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Post-traumatic stress symptoms and adult attachment: A 24 year longitudinal study

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Abstract

Objectives—Attachment theory has become a key framework for understanding responses to and consequences of trauma across the life course. We predicted that more severe post traumatic stress (PTS) symptoms at age 37 would be associated with insecure attachment at age 55 and with worse PTS symptoms 24 years later at age 61, and that age 55 attachment would mediate the influence of earlier PTS symptoms on later symptoms.

Design—Data on PTS self-reported symptoms were available for 975 community-dwelling participants from the longitudinal Vietnam Era Twin Study of Aging (VETSA) at ages 37 and 61. At age 55, participants completed the Experiences in Close Relationships Inventory, a measure of adult attachment.

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Results—PTS symptoms at ages 37 and 61 correlated r=.43 (p<.0001). Multiple mediation models found significant direct effects of age 37 PTS symptoms on age 61 PTS symptoms (β=.26; 95% confidence interval: .19; .33). Anxious and avoidant attachment at age 55 predicted PTS symptoms at age 61 (rs=.34 and .25; ps<.0001, respectively) and also significantly mediated PTS symptoms over time, showing that insecure attachment increased PTS severity. Participants with higher age 37 PTS symptoms were more likely to have a history of divorce; marital status did not mediate PTS.

Conclusions—Analyses demonstrate the persistence of PTS symptoms from early midlife into early old age. Mediation analyses revealed that one path through which PTS symptoms persisted was indirect, through their influence on attachment insecurity. This study provides insight into ongoing interconnections between psychological and interpersonal responses to stress.

Keywords

post traumatic stress symptoms; PTSD; attachment; stress; VETSA; veterans

Objectives

Children separated from their parents to protect them from danger fared more poorly than children who stayed with their parents but experienced the stresses of war more directly.(1) Neural activation in response to threat was reduced in women when their spouses, or even a stranger, held their hands during an experimental procedure.(2) Elderly veterans in Finland, studied decades after World War II, had lower than predicted rates of post-traumatic stress disorder (PTSD) and higher levels of well-being despite their exposure to extreme duress during the war; their hardiness was attributed to their strong attachments and social ties to their communities.(3) These and other studies on the role of socio-emotional bonds as protective biopsychosocial mechanisms suggest the fundamental importance of supportive attachment relationships for mitigating stress.

Attachment theory has become a key framework for understanding responses to and consequences of trauma exposure across the life course.(4,5) From infancy, secure attachment—the sense that an important relationship is trustworthy, and dependable (a “safe haven”)—plays an important role in stress response and the development of close social bonds.(4) A number of studies, predominantly cross-sectional, find associations between PTSD and impaired social bonds (i.e., insecure attachment).(6–11) Attachment insecurities are associated with a wide range of psychological disorders and dysfunctional behaviors, including PTSD.(12) Clinical evidence suggests that therapies directed toward attachment-related thoughts and behaviors improve psychiatric symptoms, including PTSD, in adults.(5,12,13)

PTS symptoms are known to persist and are associated with greater vulnerability to early mortality physical decline, and increased psychiatric comorbidities.(14–17) Based on attachment theory, we inferred that one mechanism through which PTS symptoms may persist over time is through their influence on emotional responses to relationships (i.e., attachment-related anxiety and avoidance). In turn, the diminished expectations for support from others, poor emotional regulation, and impact on stress regulatory biological systems

that are hallmarks of insecure attachment contribute to poorer resolution of PTS symptoms and to poorer outcomes when new stress exposures occur.(9) Few longitudinal studies investigate these associations. Fraley et al (2006) found that adjustment improved in securely, but not insecurely, attached survivors of the World Trade Center attacks across one year.(18) In a study of Israeli combat veterans, baseline PTS symptoms predicted higher levels of attachment insecurity and PTS symptoms 12 years later; the authors' hypothesis that baseline attachment insecurity would predict later PTS symptoms was not supported. (19)

We had a unique opportunity to examine the longitudinal dynamics of PTS symptoms and adult attachment. Participants were assessed for PTS symptoms at ages 37 and 61, and for adult attachment at age 55. We predicted that 1) PTS symptoms would persist over time; 2) age 37 PTS would be associated with insecure attachment; and 3) higher levels of insecure attachment would be associated with age 61 PTS symptoms. Finally, 4) we hypothesized that adult attachment would function as a path or mediator through which earlier PTS symptoms influence later symptoms.

