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Traumatic Memory Characteristics: A Cross-Validated Mediational Model of Response to Rape Among Employed Women

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In a cross-validated mediational model, the authors examined characteristics of memories formed in response to rape and other intense unpleasant and pleasant experiences. Data were responses to a mailed survey of women medical center and university employees. Measurement models of memory and symptom factors and a structural model with pathways among cognitive appraisal, emotional valence, memory characteristics, and health outcomes were developed in Sample 1 (N = 1,307) and confirmed in Sample 2 (N = 2,142). Rape had substantial direct effects on 2 memory factors (Clarity and Affect) and indirect effects through the construal of victimization. Rape was associated with memories described as *more* emotionally intense but *less* clear and coherent and *less* often thought of or talked about. Most effects on physical symptoms were nonsignificant. Implications of findings for neurohormonal and multiple representation models of emotional memory and to cognitive avoidance are discussed.

Emotional arousal stemming from shocking, personally consequential experiences has been shown to etch long-lasting, detailed memories compared to memories for neutral personal experiences (for reviews, see Christianson, 1992; Koss, Tromp, & Tharan, 1995). The detail and persistence of emotional memories are multiply determined. Emotional arousal triggers neurohormonal changes that influence the strength of encoding (e.g., LeDoux, 1994), directs attentional resources to the event (Christianson, Loftus, Hoffman, & Loftus, 1991), engages greater elaborative processing of the stimulus because of its consequentiality and unusualness (e.g., Christianson & Loftus, 1991), and influences how and how much the memories are talked about (e.g., Bohannon & Symons, 1992).

Viewed from a clinical perspective, past research on emotional memories is particularly thin in some areas. First, very few studies involved actual as opposed to simulated events, and even fewer studies involved targeted victims as opposed to eyewitnesses to the event (Cutshall & Yuille, 1992; Wagenaar & Groeneweg, 1990). Second, the neural mechanisms underlying emotional memory suggest that any event that evokes intense arousal, positive or negative, could result in vivid and persistent memories (Cahill, Prins, Weber, & McGaugh, 1994). However, researchers have concentrated mainly on negative emotional events (Christianson, 1992). Third, most studies limited examination of memory characteristics to issues of detail, persistence, and sometimes frequency of discussing the memory. These foci represent only a subset of the phenomena that characterize autobiographical memories (Suengas & Johnson, 1988). In the present study we contribute to these understudied areas by examining women's recollections of rape, other unpleasant experiences, and pleasant experiences using a multifactor memory characteristics questionnaire. A cross-validated mediational model is described that tested hypothesized relationships among intense experiences, cognitive appraisal and valence, memory characteristics, and physical health outcomes.

On the basis of prior studies demonstrating that the perceived threat inherent in a rape attack is a more powerful predictor of later symptoms than the actual violence, we reasoned that how rape is cognitively construed may predict the qualities of the reconstructed memory (Girelli, Resick, Marhoefer-Dvorak, & Hutter, 1986; Kilpatrick, Saunders, Veronen, Best, & Von, 1987; Norris & Kaniasty, 1991; Sales, Baum, & Shore, 1984). Charges aired in the public media have suggested that researchers err in considering as rape victims women who sustained sexual assaults that meet legal standards for rape but who do not cognitively appraise themselves as rape victims (Gilbert, 1991, 1994). The question of whether the deleterious effects of rape stem from the coerced, unwanted sexual intercourse itself, from one's self-appraisal as a victim, or from both is empirically tested in our model.

Like many trauma victims, rape survivors experience deleterious effects of victimization on their physical health (Golding, 1994; Kimerling & Calhoun, 1994; Koss, Koss, & Woodruff, 1991; Wolfe, Schnurr, Brown, & Furey, 1994; for reviews, see

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Dunn & Gilchrist, 1993; Hendricks-Mathews, 1993; Koss & Heslet, 1992). Unfortunately, none of these studies illuminate the causal pathways by which victimization influences health. In our model, we considered frequent remembering as a mediator through which disease might be created. The following indirect sequence of causation was hypothesized regarding the relationships between rape, memory for rape, and symptoms: (a) the level of rape, as legally defined, directly influenced both the cognitive appraisal and the emotional valence related to the incident; (b) both cognitive appraisal and valence directly influenced the memories related to the incident; and, finally, (c) memory characteristics directly influenced physical symptoms. This sequence assigned causal priority according to the following theoretical principles: first, to the formal characteristics of rape, as defined by the law; second, to the cognitive and affective construals of the rape, as retrospectively defined by the respondent; and, third, to the detailed representation of the rape, as reconstructed from memory.

The conceptual model of the cognitive and symptomatic sequelae of rape is illustrated in Figure 1. The focus of the model is on a range of memory phenomena broader than but partially overlapping with the diagnostic entity of posttraumatic stress disorder (PTSD), the hallmark of which is intrusive memory. Our assumption was that memory phenomena occur on a continuum of severity, which at some point become diagnosable. Some of the memory processes examined in the present study could occur among people who do not meet diagnostic criteria for PTSD but who still experience dysfunction to some degree. We used community samples to examine this continuum and to avoid limiting the range of severity to clinically significant intensity.

Method

The data were collected by a short mail survey using the total design method (Dillman, 1978). This method involved design criteria including survey length requiring less than 10 min of respondent's time, a presurvey publicity campaign, a preliminary first-class letter sent to the members of the sample set 2 weeks prior to the survey being mailed, the main survey mailing, and a follow-up mailing 2 weeks later. Women whose first-class letters were returned as undeliverable were removed from the sample frame. A phone number and instructions in Spanish were given on the cover for respondents who preferred to complete the survey in Spanish.

