lower level mediation analyses revealed that changes in PTSD symptoms had a greater impact on changes in depression and anxiety than vice versa. **Conclusions:** The finding highlights the role of PTSD symptoms in influencing subsequent change in other psychological symptoms. These findings are discussed in the context of models detailing the trajectory of psychological disorders following trauma, and clinical implications are considered. *Depression and Anxiety 00:1–7, 2012.* © 2012 Wiley Periodicals, Inc.

**Key words:** *posttraumatic stress disorders; traumatic stress; anxiety disorders; depressive disorders; rape*

### INTRODUCTION

Although posttraumatic stress disorder (PTSD) is the most well-documented mental health consequence of

exposure to traumatic life events, comorbid conditions such as depression, anxiety, and substance abuse are also very common.<sup>[1–7]</sup> Indeed, studies suggest that trauma survivors who develop PTSD without comorbidity are in the minority [e.g., [8–11]]. This is noteworthy because individuals with at least one other mental disorder have been shown to have more functional impairments and disability following trauma compared to those without additional diagnoses.<sup>[12–14]</sup> The comorbidity associated with PTSD also poses considerable clinical challenges, for example, judging which type of psychological symptoms should be targeted first.

Researchers have attempted to disentangle and explain comorbidity in PTSD. Existing research has focused on the relative timing of the onset of PTSD and other disorders following exposure to trauma. For example, if PTSD precedes depression, PTSD is inferred to be the putative cause of the depression episode. At least three hypothesized pathways have been posited. These include shared underlying vulnerabilities common to different disorders,<sup>[9,15,16]</sup> preexisting psychiatric disorders contributing to the subsequent development of PTSD,<sup>[15,17–19]</sup> and comorbid disorders developing as a secondary consequence of PTSD.<sup>[20,21]</sup> Each of these possibilities is viable, and not mutually exclusive,

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however recent studies highlight the primacy of PTSD in causing subsequent mental health problems downstream.<sup>[12,16,20,22]</sup>

In contrast, there have been relatively few studies investigating the relationship between *changes* in the severity of different types of psychological symptoms over time. In this context, a key question relates to the association between changes in PTSD symptoms and changes in other psychological symptoms (e.g., do changes in PTSD precede or follow changes in other symptoms?). Findings to date have been mixed regarding the relationship between PTSD and other psychological symptoms across time. In a cross-lagged panel analysis study, Erickson et al.<sup>[22]</sup> found that initial PTSD symptoms (particularly avoidance and hyperarousal symptoms) predicted increased depression symptoms over 2 years in Gulf War veterans. Conversely, Schindel-Allon et al.,<sup>[17]</sup> also using a cross-lagged analysis to investigate symptom change in the first 12 weeks following a single-event trauma, found evidence to support the two hypotheses that PTSD and depression change simultaneously and that depression predicts subsequent PTSD symptoms. Two studies have also investigated the relationship between changes in various symptoms in the context of clinical trials. Forbes et al.<sup>[23]</sup> found that changes in anxiety, depression, and alcohol use predicted changes in PTSD in Vietnam veterans. Aderka et al.<sup>[24]</sup> found that, among children and adolescents receiving prolonged exposure therapy for PTSD, changes in PTSD symptoms over time contributed to a greater extent to changes in depression over time than vice versa.

Although these findings suggest that different types of mental health symptoms affect one another across time following trauma, the manner and direction in which changes in the severity of different types of psychological symptoms impact changes in other symptoms in the absence of intervention needs further clarification. Further, most studies thus far have investigated psychological symptoms in the medium- to long-term period following a traumatic event. Tracking changes in symptoms over time during the initial period following trauma has the potential to clarify the interrelationships between psychological symptoms before they become chronic and potentially phenomenologically indistinguishable.

To this end, we conducted a multiwave longitudinal study of adaptation in the early aftermath of a trauma to investigate the relationship between changes in PTSD symptom severity and changes in other psychological symptoms over time. Specifically, we employed lower level mediation modeling<sup>[25]</sup> to determine how changes in PTSD symptoms over time impacted symptoms of depression and anxiety, and vice versa, in the first 4 months following a sexual assault. This allowed us to consider the mediating role of changes in various types of symptoms, and clarify the temporal relationship between change in PTSD, depression, and anxiety symptoms.