Methods

Participants

Participants in the baseline assessment of the Vietnam Era Twin Study of Aging (VETSA: 2002 to 2008) were 1237 individual male twins randomly recruited from 3322 twin pairs from the nationally representative Vietnam Era Twin Registry (VETR) (20,21) Participants served in the United States military between 1965 and 1975. VETSA baseline inclusion criteria were: 1) participants were 51 to 59 years old when recruited; and 2) both members of a twin pair agreed to participate. The VETSA follow-up assessment occurred approximately six years later (2009–2013). The VETSA is a prospective longitudinal study of risk and protective influences on aging starting at midlife in a community-dwelling sample of male veterans (not patients).(22) Vietnam era veterans currently account for one-fifth of adults over 60 and one-third of all veterans in the United States.(23)

Health and lifestyle characteristics of the VETSA baseline sample are comparable to men in the general population of the United States in this age group.(24) The majority of VETSA participants did not serve in Southeast Asia (65%) and 25% were exposed to military combat.(20) Participants entered military service in 1968 (SD 2.31) at an average age of 19.31 (SD=1.39). Other demographic characteristics of the sample are presented in Table 1. From this point on, we label timepoints using the mean age at each assessment: age 37 in 1987; 55 at VETSA baseline; 61 at follow-up.

Procedures

At age 37 VETSA participants completed a mailed survey assessing PTS symptoms and combat exposure during military service.(25) At 55 and 61, they completed mailed psychosocial questionnaire booklets (PSQ) at home two to three weeks prior to on-site testing and brought the PSQ to the test site (>99% return rate). The analytic sample

comprises participants who completed PTS symptom measures at 37 and PSQs at the ages 55 and 61 (N=975).

Attrition rates between the age 55 and 61 assessments were 18% (N=226); the major known cause of attrition was death (N=60). T-test comparisons of demographic measures in follow-up participants and the attrition group showed no differences in occupation, education, general cognitive ability, PTS symptoms at age 37, combat exposure, major chronic health problems, attachment dimensions, or marital status. Only two measures differed significantly. Non-returnees were slightly older [mean 55.7 versus 55.4 years old; t (1235)= −2.09; P=.04] and had slightly higher mean incomes [$50–$59,999 versus $40–$49,999 per year; t (1225) = −2.27; P=.02] than follow-up participants.

Institutional Review Board approval was obtained at all sites. Written informed consent was obtained from participants after they received a complete description of the study.

Measures

PTS symptoms—At age 37, participants completed a 13-item questionnaire assessing PTS symptoms based on the three symptom clusters from the Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition Revised (DSM-III-R).(25,26) The questionnaire included items about symptoms related to: 1) re-experiencing military service-related trauma; 2) avoidance of stimuli or numbing of responsiveness; and 3) arousal. Participants indicated how frequently each symptom occurred in the past six months (very often, often, sometimes, almost never, or never). The PTS measure had high reliability (alpha=0.89) and strong validity.(25,26)

The questionnaire can also be scored for presumptive diagnosis of PTSD.(25) Each item is dichotomized (sometimes, often, or very often vs. almost never or never) to indicate presence or absence of severe symptoms. Cluster severity is then determined based on a minimum number of severe symptoms associated with a cluster: re-experiencing cluster (one severe symptom present); avoidance cluster (three severe symptoms); arousal cluster (two severe symptoms). Presumptive PTSD is assigned when all three symptom clusters meet severity criteria.(25) PTS symptoms were not assessed at age 55.