Participants

Sample 1 consisted of 2,173 surveys mailed to medical center employees, from which responses were received from 1,037 women (48% response rate). Their demographic characteristics were as follows: mean age, 36.6 years; range, 18–67 years; 84% non-Hispanic White, 13% Hispanic, and 1% each of African American, Asian–Pacific Is-

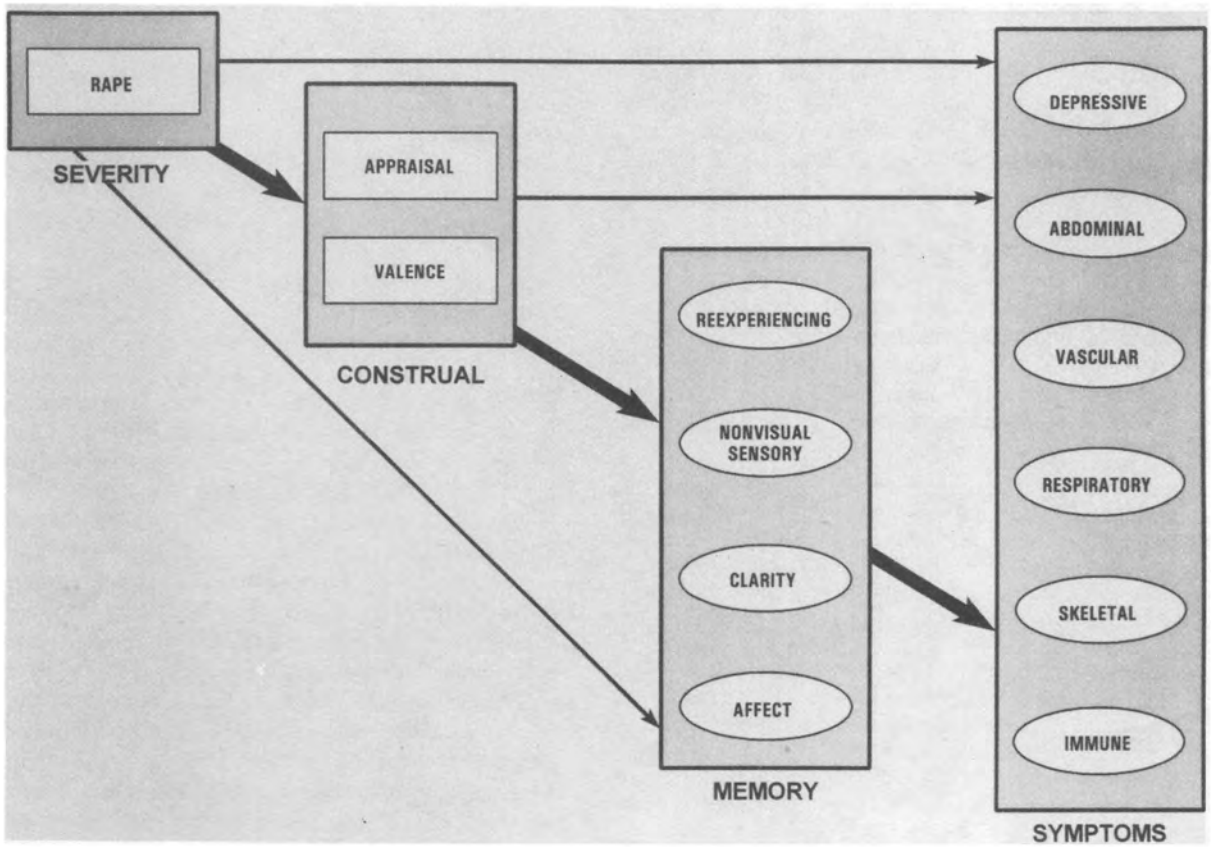

Figure 1. Conceptual model of the cognitive and symptomatic sequelae of rape.

lander, and Native American; 65% married or cohabitating, 19% single, 16% separated, divorced, or widowed; 2% high school education or less, 36% business, technical, or some college training, and 62% college graduates; 13% with family incomes less than $15,000, 36% between $15,501–$35,000, and 51% over $35,000. The medical center work force is an average of 38.3 years old and 76% White, 18% Hispanic, 3% African American, 2% Asian, and 1% Native American. Compared to the population, our sample was on average 1.7 years younger, $d = -.19$, $t(992) = -6.074$, $p < .05$, and contained 8% more Whites, 5% fewer Hispanics, and 3% fewer members of other ethnic groups, $\chi^2(4, N = 1{,}004) = 33.43$, $p < .05$.

Sample 2 consisted of 5,411 surveys mailed to university employees, from which responses were received from 2,142 women (40% response rate; the slightly lower rate was due to a financially based decision to omit the follow-up mailing in this sample). The demographic characteristics of the respondents were as follows: mean age=40.5 years, range=17–75 years; 88% White, 8% Hispanic, 1% African American, 2% Asian, and 1% Native American; 63% married or cohabitating, 17% single, 20% separated, divorced, or widowed; 6% high school education or less, 27% business, technical, or some college, and 67% college graduates; 12% with family incomes less than $15,000, 37% between $15,501–$35,000, and 51% over $35,000. The female university work force is an average of 39.9 years old and comprised of 79% non-Hispanic Whites, 12% Hispanics, 5% Asian, and 2% each African American and Native American. Compared to the work force, respondents were 0.6 years older, $d = .06$, $t(2{,}014) = 2.642$, $p < .05$, and contained 9% more non-Hispanic Whites, 4% fewer Hispanics, 3% fewer Asians, and 1% fewer each African Americans and Native Americans, $\chi^2(4, N = 2{,}047) = 90.008$, $p < .05$. Demographic differences between the two samples were not of concern to us because all data analyses were conducted in one sample and cross-validated in the other. However, we were concerned about the slight departures from representativeness, which suggest caution in generalizing the results and raise questions about the potential effects of demographic characteristics on the study variables. We address these problems statistically and fully describe our procedures in the analyses section.

Survey Contents

Respondents first answered health questions. Then they turned a page and found questions that screened for attempted and completed rape. If they checked yes to one of these items, they were asked to recall their most recent or most significant experience and indicate their cognitive appraisal of the incident. If respondents had not experienced a sexual assault, they were asked to pick another intense life experience and to check whether its emotional valence was pleasant or unpleasant. All respondents then described their memory of the target experience on standard items that measure memory characteristics. A measure of social desirability and demographic questions completed the survey.

