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An Empirical Examination of the Associations Among Crystal Methamphetamine Use History, Posttraumatic Stress Symptom Severity, and Perceived Social Support

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Abstract

Social support functions as a protective factor against the development of posttraumatic stress disorder (PTSD). Crystal methamphetamine use, however, is associated with a decrease in social functioning. This is noteworthy as people with PTSD endorse elevated rates of crystal methamphetamine use. The current study proposed to look at perceived social support as it relates to crystal methamphetamine use among individuals endorsing a wide range of posttraumatic stress symptoms. Questionnaires measuring perceived social support and posttraumatic stress symptom severity were administered to 98 traumatic event-exposed adults (M_{age} = 48.5, *SD* =7.74) recruited from the San Francisco bay area who were participating in a larger study focused on human immunodeficiency virus treatment adherence. Regression analyses were employed to test three interrelated hypotheses based on the general prediction that posttraumatic stress and crystal methamphetamine use will evidence unique and combined relations with perceived social support. While posttraumatic stress symptom severity was negatively related to perceived social support (B = -.145, β = -.322, sr^2 = .104, *t(93)* = -3.299, *p* = .001), neither the extent of previous crystal methamphetamine use, nor the interaction between posttraumatic stress symptom severity and crystal methamphetamine use were associated with decreased levels of perceived social support. Secondary analyses revealed a significant interaction between avoidance symptoms and crystal methamphetamine use, but upon further investigation, it appears that this relationship is only significant for those who deny previous crystal methamphetamine use. Similarly, an analysis of marital status indicated no significant relation between PTSD, crystal methamphetamine use, and marital status. Taken together, these results replicated research linking PTSD symptoms to social support, but do not suggest that crystal methamphetamine use further impact social support level.

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An Empirical Examination of the Associations among Crystal Methamphetamine Use History, Posttraumatic Stress Symptom Severity, and Perceived Social Support

Posttraumatic stress disorder (PTSD) is comprised of a broad set of symptoms that often occur following a traumatic event, defined as an event characterized by perceived threat that elicits fear, helplessness, or horror (American Psychiatric Association [APA], 2000). While most posttraumatic stress symptoms naturally remit among the majority of people exposed to a traumatic event, a significant minority of traumatic event-exposed people continue to struggle with these symptoms (Gilboa-Schechtman & Foa, 2001). To be diagnosed with PTSD, one must display clinically significant symptoms that span three symptom clusters: re-experiencing (e.g., intrusive memories and nightmares surrounding the traumatic event), avoidance (e.g., avoiding people or places associated with the traumatic event), and hyperarousal (e.g., exaggerated hypervigilence, difficulties sleeping; APA, 2000). Aside from meeting a minimum number of symptoms in each category, an individual must experience clinically significant symptoms for at least one month following a traumatic experience, and experience clinically significant distress or impairment in functioning as a result of their PTSD symptoms (APA, 2000).

Posttraumatic stress disorder commonly co-occurs with elevated levels of substance use and related problems (Stewart & Conrod, 2008). Specifically, PTSD has been found to be associated with elevated use of nicotine (Beckham et al., 1995; Feldner, Babson, & Zvolensky, 2007), marijuana (Bonn-Miller, Vujanovic, & Drescher, 2011; Calhoun et al., 2000), alcohol (Mills, Teesson, Ross, & Peters, 2006; Stewart, 1996) cocaine (Back, Brady, Jaanimagi, & Jackson, 2006), and crystal methamphetamine (Smith, Blumenthal, Badour, & Feldner, 2010). While a significant amount of research has examined links between posttraumatic stress and use of both alcohol (Jacobsen, Southwick, & Kosten, 2001; Kessler, Sonnega, Bromet, Hughes, &

Nelson, 1995; McFarlane, 1998; Stewart, 1996) and nicotine (Beckham, 1999; Feldner et al., 2007; Fu et al., 2007), relatively little research has examined links with crystal methamphetamine use.

Crystal methamphetamine is a derivative of amphetamine, and a member of the larger stimulant class of drugs. It can be ingested orally, smoked, snorted, or injected, and is referred to as "crystal," "meth," or "speed" (Anglin, Burke, Perrochet, Stamper, & Dawus-Noursi, 2000). Crystal methamphetamine specifically affects the central nervous system by targeting the dopamine transporter within the dopamine system. This action increases the production of dopamine, while simultaneously blocking its reuptake (Cho & Melega, 2002; Homer et al., 2008). These actions result in a rapid increase in, and abundance of, dopamine in the brain following use, which results in the "high" associated with use (Cho & Melega, 2002). Crystal methamphetamine use is thought to produce a high much like cocaine, with the difference being that it lasts longer (Anglin et al., 2000; Cho & Melega, 2002), with a half- life of 9-13 hours, compared to the cocaine half-life of 90 minutes (Cho & Melega, 2002). In addition to the euphoria associated with elevated levels of dopamine, individuals who use crystal methamphetamine may experience an increase in energy, productivity, sexuality, and attentiveness, as well as a decrease in anxiety (Anglin et al., 2000; Homer et al., 2008).

