

# 9/11 AND NEW YORK CITY FIREFIGHTERS' POST HOC UNIT SUPPORT AND CONTROL CLIMATES: A CONTEXT THEORY OF THE CONSEQUENCES OF INVOLVEMENT IN TRAUMATIC WORK-RELATED EVENTS

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**We generate and test a context theory of the impact of involvement in work-related critical incidents, positing that variation in units' postevent support and control climates explains cross-unit variation in individual stressor-strain relationships, that posttraumatic distress mediates the link between critical incident involvement and negative emotional states, and that current support and control climates assume relevance by operating as contextual moderators of these individual-level mediated paths. Using multilevel data from New York City firefighters, many of whom were involved in 9/11, we find significant but unique cross-level moderating effects for both climate factors. Research and practice implications are discussed.**

Scholars are beginning to show a distinct and growing appreciation for the role of context—"situational opportunities and constraints that affect the occurrence and meaning of organizational behavior as well as functional relationships between variables" (Johns, 2006: 386)—in organizational research. As Johns suggested, by incorporating contextual variables into their models, researchers may be able to begin to explain anomalous findings and offer more relevant and practical insights for managers. In addition, they may also begin to enhance understanding of how individual attitudes, cognitions, and behavior may vary depending upon the structures, processes, and norms characterizing the

social units within which actors are nested. Nevertheless, as Johns also noted (2006: 389), although researchers often acknowledge that their findings are context-specific, studies in which the examination of context is a "declared and substantive" research objective are rare.

Scholars' failure to consider context may be of particular concern in occupational stress research. By focusing on subject-specific perceptions of various situational dimensions (e.g., job demands, control) and failing to take into account group and organization-level variables having the potential to directly influence individual strain or moderate individual-level stressor-strain relationships, researchers are at risk of committing either the "psychologistic fallacy" (that is, assuming that individual-level outcomes can be explained exclusively in terms of individual characteristics or perceptions) or the "atomistic fallacy" (that is, assuming that individual-level results imply the nature of relationships among similar variables at higher levels of analysis) (Diez-Roux, 1998). Moreover, a focus on individual factors has resulted in researchers' drawing implications that are largely for individuals (e.g., training in coping with stress) that workers, managers, and policy makers often find impractical and/or of limited utility (Bliese & Jex, 2002).

In the current study, we therefore generated and—using 9/11, the September 11, 2001, attack on the World Trade Center as an empirical referent—tested a context theory of the impact of involve-

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ment in catastrophic critical incidents, those unique and overwhelming events deemed as highly dangerous to oneself or one's significant others. Grounded in the traumatic stress literature as well as in the cognitive appraisal (Lazarus & Folkman, 1984; Karasek & Theorell, 1990) and resource (Hobfoll, 1989) stress frameworks, the model that we develop below suggests there is likely to be systematic variation in individual stressor-strain relationships over work units, variation likely to be at least partially explained by variation in the current (i.e., postevent) support and control climates of the work units. Our model further specifies the way in which current unit-level support and control climates moderate stressor-strain relationships. We posit that posttraumatic distress mediates the link between critical incident involvement and employee emotional well-being and that *current* support and control climates take on their relevance by operating as contextual moderators of these individual-level, mediated paths. We focus on *current* unit-level context because (1) some of the most severe mental health effects of traumatic incidents, namely posttraumatic distress and comorbid (associated) negative emotional states, often manifest themselves months after an event itself (Vermetten & Bremner, 2002) and, (2) given the highly unpredictable nature of such events, managerial and policy maker interest in learning what can be done *after the fact* to ameliorate the impact of involvement in such incidents is likely to be significant. Finally, we seek to extend the methodological "road map" provided by Bliese and Jex (2002) by illustrating how cross-level effects in organizational research can be modeled and analyzed when such effects are posited to moderate mediated, individual-level relationships (i.e., multilevel, moderated mediation models).

## THEORETICAL BACKGROUND AND HYPOTHESES

### Critical Incident Involvement, Posttraumatic Distress, and Emotional Well-Being

Critical incidents are specific, often unexpected and potentially life-threatening, time-limited events presenting individuals with loss of or threats to personal goals or well-being (Flannery, 1999). Exposure to such incidents has been associated with a variety of negative emotional states, such as depression, anxiety, and stress, in the immediate postevent period as well as months and even years after the actual events (Vermetten & Bremner, 2002). Moreover, much of the traumatic stress literature explains the link between incident

exposure and subsequent psychopathology, such as negative emotional states, as being mediated by posttraumatic distress (Creamer, Burgess, & Pattison, 1992; Flannery, 1999).

Traumatic distress may arise when an individual is confronted with a threat of death or serious injury, and when, as a result, the individual experiences intense fear, horror, or helplessness (American Psychiatric Association [APA], 1994). Traumatic distress severity depends on the degree to which such traumatization results in the emergence of a cluster of characteristic symptoms, including intrusive recollections of the threat event (e.g., nightmares), avoidance of the traumatic situation (e.g., changing the topic of conversation so as not to discuss what happened), and increased physiological arousal (e.g., an exaggerated startle response) (APA, 1994; Flannery, 1999). *Posttraumatic* distress refers to such symptoms first emerging a month or more after the event or—even if they initially appeared closer to the time of the event (within a month)—continuing to be experienced for at least a month after it (APA, 1994). Emergency service workers, the focus of our attention in the current study, have been identified as being at heightened risk for posttraumatic distress (McFarlane, 1998), and 10 to 20 percent have been shown to have posttraumatic distress (e.g., Emsley, Seedat, & Stein, 2003).

Cognitive processing and resource ecology theories are among those most widely adopted by psychologists to explain the links between critical incident involvement, posttraumatic distress, and distress comorbidity. Underlying both theories is the assumption that although the neurobiological changes associated with posttraumatic distress may partially explain comorbid negative emotional states, such comorbidity may also stem from victims' responses to, and attempts to cope with, distress symptoms related to critical incident involvement (Flannery, 1999; Wilson, 1989).

According to a cognitive processing perspective (Brewin & Holmes, 2003; Creamer et al., 1992), when individuals are exposed to a critical incident, they may be confronted with information that is largely inconsistent with existing schemas regarding their safety and invulnerability (Horowitz, 1986), their ability to rely upon others (Flannery, 1999), and the predictability and rationality of events (Antonovsky, 1979). Until an individual can generate a new mental model enabling the restoration of feelings of invulnerability, attachment, and security, the event is likely to remain in the individual's active memory and may trigger the characteristic intrusion, avoidance, and hypervigilance symptoms noted earlier (Nishith, Resick, &

Mueser, 2001). In the short run, by promoting cognitive processing of the event, acute distress symptoms such as intrusive memories may be viewed as functional, effectively “teaching” the individual how to better respond to such events should they ever be encountered again (Yehuda, McFarlane, & Shalev, 1998). However, if still unresolved after a number of weeks, such symptoms can have a severe, adverse effect on victims’ emotional well-being, triggering or exacerbating such negative states as depression, anxiety, and stress (Brown, Read, & Kahler, 2002). Avoidance behaviors may be predictive of more severe negative emotional states in that by preventing an individual from confronting and resolving event-related fears, they contribute to the continued presence and potential exacerbation of psychological symptoms (Creamer et al., 1992: 453–454).