Rape

Five items based on the Sexual Experiences Survey as previously modified for use with women workers (see Koss, Woodruff, & Koss, 1991) were used to screen for rape and attempted rape. The recall period for the five items was bounded by the participant's 14th birthday. This cutoff represented the statutory age for rape (the age below which sexual penetration is automatically rape). Only two states set a statutory age below 14 years (Searles & Berger, 1987). The questions operationalized rape, which was legally defined as vaginal, oral, or anal penetration against consent, by force, threat of force, or when the victim was intoxicated and incapable of giving consent. Penetration, no matter how slight, was sufficient to complete rape. Attempted rape included overt attempts to achieve intercourse, where for various reasons penetration did not occur. An example of a typical item is the following: "Has a man made you have sex by using force or threatening to harm you? When we use the word 'sex' we mean a man putting his penis in your vagina even if he didn't ejaculate (come)." The word *rape* was not used in these questions, allowing a woman to endorse a "rape" item without considering herself a "rape victim." The rape and attempted rape items had the following internal consistency reliabilities: Sample 1, .74; Sample 2, .72. Significant correlations have been reported in similar samples of working women between the level of victimization on the basis of anonymous self-report and the level as related to an interviewer (Koss, Woodruff, & Koss, 1991; $\kappa = .51$, $p < .001$). Consistent with existing cross-sectional studies, most of the rapes reported on the surveys were nonrecent—92% of forcible vaginal rapes, 93% of forcible oral and anal rapes, and 93% of nonforcible rapes when intoxicated occurred 2 or more years prior to the study.

The study variable *rape* was scored ordinally according to the level of severity reported. Women who responded no to all the items were scored zero for nonvictims. The remaining respondents were scored as 1 (attempted rape victims) or 2 (rape victims), depending on the highest level of victimization they endorsed. In Sample 1, 8% of the respondents reported the most severe victimization they had encountered was an attempted rape, and 30% reported at least one completed rape. In Sample 2, the figures for attempted rape and rape were 8% and 29%, respectively. The rape figure is slightly higher than reported in earlier work with a similar sample of working women (Koss, Woodruff, & Koss, 1991).

Appraisal

The appraisal question was addressed exclusively to rape victimization. Victimizations other than rape and nonrape memories were scored zero. Women who had been raped or experienced attempts were asked to select the expression that best captured their cognitive appraisal: (a) I don't feel I was victimized, (b) I believe I was a victim of a serious miscommunication, (c) I believe I was a victim of a crime other than rape, (d) I believe I was a victim of rape. In Sample 1, 41% of respondents saw themselves as rape victims, 16% believed they were victims of some crime other than rape, 33% believed they were victims of a serious miscommunication, and only 10% said they did not feel victimized. The figures for Sample 2 were virtually identical, with 44% of the women classified as rape victims appraising their experience as rape. These figures are higher than previously reported for college student rape victims (Koss, 1985). The differences may be explained by heightened consciousness about what constitutes rape facilitated by media coverage of the topic that has occurred over the past 10 years or by developmental changes in the differentiation of consensual versus coercive sex.

According to statues, the crime of rape includes attempts, so cognitive appraisal as a rape victim was equally applicable. However, the data showed the differences between legal definitions and personal labels in that only 5% of the attempted rape victims appraised their experience as rape, 37% believed they were victims of a crime other than rape, 38% believed they were victims of a serious miscommunication, and 21% did not feel victimized. The figures for Sample 2 were very similar, with 6% of the attempted rape victims appraising their experience as rape.

Valence

Valence was a dichotomous item. Respondents with a rape memory were assumed to be rating an unpleasant memory. No empirical evidence suggests that rape is potentially pleasant. Respondents without a rape experience rated their intense life experience as pleasant or unpleasant. In Sample 1, 35% checked that their memory was pleasant and

65% described it as unpleasant; the figures for Sample 2 were 30% and 70%, respectively. This procedure ascribes a single level of negative intensity to all unpleasant experiences. However, many would argue that the rape could differ in severity from other unpleasant experiences. The inclusion of a multi-item measure of memory affect (see *Measurement model*) allowed us to test the performance of the dichotomous valence measure.

Memory

Most of the memory items were taken from the first factor of the Memory Characteristics Questionnaire, developed by Suengas and Johnson (1988). This questionnaire assesses characteristics of memory that have proven useful for distinguishing real from imagined experiences. Imagined as opposed to real memories differ on dimensions that include clarity, visual detail, vividness, event detail, comprehensibility of the order of events, and the frequency with which the memory is recalled. The instructions read, "Please answer the following questions about your memory. . . ." All items were rated on a 7-point scale. The instructions do not indicate a reference period, because the ratings are intended to reflect the memory as it is currently reconstructed for purposes of responding to the survey. These 17 items were supplemented by 6 items relating to flashbulb memory qualities (J. F. Kihlstrom, personal communication, July 15, 1991). *Flashbulb memory* is a descriptive term for memories of highly surprising and consequential events (for a review, see Winograd & Neisser, 1992).

Symptoms

Because past literature has reported relatively low prevalence of somatization disorder among sexual assault victims (Burnam et al., 1988) and elevated prevalence of both medically explained and medically unexplained symptoms (Golding, 1994), we sought a symptom checklist that addressed the psychophysiological spectrum of symptoms. We selected the Psychosomatic Symptom Checklist (Attansio, Andraski, Blanchard, & Arena, 1984) that requires respondents to indicate which of 17 symptoms (e.g., joint pain, indigestion) or diseases (e.g., diabetes, irritable bowel) they have had within the past 30 days. The reported test–retest correlation is .90 for 1 week (Attansio et al., 1984). We added 22 items to supplement the breadth of assessment while remaining faithful to the conceptual underpinnings of the instrument.

Data Analyses

Univariate Analyses

Several univariate analyses addressed internal and external validity.

Test for social desirability. To address concerns that participant responses may have been motivated by a desire to appear socially appropriate, 11 items from the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1960) were included and aggregated into an index following the method developed by Schwartz (G. Schwartz, personal communication, May 15, 1991). The Marlowe–Crowne has been used extensively over the past 30 years and consists of true–false items pertaining to culturally approved behaviors that have a low incidence of occurrence. Using general linear models, this single index for social desirability was used to predict each of the 65 individual items in the survey (not including demographics). Of the 130 regressions (65 items × 2 samples), only 9 were significant using a Bonferroni significance level of $p < .0007$. In Sample 1, the social desirability index predicted about 3% of the variance in the PSC item "anxiety," and less than 1% of the variance in two memory items. In Sample 2, all the significant effects accounted for 1% or less of the variance. Thus, we deemed the influence of social desirability to be negligible for practical purposes.