At age 61, participants completed the reliable, valid, 17-item self-report DSM-IV based PTSD Checklist civilian version (PCL).(27,28) Participants rated how much they were bothered by each symptom in the past month on a scale from 1 (not at all) to 5 (extremely). The two PTS measures correlated >.90 when administered to the same group of adults (personal communication, Jack Goldberg, Ph.D., 2013). The PCL can also be scored for presumptive PTSD using established, comparable criteria for type and severity of symptoms as the age 37 measure. At age 37 and 61, we created three groups: presumptive PTSD (three severe clusters), distressed (two severe clusters) and low distress (one or no severe clusters).

Adult romantic attachment—Adult romantic attachment was assessed with the 36-item Experiences in Close Relationships Inventory (ECRI).(29) at age 55: a well-validated self-report measure of adult attachment.(12,29) The ECRI yields two subscales assessing anxiety and avoidance (alphas >.90). Responses range from one (strongly disagree) to seven

(strongly agree). High scores on the attachment anxiety dimension indicate intense worries about separation and fear of abandonment by an intimate partner (e.g., “I get frustrated if romantic partners are not available when I need them”). High scores on the attachment avoidance dimension indicate distancing from emotional connections (e.g., “I prefer not to show a partner how I feel deep down”). Low scores on either scale reflect secure attachment. The subscales are continuous dimensions. No measure of attachment orientation was administered at age 37.

Poorer relational functioning at ages 37 and 55 was also measured in terms of three marital status groups: never married; history of divorce; currently married only one marriage.

Combat exposure—A combat exposure measure administered at age 37 assessed exposure to 18 specific combat experiences (yes, no) while serving in Southeast Asia and was previously validated using military service records.(25) Combat exposure was used as a covariate in the mediation analyses.

More details of the VETSA data collection are available elsewhere.(22,30)

Data Analyses

Linear mixed models were fit using the nlme package in R for each pathway in the multiple mediation model (see Figure 1).(31,32) The model tested whether attachment mediates PTS symptoms by examining the indirect effects of age 37 PTS symptoms on age 61 PTS symptoms through age 55 attachment avoidance and anxiety. Analyses adjusted for combat exposure and for the clustering of twins within pairs. Adjusting for clustering as a random effect was necessary because twins are not independent observations and the goal here was to conduct non-genetic analyses in which the individual rather than the twin pair was the unit of analysis. In Figure 1, the *a* paths reflect the effect of age 37 PTS symptoms (the independent variable) on each mediator (M1; M2). The *b* paths reflect the effect of the mediators on age 61 PTS symptoms (the dependent variable) controlling for other measures in the model. Specific indirect effects are represented by the product of $a_i x b_i$. Thus, mediation analyses of specific indirect effects involve simultaneous calculation of age 55 attachment anxiety (M1) and age 55 attachment avoidance (M2) mediating the effect of age 37 PTS symptoms on age 61 symptoms (paths a_1b_1 *and* a_2b_2 *respectively*). The c' path reflects the direct effect of age 37 symptoms on age 61 symptoms. Finally, the *c* path represents the total effect of age 37 PTS symptoms on PTS symptoms at age 61. Results are presented as the estimates of the Type III fixed effects, which represent each measure’s influence after other measures have been entered into the model. All measures were standardized with a mean of zero and SD of one.

Estimation and testing of the significance of the direct and indirect effects were accomplished by using a nonparametric bootstrap approach. This innovative non-parametric bootstrapping procedure was designed to estimate the sampling distribution of the indirect effect when multiple mediators are examined.(31,32) There are multiple benefits to using this approach: multiple mediators can be tested simultaneously; the non-parametric bootstrapping procedure makes no assumptions about whether the indirect effects are

normally distributed; and the number of statistical tests is reduced thus minimizing the likelihood of Type 1 error.