## MATERIALS AND METHODS

### PARTICIPANTS

Participants in this study were 126 women who had been sexually assaulted within the previous 4 weeks. All participants were over 18 years of age, and were recruited across the United States via advertisements (flyers and online postings) or were referred by medical advocates from a sexual assault crisis center in the Boston area.

### MEASURES

The measures described in this study were part of a larger assessment battery and only those relevant to the present analyses will be described here. Participants completed the PTSD Checklist (PCL),<sup>[26]</sup> a 17-item measure indexing severity of PTSD symptoms. This measure evidences strong psychometric properties including high internal consistency and convergent validity.<sup>[26]</sup> To obtain rates of PTSD case-ness, we applied the DSM-IV criteria, requiring participants to report at least one re-experiencing, three avoidance, and two hyperarousal symptoms. A symptom was considered to be present if the participant rated it as 4 (quite a bit) or 5 (extremely) on the PCL. Participants also completed the Depression Anxiety Stress Scales,<sup>[27]</sup> a 42-item measure consisting of three subscales indexing symptoms of depression, anxiety, and stress. This measure has high internal consistency, discriminant and concurrent validity.<sup>[28]</sup> Only the depression and anxiety subscales were used in the present study.

### PROCEDURE

Participants responding to advertisements were initially screened for eligibility by telephone. Inclusion criteria were (1) the participant was over 18 years of age, and (2) the participant had experienced a sexual assault within the previous month. Eligible individuals then provided their email address and were told the study password over the phone; name and address were also recorded for compensation purposes. Surveys were completed online via a confidential and secure website, and took 20–45 min to complete on each occasion. Participants were compensated US\$20 for each completed survey, administered at four time points (1–4 months after the assault). Reminder emails were sent containing an online link to the next set of questionnaires at Times 2–4. Information on telephone hotlines for sexual assault survivors was provided at each time point. This study was approved by the Veterans Affairs Boston Healthcare System Institutional Review Board, and subjects participated with informed voluntary online consent.

### DATA ANALYSIS

Lower level mediation analyses were conducted using the linear mixed-models module of SPSS version 18.0. We examined the potential mediating role of PTSD in the relationship between time and depression and time and anxiety; and the potential mediating role of depression and anxiety in the relationship between time and PTSD. Lower level mediation is a statistical technique that permits the examination of change in variables across time (representing Level 1 of the analysis), nested within participants (representing Level 2 of the analysis<sup>[25]</sup>). It has been used previously to investigate the relationship between changes in PTSD and depression in children and adolescents receiving psychological treatment for PTSD.<sup>[24]</sup> The present analysis is considered lower level mediation as the predictor and mediator variables were measured at Level 1 (i.e., at each of the four time points, coded as 1, 2, 3, 4). Two sets of lower level mediation analyses were undertaken for both the depression and anxiety subscales of the DASS. The first examined the mediating role of PTSD in the relationship between time and depression or anxiety (e.g., investigating whether changes in PTSD accounted for

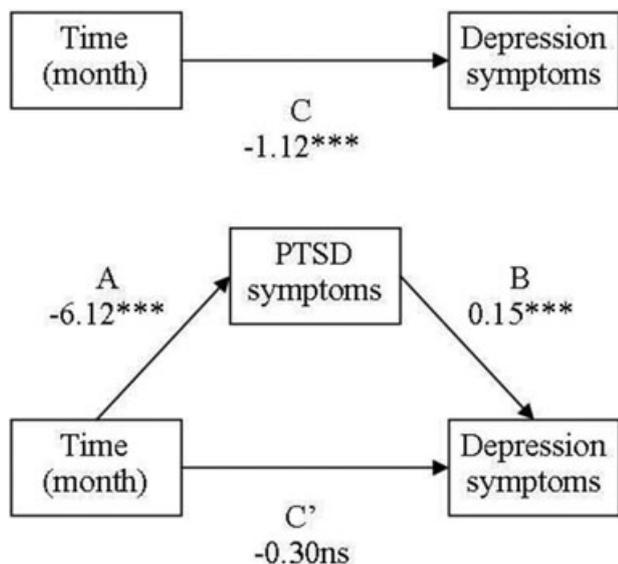


Figure 1. Mediation model of relationship between PTSD symptoms and depression symptoms.