Test for missing data bias. About 18% of Sample 1 and 17% of Sample 2 respondents were dropped because of missing data. Although this still left us with a more than adequate sample size, the question of whether dropped respondents differed systematically from those with complete data remained. To test for systematic "missingness bias" (Cohen & Cohen, 1983), a dichotomous dummy variable was constructed to distinguish all the respondents to be dropped from those to be retained. These two groups were compared by chi-square tests on six demographic variables (age, marital status, ethnicity, religion, income, and education), victimization level, cognitive appraisal, and valence. Of the 16 comparisons, 3 reached the Bonferonni corrected significance level of $p < .006$ in Sample 1, and the same 3 did in Sample 2. Because of the power resulting from large sample sizes, we computed effect sizes (Cohen's d) to determine the practical magnitude of these significant differences (Cohen, 1990). According to Cohen (1988; Cohen & Cohen, 1983), an effect size of .10 indicates a small effect, .30 indicates a medium effect, and .50 or higher indicates a large effect. The results of the chi-square comparisons can be found in Table 1. There were small to moderate effects for age—those with missing data were slightly older; for education—those with missing data were slightly less educated; and for ethnicity—those with missing data were somewhat more likely to be non-White. The significant demographics were the same variables in both samples and similar in both magnitude and direction, which suggests that they were not merely Type I errors. The pattern of missingness is fairly typical of the types of people who generally respond and do not respond more favorably to surveys. The next section describes the procedures implemented for the statistical control of demographic biases.

Residualization on demographics. Some demographic variables might have been correlated with some of the variables used in the model. To determine the amount of variance in the study variables accounted for by demographics, we entered them into regression equations to predict each of the 65 variables to be included in our multivariate model. In Sample 1, 10/65 regressions resulted in R^2s significant at the Bonferonni corrected probability of $p < .0007$. The range of variance accounted for was 4% to 11%, with an average of 6%. In Sample 2, 33/65 regressions resulted in significant effects. Here the range of variance accounted for was 2% to 10%, with an average of 3%. We chose to residualize the variables prior to multivariate analysis. Residualization subtracts any deviation systematically predicted by demographic variables from each score (Cohen & Cohen, 1983). This procedure statistically controlled for the influence of demographics by removing any spurious covariances between study variables attributable to them, without explicitly including demographics in the multivariate model (P. M. Bentler, personal communication, October, 1989). The adjusted scores, or regression residuals, were then used for multivariate modeling.

Multivariate Analyses

A factor analytic structural equations model consists of two major components: a measurement model and a structural model.

Measurement model. The measurement model was a Confirmatory Factor Analysis accomplished using Bentler's (1989) structural equations modeling program. A number of directly measured items (called *manifest variables* or *indicators*) were related to a smaller set of hypothetical constructs (called *latent variables* or *common factors*) presumed to be underlying the correlations between them. The development of the measurement model was based on an initial exploratory factor analysis in Sample 1 using a principal axis extraction and a varimax (orthogonal) followed by a promax (oblique) rotation, some empirical respecification and post hoc theoretical "trimming" of the model on that sample, followed by a confirmatory cross-validation of the

Table 1
Missing Data Effect Size Comparisons

Variable	Sample 1				Sample 2			
	Cohen's *d*	χ^2	*df*	*p*	Cohen's *d*	χ^2	*df*	*p*
Age	.18	16.59	4	.0023***	.24	28.74	5	.0000***
Marital status	.11	7.28	4	.1219	.002	2.65	4	.6173
Ethnicity	−.23	14.78	4	.0052***	−.16	14.68	4	.0054***
Religion	−.11	1.70	6	.9453	.24	15.91	6	.0142
Income	−.19	4.65	5	.4594	−.10	5.53	5	.3546
Education	−.36	24.92	6	.0004***	−.21	16.98	5	.0045***
Cognitive appraisal	.05	1.29	3	.7303	.07	9.85	3	.0199
Valence	.11	3.51	1	.0611	.07	4.32	1	.0376
Rape	.10	1.53	2	.4651	.16	10.12	2	.0064

*** $p < .0055$ (Bonferroni significance level).

cleaned-up model in Sample 2 with no further respecification. Only the results of the Confirmatory Factor Analysis are reported in this article.

Structural model. The structural component of the model is essentially a path analysis between the latent constructs that were produced by the factor analysis. Path analysis, or structural equations modeling, consists of imposing a restricted set of causal pathways, also specified a priori, and testing them against the correlations between the constructs. A saturated structural model is one that freely estimates the direct correlations between all of the common factors. However, any structural model that can adequately reproduce that pattern of intercorrelations with a reduced set of hypothesized causal pathways is judged superior by the principle of parsimony. Three analyses were performed. First, a saturated structural equations model was constructed for Sample 1. Second, a restricted structural model was tested for this sample in which all the nonsignificant effects were eliminated. The nonsignificance of each of the parameters eliminated was initially determined by the examination of individual critical ratios but was afterwards tested in an omnibus null hypothesis by nested model comparisons between the saturated and restricted models. Third, the restricted model obtained from Sample 1 was directly cross-validated on Sample 2. The saturated structural model was also retested in Sample 2 to determine how much of the loss in goodness of fit to the data of the restricted structural model was due to the added structural restrictions of that model as opposed to the prior measurement restrictions that were imposed in the Confirmatory Factor Analysis. Because a saturated model imposes no structural restrictions whatsoever, any lack of goodness of fit to the data must be entirely attributable to that of the measurement model, and the comparison can therefore be used to separately assess the performance of the structural model. Because no post hoc respecification of model parameters was done, the confirmatory nature of this analysis was not compromised. As with the measurement model, only the results of the confirmatory structural equations model are reported here.

Structural equations models were evaluated by use of chi-square, the Bentler–Bonett Comparative Fit Index (CFI), the Bentler–Bonett Normed Fit Index (NFI), and the Bentler–Bonett Nonnormed Fit Index (NNFI; Bentler, 1989; Bentler & Bonett, 1980). Chi-square measures the statistical goodness of fit of the covariance matrix observed to that reproduced by the model. A significant chi-square is therefore grounds for rejection of the model specified. The Bentler–Bonett indices are measures of practical goodness of fit for large sample sizes, because a small effect often results in a statistically significant lack of fit. Index values greater than 0.90 are considered satisfactory levels of practical goodness of fit, even if significant chi-square values are obtained (Bentler, 1989; Bentler & Bonett, 1980). Differences between hierarchically nested (e.g., progressively more restricted) models in either statistical or practical indices of fit indicate the relative loss of fit of the model to the data entailed by the additional model restrictions, such as the elimination of selected causal pathways. Where the results of such difference tests are either found to be statistically nonsignificant or negligible for practical purposes, they indicate that a restricted model performs as well as a more saturated model in predicting the observed covariances (see Widaman, 1985, for a discussion of hierarchically nested covariance structure models). Because we anticipated substantial inhomogeneities of variance in the natural distributions of study variables, all structural equation models were estimated by Generalized Least Squares (GLS), which has very similar properties and assumptions to Maximum Likelihood but with the added virtue of producing the best linear unbiased estimators under conditions of either heteroskedasticity or autocorrelation (Berry & Feldman, 1985).

