

COGNITIVE MEDIATION OF RAPE'S MENTAL HEALTH IMPACT:

Constructive Replication of a Cross-Sectional Model in Longitudinal Data

Mary P. Koss and Aurelio José Figueredo
University of Arizona

The constructive replication of a prespecified, cognitively mediated model of rape's impact on psychosocial health is reported using longitudinal data (see Koss, Figueredo, & Prince, 2002, for a summary of model development). Rape survivors ($n = 59$) were assessed four times, 3 to 24 months postrape. Structural equations modeling of baseline data (intercepts) and rate of change over time (slopes) revealed that all large effects replicated, smaller effects did not. The model's central features were confirmed and showed that Psychological Problem History exacerbated Characterological Self-Blame, leading to more Maladaptive Beliefs, which determined initial Psychosocial Distress and its rate of decline. The major contributions of the study include: (a) placement in a research program designed to balance the strengths/limitations of cross-sectional and longitudinal data; (b) analysis of prerape characteristics, cognitive mediators, and multiple psychosocial distress variables in a system; and (c) a strategy for structural equations modeling in small samples.

Recovery from rape is a prolonged process characterized by elevated levels of emotional distress and psychological symptoms. Recent literature has examined personal and contextual influences on recovery, as well as cognitive processes that may mediate the effects of rape on mental health (Ali, Dunmore, Clark, & Ehlers, 2002; Barker-Collo, Melnyk, & McDonald-Miszczak, 2000; Dunmore, Clark, & Ehlers, 2001; Epstein, Saunders, Kilpatrick, & Resnick, 1998; Frazier, 2003; Halligan, Michael, Clark, & Ehlers, 2003; Jind, 2001; Owens & Chard, 2001; Resnick, Acierno, & Kilpatrick, 1997). Mediators have included perceptions of the trauma, memory for the traumatic event, dissociation, attribution of blame, appraisal of symptoms, personal beliefs, behavioral control strategies, and resilience-recovery variables. We previously reported the development and testing in cross-sectional data of several cognitive media-

tional models of rape recovery that differed in complexity (Koss et al., 2002). The purpose of the present study was to constructively replicate the final model from that study. A constructive replication is a theoretical rather than a literal replication.

The output of growth curve analysis of the longitudinal data was analyzed using structural equations modeling (SEM). The prespecified model was constructively replicated in baseline data (intercepts), which represent the relationships among variables at a static point and is analogous to the cross-sectional analysis previously reported. Subsequently, the model was tested for fit to slope data, which address the model's ability to account for the shape and rate of reduction in cognitive mediators and distress outcomes over recovery. Most existing studies of cognitive mediation of sexual assault used cross-sectional data, and the existing longitudinal analyses were univariate analyses (e.g., Frazier, 2003). The uniqueness of the present study lies in examining effects in a single analytical system and the use of several novel methodological approaches to applying SEM to small samples of longitudinal data.

The model we sought to replicate is theoretically based on emotional processing models of posttraumatic stress disorder (PTSD; e.g., Brewin, Dalgleish, & Joseph, 1996; Ehlers & Clark, 2000; Foa & Riggs, 1995; Horowitz, 1986; Janoff-Bulman, 1992; Joseph, Yule, & Williams, 1995; Rachman, 2001). This class of theories describes the cognitive processes that occur when events with emotional

Mary P. Koss and Aurelio José Figueredo, Health Promotion Sciences, University of Arizona.

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Address correspondence and reprint requests to: Mary P. Koss, Health Promotion Sciences, Mel and Enid Zuckerman Arizona College of Public Health, the University of Arizona, 1632 E. Lester St., Tucson, AZ 85719. E-mail: mpk@u.arizona.edu

importance contradict deeply held beliefs about life. Clinical work with survivors reveals the “overwhelming assault that victimization is to the child and adult survivor’s world of meaning” (Conte, 1988, p. 325). Uncontrollable acts such as rape stimulate *causal attributions*, which are attempts to answer the question, “Why did this happen to me?” (Draucker, 1989; Frazier, 2003; Janoff-Bulman, 1992; Wortman & Silver, 1989;). In the aftermath of trauma, survivors may seek to understand their trauma by blaming external forces such as the rapist or society, and by turning to internal explanations involving controllable or uncontrollable features of their behavior or character (Janoff-Bulman, 1992). Uncontrollable acts are more distressing than those perceived as controllable (Foa, Zinbarg, & Rothbaum, 1992). Controllable, behavioral self-blame has been considered more adaptive than blaming of enduring features of the self. However, a recent review concluded that even behavioral self-blame, such as “I was raped because I drank too much,” was consistently associated with more distress among rape survivors and suggested further studies to identify mediators of the relationship between self-blame and distress (Frazier, 2000a; Frazier, Berman, & Steward, 2002).

Causal attributions are not only associated with distress, but they also affect how a particular rape experience has an impact on a survivor’s central beliefs (for a review, see Crome & McCabe, 2001). Over time we all develop almost automatic ways of processing experiences in our lives. When we try to characterize these responses, they are commonly seen to reflect beliefs including so-called “just world” assumptions (bad things happen to bad people; Lerner, 1980) and beliefs about the meaningfulness of life, safety, trust/dependency, personal control, esteem, and intimacy (McCann & Pearlman, 1990). Incongruity between lived experience and personal beliefs creates distress and stimulates attempts to resolve the conflict by altering beliefs or by modifying how one perceives the incident that is causing the dissonance. Maladaptive beliefs undermine healthy functioning because they are the cognitive schema or lens through which ongoing life events and social interactions are perceived and interpreted.

Our previous work examined mediation of rape-related distress by causal attributions and beliefs, in a conceptualization that also included characteristics reflecting the personal history of the survivor, characteristics of the rape that was experienced, and descriptive features of how the rape was remembered (Koss et al., 2002). The hypothesized sequence of mediation of rape’s impact on health that we previously developed and tested included the following hypothesized effects. (*Italicizing signifies the names of the variable sets, capitalization signifies the composite variables that were included in the tested models; empirical support for these hypotheses is summarized in Koss et al., 2002*). (a) *Personological characteristics*, including Openness to Experience, Psychological Problem History, and Violence Exposure shape vulnerability to sexual assault, consistent with the well-documented revictimization effect. (b) *Assault sever-*

ity, including the Stranger Rapist, Objective Severity, and Subjective Severity directly influence attributions about why the rape happened. (c) *Causal attributions*, particularly Behavioral Self-Blame and Characterological Self-Blame, influence development of Maladaptive Beliefs, as opposed to beliefs that promote healthy mental health and social functioning. (d) *Maladaptive Beliefs* influence how rape is remembered. Memories are understood as reconstructions that are created for the social situation in which they are recalled (see Koss, Tromp, & Tharan, 1995). For example, the survivor’s beliefs determine whether the listener is perceived as safe for explicit versus vague recounting of the experience. (e) *Memory characteristics*, especially emotionally intense and vivid recall (Reexperiencing) influence the severity of Global Distress. (f) *Health outcomes* conceptualized as Global Distress is a higher order construct that is affected by rape and in turn determines specific levels of Posttraumatic stress, Social Maladjustment, Psychopathology, and Physical Symptoms.