In addition to the "positive" symptoms crystal methamphetamine users report, research has shown that the neurotoxicity of crystal methamphetamine use is associated with psychiatric problems, including paranoia (Cho & Melega, 2002; Sommers, Baskin, Baskin-Sommers, 2005), hallucinations, delusions, and depression (Sommers et al., 2005). Neurotoxicity generally refers to the effects, either permanent or temporary, on the structures or functions of the central nervous system caused by increased amounts of crystal methamphetamine in the brain (Anglin et al.,

2000). In the presence of crystal methamphetamine use, this structural change in the brain appears to occur within the dopamine system. This change is thought to significantly affect an individual's behavior (Anglin et al., 2000; Cho & Melega, 2002). There may be long term behavioral changes due to neurotoxicity in the brain caused by excessive dopamine release following the use of crystal methamphetamine (Cho & Melega, 2002).

There are two predominant use patterns for crystal methamphetamine: chronic self-administration and binging (Cho & Melega, 2002). Although a binge use pattern results in more crystal methamphetamine ingested during a shorter period of time, both means of administration result in a significant amount of drug accumulation in the brain due to the dosage interval and the long half-life of the drug (Cho & Melega, 2002). Positron emission tomography (PET) studies to examine the brain structures of lifetime crystal methamphetamine users following abstinence have found long-term damage in the dopamine nerve terminals (McCann et al., 1998). This work suggests behavior changes consistent with crystal methamphetamine use may persist even after the person has abstained from crystal methamphetamine use.

Crystal Methamphetamine Use and PTSD

While studies have linked crystal methamphetamine use to an increase in exposure to traumatic experiences (Messina et al., 2008; Rawson, Gonzales, & Ling, 2006), there is little research examining the specific relation between PTSD and crystal methamphetamine use. Peters and colleagues found that following Hurricane Ike, African American youth living in Fifth Ward, Texas who endorsed posttraumatic stress symptom responses (i.e., avoidance of reminders of the event) were more likely to report substance use, including crystal methamphetamine use, compared to those who reported no posttraumatic stress symptom responses. In the only other study in this domain, Smith and colleagues (2010) examined the relation between crystal

methamphetamine and PTSD. Here, when compared to individuals who reported trauma exposure only, individuals who met criteria for PTSD were approximately 3 times more likely to self-report a lifetime history of crystal methamphetamine use (17.7% $_{\text{trauma only}}$ versus 50.0% $_{\text{PTSD}}$) and they reported a significantly longer average duration ($M_{\text{years trauma only}}$ = 1.83 versus $M_{\text{years PTSD}}$ = 11.70) of crystal methamphetamine use (Smith et al., 2010). While limited, this research suggests posttraumatic stress symptom severity is positively associated with crystal methamphetamine use history.

PTSD and Social Support

The relation between social support and posttraumatic stress symptomatology has been examined across many types of traumatic events, including motor vehicle accidents (Danner & Radnitz, 2000), combat exposure (Gold et al., 2000), and violent crimes (Andrews, Brewin, & Rose, 2003). This research converges to suggest individuals who endorse high levels of perceived social support evince fewer PTSD symptoms following a traumatic event (Danner & Radnitz, 2000; Eriksson et al., 2001; Solomon, Mikulincer, & Hobfoll, 1987; Tucker, Pfefferbaum, Nixon, & Dickson, 2000). This pattern has held consistent even with complex groups, like those diagnosed with PTSD who have also experienced a spinal cord injury. A study conducted by Danner and Radnitz (2000) found a decrease in PTSD symptoms in the presence of perceived social support from friends. Furthermore, they cited perceived social support from friends to be the best predictor of PTSD symptoms (Danner & Radnitz, 2000). Stretch, Vail, and Maloney (1985) found that among Vietnam Veterans, those who reported not experiencing positive social support both during their deployment and upon their return subsequently reported the highest PTSD symptoms. Similarly, they found Veterans that reported receiving positive social support throughout their deployment and upon their return home

demonstrated fewer PTSD symptoms (Stretch, Vail, & Maloney, 1985). Given the significance of social support in the context of posttraumatic stress symptomatology, it is important to understand if other factors associated with PTSD may affect social support. Crystal methamphetamine use may be one such factor that impacts social support.