Results

Measurement Model

Memories

The items that composed the first factor of Suengas and Johnson's (1988) Memory Characteristics Questionnaire did not prove to be unifactorial in our analyses, which was not surprising given the differences between the present samples and the derivation sample of college students. Instead, we were able to discriminate four distinct but correlated factors and assign the six flashbulb items among them. These factors were confirmed in Sample 2, and all items loaded significantly on the same factors identified in Sample 1. A summary of the item content and the factor loadings is found in Table 2. Because Confirmatory Factor Analysis is essentially a structural equations model, the matrix of factor loadings produced is equivalent to a traditional factor pattern rather than a factor structure (Bentler, 1989). The difference is simply that the elements of a factor pattern are expressed as standardized regression coefficients, or *beta* weights, rather than bivariate correlations (cf. Gorsuch, 1983). This distinction is important because the factors were oblique (intercorrelated), and this necessarily created indirect bivariate correlations between items that loaded uniquely on one particular factor and any other factors that happened to be correlated with it. Thus, reporting a factor structure of bivariate correlations for a set of intercorrelated factors might present the ap-

Table 2
Memory Factors: Item Content and Standardized Regression Coefficients

Item description	Memory factors			
	Reexp.	Nonvisual Sensory	Clarity	Affect
Intensity now	.661*			
Reexp. physical sensations	.709*			
Reexp. emotions–feelings	.828*			
Reexp. thoughts	.732*			
Frequency, thought about it	.168*		.491*	
Memory involves				
Sound		.688*		
Smell		.623*		
Touch		.563*		
Taste		.519*		
Memory for event			.884*	
Visual detail			.740*	
B/W or color			.519*	
Vividness overall			.902*	
Order of events			−.382*	
Overall, I remember exp.			.905*	
Intensity, feelings at time			.377*	
Frequency, talked about it			.548*	
Affect, feelings at time				.879*
Affect now				.862*
Unexpected				.529*
Affect, consequences				.616*
Point of view				
Consequences, amount				

Note. Reexp. = reexperiencing; B/W = black and white; exp. = experiences.
* $p < .05$.

pearance of factorial complexity where there was none. A factor pattern distinguishes between cases of real factorial complexity and cases of indirect relationships attributable to nonzero off-diagonal elements in the matrix of factor intercorrelations between a set of oblique factors. For example, it can be seen in Table 2 that the frequency of recalling the memory was an item that truly loaded on two different factors.

The first factor, named *Reexperiencing* ($\alpha = .84$), contained 5 items including ratings of the emotional intensity experienced as the memory is recalled, the extent to which the rememberer feels like she is reexperiencing the physical sensations, emotions, and thoughts that characterized the original experience, and the frequency with which the memory has been recalled. The second factor, called *Nonvisual Sensory* ($\alpha = .68$), represented all the sensory modalities except vision. Therefore, it described the extent to which the memory involved sound, smell, touch, and taste. The visual imagery of the memory loaded on the third factor, called *Clarity* ($\alpha = .78$). In addition to visual detail it contained 8 items including ratings of memory sharpness, color, vividness, emotional intensity of the feelings at the time of the event, meaningfulness of the order of events, and frequency with which the memory is thought and talked about. The final factor was labeled *Affect* ($\alpha = .84$) and contained 4 items including ratings of the valence (positivity or negativity) of feelings at the time, the valence of the feelings now, the magnitude of consequences engendered as a result of the experience, and the unexpectedness of the event remembered. Only two items did not load significantly on any factor including whether the rememberer was an actor in the memory or a spectator and whether the consequences of the event remembered were positive or negative. The means and standard deviations of scores on the memory factors are presented in Table 3.

Symptoms

Investigators using clinical populations as opposed to college students have not replicated the single-factor solution for the Psychosomatic Symptom Checklist, and they were not unidimensional in our data (Attansio et al., 1984; Chibnall & Tait, 1989). Therefore, one of us (Iris Bell), who is a medical doctor with extensive experience in behavioral medicine, sorted the checklist items into six theoretically based categories aggregating symptoms and diseases that share underlying mechanisms. The following symptom spectrums were specified: depression, cardiovascular spasm–stress, gastrointestinal stress, smooth muscle spasm–stress, skeletal muscle–joint, and immune dysfunction. After the factor structure was developed for the checklist items, the additional items we added were theoretically assigned among the factors. The factor structure obtained in Sample 1 was then confirmed in Sample 2. The factors were renamed on the basis of the item content that cross-validated with shorthand labels intended to signify the theoretical basis for symptom aggregation. The first factor was labeled *Depressive Symptoms* ($\alpha = .72$) and contained 13 items that reflected vegetative symptoms of the depression spectrum including difficulty sleeping, fatigue, general stiffness, difficulty concentrating, weakness, grogginess, constipation, depression, and anxiety. The second factor was named *Vascular* ($\alpha = .52$), to reflect symptoms in the cardiovascular spasm–stress spectrum. Examples of the 9 items on this factor include migraine headache, headaches, dizziness, ringing in the ears, heart palpitations, joint pains, and nausea. The third factor was labeled *Respiratory* ($\alpha = .44$), to reflect the item content of the only

Table 3
Means and Standard Deviations for Memory Factors

Factor	Unpleasant				Pleasant	
	Not raped		Raped			
	M	*SD*	*M*	*SD*	*M*	*SD*
Clarity						
Sample 1	48.7	8.6	42.3	9.7	51.3	5.8
Sample 2	48.3	8.0	41.2	9.0	50.1	5.9
Affect						
Sample 1	21.2	4.8	23.4	3.5	7.3	4.2
Sample 2	21.2	4.8	23.0	4.0	7.4	3.5
Reexperiencing						
Sample 1	22.7	6.8	20.7	7.0	24.0	5.4
Sample 2	22.3	6.6	20.4	6.8	23.3	5.7
Nonvisual Sensory						
Sample 1	12.4	5.2	13.5	6.0	15.4	5.3
Sample 2	12.0	5.3	12.8	5.7	14.7	5.1

items in the smooth muscle spasm spectrum that cross-validated—asthma and difficulty breathing. The fourth factor was labeled *Abdominal* (α = .53) and included 9 gastrointestinal and pelvic symptoms including ulcers, irritable bowel, stomach pain, indigestion, diarrhea, nausea, chronic pelvic pain, menstrual cramps, and burning in pelvic organs. The fifth factor, named *Skeletal* (α = .52), contained 6 items including arthritis, osteoporosis, backaches, general stiffness, joint pain, and clumsiness. The last factor was called *Immune* (α = .44); it contained 6 items including hay fever, allergies, asthma, itching, food or chemical reaction, and arthritis. All of the symptom items loaded significantly on at least one factor.