changes in depression over time); the second examined the reverse, namely the mediating role of depression and anxiety in the relationship between time and PTSD (e.g., investigating whether changes in depression accounted for changes in PTSD over time). Mediation analyses were based on the procedures outlined by Baron and Kenny<sup>[29]</sup> and Kenny et al.,<sup>[25]</sup> who asserted that four conditions must be satisfied to demonstrate a mediation relationship, namely: (1) the predictor variable must be significantly related to the outcome variable (see Path C in Fig. 1); (2) the predictor variable must be significantly related to the mediator variable (see Path A in Fig. 1); (3) when controlling for the effects of the predictor variable, the mediator must be significantly related to the outcome variable (see Path B in Fig. 1); and (4) the relationship between the predictor variable and the outcome variable must be substantially attenuated when controlling for the effects of the mediator (see Path C' in Fig. 1).

In each analysis, the mediator variable was lagged to allow for the establishment of temporal relations; such that the impact of the mediator at time *t* was examined on the outcome variable at time *t* + 1. The magnitude of significant mediation relationships was evaluated using PRODCLIN.<sup>[30]</sup> Finally, we calculated percentage mediation, following the procedure outlined for lower level mediation models by Kenny et al.<sup>[31]</sup> We calculated the ratio between the indirect effect and the total effect of time on the outcome variable. The total effect is the sum of the direct effect (*C'*), the indirect effect (*AB*) and the covariance of *A* and *B* (the covariance of the ordinary least-squares estimates for *A* and *B*). Percentage mediation was thus calculated using the following formula:  $(C - [C' + AB + Cov(AB)]) / (C' + AB + Cov(AB))$ .

## RESULTS

### DEMOGRAPHICS AND SYMPTOM SCORES

The mean age of participants was 33 years (*SD* = 10.55). Employment status was as follows: 84 participants were employed (66.67%), 15 participants were students (11.90%), and 27 participants were unemployed (21.43%). Level of education was as follows: 23 participants had completed high school (18.25%), 50 had

TABLE 1. Means and standard deviations of PTSD, depression, and anxiety symptoms at each time point

	Mean (SD)
PTSD Time 1	55.39 (14.93)
PTSD Time 2	49.63 (14.89)
PTSD Time 3	43.56 (15.34)
PTSD Time 4	40.40 (15.37)
Depression Time 1	10.47 (5.83)
Depression Time 2	9.25 (5.42)
Depression Time 3	8.21 (6.04)
Depression Time 4	6.94 (6.13)
Anxiety Time 1	9.10 (5.32)
Anxiety Time 2	7.50 (4.84)
Anxiety Time 3	6.58 (4.82)
Anxiety Time 4	5.54 (5.59)

attended college (39.68%), 33 had completed college (26.19%), 7 had attended graduate school (5.56%), and 8 had completed graduate school (6.35%). With regard to marital status, 72 (57.14%) were single, 30 (23.81%) were married, and 23 (18.25%) were divorced, separated or widowed. The assault had occurred a mean of 19.52 days previously (*SD* = 6.41). Approximately half of the participants (68, 53.97%) had been previous sexually assaulted. For 25 participants, (19.84%) the perpetrator of the current assault was a stranger. Mean scores and standard deviations for symptoms of PTSD, depression, and anxiety at each of the time points are displayed in Table 1. At Time 1, 43.7% of participants met criteria for PTSD, at Time 2, 24.6% of participants met criteria for PTSD, at Time 3, 12.7% of participants met criteria for PTSD, and at Time 4, 7.1% of participants met criteria for PTSD.

### LOWER LEVEL MEDIATION ANALYSES

**Relationship Between PTSD and Depression Symptoms.** See Table 2 for results of the mediation and reverse mediation models examining the relationship between PTSD symptoms and depression symptoms. Findings indicated that changes in PTSD symptoms fully mediated changes in symptoms of depression, such that Time did not explain significant

TABLE 2. Mediation and reverse mediation models of relationship between PTSD and depression symptoms

Path	Predictor	Outcome	B	SE	T	P
Mediation model						
C	Time	Depression	-1.12	0.26	-4.31	<0.001
A	Time	PTSD	-6.12	0.78	-7.88	<0.001
B	PTSD	Depression	0.15	0.02	7.92	<0.001
C'	Time	Depression	-0.30	0.32	-0.94	0.35
Reverse mediation model						
C	Time	PTSD	-4.65	0.63	-7.41	<0.001
A	Time	Depression	-1.13	0.25	-4.47	<0.001
B	Depression	PTSD	1.18	0.15	7.93	<0.001
C'	Time	PTSD	-3.78	0.70	-5.39	<0.001