Four increasingly complex models specifying these relationships were tested, beginning with a fully mediational model that proceeded directly through the previously discussed hypothesized pathways 1 through 6. The model that best fit the data was not fully mediational, and revealed effects that skipped over levels of mediation. For example, Violence Exposure had some direct effects on Maladaptive Beliefs that were not mediated through Assault Severity or Behavioral and Characterological Self-Blame. The system of confirmed effects suggested that rape-related Global Distress was most severe when the survivor reported high levels of Violence Exposure and greater Psychological Problem History. When rape occurred to women with histories of previous violence and problems, greater Characterological Self-Blame was evoked. Characterological Self-Blame was highly distressing, whereas Behavioral Self-Blame was somewhat protective against distress. Blaming one’s character led to substantial Maladaptive Beliefs, which both directly and indirectly exacerbated Global Distress and specifically, Psychopathology, PTSD, Social Maladjustment and Physical Symptoms. Among the memory characteristics, only Reexperiencing Memory predicted Global Distress, and the effect was small. We expressed caution in interpreting these findings because they were based in cross-sectional data and were unreplicated, decreasing the strength of causal inference. The final model was quite successful in predicting distress (56% for variance for general distress, 91% for psychological symptoms, 54% for PTSD, 65% for social maladjustment, and 17% of physical symptoms).

In this study, we had the specific goal of constructively replicating the previously reported findings in longitudinal data. These studies were part of a program of research funded under a single grant that aimed to balance the relative strengths and weaknesses of extensive and intensive designs (Kraemer, 1978). Extensive designs, such as our large-scale community survey collect relatively sparse

data on a large number of people (Koss, Figueredo, Bell, Tharan, & Tromp, 1996). This sample had the advantage of generalizability and power to perform psychometrics and model development. Our subsequent cross-sectional interview data were also drawn from a representative sample, but were limited in the causal inferences they support (Koss et al., 2002). The present study represents an intensive design wherein large amounts of data are collected from a smaller number of people, and because the data were also longitudinal, permitted testing of causal inferences not possible in cross-sectional samples. The constructive replication that we report here did not test some of the least powerful pathways in the final model just described to focus the available statistical power on the most important effects. The eliminated paths included: (a) the pathways involving Assault Severity; (b) the pathways to Physical Health; and (c) pathways involving Memory Characteristics. We had examined memory characteristics with few significant findings in three previous samples (Koss et al., 2002; Koss et al., 1996) using the Memory Characteristics Questionnaire (MCQ; Suengas & Johnson, 1988). Although more promising results have recently been reported utilizing new memory measures (Halligan et al., 2003), we deemed it unproductive to continue using the MCQ data.

Because a cross-sectional model does not specify how the variables change together across time, replicating our model in longitudinal data required conceptualization of how the measured variables would function as a system across months and years. Recent theoretical reviews and empirical data have demonstrated that thoughts and perceptions of one's behavior during a traumatic event (event-related cognitions and appraisals) are causes of strong emotional states and these emotional states in turn stimulate further cognitive appraisals over time (Dunmore et al., 2001; Ehlers & Clark, 2000; Joseph et al., 1995). Our cross-sectional model demonstrated the effect of cognitive mediators on emotional distress. We hypothesized that across time distress would stimulate continued cognitive processing. Therefore, we specified four additional pathways in the model, hypothesizing that Psychosocial Distress levels affected the rate of decrease in Behavioral and Characterological Self-Blame, External Blame, and Maladaptive Beliefs as recovery progressed.

METHOD

Sample

We aimed to recruit a broadly representative group of recent rape survivors by sampling the types of community services that rape survivors may access. We used multiple recruitment methods including direct referral of clients by sexual assault service centers; posters and flyers at other agencies; direct mailing to physicians, clergy, and psychotherapists; and a survey administered to psychology students. No matter how the woman learned of the study, their

first contact was a telephone call to the research office. During the intake period the closest sexual assault center completed 995 intake interviews; 269 clients met eligibility criteria (over 18, raped within 3 months, no mental disorder serious enough to interfere with ability to consent), and 48 contacted the study (17.8% participation rate). Other survivor programs referred four survivors. The study received 46 telephone calls in response to letters and posters, of whom 26 qualified for participation (57%). The primary reason for failure to meet entry criteria was rapes that occurred longer ago than 3 months. Recruitment by survey administered to psychology students identified an additional five contacts. In total, 83 women met inclusion criteria and initially agreed to participate. Of them, 59 completed the study (71%).

The mean age of the participants was 29.5 years ($SD = 10.8$, range 18–57 years). The ethnic distribution was 81% White/non-Hispanic, 7% Hispanic, 7% African American, and 5% Asian American or Pacific Islander. The marital status of the women was 57% single, 10% married or living with a partner, and 33% separated or divorced. Religious affiliation was 41% Protestant or Christian, 31% Catholic, 5% Jewish, 14% other religion, and 10% no religion. The highest educational attainment was high school or less (17%), technical school or some college (55%), completed college (19%), or graduate degree (10%). Fifty-five percent of participants had family income less than \$15,000, 24% had incomes between \$15,001 and \$35,000, and 21% had incomes above \$35,000. Compared to the community of Tucson, Arizona, the sample had fewer Hispanic participants. All the participants met diagnostic criteria for current PTSD according to DSM-IV criteria (American Psychiatric Association, 1994). Diagnosis was determined by applying the scoring rules for diagnostic inclusion to responses obtained from face-to-face administration of the Posttraumatic Diagnostic Scale (Foa, 1995; Foa, Riggs, Dancu, & Rothbaum, 1993). We may have assessed a small number of women who were fewer than four weeks posttrauma and therefore failed the duration PTSD diagnostic criterion, but unfortunately we did not link our data on date of the rape derived from telephone screening to the data on days elapsed since entering the study that were recorded on the interview protocol.