These alpha reliabilities must be viewed as minimal estimates because the symptom items were dichotomous, which attenuated correlations and resulted in underestimates using the traditional validity coefficients. The formulas for disattenuation were inappropriate here because they assume normality, and our symptom data were skewed. In practical terms, the use of Confirmatory Factor Analysis made high internal consistency among the items unnecessary for two reasons. First, common factors use only the common variance between items and, therefore, have a much higher reliability and validity than any single item. Also, the factors created by Confirmatory Factor Analysis were no longer dichotomous once the composite was made, thus transcending limitations of measurement at the item level. Second, formal significance tests for the factor loadings of individual items were performed (see Table 4), so we did not need to rely on a composite index of item agreement. The item content, endorsement percentage, and factor loadings of the symptoms can be found in Table 4.

Structural Model

Figure 2 shows the final results of the restricted structural equations model. The path coefficients are standardized regression weights obtained by GLS estimation. Only the cross-validated path coefficients are shown. The correlated residuals among endogenous factors are not represented graphically in Figure 2 to avoid visual clutter, but they are presented later. Table 5 displays the statistical and practical goodness-of-fit indices for both the saturated and restricted structural equation models. Although the chi-square values for both models were statistically significant ($p < .01$), indicating that the models did not perfectly predict the covariances between the constructs, all three of the practical indices of fit were highly acceptable. The differences between the saturated and restricted structural models was statistically significant ($p < .05$) according to the chi-square criterion but virtually negligible for practical purposes according to all three Bentler–Bonnett fit indices. Thus, the restricted structural model performed almost as well as the saturated structural model in predicting the observed covariance and should be preferred as the more parsimonious of the two.

What follows is a description of the results of this model, considering the effects on each endogenous construct in the order of hypothesized causal priority. The nonsignificant causal pathways that were deleted from the restricted model were the following: (a) all 24 possible direct effects of the 4 Memory factors on the 6 Symptom factors, (b) 4 out of the 6 possible direct effects of Appraisal on the Symptom factors (two significant pathways remained), (c) all 6 possible direct effects of Valence on the Symptom factors, (d) the direct effect of Valence on the Reexperiencing factor (significant effects on the 3 other Memory factors remained), and (e) the direct effect of Rape on the Affect factor (significant effects on the 3 other Memory factors again remained).

Appraisal and Valence

Rape had direct effects on both Appraisal and Valence. Both effects were positive in direction, but the effect on Appraisal was much larger in magnitude than that on Valence. The effect on Appraisal justified our assumption that rape experiences predict, but are not identical with, cognitive appraisal of oneself as a rape victim. The smaller effect on Valence reflected the fact that most of the nonrape memories reported in our study were also unpleasant.

Memories

Appraisal had direct effects on all four Memory factors. These effects were all positive in direction, although not very large in magnitude. This finding supported the literature on memory reconstruction in that the retrospective cognitive construal of rape influenced, to some extent, *all* of the memory characteristics measured. However, the relatively modest magnitude of these effects on memory cautioned against overestimating the importance of construal of victimization in relation to what was actually experienced. Valence also had direct effects on three out of the four Memory factors. These effects, however, were inconsistent in both direction and magnitude: They were positive and large on the Affect factor but negative and somewhat smaller on both Clarity and Sensory. The large effect of Valence on memory Affect (.802) supported the adequacy of our dichotomous item differentiating pleasant from unpleasant experiences (the means on the Affect factor were 21 and 23, respectively, for those rating rape and other unpleasant experiences vs. 7 for those rating pleasant experiences on the 28-point Affect factor). In addition, the finding affirmed our assumption that rape is almost universally perceived as an unpleasant experience and rejected the hypothesis that rape is affectively similar to any other unpleasant experience. Rape had indirect effects on the Memory factors that were mediated through Appraisal and Valence, respectively. The directions and magnitudes of these indirect effects can be obtained by simple multiplication of the successive direct effects.

In addition, Rape had direct effects on three out of four Memory factors that were not mediated through either Appraisal or Valence. These effects were on the Clarity, Reexperiencing, and Nonvisual Sensory memory factors. All three effects were negative and large in magnitude, with the effect on the Clarity memory factor being by far the largest. These findings indicated that the rape, as defined by legal descriptive criteria, possessed an independent causal agency beyond that of the subjective cognitive construals. Thus, rape can directly influence memory without being rated by the individual as a perceived victimiza-

Table 4
Symptom Factors: Item Content, Endorsement Percentages, and Standardized Regression Coefficients

Item description	Symptom (%)	Health factors					
		Depressive	Vascular	Respiratory	Abdominal	Skeletal	Immune
Difficulty concentrating	17.5	.496*					
Weakness	07.1	.483*					
Depression	22.7	.480*					−.036
Anxiety	31.3	.449*	.036				
Fatigue	52.5	.416*	.020				
Daytime grogginess	19.6	.406*					
Difficulty sleeping	39.6	.398*					
Clumsiness	06.9	.374*			−.066	−.088*	
Constipation	15.3	.270*	.028				
Dizziness	10.1	.222*	.209*				
General stiffness	20.2	.208*	−.003			.406*	
Eye pain with reading	04.5	.207*					
High blood pressure	09.1	.072*					
Migraine headache	14.2	−.155	.355*				
Heart palpitations	07.3		.298*				
Ringing in the ears	08.4		.294*				
Headaches	60.9		.280*				
Low thyroid	08.1		.132*				
Nausea	09.6		.132*		.287*		
Joint pain	21.5		.107*			.651*	
Diabetes	01.7		.088*				
Difficulty breathing	05.8			1.00*			
Asthma	08.8			.261*			.376*
Menstrual cramps	34.9			−.041	.157*		
Chronic pelvic pain	01.5			−.018	.090*		
Diarrhea	15.1			−.011	.379*		
Irritable bowel	11.2			−.007	.380*		
Stomach pain	19.5				.483*		
Indigestion	21.1				.419*		
Ulcers	05.6				.303*		
Burning sensation in pelvic organs	03.6				.262*		
Arthritis	11.8					.528*	.094*
Backaches	40.7					.348*	
Osteoporosis	01.8					.102*	
Hayfever	18.4			.029		−.016	.428*
Allergies	41.2						.584*
Food or chemical reactions	04.7						.244*
Itching skin or hives	11.8						.179*
Cancer	04.0						.024