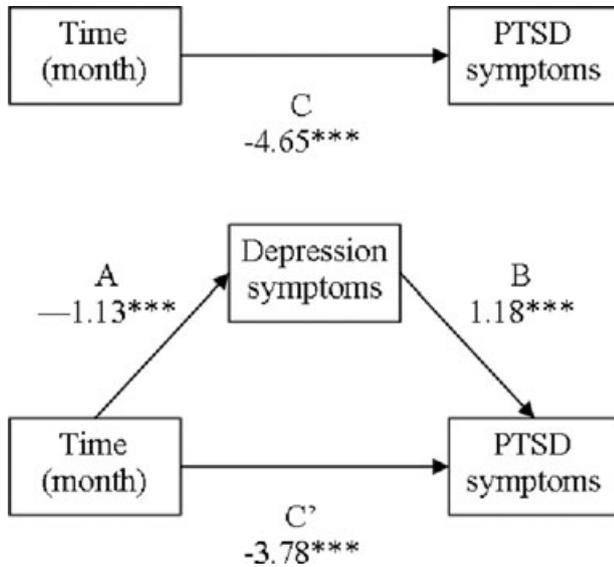


Figure 2. Reverse mediation model of relationship between PTSD symptoms and depression symptoms.

variance in depression after controlling for the effects of PTSD symptoms (Path  $C'$  in Table 2 mediation model;  $B = -0.30$ ,  $SE = 0.32$ ,  $P = 0.35$ ; see Fig. 1). Analyses using PRODCLIN confirmed that PTSD significantly mediated the relationship between time and depression (95% confidence interval [95% CI] =  $-1.27$  to  $-0.61$ ). Changes in PTSD symptoms mediated 74.87% of the total effect of time on depression symptoms.

For the reverse mediation model, results suggested that changes in depression symptoms partly mediated changes in symptoms of PTSD, such that the relationship between time and PTSD remained significant after controlling for the effects of depression (Path  $C'$  in Table 2 reverse mediation model;  $B = -3.78$ ,  $SE = 0.70$ ,  $P < .001$ ; see Fig. 2). PRODCLIN analyses confirmed that depression significantly partially mediated the relationship between time and PTSD (95% CI =  $-2.04$  to  $-0.71$ ). Changes in depression symptoms mediated 30.68% of the total effect of time on PTSD symptoms.

**Relationship Between PTSD and Anxiety Symptoms.** Results for mediation and reverse mediation models investigating the relationship between PTSD and anxiety are presented in Table 3. Results suggested that changes in PTSD fully mediated changes in symptoms of anxiety, with Time failing to explain additional variance in anxiety after controlling for the effects of PTSD (Path  $C'$  in Table 3 Mediation Model;  $B = -0.30$ ,  $SE = 0.02$ ,  $P = 0.30$ ; see Fig. 3). PRODCLIN analyses indicated that PTSD significantly mediated the relationship between time and anxiety (95% CI =  $-1.20$  to  $-0.56$ ). Changes in PTSD symptoms mediated 73.68% of the effect of time on anxiety symptoms.

The reverse mediation model indicated that changes in anxiety symptoms partly mediated changes in PTSD, such that time remained a significant predictor of PTSD

TABLE 3. Mediation and reverse mediation models of relationship between PTSD and anxiety symptoms

Path	Predictor	Outcome	$B$	$SE$	$T$	$P$
Mediation model						
$C$	Time	Anxiety	-0.95	0.24	-4.01	<0.001
$A$	Time	PTSD	-6.12	0.78	-7.88	<0.001
$B$	PTSD	Anxiety	0.14	0.02	8.02	<0.001
$C'$	Time	Anxiety	-0.30	0.02	-1.04	0.30
Reverse mediation model						
$C$	Time	PTSD	-4.65	0.63	-7.41	<0.001
$A$	Time	Anxiety	-9.49	0.24	-4.01	<0.001
$B$	Anxiety	PTSD	2.03	0.15	13.83	<0.001
$C'$	Time	PTSD	-3.04	0.58	-5.21	<0.001