Crystal Methamphetamine Use and Social Support

In a study examining the relation between crystal methamphetamine use and social and health outcomes in both treatment participating and non-treatment participating young adults (M_{age} = 21.58), Sommers, Baskin, and Baskin-Sommers (2006) reported that 50% of their participants endorsed that crystal methamphetamine use had negative effects on their interpersonal relationships. Furthermore, they found a pattern in which participants who endorsed the highest levels of crystal methamphetamine use subsequently reported the most psychological and social problems. Solomon and colleagues (2010) found that individuals dependent on crystal methamphetamine reported higher levels of interpersonal sensitivity and were less agreeable, less open, less conscientious and more neurotic than non-methamphetamine users as assessed by the NEO Five Factor Inventory. In a review of the effects of crystal methamphetamine use on an individual's social functioning, Homer and colleagues (2008) argued that the relation between chronic abuse of crystal methamphetamine leads to damage of brain structures responsible for social-cognition, which in turn results in deficits in social functioning evidenced by behavioral changes in individuals with chronic crystal methamphetamine abuse. Homer and colleagues (2008) used the term "social cognition" to refer to the culmination of processes involved in processing social situations. Social cognition is suggested to involve managing the assessment of various constructs in real time, such as the mental states of the self and others, as well as the beliefs and desires of others. Collectively,

research on crystal methamphetamine use and social functioning suggests that the extent of use of this potent drug is likely to negatively correlate with perceived social support.

Current Study

As reviewed above, evidence suggests perceived social support is negatively correlated with posttraumatic stress symptom severity (with PTSD representing one end of the continuum of severity; Ruscio, Ruscio, & Keane, 2002). Research suggesting crystal methamphetamine use may deteriorate social functioning posits that related use histories may be associated with lower levels of perceived social support. The current study sought to examine three interrelated hypotheses that are based on the general prediction that posttraumatic stress and crystal methamphetamine use would evidence unique and combined relations with perceived social support. Specifically, it was predicted that (1) extent of previous crystal methamphetamine use would be negatively related to perceived social support, (2) posttraumatic stress symptom severity would be negatively related to perceived social support, and (3) posttraumatic stress symptom severity and crystal methamphetamine use histories would interact such that relatively elevated levels of both would be associated with less perceived social support than any other combination of these factors.

Method

Participants

Participants included 98 traumatic event-exposed adults (M_{age} = 47.78, SD = 8.30) recruited from the San Francisco bay area as a part of a larger study examining HIV treatment adherence. Aside from the broader inclusionary criteria employed in the larger study (i.e., receiving treatment for HIV), the current study only required endorsement of exposure to at least one traumatic event as defined by the *Diagnostic and Statistical Manual, 4th Edition, Text*

Revision (DSM-IV-TR; APA, 2000). Participants endorsed the following categories of traumatic events: accident, fire or explosion (*n* = 56), natural disaster (*n* = 49), non-sexual assault by a family member (*n* = 36), non-sexual assault by a stranger (*n* = 42), sexual assault by a family member (*n* = 27), sexual assault by a stranger (*n* = 22), military combat (*n* = 6), sexual contact (*n* = 31), imprisonment (*n* = 33), torture (*n* = 3), illness (*n* = 53*),* and other (e.g. seeing someone else killed, witnessing a sexual assault; *n* = 35). Of the participants, 28.6% met diagnostic criteria for PTSD. In regards to crystal methamphetamine use, 10.2% endorsed currently using crystal methamphetamine, 57.1% endorsed ever using crystal methamphetamine, and 42.9% denied ever using crystal methamphetamine. Our sample was 75.5% male (*n* = 74) with the plurality of our sample identified as African American, Non-Hispanic (40.8%; *n* = 40). Participants reported varying levels of education: 18.4% completed partial high school (*n* = 18), 19.4%) graduated high school (*n* = 19), 40.8% completed partial college (*n* = 40), 19.4% graduated from a 2-or 4-year college (*n* = 19), 1% completed partial graduate school (*n* = 1), and 1% completed graduate school (*n* = 1). The plurality of our sample reported never being married (42.9%, *n* = 42), 23.5% reported being married or living with someone (*n* = 23), 5.1% reported being widowed (*n* = 5), while 26.5% reported being separated, annulled, or divorced (*n* = 26).

Measures

Traumatic Event Exposure and PTSD. Traumatic event exposure and PTSD symptom levels were measured using the Posttraumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997). The PDS includes a traumatic event checklist, along with descriptors of the event that correspond to DSM-defined criteria for a traumatic event (i.e., perceived threat and peritraumatic fear, helplessness, and horror). This part of the PDS allows for indexing traumatic

event exposure and was employed in the current study to identify participants meeting the traumatic event exposure inclusion criterion.