Procedures

Upon phoning the research office, participants were briefly screened to ensure that they had experienced a sexual assault that met the study definition of rape. The screening questions used on the telephone were based on the Sexual Experiences Survey (Koss, Koss, & Woodruff, 1991) and did not include the word *rape*. The internal consistency reliability of these items in our previous study (Koss et al., 2002) was .72. Selection criteria included that the incident had occurred within the prior 3 months and involved some form of penetration (oral, anal, or vaginal) against consent, through the use of physical force, threat of bodily harm, or

when the survivors were unable to refuse or consent due to lack of consciousness or intoxication. Participants were rescreened at interview. All participants met rape criteria at both screenings. Participants may have been raped more than once in their lives, but they were directed to think of the recent incident as the focus of their responses to interview questions about Characterological and Behavioral Self-Blame, and External Blame. Survivors were privately interviewed the first time within 3 months of their rape and subsequently at 6, 12, and 18 or 24 months postassault (length of follow-up depended on the time remaining under grant support from the point of entry). The average number of measurements available for the participants was 3.38 out of 4. The average number of days that elapsed between measurement points was 140 days between the first and second interview, 337 days between the first and third interview, and 642 days between the first and final interview. Interviews were held in an off-campus research facility, in a private office, and with a trained female interviewer. Oral informed consent was obtained for telephone screening and participants signed written consent forms prior to initiation of the face-to-face interview. Survivors were paid \$25 for each interview in compensation for their time, childcare expenses, and transportation. Refreshments were available during breaks in the interviews. The length of the interviews varied from 2 to 5 hours depending on the verbal productivity of the respondent and whether the assessment was the full baseline or the shorter repeated assessment. The dropout rate was minimized by monthly telephone calls to participants.

Interviewers were mature women ($N = 12$), B.A. degree or above, with extensive human service experience, most as nurses or social workers. Their training consisted of a 20-hour training program accompanied by a 230-page training manual, exemplar videotapes, and practice interviews that were evaluated. All interviews were tape-recorded with the survivor's consent. Ongoing supervision consisted of monitoring each tape for clinical appropriateness, random monitoring of entire tapes, weekly feedback sessions with interviewers, monthly update training, and quality review of every protocol with return to the interviewer for recontact if necessary to complete missing information. To assess the standardization that was achieved among interviewers by our training program, 20 protocols from the face-to-face interviews were compared to protocols filled out by different interviewers who listened to the tape-recorded session. The variance components attributable to rater error were separately estimated using a hierarchical general linear model (Cohen & Cohen, 1983). The resultant *eta* of .946 represented a high proportion of true score variance as opposed to rater error.

Measurement

All measures were presented orally and in a standard order with the exception of four assessments that are identified in the text as having been administered by self-report. Self-

report measures were completed on-site, immediately following the interview, under supervision, and then a written and oral debriefing was performed. Personological characteristics (Openness to Experience, Violence Exposure, and Psychological Problem History) were included as baseline measures only; all the variables were measured at baseline and at each repeated measurement. The creation of composite variables from the measures is described following the enumeration of the assessments themselves. The internal consistency statistics reported for our measures were developed in our larger cross-sectional sample and then applied to the longitudinal data. Our rationale for this novel strategy is presented in the data analysis section.

Personological Characteristics

Openness to experience. This personality trait characterizes the strength of peoples' needs to maintain a stable knowledge base about the self. Rape presents a challenge to pre-existing worldviews. Openness may influence how people explain the causes of rape and the extent to which it leads to maladaptive beliefs about the self and others. This trait was assessed by self-report using the Openness to Experience Scale of the NEO Personality Inventory (Costa & McCrae, 1985, 1988). Questions on this 48-item scale are responded to on a 5-point scale anchored by *strongly disagree* and *strongly agree*. Sample items are: "I am pretty set in my ways" and "I find it hard to get in touch with my feelings." The published internal consistency of the Openness scale is .88. Cronbach's alphas in our data for the Openness subscales ranged from .47 to .82. The correlations of the subscales with the composite variable ranged from .43 to .70.

Violence exposure. This measure consisted of 44 standard interview questions that allowed the respondent to indicate how many times each particular act had occurred. Included were seven items from the National Crime Victimization Survey to assess stereotypical street crime (robbery, assault, burglary, and mugging items; e.g., see Bureau of Justice Statistics, 1997), six items about physical violence in the respondent's home while growing up (adapted from Straus, 1990), four questions regarding sexual abuse (from Finkelhor, 1979), and five questions from the SES to measure any rapes since the respondent's 14th birthday beyond the rape that served as the index event on which the interview focused (Koss, Woodruff, & Koss, 1991). Finally, the Conflict Tactics Scale (Straus, 1990) was used to measure verbal and physical aggression within relationships since age 18. All items except the Conflict Tactics Scale were responded to on a 5-point scale where ranging from 0 (*never*) to 4 (*often*). The Conflict Tactics Scale is responded to on a 7-point scale that ranges from 0 (*never*) to 6 (*more than 20 times*). The Violence Exposure score reflected the frequency that all forms of violence had been experienced, minus the single rape that formed the basis for selection into the study. Cronbach's alphas for the subscales ranged

from .48 to .88; the correlations of the subscales with the composite ranged from .50 to .64.

Psychological problem history. These 16 items assessed the frequency with which the respondent reported prior behavior problems, referral to juvenile services, substance abuse or psychological treatment, psychiatric hospitalization, suicide attempts, and psychoactive medication use. Sample items included, "Did you get in trouble when you were in school and have to see the principal, guidance counselor, or school psychologist?" The responses were on a 5-point scale ranging from 0 (*never*) to 4 (*often*). They were adapted from the standard interview used by Foa (adopted from Foa, Rothbaum, Riggs, & Murdock, 1991). The Cronbach's alpha for this scale was .80.

Cognitive Mediators

Causal attributions. We used the Rape Attribution Questionnaire (Frazier, 2000b), consisting of three seven-item subscales that assess Behavioral and Characterological Self-Blame and External Blame. Ratings were made on a 5-point Likert scale anchored by 0 (*never*) and 4 (*very often*). The Behavioral Self-Blame scale includes items such as, "You put yourself in a vulnerable situation." The Characterological Self-Blame scale includes items such as, "You are just the survivor type." A typical External Blame item is "Men need to feel power over women." Alpha coefficients were .83, .76, and .81 for Behavioral, Characterological, and External Blame, respectively.