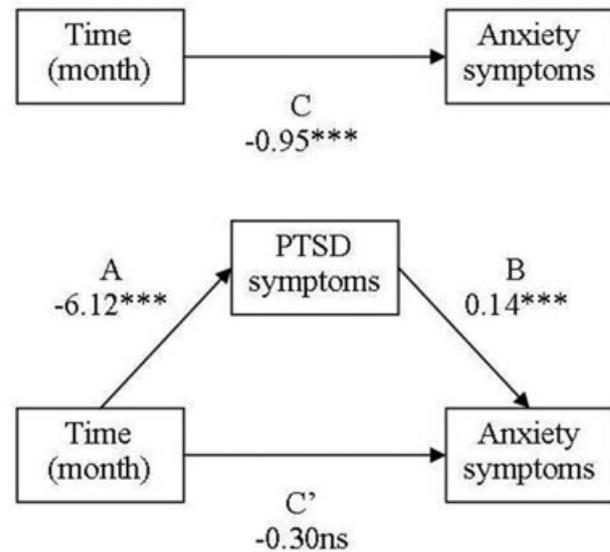


Figure 3. Mediation model of relationship between PTSD symptoms and anxiety symptoms.

after anxiety symptoms were accounted for (Path  $C'$  in Table 3 reverse mediation model;  $B = -3.04$ ,  $SE = 0.58$ ,  $P < .001$ ). Analyses conducted with PRODCLIN confirmed that anxiety partly mediated the relationship between time and PTSD (95% CI =  $-22.25$  to  $-16.35$ ; see Fig. 4). Changes in anxiety symptoms mediated 52.06% of the effect of time on PTSD symptoms

## DISCUSSION

We employed time-lagged lower level mediation analyses to examine the association between changes in severity of symptoms of PTSD, and depression and anxiety over the initial 4 months following sexual assault. This analysis allowed us to consider the impact of changes in PTSD symptoms over this time period on subsequent changes in anxiety and depression symptoms, and vice versa. The key finding was that PTSD symptoms fully mediated the relationship between time and symptoms of depression and anxiety. In other words,

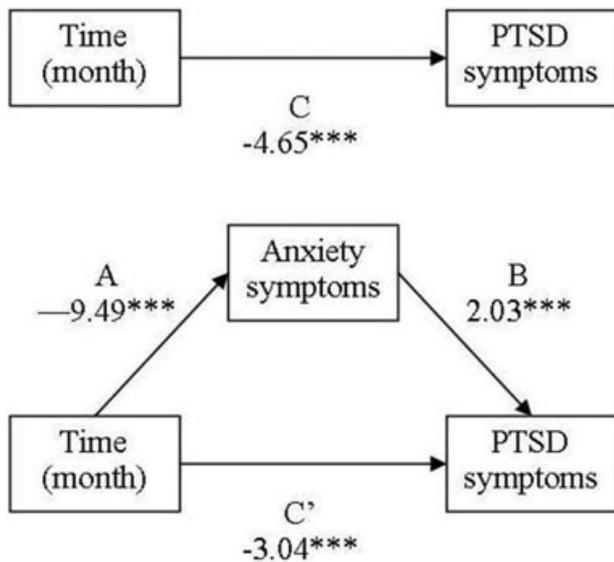


Figure 4. Reverse mediation model of relationship between PTSD symptoms and anxiety symptoms.

changes in PTSD symptoms accounted for changes in depression and anxiety symptoms in the initial months following the sexual assault. Conversely, symptoms of depression and anxiety only partly mediated the relationship between time and PTSD symptoms, suggesting that changes in depressive and anxiety symptoms also, to a lesser extent, impacted changes in PTSD following the sexual assault. This was reflected in the relatively larger proportion of the effect of time on depression and anxiety explained by changes in PTSD, compared to the effect of time on PTSD explained by changes in depression and anxiety.

Our findings suggest that changes in PTSD symptoms may precede changes in other kinds of psychological distress (specifically, depression and anxiety) in the initial months following a traumatic experience. This is consistent with Ginzburg et al.<sup>[21]</sup> who found that, after controlling for initial depression symptom severity, initial symptoms of PTSD predicted subsequent depression in Gulf War veterans over a 2-year period. This is also in accordance with findings by Aderka et al. suggesting that changes in PTSD contributed to a greater extent to subsequent changes in depression during treatment for PTSD in children and adolescents.<sup>[32]</sup> Because changes in PTSD symptoms had a much stronger impact on subsequent changes in depressive and anxiety symptoms than vice versa, our results suggest that symptoms of depression and anxiety develop secondarily to PTSD in trauma survivors. It appears that, not only does PTSD often manifest prior to other psychological disorders as suggested by other studies, but that changes in PTSD symptoms strongly impact changes in comorbid depression and anxiety.