The PDS also includes a 17-item self-report measure that is designed to measure the frequency for all of the DSM-IV-TR symptoms for PTSD as well as other diagnostic criteria (e.g., duration of symptoms, impairment related to symptoms). The PDS can be used to derive either a dichotomous or continuous measure of PTSD. Symptom frequency is measured using a 4-point Likert scale (0 = *not at all* to 3 = *very much*). Frequency ratings are then totaled to yield a total symptom severity score. The PDS evidences adequate psychometric properties (Foa et al., 1997). It has demonstrated both high internal consistency (Chronbach's $\alpha = .92$) and high test-retest reliability for the total PDS score ($k = .83$; Foa et al., 1997). The PDS also has demonstrated good convergent validity via high correlations between the PDS and other gold-standard measures of PTSD, including the Clinician-Administered PTSD Scale (CAPS; r=.71) and the Structured Clinical Interview for DSM-IV (SCID; kappa = .65; First, Spitzer, Gibbon, & Williams, 1997). Finally, when using a cut score of 17 in combination with the DSM-IV-TR criteria for PTSD, the PDS demonstrated adequate sensitivity (.9) and specificity (.59), thereby further supporting its convergent and divergent validity (Griffin, Uhlmansick, Resick, & Mechanic, 2004). The PDS was employed in the current study to create a continuous measure of posttraumatic stress symptoms consistent with taxometric research suggesting posttraumatic stress symptoms are continuous in nature, rather than dichotomous, discrete categories (Ruscio et al., 2002).

Crystal Methamphetamine Use Histories. Crystal methamphetamine use histories were measured using the Crystal Methamphetamine Questionnaire. This standardized measure was originally created by Smith and colleagues (2010) for use in their study on the relations between

crystal methamphetamine use and PTSD. The questionnaire assesses crystal methamphetamine use by asking participants about several aspects of their use history, including inquiring about past use ("Have you ever used crystal methamphetamine?"; "If yes, about how many times have you used crystal methamphetamine?"), current use ("Do you currently use crystal methamphetamine?"; "Please rate your crystal methamphetamine use in the past 30 days.") and quit attempts ("Have you ever tried to quit using crystal methamphetamine?"; "If yes, how many times have you tried to quit?"; "About how long (in days) were you able to quit?"). For the purpose of this study, the extent of lifetime crystal methamphetamine use was measured by the number of times the participant endorsed using crystal methamphetamine. Although psychometric data are not currently available for this measure, correlations between use histories and posttraumatic stress symptomatology have begun to support construct validity of the measure (Smith et al., 2010).

Perceived Social Support. Perceived social support was measured using two of eight subscales of the Life Stressors and Social Resources Inventory (LISRES; Moos & Moos, 1997): the Spouse/Partner Subscale and the Friends Subscale. Both subscales ask participants about their perceived relationships and perceived interactions with their spouse/partner and friends (e.g., "Can you confide in him or her?"; "Can you count on your friends to help you when you need it?"). Participants rated each question on a 5-point Likert scale ranging from *never* to o*ften*. The total score for each subscale of the LISRES was calculated by totaling the item scores, such that higher scores are associated with greater perceived social support (Moos & Moos, 1997). Consistent with previous research (Brennan, Schutte, & Moos, 2006), a mean global rating of perceived social support was created by summing items across the two subscales administered and then dividing this sum by the number of subscales they completed (thus dividing by either 1

[when participants did not complete the spouse/partner scale, for example] or 2). The LISRES has demonstrated good psychometric properties with an internal consistency of .79 and an average test-retest reliability of .7 over a 1-year re-test interval (Moos & Moos, 1997).

Axis I Disorders. All Axis I disorders were assessed using the SCID (First et al., 1997). The SCID is a well-established semi-structured diagnostic interview that allows a trained professional to assess DSM-defined Axis I diagnoses (First & Gibbon, 2004). Each participant was assessed by a trained interviewer to determine whether or not the participant met criteria for abuse or dependence of a wide array of substances (e.g. cocaine, marijuana, alcohol), mood disorders, and anxiety disorders. Relations among the primary variables were examined first. Given our small number of participants who met criteria for each Axis I disorder, these groups were collapsed into one comprehensive group that represented the presence of one or more co-morbid Axis I condition.

Procedure

Upon their first visit (in the parent longitudinal study), participants completed the Crystal Methamphetamine Questionnaire, Posttraumatic Diagnostic Scale, and the Life Stressors and Social Resources Inventory. Additionally, participants were interviewed by a trained research assistant using the SCID.

Data Analytic Approach for Testing the Primary Hypotheses

Hierarchical regression analyses were conducted to identify the degree to which posttraumatic stress, crystal methamphetamine use, and social support were related. First, the relations among these variables were examined in a hierarchical regression analysis without including any covariates. A second regression analysis was then conducted in order to determine if unique relations among these variables emerge upon statistically controlling for comorbidity.