Maladaptive beliefs. The McPearl Belief Scale Revision D was administered by self-report to assess personal beliefs. This scale was the most recent version then available of the scale now known as the TSI/CAAPS Belief Scale (Pearlman, 1996). This 80-item scale measures individuals' personal beliefs about meaningfulness, safety, trust/dependency, independence, esteem, and intimacy. For each area there are questions that assess beliefs about the self and beliefs about others. Examples of self-items include, "I have little control over what happens to me" or "I feel confident that I can protect myself from harm." Examples of items that assess beliefs about others include, "Most people destroy what they build" or "Other people are no good." The response scale ranged from 1 (*disagree strongly*) to 6 (*agree strongly*). A higher score indicated maladaptive outcomes of trauma exposure. The Cronbach's alphas for the 10 subscales, including both self-scales and other-scales for safety, trust, esteem, intimacy, and control, ranged from .55 to .88; the correlations of the subscales with the composite ranged from .44 to .80.

Psychosocial Health Outcomes

Posttraumatic stress symptoms. Symptoms of PTSD were assessed with the 17-item Posttraumatic Diagnostic Scale (Foa, 1995; Foa et al., 1993). The item responses were on a 4-point scale with anchors that ranged from 0 = *not at*

all to 3 = five or more times per week (Re-experiencing subscale), 0 = *not at all to 3 = very much* (Avoidance subscale), and 0 = *not at all to 3 = almost always* (Hyperarousal subscale). We created continuous scores for each subscale and a composite global severity score. The Cronbach's alphas for reexperiencing, avoidance, and hyperarousal ranged from .71 to .76; the correlations of the subscales with the composite ranged from .80 to .84.

Psychopathology. The Brief Symptom Inventory (BSI) was administered by self-report to assess the domain of psychopathology (DeRogatis & Melisaratos, 1983). It is responded to on a 5-point scale that ranges from 0 (*not at all*) to 4 (*extremely*). In our previously described measurement model, all 10 subscales of the BSI correlated significantly with a single higher-order factor that recreated the Global Symptom Index recommended by the test's creators. Cronbach's alphas for the subscales ranged from .61 to .90; the correlations of the subscales with the composite ranged from .73 to .89.

Social maladjustment. Social functioning was measured by self-report using the Social Adjustment Scale-Self-Report (SAS; Weissman & Bothwell, 1976). This 53-item questionnaire measured social functioning at school and work, in social and leisure activities, immediate and extended familial situations, and in dating, marital, parental, familial, school functioning, and financial spheres. The anchors for the 5-point response format varied with the content of each item. In our previous study, the Cronbach's alphas for these subscales ranged from .53 to .69. The correlations of the subscales to the composite ranged from .28 to .82. A few scales had low correlations because they could not be assessed for every participant (i.e., students who were not parents; persons who were unemployed).

Data Analyses

The principal analytic challenge in this study was to constructively replicate a structural equations model with only 59 cases. Because the statistical power available for longitudinal modeling is a joint function of the number of respondents, the number of repeated measures, and the reliability, we used several complementary strategies to enhance both psychometric validity and statistical power for multivariate modeling (Petrinovich & Widaman, 1984; Raudenbush & Xiao-Feng, 2001). Although we would never attempt model development in a small sample, in the present study we were testing the fit of a limited set of pathways from a prespecified model, not doing exploratory analysis. Furthermore, we focused available power by developing the measurement model in our previous, much larger cross-sectional sample. Development of a measurement model involves use of Cronbach's alpha, which is a large sample statistic that may not be sufficiently stable in small samples (Nunnally, 1978) to support psychometric conclusions. Although the alpha statistics in the longitudinal data were very respectable (range = .75 to .95), we are not reporting these

values because in our judgment they are unstable and less methodologically defensible than basing the measurement model in another independent sample from the same population. Detailed description of the development of the measurement model is described elsewhere (Koss & Figueredo, 2004) and is only briefly reviewed here.

The technique we used in development of the measurement model to enhance the reliability of measurement, and hence the statistical power of the analysis, is called Multivariate Aggregation (MVA). Measurement reliability is a key component of statistical power (Sutcliffe, 1980). MVA applies the psychometric principle of aggregation to the reduction of measurement error, which may represent nearly 50% of the variance in psychological measurement and may far exceed the degree of sampling error present even in a relatively small sample. MVA is supported by multiple data simulations published in Figueredo, McKnight, McKnight, and Sidani (2000). Briefly the procedures were as follows: Items were assigned to either simple scales or subscales based on the standard scoring of the measures. Subscales were then assigned to composite scales representing more general constructs, and the correlation of each subscale to its composite was assessed. In many instances our procedures resulted in scales identical to published indices including Openness to Experience (identical to NEO Openness Scale), Behavioral, Characterological, and External Blame (as developed by Frazier, 1990), Posttraumatic Stress Symptoms (identical to the PDS total severity score), Psychopathology (identical to Global Severity Index), and Social Maladjustment (comparable to Global Adjustment Index). In other cases, although the items came from published measures, the composites were our own, including the Violence Exposure, Psychological History, and Maladaptive Beliefs. Also because of limited sample size, we chose to compute all of the lower-order and most of the higher-order factor scores as unit-weighted scales (Gorsuch, 1983) using the unweighted means of the component measures. The only variables that were estimated in the model as latent constructs were the intercept and slope of Psychosocial Distress. We created these as latent variables through structural analysis to distinguish the general effects of the predictors upon the higher-order Psychosocial Distress construct from their specific effects upon the lower-order indicators (BSI, SAS, and PTSD).

The use of MVA also permitted the use of Multivariate Imputation (MVI), which presupposes unit-weighted factor scaling, for the handling of missing data (Figueredo, McKnight et al., 2000). MVI is an available data method that preserves sample integrity by estimating composite variable scores from the mean of nonmissing indicator scores. Using this procedure, only 2 out of 59 study participants were entirely lost from data analysis due to missing data. The mean proportions of complete data by composite variable was 96.6% for Openness to Experience, 100.0% for Violence Exposure, 100.0% for Psychological Problem History, 99.5% for Behavioral Self-Blame, 99.5% for Characterolog-

ical Self-Blame, 99.2% for External Blame, 93.1% for Psychopathology, 99.3% for Posttraumatic Stress Symptoms, and 79.4% for Social Maladjustment (the lower percent complete is due to domains that were inapplicable to some participants). MVI was also used to handle missing measurement occasions (Figueredo, McKnight et al., 2000), by estimating the Level 1 growth curve parameters from the nonmissing measurement occasions. Finally, we chose not to residualize variables for demographic influences prior to multivariate analysis because the few significant effects observed in our past work (9/821 regressions; Koss et al., 2002) did not justify the degrees of freedom that would be used by this method.