According to a resource ecology perspective (Hobfoll, 1989), critical incident involvement may result in distress because of how people cope or attempt to cope with the loss or threatened loss of key resources—those objects (e.g., home), personal characteristics (e.g., self-esteem), energies (i.e., physical, financial), and social systems (i.e., interpersonal relationships) of greatest value to them. Involvement in a critical incident may itself result in the loss of object, energy, personal, or social resources (primary resource loss), and *secondary* resource loss may occur as one uses personal, energy, and social resources to counter or compensate for the primary resource loss. Moreover, as resources become depleted, individuals tend to adopt less efficient or maladaptive loss-control strategies, resulting in the emergence of loss spirals, or patterns of increasingly more rapid depletion of the resources needed to offset stress, improve one’s condition, and reduce future stress vulnerability (Hobfoll et al., 2003: 633). To the extent that compulsive (e.g., persistent and chronic reexperiencing of a critical incident in thoughts and daydreams), arousal (e.g., hypervigilance), and avoidance (i.e., of places or things associated with the event) behaviors characterize the maladaptive loss-control strategies that some individuals adopt as they approach resource depletion, conservation of resources theory provides a logical explanation for the association between critical incident involvement and posttraumatic distress (Arata, Picou, Johnson, & McNally, 2000). This theory also provides an alternative explanation for the link between posttraumatic distress and comorbid negative emotional states by suggesting that (1) prolonged and unsuccessful distress coping may only result in further resource deterioration, “with negative sequelae occurring in increasingly rapid

and critical loss cycles” (Hobfoll, 2002: 314) and (2) having already depleted their resource reservoirs in attempting to cope with a critical incident itself, victims may lack the resources needed to cope with posttraumatic distress symptomatology (Holohan, Moos, Holohan, & Cronkite, 1999; Kaniasty & Norris, 1993).

In sum, extensive and consistent evidence supports a link between critical incident involvement and negative emotional states, with posttraumatic distress serving as a critical mediator of this relationship. Moreover, implicit in most models is the recognition that not all individuals are likely to be similarly affected by a common critical incident experience and that individual-level factors (e.g., Brewin, Andrews & Valentine, 2000) as well as broader concurrent and postincident contextual conditions (Brewin et al., 2000: 751) may condition posttraumatic distress processes.

### On the Need to Consider Unit-Level Context in Occupational Stress Research

Although the broader social context is far less studied than individual difference moderators of posttraumatic distress processes, for a number of reasons it may be important to consider this context in seeking to explain why some individuals experience more severe psychological outcomes than others when exposed to similar traumatic stimuli. First, as Bliese and Jex (2002: 267) noted, failure to consider contextual or climate factors in stress models may increase bias in standard error estimates and statistical inferences, since stress data are typically collected from individuals nested in groups, and since individual strain- and stress-related perceptions may be at least partially a function of the group to which these individuals belong. Second, social context, by shaping or characterizing social interaction, may significantly affect both the degree to which an incident is interpreted as traumatic (Festinger, 1954) and “how individuals respond to stressors” (Bliese & Jex, 2002: 267).

Although, as noted earlier, organizational researchers have only recently begun to consider the conditioning effects of context, a substantial body of empirical evidence already suggests that the individual-level relationship between a given stressor and psychological strain may not be consistent over social units (see, e.g., Bliese & Castro, 2000; Jex & Bliese, 1999). Generalizing from such findings to the critical incident involvement–negative emotional states relationship, we therefore propose:

*Hypothesis 1. The association between the intensity of employees’ involvement in a work-*

*based critical incident and their postevent negative emotional states (i.e., depression, anxiety, and stress) varies significantly over work units.*

### **Postincident Unit Support and Control Climates as Protective Factors**

If the association between the intensity of involvement and negative emotional states does indeed vary among work units, what are the salient dimensions along which these work units vary that might explain these differential effects? Drawing from both cognitive/appraisal-based and resource-based models of stress, we propose that two *current* (i.e., postincident), *unit-level* climate factors having to do with control (i.e., employee influence climate) and support (i.e., supervisory support climate) moderate the association between critical incident involvement and negative emotional states and therefore largely explain these differential effects. A focus on postincident unit climate conditions is important as some preliminary evidence shows that factors operating after a critical incident may have stronger effects on well-being than pre-incident factors or those concurrent with the event itself (Brewin et al., 2000; Emsley et al., 2003). From a practical perspective, given that critical incidents are by definition unpredictable and that practitioners therefore often find it difficult to take the necessary steps to minimize their impact *prior* to event occurrence, identifying the kinds of postevent work unit conditions that may ameliorate the psychological impact of critical incidents on their victims potentially has substantial value. Understanding these conditions may facilitate the adoption of postincident interventions aimed at creating a more therapeutic and recovery-favorable postevent unit climate.

Our focus on unit-level control and support climates stems from the fact that for over 30 years, control and support (Johnson & Hall, 1988; Karasek & Thorell, 1990) have been recognized as potentially protecting employees from stressful workplace conditions. However, as Van Yperen and Snijders (2000) noted, although the job demands, control, and support (JDCS) model was initially based on the buffering effect of control and support as *environmental* factors, it has almost always been tested in terms of respondents' *personal perceptions* of such factors. Indeed, Van Yperen and Snijders's empirical results suggest that one reason for the inconsistent support for the JDCS model is that these buffering effects, which have more to do with differences between work groups than differences between individuals within work groups, are diffi-

cult to pick up when testing buffering models with individual-level analyses. Results of recent multi-level analyses (Bliese & Castro, 2000; Jex & Bliese, 1999; Van Yperen & Snijders, 2000) suggest that as long as intragroup perceptions of support and control are relatively homogeneous, these buffers may indeed show relatively consistent and robust impacts on individual stressor-strain relations when examined as aggregate, unit-level phenomena. From a cognitive perspective, current unit control and support climates may influence victims' ability to both process and cope with a previously experienced incident. As we discuss below, members of units characterized by greater employee control may be better positioned to engage in problem-focused (rather than avoidance-focused) incident processing (Jex & Bliese, 1999), thus reducing their risk of distress and comorbid negative emotional states. Similarly, units' supportive climates may facilitate their members' cognitive processing in that they may be less exposed to postincident social disruption (Freudenburg, 1997) and more able to seek and receive needed assistance (Hopkins, 1997).

From a resource ecology perspective, conservation of resources theory also suggests control and support as key environmental factors conditioning the effects of incident involvement on individuals' subsequent emotional well-being (Arata et al., 2000). Specifically, a strong employee control climate, by providing employees the opportunity to influence their work process and/or context, is likely to provide unit members with an important basis for a strong sense of self-efficacy, a key personal resource. Similarly, a strong supervisory support climate is likely to provide an important basis from which unit members can draw key object, energy, and social resources. In this context, the resource ecology literature suggests that when policies and practices giving employees greater mastery over situations that pose an objective risk to valued resources characterize work contexts, employees may gain self-efficacy and use their own resources more efficiently in both directly confronting the risk and cognitively processing their involvement in threatening situations *post hoc*. Similarly, in more supportive work environments, the rate and extent of net resource loss resulting from postincident coping and processing may be reduced and perhaps even offset as supervisors facilitate the replenishment of depleted resources.