Confidence intervals were obtained by performing 1000 bootstrap replicates from the sample of 975 individuals. Bootstrapping samples with replacement twin pairs from the original sample were constrained to have the same number of monozygotic and dizygotic twins as in the original sample. Resampling with replacement was repeated 1,000 times to obtain path estimates for all portions of the full model. The middle 95% of estimates for direct and indirect effects from these samples were used to create 95% confidence intervals (CI). Bootstrapped CI are considered to be preferable to traditional Sobel tests because they make no assumptions regarding the sampling distribution of the indirect effect.(31,32) Interpretation of bootstrap data is accomplished by examining whether zero is contained within the 95% CI. Results are significant if zero is not included within the 95% CI.

Other analyses were conducted with mixed models in R, in order to adjust for the random effect of the non-independence of twins.

Results

Descriptive Analyses

Men with higher levels of PTS symptoms at age 37 had significantly higher levels of attachment anxiety and avoidance at age 55 as well as more severe PTS symptoms at age 61 (Table 2). Age 55 attachment significantly predicted age 61 PTS; men with higher levels of avoidant and/or anxious attachment had higher PTS symptoms six years later. Although combat exposure from military service correlated significantly with age 37 and age 61 PTS symptoms, it was not associated with attachment avoidance or anxiety at age 55.

In Table 2 the descriptive data are also broken down by age 37 symptom cluster severity groups (i.e., presumptive PTSD, distressed, low distress). The results show significant linear trends in which it is evident that the distressed group (below clinical threshold) was impaired at later ages—with significantly higher anxious and avoidant attachment, and age 61 PTS symptoms than the low distress group. Finally, 7.5% (N=73) of age 37 and 7.2% (N=70) age 61 participants reported PTS symptoms severe enough to be coded as presumptive PTSD (Table 3). Although the rates of presumptive PTSD were similar at both times, chi-square analyses found that 20 (28%) individuals scored as having presumptive PTSD at both times. Forty-eight men (66%) with presumptive PTSD at age 37 improved over time (i.e., low distress at age 61) but 33 men who were low distress at age 37 now scored as presumptive PTSD (4% of age 37 low distress group). Age and ethnicity were not associated with PTS symptoms or attachment so they were not included as covariates in the multiple mediation models.

Bootstrapped Multiple Mediation Model. Age 55 attachment anxiety and avoidance both significantly mediated the association between age 37 and age 61 PTS symptoms (paths $a_1b_1 + a_2b_2$; total indirect effects $\beta=0.07$; Table 4). The direct effect of age 37 PTS symptoms on age 61 symptoms, adjusting for the influence of the mediators and covariates, remained significant (path c': $\beta=.26$). The total effect (path c: direct plus indirect) was $\beta=0.32$. Most of

the effect (81%) on age 61 PTS symptoms was accounted for by direct effects of symptoms at age 37. Thus attachment orientation only partially mediated the effect of age 37 PTS on later PTS symptoms. The results indicate that, overall, each one standard deviation increase in age 37 PTS symptoms (a one unit increase = 7.7 points) was associated with 0.32 SD or an approximately 3.3 point increase in PTS symptoms at age 61.

Figure 2 presents standardized individual path estimates and confidence intervals for the predictor and two mediators in the multiple mediation model. All of the path estimates were significant. Here we see, for instance, that each one SD increase in PTS symptoms at age 37 was associated with 25% higher attachment anxiety and 17% higher avoidance at age 55. Insecure attachment predicted higher PTS symptoms at age 61, even when adjusting for earlier symptoms and combat exposure.

Age 37 PTS symptoms significantly predicted increased risk for divorce and never marrying at age 55 [OR 1.51 (CI 1.21; 1.88); OR 1.89 (CI 1.24; 2.88) respectively, married once as comparison group]. Marital status, however, was not associated with PTS symptoms at age 61 [F (2,431) = 0.29, p=.75] so did not mediate PTS symptoms over time.