Level 1 Growth Curve Analysis

Level 1 growth curve analysis provided statistics that estimated the starting value, shape, and rate of change. An intercept value represents status at baseline but is more reliable than a single assessment of initial levels because it is estimated from all the data available at every measurement point. Level 1 analysis also estimated slopes representing direction and magnitude of average change on each score over time, again using all available data. Slope data also permitted comparison of group starting and ending levels. The detailed results from the Level 1 analyses were split off from the present analysis at the request of previous reviewers and have been published elsewhere (Koss & Figueredo, 2004). However, we summarize our Level 1 methods and results briefly here because they provided the input for the structural analysis of the present study.

Individual growth curve parameters for all composite scores that were measured repeatedly were calculated by ordinary least-squares estimation, plotting scores over time and calculating a regression line (Figueredo, Brooks, Leff, & Sechrest, 2000). Each participant was treated as a separate case study for analysis. Individual regression parameters were estimated. The times of measurement used in the data analyses were the exact number of days post-intake at which an interview occurred. Natural logarithmic transformations of the data were used. There were several reasons to transform the data: (a) On theoretical and empirical grounds we expected that recovery from rape was curvilinear, not linear, meaning that change was more rapid initially than after months and years have passed; (b) Regression analysis will plot a straight line and data must be transformed for curvilinear regression; and (c) We previously tested alternative linear and curvilinear function forms for fit to the data (Koss & Figueredo, 2004). The curvilinear model had better explanatory power than the rectilinear model, and the logarithmic model was superior to the quadratic. The impact of logarithmic transformations is that recovery does not proceed at an even rate but decelerates over time.

The Level 1 analyses revealed significant change on all variables over time and demonstrated that the variables were covarying (changing together across time). Initially

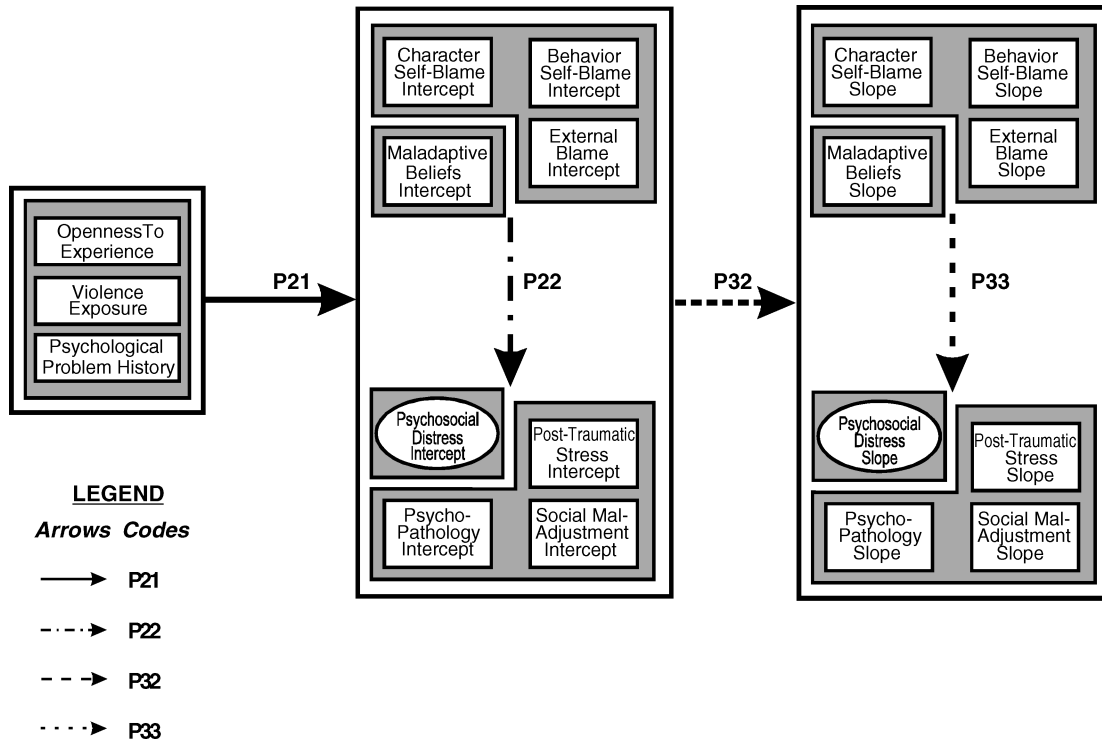


Fig. 1. Schematic of Longitudinal Structural Equations Model for Cognitive Mediation of Rape Recovery.

these rape survivors had clinically significant levels of distress. For example, initial Global Severity Index scores on the BSI were two standard deviations above the community norms, the PTSD scores were over three standard deviations higher, but SAS scores were within one standard deviation of community samples. The consensus is that “normal” is defined as scores that are within one standard deviation of the mean of nonpatient community samples, two standard deviations higher represent disturbance, and three standard deviations and beyond reflect more severe disturbance (Jacobson & Truax, 1991; Kendall & Grove, 1988; Ogles, Lambert, & Masters, 1996). At the end of 2 years of recovery PTSD was over two standard deviations lower on average than at baseline, and the final scores were similar to those from non-PTSD norm groups. This amount of change is highly clinically significant. Scores on the Global Severity Index of the BSI declined 0.7 standard deviations but were still more than one standard deviation elevated from nonpatient norms. Initial scores reflected clinically significant levels of distress whereas the predicted final scores, although elevated above the community norm, were not indicative of disturbance.

Level 2 Growth Curve Analysis

Level 2 growth curve analysis (Willett & Sayer, 1994) used the intercepts and slopes derived from Level 1 analysis and was accomplished with factor analytic SEM using EQS 5.7b (Bentler, 1995). More detailed discussions of the merits and

limitations of our approach to longitudinal data analysis can be found in Figueredo, Brooks et al. (2000). Figure 1 is a schematic diagram of the longitudinal model that, with the omissions noted earlier, was developed and tested in previous cross-sectional data. The first set of boxes on the left represents the personological characteristics measured at baseline only. The second set of boxes represents the model of mediators and outcomes that were tested using intercept data. The third set of boxes represent the model of mediators and outcomes that was tested using slopes data. The notation in the figure serves to link this replication to that used in the previously published work (Koss et al., 2002). P signifies pathway and the number 1 represents those characteristics measured only at baseline. The number 2 represents intercepts of the mediators and outcomes that were subject to repeated measures, and the number 3 references the slopes of mediators and outcomes. The notation P21 represents all the direct pathways from baseline measures to intercepts of mediators and outcomes. P22 represents all direct pathways among the intercepts of mediators and outcomes, and reflects interrelationships among the study variables at baseline. The P32 pathways specified how the sequence moved from the static set of relationships measured at baseline to the dynamic changes that occurred across time. Finally, the P33 pathways among the slopes of mediators and outcomes reflected how the study variables influenced each other across time. Residual correlations were specified among: (a) all personological characteristics and all other personological characteristics; all