The mechanisms by which changes in PTSD symptoms may impact depression and anxiety warrant com-

ment. Some have argued that comorbid disorders following trauma are an epiphenomena of shared psychological distress and should not be conceptualized as separate illnesses.<sup>[33–35]</sup> In contrast, other research has shown that PTSD and other disorders, such as depression, are distinct from one another.<sup>[9,20,36,37]</sup> Our findings provide support for the assertion that mental disorders are distinct posttraumatically, as trajectories of change varied according to symptom type.

Nevertheless, there is considerable symptom overlap between PTSD and commonly comorbid disorders. This is highlighted by a factor analytic study conducted by Gros et al.,<sup>[38]</sup> who found that, while PTSD and depression represented distinct symptom constellations, certain PTSD symptoms (characterized by emotional numbing and dysphoria) loaded onto a depression factor, representing nonspecific shared factors. Symptom overlap is likely to have implications for associations in symptom change, as comparable symptoms may evidence similar change simultaneously. Alternatively, the alleviation of particular types of symptoms may be functionally related to amelioration in other symptoms. For example, a reduction in the re-experiencing symptoms and associated avoidance in the PTSD syndrome may lead to decreased general levels of anxiety. Similarly, reductions in avoidance in the months following the trauma may lead the rape survivor to spontaneously self-expose to previously avoided situations (e.g., leaving the house, visiting friends, engaging in exercise). This may promote fear extinction and may play a secondary behavioral activation role, resulting in decreased symptoms of depression. Such improvements may trigger a positive spiral of healthy responses, such that decreases in PTSD symptoms lead to reduced depression and anxiety. Alleviation of these other symptoms may then, in turn, feed back into the “spiral” by improving PTSD symptoms, thus accounting for the reverse partial mediation relationship observed in this study. Further research should investigate the interrelationships between changes in psychological symptoms to elaborate on the mechanisms underlying symptom change.

In terms of clinical practice implications, our findings suggest that changes in PTSD play an important causal role in recovery from comorbid depression and anxiety in the initial months following a sexual assault. The co-occurrence of multiple disorders following a trauma may present a considerable challenge for clinicians working with trauma survivors as they attempt to determine which psychological symptoms should be targeted first, and hence, which treatment intervention should be prioritized. Findings from this study suggest that it may be most beneficial to first target PTSD symptoms in individuals with comorbid PTSD/depression/anxiety diagnoses in the months following a traumatic event. The impact of changes in PTSD on subsequent changes in depressive and anxiety symptoms suggest that treatments targeting PTSD may have the greatest beneficial effects for psychological distress overall. This is consistent with findings that, during treatment for PTSD, changes in

PTSD symptoms have a strong impact on subsequent changes in symptoms of depression.<sup>[32]</sup> Taken together, these results suggest that, in the context of both naturally occurring and treatment-induced symptom change, changes in PTSD symptoms play a primary role in influencing other symptom change.

There are limitations associated with this study. We only examined psychological symptoms in the acute period following sexual assault. Future studies can extend this examination to investigate long-term interrelationships between psychological symptoms. Further, the use of an online questionnaire did not allow us to administer structured diagnostic interviews to investigate diagnoses; however, it is important to note that this did increase the accessibility of the study. It is often difficult to access survivors of sexual assault for research studies. Online surveys provide an anonymous and confidential vehicle to collect information about mental health symptoms following sexual assault. It may be that individuals may be more willing to disclose traumatic events in writing than face to face; as such, these methods are being increasingly frequently used in research studies.<sup>[39]</sup> Finally, only female sexual assault survivors were examined, which limits the generalizability of the findings.

This study represents the first prospective investigation of the relationship between changes in PTSD and comorbid symptoms of depression and anxiety in women who have been recently sexually assaulted. Findings underscore the importance of change in PTSD symptoms in influencing subsequent change in symptoms of depression and anxiety, and highlight the potential overall psychological benefits of first targeting symptoms of PTSD in the acute period following sexual assault.

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