Effect sizes

There is no established procedure for calculating effect sizes from mixed models that are adjusted for a random effect. In order to estimate the effect size we conducted a multiple linear regression in the R statistical package predicting PTS at age 61 using just one twin from a pair. The dependent variable was PTS symptoms at age 61; the model included combat exposure, PTS symptoms at age 37, attachment anxiety and avoidance at age 55 as predictors. All measures were standardized. The adjusted multiple R squared was .30 (Table 5). Thus about one-third of the variability of age 61 PTS symptoms is explained by these combined measures; this is a large effect size according to Cohen's convention and accounts for influences across nearly 25 years.(33) As can be seen by the parameter estimates, all measures significantly predicted age 61 PTS symptoms (Table 5). Although the regression model provides some insight into the long-term influences of these predictors, it provides little information about the longitudinal effects of the measures on each other, as was revealed through mediation analyses.

Conclusions

The severity of PTS symptoms in middle adulthood had enduring influences on PTS symptoms nearly 25 years later in this sample of aging veterans. PTS symptoms both influenced and were influenced by attachments to intimate others. Although earlier PTS was associated with both midlife relational quality (attachment) and marital history, only attachment was associated with PTS symptoms at age 61. Mediation analyses revealed that some of the effect of early PTS symptoms on later life symptoms was indirect, through their association with attachment avoidance and anxiety at age 55. Thus, attachment insecurity appears to be one mechanism contributing to the persistence of PTS symptoms over time.

These results extend previous cross-sectional studies finding associations between PTS symptoms and attachment.(6–8) However, they differ from the Solomon et al. longitudinal

study of Israeli POWs in which, contrary to their hypothesis, attachment at baseline did not predict PTS 12 years later.(19) In our analyses, age 55 attachment avoidance and anxiety still predicted age 61 PTS symptoms over and above the influence of age 37 symptoms. Our results are consistent with predictions from attachment theory in which feelings of safety in an important relationship should serve to mitigate psychological responses to stress. The fact that the Israeli study was much smaller than the VETSA, used different measures of attachment and PTS, and had different timepoints may account for the difference in results.

We compared rates of presumptive PTSD in the VETSA participants, based on published cut-offs, with rates from two other studies. At age 61, 6.8% of the VETSA participants scored higher than a clinically meaningful cut-off of 44 on the PCL. Pietrzak et al. reported a rate of 3.5% of veterans with scores greater than 44 in a sample with average age 71.(11) At age 37, 7.5% of the VETSA participants—veterans of the Vietnam War—were coded as having presumptive PTSD (a comparable index to a severity of 50 on the PCL) and 4.6% of the VETSA men scored higher than 50 on the PCL at age 61. Clark and Owens found that 15% of veterans of the wars in Iraq and Afghanistan had PCL symptoms greater than 50 at age 35. Part of the discrepancy in these rates may be due to characteristics of the combat arena, age, sample, or methodology. The Pietrzak sample, for instance, was a large national survey sample of elderly veterans whereas Clark and Owens studied 147 volunteer veterans through an internet survey. It is also possible that the different rates of diagnosable PTSD in these samples may reflect a selection factor. That is, younger individuals who are closer in time to the traumatic event and are experiencing more symptoms may be more likely to participate in studies.

These results are important in several ways. Traumatic events and/or failures in significant relationships are theorized to influence development of and changes in both PTS symptoms and attachment orientation.(5,12) In most people, PTS symptoms subside with time and distance from the contributing traumatic event, sometimes aided by formal therapeutic interventions as well as informal ones—such as the responsiveness and support of loved ones. Adult attachment theory, however, would predict that even in middle adulthood and decades after trauma exposure, trusting, dependable relationships with significant others (e.g., clinician, spouse, friend) could improve feelings of attachment security and thereby, potentially, influence PTS symptoms.(5,13,34) In survivors of sexual abuse with PTSD, for example, poor attachment interferes with the formation of therapeutic alliances, which have been found to be important for recovery.(35) Given research findings on the long-term effects of PTS symptoms on morbidity, mortality, relationships, and quality of life, interventions to reduce the sequelae of PTS symptoms on aging adults could have significant impact on social, psychological, and economic aspects of public health. (15,19,36,37)