intercepts of causal attributions and those of other causal attributions; (b) all slopes of causal attributions and those of other causal attributions; (c) all intercepts and all the corresponding slopes for the same variables. No other residual covariances were specified in the longitudinal model. Structural equations models were evaluated by use of chi-square and the Bentler-Bonnett Comparative Fit Index (CFI). Index values greater than 0.90 are considered satisfactory levels of practical goodness-of-fit (Bentler & Bonnett, 1980; Bentler, 1995). The CFI was selected because it is adjusted for model parsimony and performs well with moderate to small sample sizes ($N < 250$), especially with Maximum Likelihood estimation (Bentler, 1990; Hu & Bentler, 1995). Alternative fit indices, such as the Bentler-Bonnett Normed Fit Index (NFI) and the Bentler-Bonnett Non-Normed Fit Index (NNFI), provide poor estimates of model fit with small samples (Hu & Bentler, 1995).

RESULTS

Figure 2 displays the results of the theoretically specified factor-analytic structural equations model. Those pathways with coefficients in bold, followed by an asterisk, and with larger arrowheads represent the statistically significant ($p < .05$) path coefficients. The significant pathways represented causal effects in our previously reported cross-sectional model that replicated; the nonsignificant pathways represented those that did not. Although the chi-square value was statistically significant, $X^2(86) = 127.806$, $p = .002$, indicating that the theoretical model did not per-

Table 1
Freely Estimated Residual Correlations Between Intercepts and Corresponding Slopes

Intercept	Slope	Correlation
Behavioral Self-Blame	Behavioral Self-Blame	-.009
Characterological Self-Blame	Characterological Self-Blame	-.481*
External Blame	External Blame	-.700*
Maladaptive Beliefs	Maladaptive Beliefs	-.579*
Psychopathology	Psychopathology	-.924*
Posttraumatic Stress Symptoms	Posttraumatic Stress Symptoms	-.509*
Social Maladjustment	Social Maladjustment	-.629*
Global Psychosocial Distress	Global Psychosocial Distress	-.595*

* $p < .05$

fectly explain all the observed covariances, the CFI (.912) was acceptable ($> .90$) for practical purposes. The values for certain other fit indices, including the NFI (.791) and NNFI (.861), were somewhat lower. However, as we previously noted, the latter two indices provide poor estimates of model fit with small samples (Hu & Bentler, 1995) and thus did not provide a sufficient basis on which to reject the model. Table 1 displays the residual correlations between each of the intercepts and their corresponding slopes, and Table 2 presents the residual correlations that were specified for the model. The proceeding description of the results

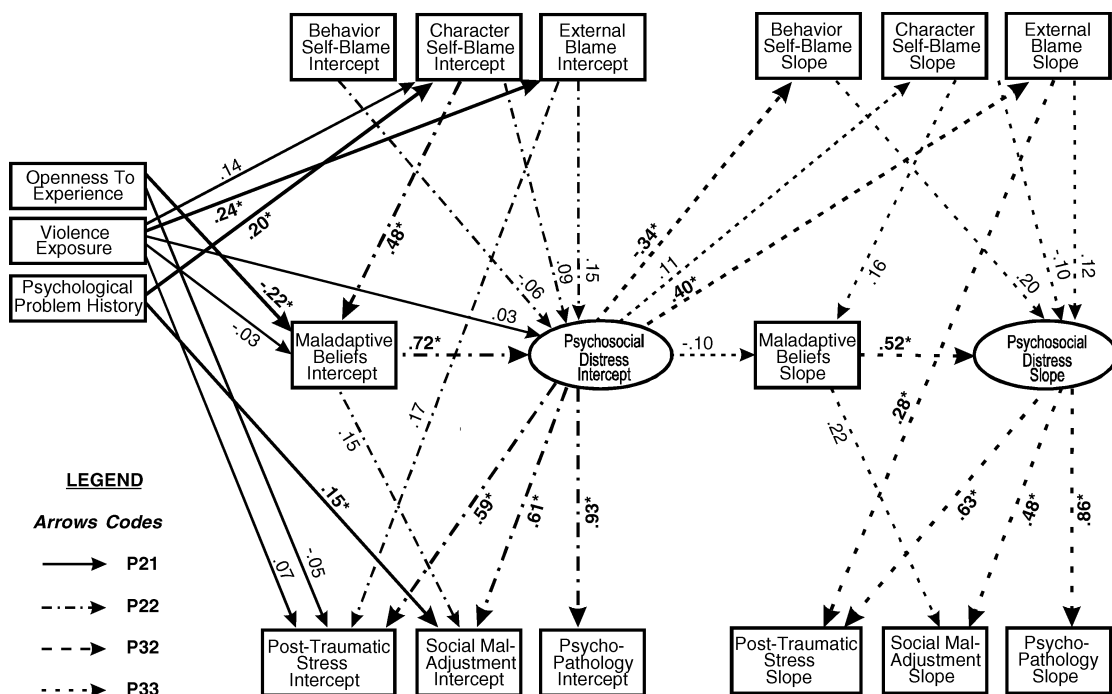


Fig. 2. Cognitive Mediation of Rape Recovery: Inclusive Structural Equations Model Demonstrating Constructive Replication in Longitudinal Data.

Table 2
Residual Correlations Within Conceptual Categories
of Variable

Measure	1.	2.	3.	4.	5.	6.
1. Openness To Experience	.					
2. Violence Exposure	-.195	.				
3. Psychological Problem History	-.073	.599*	.			
4. Behavioral Self-Blame				.	.504*	.016
5. Characterological Self-Blame				.581*	.	.047
6. External Blame				-.007	-.084	.

* $p < .05$

Note. Correlations for the intercepts of Behavioral, Characterological, and External Blame are tabulated below the diagonal and correlations for their slopes are tabulated above the diagonal.

follows the hypothesized causal sequence depicted in Figure 2. First, the relationships of background characteristics to baseline values for cognitive mediators and outcomes (P21) are described. Next, the effects of those variables on one another at study initiation (P22) are reported. Then, the results of testing the pathways that connect initial distress to change across time are displayed (P32). Finally, the effects of slopes of the variables on one another across time are given (P33). Only the statistically significant pathways reported are reported in text, but all the nonsignificant results are included in Figure 2.