Research has shown that individuals who abuse crystal methamphetamine frequently also abuse other substances like alcohol, nicotine, or cocaine (Cho & Melega, 2002). Additionally, other Axis I disorders, including depression, are often related to PTSD (Kessler et al., 1995) and social support (Grav, Hellzen, Romild, & Stordal, 2012). To increase confidence that relations between crystal methamphetamine, posttraumatic stress symptom severity, and perceived social support are not due to other drugs that are commonly used in conjunction with crystal methamphetamine, or other Axis I disorders, we statistically co-varied for the presence of any Axis I condition (as indexed via *t* tests) with perceived social support in the current data (using dichotomous, SCID-indexed diagnoses of substance dependence) in step 1 of the hierarchical regression. There zero-order relations were examined between comorbidity and social support in order to determine if comorbidity was important to include as a covariate in the primary analyses. All predictors were mean-centered prior to being entered into the regression models, (Cohen & Cohen, 1983; Holmbeck, 2002).

Results

Descriptive Statistics and Zero Order Relations

Zero order correlations revealed that perceived social support was significantly related to posttraumatic stress symptom severity, $r = -.291$, p (one tailed) $< .01$. Perceived social support was not significantly related to crystal methamphetamine use, nor was crystal methamphetamine use significantly related to posttraumatic stress symptom severity. One-way ANOVAs also were utilized to examine the relations between primary variables. These analyses suggested that crystal methamphetamine use was not significantly related to posttraumatic stress symptom severity [$F(2,95) = .192$, $p = .826$], or perceived social support [$F(2,95) = .042$, $p = .959$]. The presence of a co-morbid Axis I condition was significantly related to perceived social support

[$t(96) = 2.052$, $p = .043$], with those who endorsed a co-morbid Axis I condition reporting significantly less perceived social support ($M = 25.96$, $SD = 6.80$) compared to those who did not meet criteria for a co-morbid Axis I condition ($M = 29.02$, $SD = 5.98$). Therefore, in an effort to isolate the unique association between posttraumatic stress symptom severity, crystal methamphetamine use history, and social support, the presence of an Axis I disorder (coded dichotomously: present versus absent) was entered into step 1 of the regression analyses employed to test the primary hypotheses.

Primary Hypothesis Tests

A hierarchical regression analysis was first employed to examine the relations among crystal methamphetamine use, posttraumatic stress symptom severity, and perceived social support without consideration of the role of comorbid psychopathology. The main effects of crystal methamphetamine use history and posttraumatic stress symptom severity were entered in step 1 of the model. Subsequently, the interaction term was entered in step 2. As expected, posttraumatic stress symptom severity was significantly related to perceived social support [B = -.145, β = -.322, $sr^2 = .104$, $t(93) = -3.299$, $p = .001$]. Contrary to hypotheses, frequency of crystal methamphetamine use was not significantly related to perceived social support [B = .003, β = .000, $sr^2 = .000$, $t(93) = .003$, $p = .998$]. Similarly, the interaction between posttraumatic stress symptom severity and methamphetamine use was not related to perceived social support [B = .069, β = .119, $sr^2 = .014$, $t(93) = 1.218$, $p = .226$].

A second hierarchical regression analysis was conducted to determine if posttraumatic stress and crystal methamphetamine use were related (independently or in combination) to perceived social support after statistically controlling for comorbidity observed to be related to social support in the current data. The presence of a co-morbid Axis I condition was

significantly related to perceived social support [B = -3.001, β = -.201, sr^2 = .040, t(95) = -2.004, p = .048]. Similar to our first analysis, there was a significant main effect of posttraumatic stress symptom severity [B = -.133, β = -.296, sr^2 = .085, t(93) = -3.001, p = .003]. There was not a significant main effect of methamphetamine use frequency [B = .101, β = .012, sr^2 = .000, t(93) = .120, p = .905], and the interaction term was not significantly related to social support [B = .089, β = .152, sr^2 = .022, t(92) = 1.548, p = .125].

Secondary Analyses

In a preliminary effort to examine crystal methamphetamine use rate (i.e., amount of use occurring during a particular period of time) rather than simply total lifetime use, we conducted an additional hierarchical regression adding age as a covariate in step 1 of the model described above. In this secondary analysis, the presence of a co-morbid diagnosis [B = -3.416, β = -.227, sr^2 = .051, t(90) = -2.197, p = .031] was significantly related to perceived social support, while age [B = -.076, β = -.094, sr^2 = .009, t(90) = -.906, p = .368] was not significantly related to perceived social support in step 1 of the model. In step 2, there was a significant main effect of posttraumatic stress symptom severity [B = -.304, β = -.304, sr^2 = .090, t(88) = -3.045, p = .003]; however, the frequency of methamphetamine use [B = .070, β = .008, sr^2 = .000, t(88) = .081, p = .936] was not significantly related to perceived social support. Finally, the interaction term, while still not at the .05 threshold of significance, began to approach significance once age was entered into the regression model as a covariate [B = .101, β = .172, sr^2 = .028, t(87) = 1.728, p = .087].