Consequently, drawing from both of these perspectives, we posit that postincident, unit-level employee control and supervisor support climates explain the cross-unit variance, posited in Hypothesis 1, in the association between the intensity of

employees' involvement in critical incidents and postevent negative emotional states. Specifically, we propose:

*Hypothesis 2. Postincident unit control and supervisory support climates attenuate the direct association between the intensity of an employee's involvement in a work-related critical incident and the employee's postevent negative emotional states.*

### How These Climatic Buffering Effects Operate

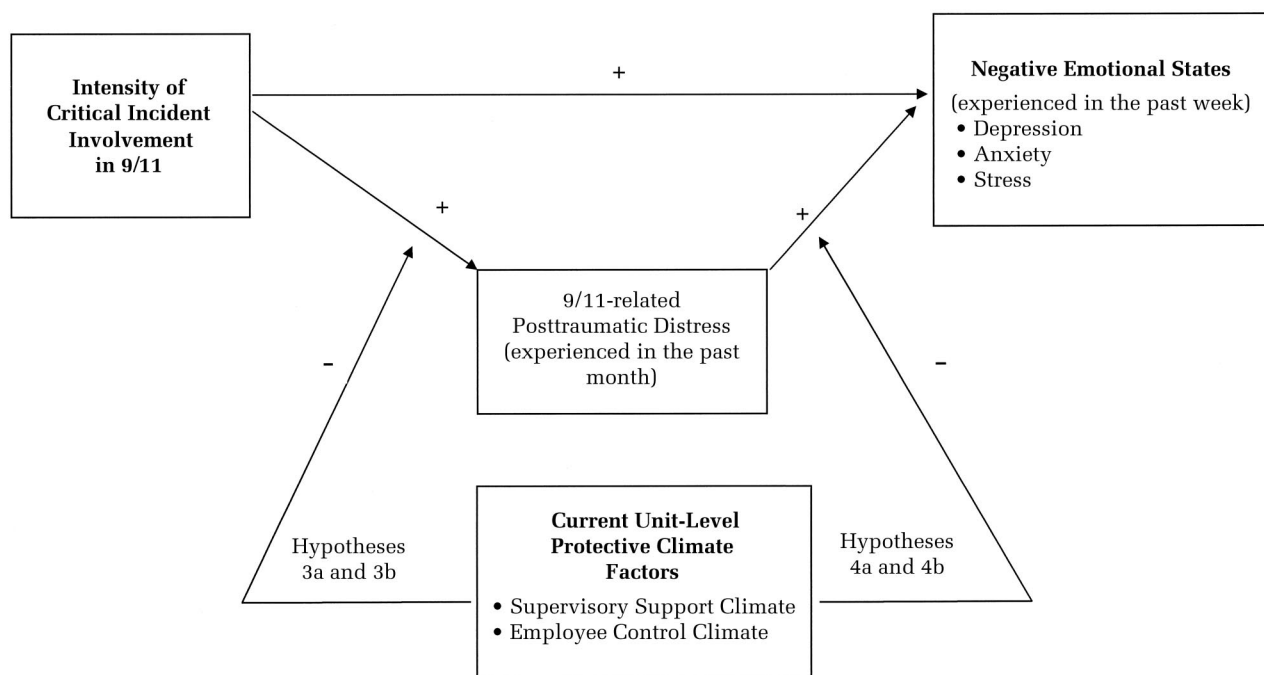
However, if, as suggested above, posttraumatic distress does mediate the association between incident involvement and negative emotional states, conditioning effects of the postincident control and support climates on the main effect of critical incident involvement on negative emotional states should be explained by these same climate factors conditioning the mediating paths (that is, the paths between critical incident involvement and posttraumatic distress, and between distress and negative emotional states). The question thus becomes whether and how the two unit-level climates moderate the two mediating paths. As Figure 1 shows, we propose that the unit-level employee control and supervisory support climates are protective, attenuating the association between critical incident involvement and posttraumatic distress as

well as that between distress and negative emotional states.

Employee control climate moderation of the association between critical incident involvement and distress is consistent with both the cognitive processing and resource perspectives discussed above. A cognitive perspective suggests that units with strong control climates are likely to provide their members with strong senses of mastery and control over their jobs, general work environment, and the risks inherent in both. Consequently, members of such units are less likely to feel they must be hypervigilant to regain mastery and control over their work environment, and they may also be more likely to process such experiences via problem-focused as opposed to avoidance-focused coping (Jex & Bliese, 1999). A resource perspective, as noted above, suggests that units with strong control climates are likely to instill in their members greater senses of self-efficacy, a key personal resource. Approaching the stresses of incident involvement with superior resource armamentaria, employees in such units are consequently less likely to enter loss cycles and adopt the maladaptive and ultimately resource-draining loss-control strategies (e.g., hypervigilance, avoidance) characteristic of such cycles.

Similarly, the cognitive processing and resource perspectives suggest that a unit's supervisory sup-

**FIGURE 1**  
**A Moderated Mediation Model of the Impact of the Intensity of Critical Incident Involvement in 9/11 on Depression, Anxiety, and Stress**



port climate is likely to condition the association between incident involvement and posttraumatic stress. From a cognitive perspective, one would expect individuals employed in units with strong supervisory support climates to be better protected from the challenges that traumatic events often pose to social relationships (Arata et al., 2000). That is, in contrast to the members of units with strong supervisory support climates, members of units in which supervisor support is weaker are likely to experience more postevent bureaucratic rigidity and evasiveness, aspects of what Freudenburg (1997) labeled "corrosive community." Given that avoidance and hypervigilance may offer rational means by which to cope with the social disruption inherent in corrosive communities and that such conditions may only exacerbate intrusive reminders, it is likely that the link between incident involvement and posttraumatic distress is weaker among members of units in which supervisory support is stronger.

Conservation of resources theory can also serve as a basis for prediction of such attenuation, because in this theory, support is considered a primary social resource. As noted above, according to conservation of resources theory, employees in units rich in support resources are likely to be less negatively affected by the resource drain or loss that accompanies stressful conditions (Hobfoll, 2002: 318). In addition, because members of units with stronger support climates are likely to have the necessary resource armamentaria to allow them to better solve the administrative, social, and political problems often resulting from a critical incident, they are also less likely to be forced to allocate scarce resources to the management of stresses stemming from postincident social deterioration (Freudenburg, 1997; Kaniaty & Norris, 1993). The upshot is that members of trauma-exposed units in which social resources are in lower supply (units with weaker postincident supervisory support climates) are likely to be more vulnerable to secondary resource loss and depletion and, as a result, more likely to manifest the distressed behaviors typical of those in a state of resource depletion (Arata et al., 2000; Hobfoll, 1998).

Taking both perspectives into account, we posit:

*Hypothesis 3a. Postincident unit-level employee control climate moderates the association between the intensity of involvement in a work-related critical incident and posttraumatic distress in such a way that the stronger the unit-level employee control climate, the weaker this link.*

*Hypothesis 3b. Postevent unit-level supervisory support climate moderates the association between the intensity of involvement in a work-related critical incident and posttraumatic distress in such a way that the stronger the unit-level supervisory support climate, the weaker this link.*

Furthermore, in keeping with both the cognitive and resource perspectives noted above, these same two unit climate factors may also condition the association between posttraumatic distress and such negative emotional states as depression, anxiety, and stress. From a cognitive perspective, we argue that posttraumatic distress may be less predictive of negative emotional states among employees in units with stronger support and employee control climates because of the climates' effect on trauma victims' willingness and ability to receive assistance. The literature on work-based helping (e.g., Hopkins, 1997) suggests that supervisors, who are key referral agents for troubled workers, are more willing to recognize employee problems and take supportive action when providing such assistance is a taken-for-granted form of interaction in a work unit and that those needing help are more receptive to it when it is offered in such a context. Consequently, in units with stronger supervisory support climates, employees suffering from posttraumatic distress are more likely to be encouraged to seek help earlier and more likely to respond to their supervisors' help-giving attempts. Similarly, employees in units with stronger employee control climates may feel strong senses of self-efficacy and self-confidence (Gist & Mitchell, 1992), both of which may facilitate help seeking (Nadler, Maler, & Freidman, 1984) and thereby result in more timely and effective management of posttraumatic distress and avoidance or amelioration of associated negative emotional states. In contrast, employees in units with weak employee control climates may be subject to learned helplessness (Mikulincer & Nizan, 1988), an important impediment to timely and effective help seeking (Nadler et al., 1984). Thus, to the extent that employees in strong support and control climates are better positioned to resolve distress-related problems earlier than employees in weak support and control climates, it is likely that the association between distress symptomology and negative emotional states will be weaker among the employees in the strong climates.