P21: Effects of Personological Characteristics on Intercepts

These pathways examined the effects of personological characteristics on the starting values for the other study variables, specifically self-blame, external blame, beliefs, and distress. Openness to Experience had a direct and negative effect on the intercept of Beliefs ($-.22$). Violence Exposure had a direct effect on the intercept of External Blame ($.24$). Psychological Problem History affected the intercept of Characterological Self-Blame ($.20$) and also had a direct effect on Social Maladjustment ($.15$) that was not mediated by Psychosocial Distress. The remaining four pathways depicted in Figure 2 were not statistically significant and therefore did not replicate.

P22: Effects of Intercepts on Intercepts

These effects tested the pathways that existed among the study variables at baseline. Thus, they specifically examine how the starting values of self-blame and external blame influence beliefs and distress. These results are analogous to analysis of cross-sectional data in that they give a snapshot taken at one point in time of how the variables influence

each other. Of the three causal attributions, only the intercept of Characterological Self-Blame had a significant and positive direct effect upon that of Maladaptive Beliefs ($.48$). The intercept of Maladaptive Beliefs had a substantial and positive direct effect upon Psychosocial Distress ($.72$). The intercept of Psychosocial Distress loaded significantly on the intercepts of Psychopathology ($.93$), Social Maladjustment ($.61$), and Posttraumatic Stress Symptoms ($.59$). The remaining five pathways depicted in Figure 2 were not statistically significant and therefore did not replicate.

P32: Effects of Intercepts on Slopes

This set of pathways examined how the starting values on the study variables influenced change over time. These analyses reveal whether our static model could also account for how the variables change together over time. There were direct effects of the intercepts on slopes in addition to the residual covariances specified in Table 2. Of the four new hypotheses specifying how initial Psychosocial Distress at baseline affected change in causal attributions and beliefs over time, two were confirmed. Specifically, there were two nearly equal and opposite direct effects between the intercept of Psychosocial Distress and the rates of change in Behavioral Self-Blame ($-.34$) and External Blame ($.40$). The hypothesized direct effects of the intercept of Psychosocial Distress on the slopes of Characterological Self-Blame ($.11$) and Maladaptive Beliefs ($-.10$) were not statistically significant.

P33: Effects of Slopes on Slopes

This set of effects examined how the variables changed together over time. That is, did change in one variable significantly influence change in other variables as specified in the model? Contrary to the intercept results, there was no significant effect of the slope of Characterological Self-Blame upon that of Maladaptive Beliefs ($.16$). The slope of Maladaptive Beliefs had a substantial and positive direct effect upon the slope of Psychosocial Distress ($.52$). The slope of Psychosocial Distress loaded significantly on the slopes of Psychopathology ($.86$), Social Maladjustment ($.48$), and Posttraumatic Stress Symptoms ($.63$). The slope of External Blame also had a direct effect on the slope of Posttraumatic Stress Symptoms ($.28$) that was not mediated by Psychosocial Distress. The remaining four pathways depicted in the slope model of Figure 2 were not statistically significant and thus did not replicate.

Summary of Effects

The factor analytic structural equations model as a whole accounted for 58.4% of the variance in the intercept of Psychosocial Distress, which accounted for 85.5% of the variance in Psychopathology, 58.0% of the variance in Social Maladjustment, and 45.0% of the variance in Posttraumatic Stress Symptoms. The model furthermore accounted for

36.2% of the variance in the slope of Psychosocial Distress, which accounted for 74.6% of the variance in Psychopathology, 39.8% of the variance in Social Maladjustment, and 43.9% of the variance in Posttraumatic Stress Symptoms.

DISCUSSION

We applied a previously reported structural model to longitudinal data from an independent sample. Our aim was to determine if the model could be constructively replicated in intercept data reflecting initial status and in slope data representing changes in the study variables across time. The constructive replication was partially successful. All of the previously reported large effects replicated and most of the smaller ones failed to replicate. The major pathways of the model that we previously articulated were still evidenced in the results of the replication. The following discussion guides the reader through the results beginning with the baseline findings and then addressing change over time, using Figure 2 as a guide.

The Static Picture of Cognitive Mediation at Baseline

At the initial contact within 3 months of rape, analysis of the intercept data indicated that both survivors' Openness to Experience and Psychological Problem History had indirect effects on Psychosocial Distress. Problem History had a noncognitively mediated direct effect on Social Maladjustment. Those survivors with extensive histories of emotional and behavioral problems likewise demonstrated more problems in their current social functioning. These pathways are consistent with literature that links adverse childhood environments with a variety of adult negative health outcomes (Felitti et al., 1998). Openness to Experience lessened distress indirectly because it reduced the severity of Maladaptive Beliefs about the self and others regarding meaningfulness, safety, trust/dependency, control, esteem, and intimacy, such as beliefs that the world is dangerous, people are malevolent, and that one has little control over personal outcomes. Because beliefs are the cognitive schema through which ongoing experience is perceived and given meaning, alterations in them have wide-ranging influences on everyday interactions. The protective effect of Openness to Experience on reducing Maladaptive Beliefs suggests that this personality trait is associated with cognitive processing of rape that is less provocative of maladaptive changes that undermine healthy interactions with the self and others. The protective effect is important because Maladaptive Beliefs were strongly predictive of Psychosocial Distress.

Those survivors who had past behavioral issues that had brought them to the attention of professionals such as teachers, principals, and psychologists were more likely to blame their own personal style and character when assessed shortly after their rape than women who had more benign backgrounds. Initial levels of Characterological Self-

Blame indirectly promoted Psychosocial Distress, an effect that was mediated by Maladaptive Beliefs. This type of self-blame, by implicating enduring and unchangeable features of the self, does not support appraisals that sexual assault is controllable in the future, and therefore, fails to offer the survivor even an illusion that she can protect herself from further rapes. In existing studies using univariate and regression analyses, both behavioral and characterological self-blame were predictive of distress (e.g., Frazier, 1990; Frazier & Schauben, 1994; Hill & Zautra, 1989; Meyer & Taylor, 1986; or Frazier, 2003, for behavioral self-blame only). We were unable to replicate our previously reported finding that Behavioral Self-Blame, consistent with original theory (Janoff-Bulman, 1992), was somewhat protective against distress. In the present data, the direction of the relationship suggested protection, but the size of the effect was not significant. An additional finding on causal attributions that we confirmed was the effect of previous Violence Exposure on exacerbating External Blame. It is certainly possible that as women have repeated victimizations, they become more certain of where its causes lie. Finally, in the baseline model, Posttraumatic Stress Symptoms, Social Maladjustment, and Psychopathology were highly significant predictors of a shared construct we labeled Psychosocial Distress. This finding simply points out that all forms of Psychosocial Distress mediate the impact of rape on health outcomes, and it is the distress level that determines the extent of specific symptoms of psychopathology and social dysfunction.