There are several limitations to this study. The sample included only men thereby limiting its generalizability to women. We did not have measures of attachment or measures of characteristics prior to combat exposure, thereby limiting the causal inferences that can be made. Without a priori information, we cannot know how attachment might have contributed to initial development of PTS symptoms.(38,39) We examined two different PTS symptom measures at 37 and 61; however, the PCL had not yet been developed in 1987 and the PTS measures used in this study are known to be reliable, valid, and correlate > .90.

The PTS measures are also self-report rather than categorical clinical diagnosis but having continuous PTS symptom measures are also a strength of our study since it allows us to examine the entire sample, and subclinical threshold symptoms levels rather than just those few adults who meet diagnostic standards. Finally, although this is a twin study, it was beyond the scope of the analyses to address the roles of genetic and environmental influences on these associations. Genetic influences on PTSD, stress exposure, and attachment are modest but significant, with heritabilities ranging from approximately .20 to .30. (30,38,40) Examination of genetic and environmental influences (and their interactions) may provide additional insight into the dynamic associations between relational characteristics such as attachment and responses to stress.

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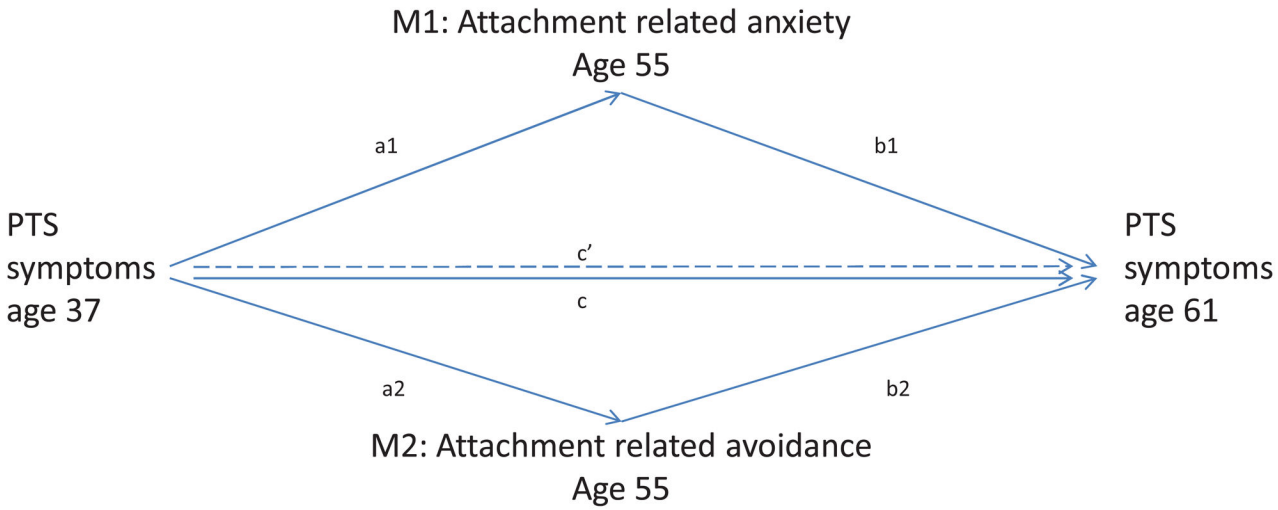

Figure 1.

Basic Multiple Mediation Model. M1, M2 are mediating variables; a_i paths represent the indirect paths from the independent variable (IV: PTS symptoms age 37) to the mediating variable; b_i paths represent indirect paths from the mediating variable to the dependent variable (DV: PTS symptoms age 61); c′ represents the direct path from the IV to DV; c represents the total direct and indirect effects. The model is adjusted for combat exposure.