A similar prediction can be based on conservation of resources theory. The threat of negative emotional states is particularly high after critical incidents because, after an initial mobilization of social support, support often deteriorates (Kaniasty

& Norris, 1993), leaving people even more vulnerable to negative sequelae in the postincident environment. However, work units characterized by strong supervisory support and employee control climates may provide their members with greater social (i.e., support) and personal (i.e., self-efficacy) resources, making them more capable of effective and efficient problem solving (Hobfoll, 2002) and thus less susceptible to the coping-related resource drain that may have negative psychological sequelae.

Consequently, drawing from both the cognitive and resource perspectives, we posit:

*Hypothesis 4a. Postincident unit employee control climate moderates the association between posttraumatic distress and negative emotional states (i.e., depression, anxiety, and stress): the stronger the unit-level employee control climate, the weaker this link.*

*Hypothesis 4b. Postincident unit supervisory support climate moderates the association between posttraumatic distress and negative emotional states: the stronger the unit-level supervisory support climate, the weaker this link.*

## METHODS

### Sample

To test the hypotheses presented above, we analyzed data collected from a sample of New York City firefighters. These data were collected in early 2003 via a self-report questionnaire distributed to all members of a stratified random sample of 144 (out of a total of 346) engine and ladder companies, regardless of their level of involvement in the events surrounding the September 11, 2001, attack on the World Trade Center. Specifically, using the Fire Department of New York's (FDNY's) three-category system differentiating more active from less active firehouses, we randomly sampled an equal number of the firehouses in each category (48 each from "highly active," "moderately active," and "relatively inactive") for inclusion in the study. Surveys were distributed by union shop stewards and returned by respondents directly to us by prepaid mail. Of the 2,502 questionnaires distributed, 1,653 were returned (a response rate of 66 percent).

We included in our analysis only those firefighters ( $n = 1,600$ ) who specified the company to which they belonged. In addition, given the small number of women firefighters in our sample ( $n = 10$ ), we included only individuals responding to the gender question (10 failed to do so) and indi-

cating that they were male ( $n = 1,580$ ). Additionally, following Bunderson (2003), and in order to ensure the reliability of the unit-level assessed independent variables, we only included firefighters from the 101 companies with at least 5 respondents ( $n = 1,401$ ). Thus, in the average company included in our final sample, 14 of the 20–25 company members had responded to the survey, for a mean company-level response rate of over 60 percent. Finally, 291 observations were excluded because of missing data on one or more core demographic variables such as age, education, and marital status, leaving a final sample of 1,110. There were no significant differences in any of the individual-level variables of theoretical interest (i.e., intensity of exposure, distress, depression, anxiety, stress) between those dropped from the sample for any of the reasons specified above and those retained. Respondents ranged in age from 21 years to over 60, with a mean age of 33.

### Measures

With the exception of the measures of current support and control climate, which were aggregated to the unit level (level 2), all of the variables described below were specified at the individual level (level 1).

**Dependent variables.** Given the centrality of depression, anxiety, and stress as comorbid phenomena in the trauma literature (Vermetten & Bremner, 2002: 15), we operationalized *current* negative emotional states in terms of these three variables, assessing them on the basis of the 21-item version of the Depression Anxiety and Stress Scale (DASS-21; Antony, Bieling, Cox, Enns, & Swinson, 1998). Like the longer version of the DASS upon which it is based, the DASS-21 has been found to effectively distinguish between features of depression, physical arousal, psychological tension, and agitation and to have excellent internal consistency, temporal stability, and concurrent validity (Antony et al., 1998). Study participants were asked the degree to which each of 21 statements relating to stress (e.g., "I found it difficult to relax"), depression (e.g., "I felt down-hearted and blue"), and anxiety (e.g., "I felt I was close to panic") applied to them *over the past week*. The response format ranged from 0 ("did not apply to me at all") to 3 ("applied to me most of the time"). The Cronbach alpha reliability coefficients were .93, .88, and .92 for depression, anxiety, and stress, respectively.

**Independent and mediating variables.** *Intensity of involvement in 9/11* (critical incident involvement) was assessed with Monnier, Cameron, Hobfoll, and Gribble's (2002) critical incident inven-

tory, a measure developed to assess the intensity of first-responder exposure to multiple critical incidents in the weeks prior to assessment. We modified this measure slightly to reflect the varying involvement of firefighters with one particular critical incident, namely 9/11, the September 11, 2001, destruction of the World Trade Center in New York. Our measure of critical incident involvement required respondents to focus on this particular event and respond with it as their frame of reference. Our modified Monnier et al. measure assessed 19 different modes of involvement, 4 of which had to do with varying degrees of self-injury. As did Monnier et al., we generated a total score for critical incident involvement by summing the item-specific scores. However, because self-injury suggests involvement of a different order of magnitude, whereas each of the remaining 15 items was scored 0 or 1 (“affirmative”), an affirmative answer to any of the four self-injury items was assigned a value between 2 (“minor injury but no treatment required”) and 5 (“severe injury requiring medical attention and placement on light duty or leave for 3+ tours”), for a total measure range of 0 to 20. Additionally, for this measure to also capture whether or not a person was on-site on that day, those who were not at the World Trade Center on September 11 itself received a 0 on this measure. We limited our examination of intensity to the day itself because, given the nature of the event and the relative lack of survivors to be searched for or rescued, a largely invariant degree of involvement intensity characterized the days following the actual event.

Finally, we should note that although intensity of involvement was assessed approximately 18 months after the event itself, for a number of reasons, we deem the likelihood of retrospective bias to be low. First, as Brewin et al. (2000) noted, the risk of bias in reports about involvement in a traumatic event is in fact likely to be *lower* when individuals evaluate their involvement some time after the event. If surveyed too soon after the event, trauma victims are often unable to accurately appraise what happened, because they feel numb. Second, as Miller, Cardinal, and Glick (1997: 201) noted, the risk of retrospective bias is greatly diminished when, as in the current case, appraisal items ask about simple, objective facts and concrete events (i.e., the number of sick days taken owing to injury), the event of interest occurred in the recent (rather than distant) past, and respondent confidentiality is assured.

We measured *posttraumatic distress* using Weiss and Marmar’s (1997) Impact of Event Scale Revised (IES-R). Based on the original IES developed by

Horowitz, Wilner, and Alvarez (1979), this validated measure is one of the instruments most widely used to assess the extent of traumatic event intrusion, avoidance, and hyperarousal. To ensure that respondents reported intrusion, avoidance, and hyperarousal symptoms related to 9/11, we added a reference to the World Trade Center collapse on September 11 to all scale items. Accordingly, respondents were asked to indicate the extent to which they had experienced, *in the past month*, any of 23 symptoms relating to 9/11 (regardless of whether or not they were at the World Trade Center on that day). The symptoms listed included: “trouble staying asleep due to thoughts about 9/11” (intrusion), “making efforts to try and NOT talk about 9/11” (avoidance), and “reminders of 9/11 resulting in a physical reaction” (hyperarousal) (0, “not at all,” to 4, “frequently”). The Cronbach’s alpha reliability for this measure was .95.