As an additional secondary analysis, the relations among crystal methamphetamine use, each of the three posttraumatic stress symptom clusters (re-experiencing, avoidance, hypervigilance), and social support were examined. Table 1 provides information regarding

these analyses. As evinced in the table, the interactions between crystal methamphetamine use and both reexperiencing and hyperarousal symptoms were not related to social support. However, the interaction between crystal methamphetamine use frequency and avoidance symptoms was significantly related to perceived social support [B = .780, β = .220, sr^2 = .046, $t(93) = 2.251$, $p = .027$]. This significant interaction was probed in two primary ways. First, Table 2 lists levels of avoidance and social support as a function of level of crystal methamphetamine use. Second, the nature of the interaction was examined consistent with recommendations offered by Holmbeck (2002). These analyses suggested that avoidance was a significant predictor of perceived social support for participants who denied ever using crystal methamphetamine [B = -1.115, β = -.387, sr^2 = .150, $t(52) = -3.060$, $p = .004$], but not a significant predictor for those who endorsed a history of crystal methamphetamine use [low use: B = -.811, β = -.342, sr^2 = .113, $t(23) = -1.781$, $p = .088$; high use: B = 1.232, β = .388, sr^2 = .107, $t(14) = 1.383$, $p = .188$].

Given that our original analyses were based on a self-report measure of perceived social support, an analysis using the presence of PTSD and crystal methamphetamine use to predict the likelihood of a failed marriage was conducted in an effort to examine a more objective measure of social support. A hierarchical logistic regression was conducted with dichotomous indices of PTSD and crystal methamphetamine use (i.e., positive versus negative use histories). The decision to use a dichotomous measure of crystal methamphetamine use was based on the pattern that emerged during the secondary analyses focused on specific PTSD symptom clusters. In that analysis, nonsignificant relations between avoidance symptoms and social support emerged for both participants low and high in crystal methamphetamine use frequency, but avoidance was related to social support among people who denied a history of using crystal methamphetamine.

This pattern suggests that crystal methamphetamine use history may be appropriately examined in the current study as a positive versus negative history of use. Therefore, the presence of a comorbid condition was entered in Step 1, the main effects of crystal methamphetamine use and PTSD were entered in Step 2, and the interaction term was entered into Step 3 of the model. Descriptive information for this analysis is listed in Table 3. The covariates, main effect, and the interaction were not significantly related to marital status. [1]

Discussion

There are strong negative associations between posttraumatic stress symptoms severity and perceived social support (Danner & Radnitz, 2000; Eriksson et al., 2001; Solomon, Mikulincer, & Hobfoll, 1987; Tucker, Pfefferbaum, Nixon, & Dickson, 2000). Indeed, PTSD has been associated with an increase in the occurrence of relationship difficulties and aggression (physical and psychological; Taft, Watkins, Stafford, Street, & Monson, 2011) as well as a decrease in reported social support (Kaniasty & Norris, 2008). Furthermore, research has linked PTSD with elevated use of crystal methamphetamine (Smith et al., 2010). The current study sought to examine relations among these commonly comorbid diagnoses and perceived social support.

In contrast to expectation, the main effect of crystal methamphetamine use, as well as the interaction between posttraumatic stress symptoms and crystal methamphetamine use frequency were not significantly related to perceived social support. This pattern suggests that crystal methamphetamine use may not be related to social support directly or in combination with posttraumatic stress symptom severity. However, when examining crystal methamphetamine use by PTSD symptom cluster, the significant interaction between crystal methamphetamine use and avoidance symptom severity seems to suggest otherwise. This interaction suggests avoidance

does not relate to perceived social support in the context of crystal methamphetamine use; however, social support does negatively co-vary with avoidance among non-users. One possible explanation for this pattern is that different combinations of levels of methamphetamine use frequency and avoidance resulted in essentially the same reported level of perceived social support. Please see Figure 1 for graphic representation of the pattern of mean perceived social support by level of crystal methamphetamine use and avoidance. In a first attempt to understand this interaction, comparisons between combinations of no, low, or high reported crystal methamphetamine use histories and low or high levels of posttraumatic symptom severity were attempted. This preliminary data pattern tentatively suggests that avoidance is significantly related to perceived social support when crystal methamphetamine use is not present, but that as crystal methamphetamine use increases, avoidance no longer relates as strongly to perceived social support. Given the number of analyses in the current study as well as the relatively few instances of crystal methamphetamine use relating to social support, replication of this pattern is needed prior to placing confidence in such an inference.