* $p < .05$.

tion. Furthermore, the magnitude of the direct effects of Rape also indicated that it contributed to the characteristics of memory over and above the effects typically created by unpleasant events in general. Rape memories, compared to other unpleasant memories, were less clear and vivid, were less likely to occur in a meaningful order, were less well-remembered, and were less thought and talked about.

Symptoms

The Memory factors had no direct effects on Symptoms. Therefore, Rape, Appraisal, and Valence had no indirect effects on Symptoms that were mediated through Memories. Nevertheless, Appraisal did have direct effects on Symptoms that were not mediated through Memories. These direct effects were on Depressive and Abdominal symptoms. Both effects were in the positive direction but rather weak in magnitude. Valence had no direct or indirect effects on either these or any other Symptoms. Therefore, Rape had indirect effects on these two Symptoms that were mediated through Appraisal but were not mediated through either Valence or the Memory factors.

Factor Intercorrelations

Because women who were raped may have been overrepresented in our sample of respondents (as compared to the prevalence of rape in the general population), the unresidualized bivariate correlations among the Memory and Symptom factors were somewhat inflated by the spurious components attributable to the common rape experience. Residualized correlations

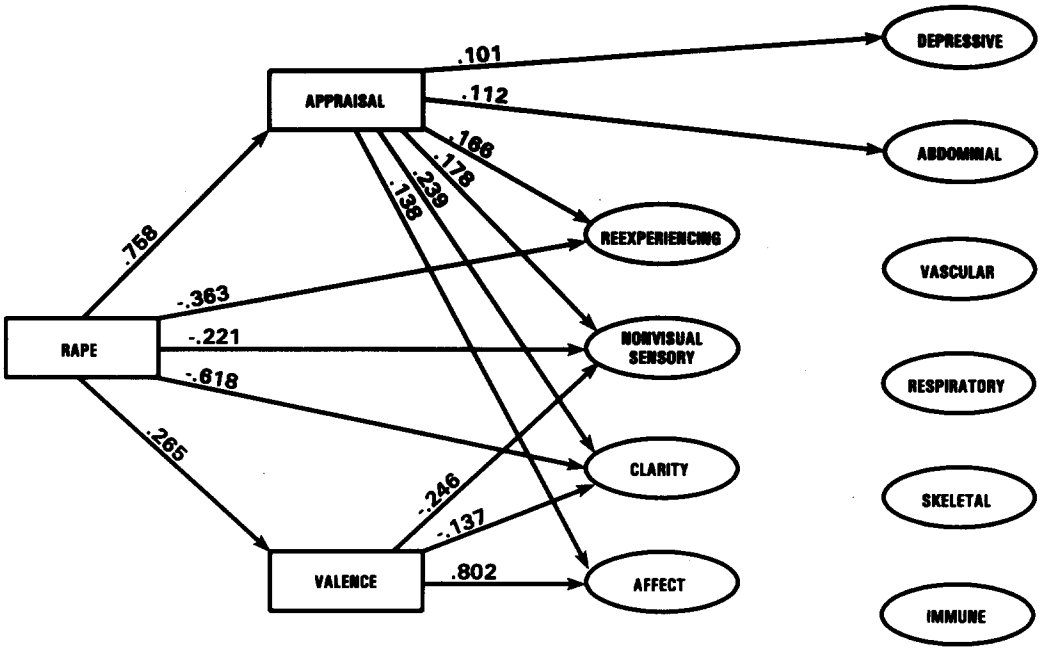

Figure 2. Cross-validated structural equations model for the cognitive and symptomatic sequelae of rape.

represent those portions of the correlations between variables that remain unexplained by the model because they are not attributable to any specified causal influences. Thus, they are interrelationships between the endogenous constructs that are unrelated to any effects of the model predictors. For example, those between physical symptoms could be interpreted as the natural comorbidities of certain organic disorders for which purely biomedical explanations might exist. Residual correlations probably represent more generalizable estimates of the "natural" correlations that might exist between these constructs independently of the particulars of any one type of experience, and they most closely represent the intercorrelations other investigators will find if they extend this work to populations other than rape victims. Tables 6 and 7 present the residual correlations between our two sets of endogenous constructs below the diagonal and the unresidualized correlations above the diagonal. No other residual correlations were specified in any of the models tested.

Overview of Effect Sizes

Using only the significant predictors, the coefficients of determination (R^2) for the Memory factors ranged in magnitude from very large, to substantial but moderate, to relatively small: .706 for the Affect factor, .267 for the Clarity factor, .068 for the Reexperiencing factor, .092 for the Sensory factor. On the other hand, the two direct effects of Appraisal on the Symptom factors were quite weak: .008 for the Depressive factor and .011 for the Abdominal factor. By multiplication of successive causal pathways, the indirect effects of Rape on these two Symptoms were weaker still. Because of the lack of significant predictors in the model, the coefficients of determination (R^2) for the other four Symptom factors were reduced statistically to 0. The direct and indirect effects of Valence and the four Memory factors that were tested on the Symptoms were also statistically nonsignificant.

Summing across all direct and indirect effects, the total effects of Rape on each of the Memory factors were as follows: −.473 for Clarity, .317 for Affect, −.237 for Reexperiencing, and −.151 for Sensory. Because Rape had no significant direct effects on Symptoms, the total effects were reduced to the indirect effects of Rape that were mediated through Appraisal: .081 for Depressive and .085 for Abdominal.