**Moderating variables.** We assessed *current unit control climate* by aggregating company members’ individual-level scores on Bacharach, Bamberger, Conley, and Bauer’s (1990) instrument as adapted for use with firefighters. On the basis of preliminary interviews with over a dozen New York City firefighters and officers, we identified six main decision areas (e.g., task and field assignments and selection of equipment and resources) over which the degree of firefighter influence appeared to vary from company to company (see Appendix A for scale items). Using the Bacharach et al. (1990) measure, we constructed an individual-level employee influence score by estimating the mean level of influence (1, “little or no input,” to 7, “a great deal of input”) firefighters felt that they had regarding each of these six decision domains. Cronbach’s alpha was .86. We aggregated individual-level perceptions to each firefighter company to provide a unitwide description of control climate. Aggregation was empirically justified on the basis of the within-group agreement (median  $r_{wg} = .77$  [range = .16–.95]); significant explanation of the individual-level variability by company affiliation ( $ICC_1 = 0.07$ ,  $p < .05$ ); and the reliability of group means ( $ICC_2 = 0.24$ ).

To assess the *current supervisory support climate*, we asked respondents to indicate how often (1, “not at all,” to 4 “very often”) their company officers<sup>1</sup> exhibited the four support behaviors serving as the basis of Caplan, Cobb, French, Harrison, and Pinneau’s (1975) measure of social support. We

<sup>1</sup> The average FDNY company has four officers, of whom two work any given “tour” (i.e., shift).

aggregated the individual-level perceptions to obtain a unitwide description of supervisory support climate ( $\alpha = .82$ , median  $r_{wg} = .83$  [range = .48–.97],  $ICC_1 = 0.08$ ,  $p < .01$ , and  $ICC_2 = 0.52$ ).

**Control variables.** In testing the hypotheses noted above, we controlled for a variety of respondent demographic attributes, including age, marital status, and education level. In addition, we controlled for social desirability bias, assessed with the Balanced Inventory of Desirable Responding (BIDR) scale (Paulhus, 1991). Finally, we controlled for respondent presence at the World Trade Center on September 11 to take into account its possibly confounding effect on intensity of involvement.

In addition, to take into account the possible effects of involvement in post-9/11 search and rescue/recovery activities, we also controlled for the duration of involvement in each of these post-9/11 critical incident phases, asking each respondent to report the number of days he was engaged in each operation (up to 19 days for search and rescue and up to 311 days for recovery). Furthermore, because of the lag between possible involvement in 9/11 or one of the post-9/11 search or recovery phases on the one hand, and our assessment of firefighters' emotional well-being on the other, we also controlled for the possibly confounding effects of involvement in other, post-9/11, critical incidents. We controlled for *other critical incident involvement* on the job using the 24-item measure (Monnier et al., 2002) mentioned above. We modified this measure to include a total of 26 items by breaking the item concerning injury to oneself into 3 separate items, as reported above for the measure of intensity of involvement in 9/11. The instrument asks respondents to indicate the number of times (0, "zero times," to 7, "seven or more times") they were exposed to any of the 26 forms of critical incident experiences while on the job during the previous four months. Although the original critical incident involvement measure uses a time frame of two months, we expanded this to four months to cover more of the potential lag between involvement in 9/11-related activities and data collection. Thus, in theory, a respondent's score on the other critical incident involvement scale could range from 0 to 182. The actual range of scores was 0 to 153 (s.d. = 19.1). We also controlled for the number of firefighter victims of 9/11 known personally by a respondent since, regardless of the respondent's involvement in 9/11, simply having known firefighters who perished at the World Trade Center might have a strong influence on postevent distress. Finally, as postevent distress may be attenuated among those respondents who

had received or were continuing to receive counseling, we controlled for the extent to which counseling was received after 9/11.

### Analytical Approach

The first step of our analysis involved a confirmatory factor analysis of the four endogenous variables (posttraumatic distress, depression, anxiety, and stress). Then, given that each respondent belonged to 1 of 101 different fire companies and that we posited that unit-level characteristics would moderate the mediated association between incident exposure and negative emotional states (assessed at the individual level), we tested our hypotheses via a multilevel approach, hierarchical linear modeling (HLM). As Kenny (2006) noted, "Estimation of mediation within multilevel models can be very complicated, especially when the mediation occurs at level one and when that mediation is allowed to be random, i.e., vary across level-two units," as is precisely the case in the current analysis. Adopting an approach similar to that adopted by Duffy et al. (2006), we began by testing for the significance of the random slopes (Hypothesis 1). We then tested for a climate-moderated main effect (the relationship between intensity of involvement and each of the three negative emotional states) in the absence of the distress mediator (Hypothesis 2) to demonstrate the climate-moderated relationship between intensity of involvement and distress (Hypotheses 3a and 3b). Per convention (Aiken & West, 1991), we centered all nondichotomous variables before estimating the models. Finally, after establishing the climate-moderated relationship between the distress and negative emotional states variables, we assessed the degree to which parameters associated with the main effect slopes-as-outcomes (i.e., critical incident involvement by support climate and critical incident involvement by control climate) were reduced or made insignificant when mediator slopes-as-outcomes (i.e., distress by support and distress by control climate) were added to the model (Hypotheses 4a and 4b).

Because the two moderating variables examined in the current study were assessed at the unit level, we used SAS Proc Mixed to fit the HLM, as is described in more detail below. Like HLM, Proc Mixed allows a researcher to model both individual- and group-level variance in individual outcomes, with the intercept and slope from the level 1 (within-unit) analysis serving as the dependent variables in the level 2 (i.e., between-unit) analysis (Singer, 1998). Using this approach, one first tests for significant variance between groups (i.e., ran-

dom slopes) before going on to test for a significant unit-level (i.e., level 2) moderation of the individual level (i.e., level 1) mediation. If no significant variance is found in the slopes, there is little point in continuing to test for a fixed, level 2 (unit-level) factor that might explain cross-group variation. Appendix B provides further detail on the analytical approach used to test our hypotheses.

## RESULTS

The results of the confirmatory factor analysis of the four endogenous variables (posttraumatic distress, depression, anxiety, and stress) indicated support for a four-factor model. Specifically, a four-factor model was found to manifest an acceptable fit ( $\chi^2_{883} = 4,127.77$ ,  $p < .01$ , CFI = .91, TLI = .90, SRMR = 0.05, and RMSEA = 0.05) and significantly better fit than alternative three-, two-, and one-factor models (none of which had acceptable values on any of these fit indexes). For example, between the hypothesized four-factor model and alternative three-factor (depression, anxiety, and combined stress-distress), two-factor (a combined negative emotional states construct plus distress), and one-factor models, the chi-square differences were 3,279.75 ( $\Delta df = 3$ ,  $p < .0001$ ), 963.31 ( $\Delta df = 5$ ,  $p < .0001$ ), and 6,038.86 ( $\Delta df = 7$ ,  $p < .0001$ ), respectively.

Table 1 displays means, standard deviations, and correlations among the variables. Table 2 presents results of the multilevel analyses. The distribution of scores on the negative emotional states variables were, as expected, skewed to the right, with means for depression, anxiety, and stress being 0.36, 0.28, and 0.78 (s.d. = 0.51, 0.36, and 0.65), respectively (see Table 1). The distribution of scores on the distress measure was also skewed to the right, with a mean of 1.31 (s.d. = 0.80). The results in Table 1 also indicate that there are no problems of multicollinearity.