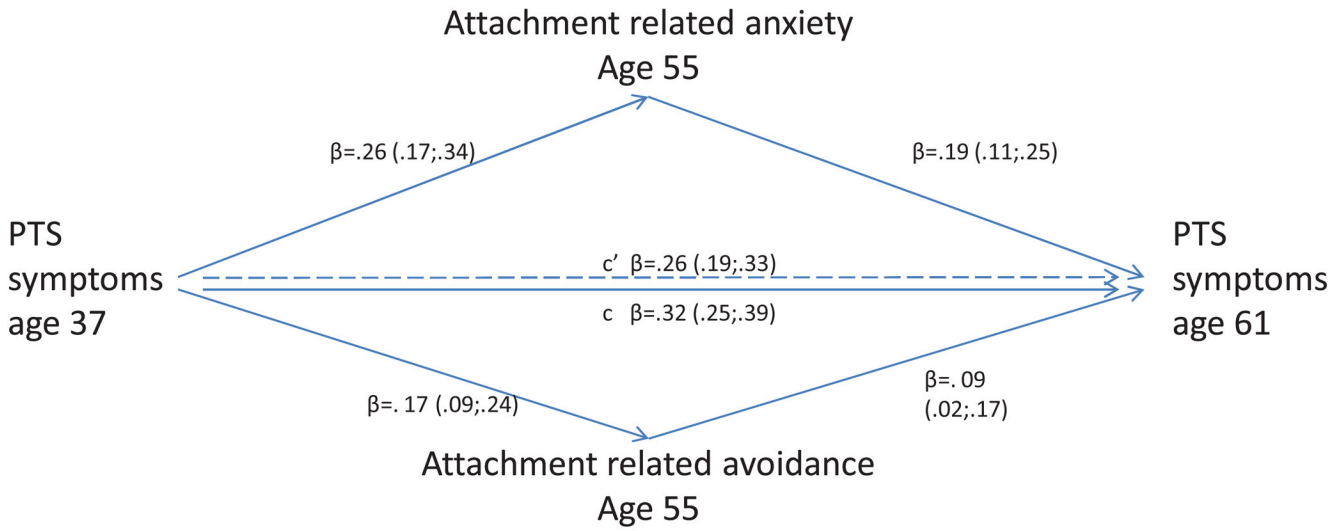

Figure 2.

Attachment anxiety and avoidance mediating the influence of PTS symptoms at age 37 on PTS symptoms at age 61. All measures in multiple mediation models are standardized. Shown are parameter estimates adjusting for all other measures in the model, combat exposure as fixed effects and family (twin) as a random effect with 95% confidence limits, two tailed.

Table 1

Sample demographics

Age	
1987 assessment	37.49 (SD=2.49; range 32–43)
VETSA baseline	55.46 (SD=2.49; range 51–60)
VETSA follow-up	61.13 (SD=2.48; range 56–67)
Ethnicity (white non-Hispanic)	90%
Lifetime education: mean (SD)	13.91 (SD=2.11), range 8–20;
Income per year: age 37/ 55/ 61 (median)	$30–34,000/ $50–59,000/ $50–59,000
Marital status: age 37/ 55/ 61	
Never married	9% / 5% / 5%
Ever divorced	27%/ 43%/ 43%
Married once	64%/ 52%/ 52%
Work status: age 55 / 61	
Work Full-Time	79% / 51%
Retired	9% / 32%
Disability	5% / 7%
Other (e.g., part-time work)	8% / 10%

Percents do not always add up to 100 due to rounding

Table 2

Associations between PTS symptoms, combat exposure, and attachment with symptoms at age 37 as a continuous measure and as cluster severity groups.