There are many different factors that may have resulted in the null findings related to associations between crystal methamphetamine use and perceived social support. The sample used in this study was a fairly unique sample. Given that all of the participants in the parent study were HIV positive, this may have altered what might be more typical patterns related to social support. For example, the LISRES measured support from friends and support from a spouse or partner. The unique characteristics of our sample may have resulted in unintentional missing or over-emphasizing of particular aspects of social support. Post hoc analysis of the National Comorbidity Survey-Replication (NCS-R) dataset revealed that the number of individuals in the current sample reporting never being married [42.9% (M_{age} = 47.78)] is much

larger compared to that being reported in nationally representative studies (i.e., 10.8% of individuals 40-50 year olds; unpublished analysis; Dutton, 2012). Furthermore, because participants in the current sample may be particularly likely to deny having a spouse or partner, the construct validity of the LISRES may have been reduced. It would appear from our sample that those who have been able to stay in a committed relationship (i.e., married or partnered; n = 40) report an average level of social support (M_{Males} = 23.44, SD = 5.37; $M_{Females}$ = 21.12, SD = 8.20) that appears slightly greater than that reported by the normative sample (M_{Males} = 19.69 SD = 4.39; $M_{Females}$ = 18.54, SD = 5.14; Moos, 1994). This may be indicative of the fact that the relatively few participants who were able to maintain a committed relationship were in particularly resilient and supportive relationships. This may have overshadowed the fact that on average, our sample reported feeling less supported by friends (M_{Males} = 21.02, SD = 5.85; $M_{Females}$ = 18.76, SD = 6.21) than those in the norming sample (M_{Males} = 23.78 SD = 7.52; $M_{Females}$ = 27.48, SD = 6.22; Moos, 1994).

In addition to concerns regarding measurement of social support, it also is possible that crystal methamphetamine was not the primary drug used by our participants. While we were able to statistically isolate the relations between crystal methamphetamine and social support, frequent use of other substances may have masked an effect of crystal methamphetamine use that would be seen among individuals who primarily use crystal methamphetamine. Bias in self-reporting frequency of crystal methamphetamine use may also be a contributing factor to the null main effects. One limitation of the current measure used to quantify crystal methamphetamine use frequency is that researchers coded use frequency as "99" for participants who reported that they had used "too many times to count." This coding system artificially grouped users with frequent use histories into a single category. Exploratory analyses of rate of crystal

methamphetamine use rather than total use suggested the interaction between crystal methamphetamine use density and posttraumatic stress symptom severity approached significance in predicting social support. Future studies should augment the manner in which they quantify crystal methamphetamine use to account for rate of use rather than total use alone.

Consistent with hypotheses, posttraumatic stress symptom severity was related to perceived social support. Results suggested a significant negative association between perceived social support and posttraumatic stress symptom severity. Consistent with the literature, there was a medium effect size of posttraumatic stress symptoms as related to perceived social support (r = -.31; Cohen, 1992). This is similar to the effect size (r = .3) found between a lack of social support and posttraumatic stress disorder in the civilian studies of a meta-analysis of the risk factors for posttraumatic stress disorder (Brewin, Andrews, & Valentine, 2000).

Given the unique nature of our sample, and that a large amount of our sample reported never having been married, rate of failed marriage was likely not an ideal index of social support. Similarly, 77.1% of the sample reported using crystal methamphetamine with 2 or more people. Research has shown that crystal methamphetamine is often used as a "club drug" (Fernández et al., 2005; Hirshfield, Remien, Humberstone, Walavalkar, & Chiasson, 2004), thus insinuating that it may artificially enhance one's perceived social support network by creating a social environment with other users. Perhaps, the current participants who endorsed both high lifetime use of crystal methamphetamine and high levels of perceived social support feel supported socially, but it may not be the type of social support that aids in the remediation of posttraumatic stress symptoms (e.g., inclusive of traumatic event-related information processing). Given that we do not know who they based their social support ratings on, it is not possible in the current

study to determine if the social support reported here is the type of social support thought to aid in the recovery from traumatic event exposure.