### Random and Main Effects: Tests of Hypotheses 1 and 2

Following the recommendation of Kenny, Korchmaros, and Bolger (2003: 118), before testing the hypothesized moderated mediation, for each of the three negative emotional states variables, we first ran three random-effects models to assess the degree of level 2 variation in the slopes of (1) each negative emotional states variable regressed on critical incident involvement ( $\sigma^2_{\text{slope of } Y \text{ on } X}$ ), (2) each negative emotional states variable regressed on posttraumatic distress ( $\sigma^2_{\text{slope of } Y \text{ on } M}$ ), and (3) posttraumatic distress (the mediator) regressed on

critical incident involvement ( $\sigma^2_{\text{slope of } M \text{ on } X}$ ). To the extent that these variabilities are not significantly different from zero, as Kenny et al. noted, "The effect of X (or M) on Y (or M) does not vary, and it makes little sense to search for the level-two factors that would explain any variation" (2003: 118–119). However, as can be seen in the bottom three rows of Table 2, all three random slopes were significantly different from zero ( $p < .05$  at the very least) in the case of anxiety and stress. In the case of depression (not shown), the slope ( $\sigma^2_{\text{slope of } Y \text{ on } X}$ ) was not significantly different from zero ( $p > .05$ ), suggesting that it makes little sense to test potential level 2 moderators of the distress-mediated relationship of critical incident involvement and depression. Consequently, with Hypothesis 1 supported only with respect to anxiety and stress, we dropped any further analysis of the association between critical incident involvement and depression.

The results of our test of Hypothesis 2 (which predicts that unit-level supervisory support and employee control climates explain these significant random effects) are presented in models 2 (for anxiety) and 4 (for stress) of Table 2. These results indicate that, as predicted, unit-level support and control climates significantly attenuate the main effect of critical incident involvement on both anxiety ( $\gamma_{y11} = -0.02$  and  $\gamma_{y12} = -0.01$ , respectively, for support and control climates; both  $p < .05$ ) and stress ( $\gamma_{y11} = -0.04$  and  $\gamma_{y12} = -0.03$ , respectively, for support and control climates; both  $p < .05$ ). A comparison of the  $-2$  log-likelihood values for models 2 and 4 with that of the parallel model with the moderator ( $G$ ) terms excluded indicates that inclusion of the level 2 moderator terms significantly improves overall model fit for both anxiety and stress ( $\Delta -2$  log-likelihood  $\Delta df = 4 = 11.8$ ,  $p < .05$ , and 14.6,  $p < .01$ , for anxiety and stress, respectively). Finally, with the inclusion of these unit-level fixed effects, the coefficients for the random slopes ( $\sigma^2_{uy1j}$ ) are no longer significantly different from zero, suggesting that company-level differences in unit supervisory support and employee control climates indeed explain the previously noted random effect.

### Moderated Mediation Effects: Tests of Hypotheses 3 and 4

In Hypotheses 3 and 4, we propose that the climate-moderated main effect of intensity of involvement on negative emotional states would be explained by the climate-moderated mediating role of post-traumatic distress. We therefore next examined the degree to which the two unit-level cli-

**TABLE 1**  
**Correlations, Means, and Standard Deviations<sup>a</sup>**

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1. Depression	0.36	0.51																				
2. Anxiety	0.28	0.36	.67																			
3. Stress	0.78	0.65	.64	.69																		
4. Posttraumatic distress	1.31	0.80	.40	.40	.38																	
5. Age <sup>b</sup>	3.98	1.49	.05	.05	.07	.07																
6. Education	4.40	1.42	-.08	-.06	.02	-.04	-.22															
7. Married	0.70	0.46	-.07	.00	.04	-.05	.31	-.14														
8. At World Trade Center on 9/11	0.69	0.46	.08	.08	.10	.18	.11	-.01	.09													
9. Involvement in World Trade Center search/rescue	8.64	6.02	.11	.08	.12	.22	.08	-.08	.06	.34												
10. Involvement in World Trade Center recovery	35.40	50.53	.12	.10	.09	.12	.03	-.02	.03	.19	.51											
11. Number of colleagues who died in 9/11	3.81	2.35	.10	.10	.13	.29	.26	-.07	.04	.28	.36	.25										
12. Counseling before 9/11	0.14	0.35	.17	.15	.14	.11	.14	.03	-.05	-.01	.04	.02	.11									
13. Counseling after 9/11	0.43	0.49	.15	.13	.17	.22	.10	.02	.01	.19	.20	.14	.25	.16								
14. Other critical incident involvement	22.52	18.48	.19	.27	.25	.29	-.01	.05	-.08	.11	.26	.26	.22	.11	.07							
15. Social desirability	6.88	3.98	-.25	-.23	-.24	-.24	.00	-.01	.04	-.02	-.03	-.03	-.04	-.07	-.04	-.07						
16. Intensity of involvement in 9/11	5.46	4.61	.13	.14	.16	.30	.06	-.04	.05	.80	.40	.28	.35	.02	.23	.28	-.06					
17. Individual control	2.71	1.23	.01	.01	-.01	.05	.17	-.06	.00	.02	.05	.08	.07	.04	.05	.01	-.02	.04				
18. Individual supervisory support	3.28	0.64	-.20	-.18	-.22	-.08	-.03	-.05	.00	-.01	.06	.01	.00	-.07	-.10	.04	.12	-.04	.14			
19. Unit supervisory support climate	3.28	0.26	-.20	-.18	-.22	-.08	-.03	-.05	.03	.06	.08	.04	.10	-.03	-.11	.08	-.02	.04	.03	.39		
20. Unit control climate	2.66	0.36	-.04	-.05	-.04	-.06	.05	.01	.01	.02	.02	-.01	.00	.06	.00	.03	.01	.01	.30	.06	.12	

<sup>a</sup>  $n = 1,110$  (firefighters employed in 101 units). All values greater than .05 but less than .08 are significant at  $p < .05$ , and all values greater than .08 are significant at  $p < .01$ .  
<sup>b</sup> Category.