		Continuous Measures				PTS Symptom Cluster Severity Groups at Age 37			
	Mean (SD) Range N	**PTS Symptoms Age 37**	**PTS Symptoms Age 61**	**Combat Exposure**	**Avoidant attachment Age 55**	**None/low (N=740) Mean (SE)**	**Distressed (N=162) Mean (SE)**	**Presumptive PTSD (N=73) Mean (SE)**	**Mixed model F, df, P and group comparisons**
PTS symptoms (age 37)	22.39 (7.71)					19.28 (.19)	29.53 (.38)	38.25 (.57)	F (2,436)=724.91
	range 13–57 N=975								P<.0001; 0<1<2
PTS symptoms (age 61)	26.13 (10.45)	.43				24.30 (.38)	29.81 (.76)	37.12 (1.13)	F (2,436)=72.55
	range 17–84 N=975	P<.0001							P<.0001; 0<1<2
Combat exposure	1.46 (2.79)	.32	.23			1.02 (.10)	2.42 (.21)	3.93 (.29)	F (2,436)=52.57
	range 0–16 N=975	P<.0001	P<.0001						P<.0001; 0<1<2
Avoidant attachment(age 55)	47.45 (18.85)	.17	.25	.07		46.2 (.72)	50.0 (1.47)	55.2 (2.22)	F (2,227)=9.29
	range 18–118 N=966	P<.0001	P<.0001	P=.027					P<=.0001; 0<1<2
Anxious attachment (age 55)	51.11 (19.85)	.27	.34	.017	.44	49.1 (.75)	56.1 (1.47)	61.3 (2.21)	F (2,427)=21.22
	range 18–116 N=966	P<.0001	P<.0001	P=.605	P<.0001				P<.0001; 0<1<2

Mixed effects models used to compare cluster severity groups adjusting for twin as a random effect; PTS symptom cluster severity groups based on the number of clusters (Re-experiencing, Avoidance, Arousal) meeting severity criteria for the number of symptoms within the cluster rated “moderately” or above (1 symptom; 3 symptoms; 2 symptoms respectively). None/low=0 or 1 severe clusters; distressed=2 severe clusters; Presumptive PTS=3 severe clusters

Table 3

Crosstabs of Presumptive PTSD groups at ages 37 and 61

	AGE 61			
	Low distress	**Distressed**	**Presumptive PTSD**	**Total N (%)**
Age 37:				
Low distress	675	32	33	740 (75.9%)
Distressed	128	17	17	162 (16.6%)
Presumptive PTSD	48	5	20	73 (7.5%)
Total	851 (87.3%)	54 (5.5%)	70 (7.2%)	975
			Chi-square=67.50; df=4; p <.0001	

Notes: Post traumatic stress disorder (PTSD)

Table 4

Direct, indirect, and total effects of PTS symptoms at age 37 on PTS symptoms at age 61.

	Path	Parameter estimate (95% CI)
Direct effect:		
PTSD age 37	c'	β=.26 (.1875,.3301)
Indirect effect via:		
M1: Attachment Anxiety	a_1b_1	β=.05 (.0242; .0739)
M2: Attachment Avoidance	a_2b_2	β=.02 (.0038, .0315)
Total effects:	c	β=.32 (.2462, .3938)

Notes: Parameter estimates from multiple mediation models; estimates for each measure adjust for all other measures and combat exposure as fixed effects and twin as a random effect. Measures standardized (mean=0; SD=1). All estimates are significant at p<.05, two-tailed.

Table 5

Multiple regression results predicting PTS symptoms at age 61.

Type 3 effects	Standardized parameter estimates/ (SE)	t-test (P value)
Combat exposure	0.136 (0.040)	t=3.441 P=0.0006
Post-traumatic stress symptoms age 37	0.333 (0.042)	t=7.974 P<.00001
Avoidant Attachment age 55	0.096 (0.039)	t=2.460 P=0.0142
Anxious Attachment age 55	0.214 (0.044)	t=4.918 P<.00001
	Adjusted R^2 = 0.30; F (4,476) = 53.26, P<.00001	

Notes: Post traumatic stress (PTS). Parameter estimates from linear regression models based on “A” twin. Measures standardized (mean=0; SD=1). Significance tests are two-tailed.