There are various limitations associated with the current study in addition to those described above that should be considered when interpreting the results. One limitation of the study is the difficult nature of measuring social support. The current study utilized a self-report measure of social support, which opened the data up to potential reporter bias. As an effort to look at an unsophisticated measure of actual social support, we examined the rate of failed marriages as a function of both posttraumatic stress symptom levels and crystal methamphetamine use frequency. These results also showed that none of the predictors were significantly related to the failure of marriage. To date, there are no psychometric data available on the crystal methamphetamine questionnaire used in this study. For the current study, we utilized the number of times a participant endorsed using crystal methamphetamine as a measure of crystal methamphetamine use history. Perhaps utilizing different use criteria (e.g., crystal methamphetamine dependence) or capturing rate of use would provide a more representative picture of the effects of crystal methamphetamine use on social support. According to the National Survey on Drug Use and Health, there were 323,000 new initiates of crystal methamphetamine use in the year 2002 alone (U.S. Department of Health and Human Services, 2003). When we look at use for individual states, we see that west coast states like California have some on the highest use rates, with Public Broadcasting Service (2006) reporting that in 2003, California had 175 treatment admissions for methamphetamine use for every 100,000 residents. Given that all individuals in our sample were diagnosed with HIV, reported multiple co-morbid Axis I conditions, and lived in an area that has higher reported rates of

methamphetamine use than other locations, the results of the study will likely generalize best to similar populations.

Future studies may benefit from utilizing alternative measures of social support that examines other social support constructs. For example, looking at apprehension about utilizing social support, social conflict, or even functional versus perceived social support. Recent research has demonstrated that while individuals with varying levels of psychopathology may not endorse differing levels of perceived social support, they do endorse significantly different levels of apprehension about utilizing this social support (Dutton, unpublished data). Similarly, a sample that is not diagnosed with HIV and primarily use crystal methamphetamine, may yield a more generalizable representation of the relations between posttraumatic stress symptom severity, crystal methamphetamine use frequency and perceived social support.

Limitations not withstanding, this study served to expand our understanding of the relations among crystal methamphetamine, posttraumatic stress symptoms, and perceived social support. By replicating an association between posttraumatic stress symptom severity, this study highlighted the importance of continued study of the complex relation between posttraumatic stress symptom severity and perceived social support. While crystal methamphetamine did not appear to negatively impact perceived social support or posttraumatic stress symptoms severity, it is important to continue to investigate these relations with alternative populations and primary variables prior to concluding that these variables are not significantly related to one another. Further understanding these relations will afford us the knowledge necessary for the improvement of existing treatments and the creation of treatments that target these co-morbid disorders.

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Footnotes

[1] The sample size for the logistical regression (n = 49) was significantly smaller than our original sample (n = 98) due to the fact that 49 out of 98 people endorsed being widowed or never married, and thus were not coded into the married or separated/divorced groups utilized in the analysis.

Table 1.

Individual Variable Contributions Predicting Perceived Social Support

	Re-experiencing			Avoidance			Hypervigilance		
	ΔR^2	β	sr^2	ΔR^2	β	sr^2	ΔR^2	β	sr^2
Step 1	.042*			.042*			.042*		
Co-Morbidity		-.205	.042		-.205	.042		-.205	.042
Step 2	.037			.064*			.099**		
CM Use		.012	.000		.025	.000		-.016	.000
PTSS		-.192	.036		-.254*	.064		-.321*	.099
Step 3	.011			.047*			.002		
CM Use × PTSS[a]		.111	.011		.228*	.047		-.046	.002

Note. $n = 98$; β = standardized beta weight; CM = crystal methamphetamine; PTSS = posttraumatic stress symptom severity.
[a] = interaction term for crystal methamphetamine use frequency and reported posttraumatic stress symptom severity.
*$p < .05$. **$p < .01$. ***$p < .005$.

Table 2.

Levels of Perceived Social Support and Avoidance as a Function of Crystal Methamphetamine Use Frequency

Group		Perceived Social Support	Avoidance Symptoms
	n (%)	*M (SD)*	*M (SD)*
No Crystal Methamphetamine Use	55 (56.1%)	27.87 (6.93)	2.09 (2.41)
Low Crystal Methamphetamine Use (1 - 98 times)	26 (26.5%)	26.50 (5.37)	1.50 (2.27)
High Crystal Methamphetamine Use (More than 99 times)	17 (17.3%)	27.06 (8.02)	2.65 (2.52)

Table 3.

Logistical Regression Predicting Failed Marriage

	Wald	*p*	Exp(B)	95% Confidence Interval
Comorbid Axis I Condition	.257	.612	1.395	.385-5.053
Crystal Methamphetamine Use	.404	.525	1.554	.399-6.047
PTSD	.251	.616	.645	.116-3.589
Interaction	.076	.783	.687	.048-9.859

Note. $n = 49$; Exp(B) = exponentiation of the B coefficient, or the odds ratio; PTSD = posttraumatic stress disorder.

Figure 1.

Perceived Social Support as a Function of Crystal Methamphetamine Use Level and Avoidance Level.