**TABLE 2**  
**Results of the Mixed Model Analysis<sup>a</sup>**

Dependent Variables	Posttraumatic Distress			Anxiety			Stress								
	Model 1—Moderated Mediation: $X \times G \rightarrow M$			Model 2—Total Effect: $X \times G \rightarrow Y$			Model 3—Moderated Mediation $(X + M) \times G \rightarrow Y$								
	Estimate	s.e.		Estimate	s.e.		Estimate	s.e.							
Intercept	$\gamma_{m00}$	0.13	0.07	$\gamma_{y00}$	0.40**	0.03	$\gamma_{y00}$	0.37**	0.03	$\gamma_{y00}$	1.01**	0.06	$\gamma_{y00}$	0.96**	0.06
Education		-0.02	0.02		-0.02**	0.01		-0.02*	0.01		-0.02**	0.01		0.03*	0.01
Age		0.01	0.02		0.01	0.01		0.004	0.01		0.02	0.01		0.01	0.01
Marital status		-0.07	0.05		0.01	0.02		0.02	0.02		0.08	0.04		0.08*	0.04
Other critical incident involvement		0.01**	0.00		0.01**	0.00		0.004**	0.00		0.01**	0.00		0.01**	0.00
Involvement in World Trade Center search/rescue		0.01	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00
No. of colleagues who died in 9/11		0.05**	0.01		-0.002	0.01		-0.01*	0.00		0.01	0.01		-0.0006	0.01
Involvement in World Trade Center recovery		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00
Counseling before 9/11		0.06	0.06		0.11**	0.03		0.09**	0.03		0.13*	0.05		0.12*	0.05
Counseling after 9/11		0.17**	0.05		0.05*	0.02		0.03	0.02		0.13**	0.04		0.07	0.04
At World Trade Center on 9/11		0.15	0.08		0.01	0.04		0.03	0.03		0.01	0.07		0.04	0.06
Social desirability		-0.04**	0.01		-0.02**	0.002		-0.01**	0.00		-0.04**	0.005		-0.03**	0.005
Intensity of involvement in 9/11 (X)	$\gamma_{m10}$	0.04**	0.01		0.00	0.004		0.00	0.00		$\gamma_{y10}$	0.01	$\gamma_{y10}$	0.01	0.007
Posttraumatic distress (M)															
Supervisory support climate (G1)	$\gamma_{m01}$	-0.17	0.09		-0.03	0.04		$\gamma_{y20}$	0.14**	0.02	$\gamma_{y20}$	0.17*	$\gamma_{y20}$	0.25**	0.03
Intensity of involvement $\times$ supervisory support climate	$\gamma_{m11}$	-0.05*	0.02		-0.02*	0.01		$\gamma_{y01}$	-0.002	0.04	$\gamma_{y01}$	-0.04*	$\gamma_{y01}$	-0.12	0.08
Level 2 control climate (G2)	$\gamma_{m02}$	-0.13*	0.06		-0.05	0.03		$\gamma_{y11}$	-0.01	0.01	$\gamma_{y11}$	-0.08	$\gamma_{y11}$	-0.03	0.02
Intensity of involvement $\times$ control climate	$\gamma_{m12}$	-0.02	0.01		-0.01*	0.007		$\gamma_{y02}$	-0.02	0.03	$\gamma_{y02}$	-0.03*	$\gamma_{y02}$	-0.05	0.05
Posttraumatic distress $\times$ supervisory support climate								$\gamma_{y12}$	-0.007	0.01	$\gamma_{y12}$	-0.03*	$\gamma_{y12}$	-0.02	0.01
Posttraumatic distress $\times$ control climate								$\gamma_{y21}$	-0.06	0.06	$\gamma_{y21}$	-0.007	$\gamma_{y21}$	-0.007	0.012
Variance of unit-level intercepts	$\sigma_{um0j}^2$	0.01	0.01		0.002	0.002		$\gamma_{y22}$	-0.10*	0.04	$\gamma_{y22}$	-0.16*	$\gamma_{y22}$	-0.16*	0.08
Variance of unit-level slopes ( $\sigma_{u\text{slopes } Y \text{ on } X}^2$ )	$\sigma_{um1j}^2$	0.00	0.00		0.00	0.00		$\sigma_{uy0j}^2$	0.003*	0.002	$\sigma_{uy0j}^2$	0.006	$\sigma_{uy0j}^2$	0.007	0.005
Variance of unit-level slopes ( $\sigma_{u\text{slopes } Y \text{ on } M}^2$ )								$\sigma_{uy1j}^2$	0.00	0.00	$\sigma_{uy1j}^2$	0.00	$\sigma_{uy1j}^2$	0.00	0.00
-2 log-likelihood								$\sigma_{uy2j}^2$	0.01**	0.005	$\sigma_{uy2j}^2$	0.02*	$\sigma_{uy2j}^2$	0.02*	0.01
Check for random slope $X \rightarrow Y, G$ s excluded		2,334.3			667.2			517.3			2,019.0			1,894.5	
Check for random slope $M \rightarrow Y, G$ s excluded								Estimated random slope = 0.001* (s.e. = 0.00)			Estimated random slope = 0.001*** (s.e. = 0.00)			Estimated random slope = 0.001*** (s.e. = 0.00)	
Check for random slope $X \rightarrow M, G$ s excluded								Estimated random slope = 0.01* (s.e. = 0.004)			Estimated random slope = 0.02*			Estimated random slope = 0.02*	(s.e. = 0.01)

<sup>a</sup>  $n = 1,110$ . Variables were specified at the individual level (level 1), except for the climate variables, specified at level 2. Where random variance is estimated at below the minimum boundary level, SAS fixes the estimate at zero.

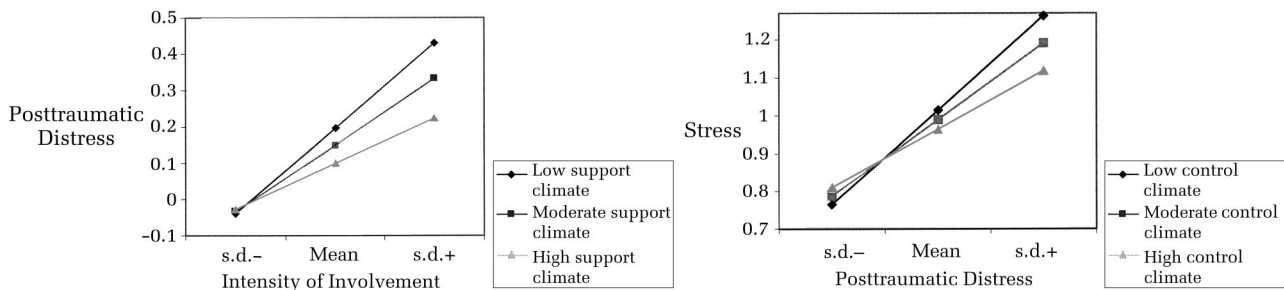
\*  $p < .05$   
 \*\*  $p < .01$   
 \*\*\*  $p < .001$

mates moderated the association between critical incident involvement and posttraumatic distress. As shown in model 1 of Table 2, although our findings offer no support for Hypothesis 3a regarding the moderating role of unit control climate ( $\gamma_{m12} = -0.02$ , n.s.), they are consistent with Hypothesis 3b. Specifically, they indicate that critical incident involvement has a significant, positive association with the mediating variable (posttraumatic distress ( $\gamma_{m10} = 0.04$ ,  $p < .01$ ) and that this effect diminishes as a function of unit-level supervisory support climate ( $\gamma_{m11} = -.05$ ,  $p < .01$ ). Despite the insignificant moderating role of unit-level control climate, a comparison of the  $-2$  log-likelihood values for model 1 with that of the parallel model excluding the  $G$ s (i.e., the control and support climate moderators) indicated that the inclusion of the moderating role of unit-level climate factors in the model results in a significant enhancement of model fit ( $\Delta -2$  log-likelihood  $\Delta_{df=4} = 13.8$ ,  $p < .01$ ). Once again, with the inclusion of these unit-level fixed effects, the coefficient for the random slope ( $\sigma^2_{uy1j}$ ) is no longer significantly different from zero, suggesting that company-level differences in supervisory support largely explain the previously noted random effect. Moreover, the magnitude and significance of the attenuating effects of unit-level support climate on the critical incident involvement–distress relationship remained essentially unchanged when we recalculated model 1, controlling for the fixed effects of *individual-level* perceived control and support, as well as the interactions between critical incident involvement and each of these two level 1 variables (none of which were significant).

Models 3 and 5 of Table 2 present evidence of the cross-level moderation effects of unit-level climate on the second stage of the proposed distress-mediated relationship between critical incident involvement and negative emotional states (i.e., between distress and anxiety/stress). These results indicate a significant, positive relationship between post-

traumatic distress and both anxiety and stress ( $\gamma_{20} = 0.14$  and  $0.25$ , respectively; both  $p < .01$ ). They further indicate that, although the moderating role of unit support climate (Hypothesis 4b) is not statistically significant, the moderating role of control climate on the distress–negative emotional states relationship *is*. Specifically, supporting Hypothesis 4a, both the distress–anxiety and distress–stress slopes are significantly attenuated as a function of unit control climate ( $\gamma_{y22} = -0.10$  and  $-0.16$  for anxiety and stress, respectively;  $p < .05$  in both cases). Figure 2 graphically depicts this attenuation. The robustness of control climate as a moderator of the distress–negative emotional states relationships is further indicated by the fact that with the addition of this climate factor to the model, the coefficient for the random slope ( $\sigma^2_{uy2j}$ ) is no longer significantly different from zero for either anxiety or stress. Evidence of the mediating role of control-moderated distress stems from the fact that the coefficients for the climate-moderated effects of critical incident involvement on both anxiety and stress ( $\gamma_{y12}$ ) became insignificant with the inclusion of the climate-moderated effects of distress. With respect to anxiety, these coefficients went from  $-0.02$  (support) and  $-0.01$  (control) (both  $p < .05$ ) in model 2, to  $-0.01$  and  $-0.007$  (both n.s.) in model 3. With respect to stress (Table 3), these coefficients went from  $-0.04$  (support) and  $-0.03$  (control) (both  $p < .05$ ) in model 4, to  $-0.03$  and  $-0.02$  (both n.s.) in model 5. Further evidence of complete mediation by climate-moderated distress was apparent from the significant differences between models 2 and 3 and between models 4 and 5 in  $-2$  log-likelihood values. Further, even with the main effect of critical incident involvement and its two climate interaction parameters excluded from model 6, there was *no* significant decline in model fit ( $\Delta -2$  log-likelihood  $\Delta_{df=6} = 7.5$  for anxiety and  $10.5$  for stress; both  $p > .10$ ). Moreover, the magnitude and significance of the moderating effects of unit-level control climate on