Discussion

Respondents described either rape or another memory under instructions to select "an intense life experience." Neurohormonal theories of the affect–memory relationship predict more clear and detailed memories under high levels of arousal, regardless of whether the emotions experienced were positive or

Table 5
Nested Factor Analytic Structural Equation Models

Model	*df*	χ^2	NFI	NNFI	CFI
Restricted	1,832	4,150.313**	.983	.990	.991
Saturated	1,796	4,096.214	.984	.990	.991
Difference	36	54.099*	−.001	.000	.000

Note. For all models, N = 1,757. NFI = Normed Fit Index; NNFI = Nonnormed Fit Index; CFI = Comparative Fit Index.
* $p < .05$. ** $p < .01$.

negative. However, the rape memories reconstructed for the purpose of responding to the survey, and to a lesser extent the unpleasant memories in general, compared to memories for pleasant experiences, were rated as less clear and vivid, less visually detailed, less likely to occur in a meaningful order, less well-remembered, less talked about, and less frequently recalled either voluntarily or involuntarily; with less sensory components including sound, smell, touch, and taste; and containing slightly less reexperiencing of the physical sensations, emotions, and thoughts than were present in the original incident. Thus, memories of events that were unexpected and highly negative both in their emotional valence and in their consequences were differentiated from memories of pleasant life events. The present data cannot reveal whether traumatized respondents possessed more detailed memories than they described, levels that might have been accessed by clinical treatments such as exposure (e.g., Foa, Rothbaum, Riggs, & Murdock, 1991) or by cognitive interviewing procedures (e.g., Fisher, McCauley, & Geiselman, 1994).

Rape victims often face a disclosure environment that holds them accountable for their assault, which could explain the reduced tendency to talk about their memories. The lower clarity and likelihood that the memory is thought about could be a demonstration that highly traumatized respondents were using cognitive avoidance, damping down some characteristics while remembering their trauma. However, any cognitive avoidance that was taking place was not very effective in reducing negative affect. These findings are consistent with recent factor analytic study of the PTSD symptom scale, which revealed that avoidance formed a factor with arousal and not with numbing (Foa, Riggs, & Gershyny, 1995). Thus, numbing of emotion might function independently of avoidance of thoughts about the trauma. The present results could be explained without avoidance and numbing through models of memory that emphasize multiple representations of the same experience (e.g., dual coding—Paivio, 1990; or fuzzy trace theory—Reyna & Brainerd, 1995). These theoretical perspectives all emphasize the potential for formation of multiple memories from a single incident, memories that may differ in accessibility to later recall and that functionally separate emotion from other components of the experience.

The results demonstrated that rape had direct effects on memory beyond what could be accounted for by its status as an unpleasant event and independently of how a woman cognitively appraised her experience as a victim. Existing literature establishes the primacy of subjectively felt threat over objectively rated severity in predicting rape aftereffects. However, memory characteristics were better predicted by the event itself as opposed to the cognitive appraisal of victimization. It was simply *not* the case that those who merely denied sexual victimization were identical in memory characteristics to those who never experienced rape. On the other hand, the findings suggest that the affective component of construal exerted major effects on the qualities of recall.

The depth of measurement in the present study was limited by the necessity to keep the survey short to maximize response rate. There are a number of other pieces of information that would have contributed to the interpretation of the findings. For example, the lower intensity of the rape memories could relate to the fact that some victims were probably intoxicated at the time of their rape. Police files reveal the high frequency with which victims and witnesses to *all* crimes are under the influence of alcohol (Yuille & Tollestrup, 1990). However, alcohol–memory studies designed for forensic relevance do not explain the vague and hazy memories for intense unpleasant events in the present study. Witnesses of staged crimes who were under the influence of alcohol provided somewhat less scorable detail than nondrinking controls, but their level of accuracy or clarity was similar (i.e., Yuille & Tollestrup, 1990). Other potential influences on our results include possible differences between the age at which the rape occurred versus the other unpleasant incidents, or differences in the time that had elapsed since the experience. Unfortunately, we cannot characterize any further the content of the nonrape memories, nor can we substantiate that the types of memories were equivalent in developmental stage or recency. Furthermore, the influence of demographic variables was not modeled in the present study. A final limitation is the lack of effects on physical symptoms, which could be related to the choice of measurement instrument. Our ongoing research involves in-depth face-to-face interviews and multioperationalized assessment of physical, social, and psychological health in both a cross-sectional and a prospective sample. Therefore, we will have many additional variables that will allow us to test a number of relevant effects within the current model of memory, evaluate some competing explanations for

Table 6
Memory Factor Intercorrelation Matrix

Memory factor	1	2	3	4
1. Clarity	—	−.094*	.603*	.727*
2. Affect	.042	—	.073*	−.126*
3. Reexperiencing	.494*	.175*	—	.568*
4. Nonvisual Sensory	.724*	−.014	.521*	—

Note. The numbers above the diagnoal are unresidualized correlations; those below the diagonal are residualized. See text for discussion of each type of correlation.
* $p < .05$.

Table 7
Physical Symptom Factor Intercorrelation Matrix

Physical symptom factor	1	2	3	4	5	6
1. Depressive	—	.780*	.248*	.608*	.314*	.373*
2. Vascular	.745*	—	.307*	.656*	.476*	.423*
3. Respiratory	.253*	.350*	—	.250*	.086*	.334*
4. Abdominal	.577*	.632*	.252*	—	.387*	.439*
5. Skeletal	.193*	.379*	.055	.322*	—	.251*
6. Immune	.323*	.309*	.307*	.363*	.159*	—

Note. The numbers above the diagonal are unresidualized correlations; those below the diagonal are residualized. See text for discussion of each type of correlation.
* $p < .05$.

our findings, and examine a broader range of outcome phenomena. The contributions of the present study include study of real victims describing events they actually experienced, large community samples, inclusion of intense pleasant memories along with unpleasant ones, assessment of a range of memory phenomenon, and the relevance of the results to theories of emotional memory, cognitive avoidance, and numbing.

It is commonly assumed that one's strongest memories are those central to self-identity (Neisser & Fivush, 1994). If so, then rape memories, although long-lasting, would be predicted on the basis of their lower clarity to be less important than nonrape unpleasant memories and pleasant memories for self-concept, attributions, beliefs, and role constructs. This assertion is contrary to clinical experience working with sexual assault survivors, which clearly reveals the severe crisis in meaning for the victim that is triggered. Thus, the present results argue for an expanded agenda of research on the interrelationships between social cognitions and traumatic memories and the role of both sets of variables as mediators between trauma and outcome.

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