We interpreted the pathway from Psychological Problem History to initial Characterological Self-Blame and to Maladaptive Beliefs as consistent with Gilfus (1999). She suggested that people with extensive problem histories and socioeconomic stress may never have had the luxury of believing that the world is a safe place and that people are basically good. Their maladaptive beliefs allow them to survive in a harsh environment. For them, rape may have served to confirm and intensify existing beliefs rather than stimulate change in them as cognitive theory suggests.

Dynamic Changes in Cognitive Mediators and Distress

The set of boxes on the right side of Figure 1 represent the results of testing whether our model derived from cross-sectional data and representing static relationships at a single assessment point also accounted for how the variables affected each other over time as recovery progressed. The results from the slopes analyses indicated that some of the central features of the static model replicated in dynamic data. We also confirmed two of the hypotheses we made about the effects of initial distress on changes in causal attributions over time. Higher levels of Psychosocial Distress at baseline slowed reduction in Behavioral Self-Blame, sped up the lessening of External Blame, and had a nonsignificant effect on Characterological Self-Blame and Maladaptive Beliefs. The rate of decrease in External Blame increased

the speed of reduction in Posttraumatic Stress Symptom severity, which in our previous report was mediated by the influence of External Blame on how the rape was remembered. Because we did not include the memory mediators in the constructive replication, the effect on PTSD symptoms is now direct. It is intriguing that attributing blame to factors external to the self, often considered both by theory and by victim advocates to be a healthy understanding of where the causes of rape lie, was associated with more posttraumatic symptoms. Maladaptive Beliefs maintained its provocation of Psychosocial Distress as recovery proceeded. Psychosocial Distress continued to determine the levels of specific symptoms over time.

None of the previously reported paths from Behavioral, Characterological, or External Blame to Maladaptive Beliefs that were significant at baseline replicated in the slopes analyses. What that finding suggests is that the amount of distress experienced during recovery continued to be influenced by the level of Characterological Self-Blame elicited in the immediate postrape period, and moving further back in the causal sequence, by the Psychological Problem History of the survivor. The results suggest that those who have had the most problems in the past have the most difficulty recovering from rape, and that one mechanism that complicates their recovery is the higher level at which Characterological Self-Blame operates once it is triggered. Finding that no form of blame was associated with reductions in Psychosocial Distress is consistent with data that suggest that optimal recovery occurs when survivors cease their preoccupation with attributing cause (Brewin et al., 1996; Harvey et al., 1994; Harvey, 1996; Lebowitz, Harvey, & Herman, 1993; McCann & Pearlman, 1990).

Strengths and Limitations

The findings are governed by certain constraints and limitations. Because a repeatable sampling strategy was not used, the representativeness and generalizability of the sample is unknown. Few crime survivors in general (12%, Norris, Kaniasty, & Scheer, 1990) or rape survivors in particular (9%; Koss et al., 1991; 19%, Kimerling & Calhoun, 1994) seek services from the formal mental health system. One could draw a representative sample from these settings that would be generalizable to these specific service settings. However, the samples would be a poor reflection of the majority of survivors who do not seek these services. Our sample plan aimed to recruit rape survivors through a broad range of community sites to maximize representation of survivors outside formal systems, but this goal sacrificed reproducibility. We cannot directly compare our volunteers to those who chose not to participate. Through census data we concluded that our sample underrepresented Hispanics and American Indians despite considerable attention to cultural competence. Close to one in three persons residing in Tucson is Hispanic, primarily Mexican American. The predominant American Indian tribe in Tucson is also Spanish-speaking as a legacy of contact with Spanish Jesuit

missionaries in the late 18th century, although there is also an indigenous language and English proficiency. To ensure that our efforts at inclusion were exhaustive, we used bilingual flyers posted in agencies that serve a primarily Spanish-speaking clientele, used a bicultural-bilingual telephone screener, provided vouchers for transportation to the research office, and reimbursed for childcare. We served food during the interview. Bicultural and bilingual native speakers were trained as interviewers and all materials translated to Spanish. Thus, we had the capacity to conduct the total interaction with the participant from recruitment through interviews and assessments entirely in Spanish using culturally competent personnel. To supplement these more standard recruitment techniques, we also employed a promotora, which is a native speaker and respected community member, to publicize the project in Spanish on Spanish radio, TV, and through presentations to Hispanic community groups. Finally, the promotora conducted focus groups in Spanish with primarily monolingual nonvictims to create informed opinion leaders who could spread the word informally about the project within their communities. The underrepresentation of Hispanic participants resulted despite very significant efforts to reach this population. We have written elsewhere about the challenges to recruit Hispanic participants into rape research.

Another limitation was low power. Although we have presented some novel methods of applying structural modeling to small samples of longitudinal data, some of the smaller effects in our previous study may have failed to replicate due to low statistical power. However, low power does not detract significance from the positive results that did replicate. A further limitation is that we modeled both Violence Exposure and Psychological Problem History as baseline values to accommodate our sample size. We recognize that some participants may have used counseling services during follow-up and may have experienced further violence. Finally, we did not include noncognitively mediated influences on recovery such as biological markers, social support, or coping behavior. Nevertheless, we did include the same standard indicators of recovery (posttraumatic stress symptoms, psychopathology, and social maladjustment) that would be used to establish symptom severity in studies that examined them. Our findings demonstrate that cognitive mediators contributed notably to the prediction of the variance that these symptom measures reflect. That means that cognitive mediators would be important to account for in any conceptual model of recovery from rape, although prediction could be improved by expanding the scope of mediating variables.

Other empirical demonstrations of cognitive mediation of rape are currently available that were not published when our program of research was initiated. Now, the theoretical model is not unique in itself, nor is the analysis of change in cognitive mediators across time. However, previous studies have focused on univariate analysis of change. The present results showed how prerape characteristics, cognitive mediators, and multiple psychosocial distress indicators work

together in a system to predict distress and psychopathology both statically and across time. The study also advanced some novel approaches to designing a series of studies that counterbalanced the strengths and weaknesses of large samples and small samples from the same population, and of cross-sectional and longitudinal data. Finally, the study outlined the preconditions and presented a strategy for applying structural equations modeling in small samples.

We have previously published a discussion of the clinical and theoretical implications of our longitudinal findings (Koss & Figueredo, 2004). The bottom line was that clinicians should be concerned about secondary traumatization that survivors encounter in the aftermath of rape while seeking medical care or criminal justice services because survivor blaming directly fuels the cognitive processes that exacerbate distress and prolong recovery.

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QUERY

Q1 AU: Any update?