**FIGURE 2**  
**Plots of Cross-Level Interaction Effects**



the links between distress and both anxiety and stress remained unchanged when we controlled for the fixed effects of *individual-level* perceived influence and support, as well as the interactions between distress and each of these two individual-level variables (both of which were significant).

## DISCUSSION

Taken as a whole, the results presented above suggest that posttraumatic distress mediates the relationship between the intensity of critical incident involvement and subsequent anxiety and stress, and that this mediated relationship itself appears to be conditioned by *current* (postincident), *unit-level* contextual factors. More specifically, we found that the distress-mediated effects of incident involvement on postincident anxiety and stress varied over work units and that this unit-level variance was largely explained when two current unit-level control- and support-related climate factors were taken into account. Moreover, each of these two climate-related buffering factors was found to play a unique role in attenuating the impact of the intensity of firefighter involvement in 9/11 on subsequent negative emotional states. Whereas current supervisory support climate moderated the association between critical incident involvement and posttraumatic distress (the first stage of the mediation), it played no significant moderating role in the second stage of the mediation (between posttraumatic distress and negative emotional states). In contrast, current unit-level employee control climate, which had no significant impact on the link between critical incident involvement and posttraumatic distress, moderated the relationship between posttraumatic distress and two negative emotional states, namely, anxiety and stress. Thus, although the hypothesized cross-level moderation effects for both control and support climates were in some cases grounded on similar theoretical arguments, our findings drive home the point that these are two unique climatic factors, each having their own independent cross-level moderating effects on the relationship between individual-level critical incident involvement and negative emotional states.

As for why each climate attenuates a different stage of the distress-mediated model, we can only speculate. From both cognitive and resource perspectives, the attenuating effect of supervisor support climate on the association between involvement and distress makes sense in terms of the protection from the social deterioration often following critical incidents of great magnitude (Freudenburg & Jones, 1991) that such a climate may offer unit members. As noted earlier, social

deterioration after critical incident involvement can significantly drain personal and social resources and make it difficult for those involved to effectively process the event, regain a sense of coherence (Antonovsky, 1979), and move beyond hypervigilant and avoidant behaviors. Moreover, the link between involvement and distress may be attenuated in units characterized by a more supportive supervisory climate because such climates offer psychologically "safer" environments for discussing incident-related experiences and emotions, thus enabling more efficient and effective cognitive processing, reducing the risk of chronic ruminative behavior (i.e., intrusive thoughts), and increasing the likelihood that those requiring help will be guided toward assistance before such distress symptoms become chronic and/or serve as the basis for the development of other psychological sequelae (Breslau et al., 2000).

Similarly, our finding that employee control climate plays a more salient role in attenuating the link between postevent distress and negative emotional states than supervisory support climate may also be interpreted in terms of both cognitive processing and resource conservation. To the extent that such climates are conducive to greater individual and collective self-efficacy, it may be that distress victims employed in units with stronger control climates adopt more problem-focused, help-seeking coping strategies, whereas distress victims employed in units with weaker control climates adopt more emotion-focused coping strategies. Given that those adopting emotion-focused coping tend to worry about stressors, whereas those adopting problem-focused strategies tend to do something about them (Jex & Bliese, 1999: 350), the first responders in this sample who were employed in units with weaker employee control climates may have been more vulnerable to distress-related sequelae than those employed in more efficacy-generating units with stronger employee control climates. In addition, to the extent that "a strong sense of collective efficacy may also contribute to greater cooperation and helping among group members" (Jex & Bliese, 1999: 350), members of units with stronger employee control climates may have been further protected from the negative emotional states posttraumatic distress can generate by unit members working with one another to provide assistance to colleagues in need. Finally, from a resource perspective, to the extent that members of units with stronger employee control climates are likely to have greater efficacy-related resources at their disposal and therefore likely be more capable of effective problem solving, they may also be better positioned to protect themselves against the sec-

ondary resource depletion processes noted above as well as the negative psychological sequelae often associated with such resource deprivation.

Up to this point, we have discussed our findings with regard to only two of the three negative emotional states examined: anxiety and stress. Our findings with regard to the third negative emotional state examined, depression, are also likely to be of interest. Unlike the slopes for anxiety and stress, the random slopes for depression were not significant; there was no significant difference over units in the association between intensity of firefighter involvement in 9/11 and depression for unit-level climatic differences to explain. One possible explanation for the absence of significance may be that personal vulnerabilities (e.g., history of childhood trauma, history of family depression, and neuroticism) play a greater role than contextual vulnerabilities in individuals' susceptibility to depression subsequent to involvement in catastrophic critical incidents. Support for such an explanation is evident in a number of studies (see Breslau, Davis, Peterson, & Schultz, 2000; Yehuda et al., 1998). If this is in fact the case, and if trauma-related vulnerabilities to depression are largely person-based, it suggests that managerial efforts to "protect" first responders from involvement-related depression via post hoc climate-oriented interventions are likely to offer limited utility.

### Implications

Both researchers and practitioners may draw a number of important implications from the findings reported above. At the most basic levels, these findings are important for researchers because they suggest that these post hoc, climate-level analogues of what have to date been viewed as individual- or job-level buffers may have a robust impact on employee well-being, with effects detectable months after an acute stressor has been experienced. Although our findings are consistent with those reported in other studies examining the moderating effects of a group-level buffer on the relationship between chronic workplace stressors such as high overload on a variety of stress-related outcomes (see Bliese & Jex, 2002), they go well beyond these studies by (1) examining the climate analogues of *both* support and control in the context of a single model and (2) examining the extent to which these group-level analogues may moderate individual stress processes months after an actual stressor experience. By examining both support and control climates in a single model, we were able to more precisely identify just how each of these two factors affected individual stress processes. By focusing on

post hoc climates, we were able to demonstrate that, as might be expected, individuals' experiences in coping with traumatic workplace experiences may be shaped not only by the climate contextualizing incidents at the time they are experienced, but also by the climate contextualizing the work environment within which the individuals attempt to cope with and come to terms with the incidents weeks and months later. As to whether it is in fact postincident unit climate that conditions the effects of involvement or distress—as opposed to preincident unit climate, simply reflected in post hoc assessment—we are unable to comment, since no data are available on FDNY company-level support and control before 9/11 or on the day itself. Nevertheless, given that most FDNY companies experienced substantial leadership and personnel changes as a result of the large number of officers and firefighters killed on 9/11, we deem it to be rather unlikely that the company climates assessed 18 months after 9/11 necessarily reflect those prior to 9/11.

However, beyond simply shedding light on the role of unit-level climate factors in potentially protecting employees from the negative psychological consequences of intense involvement in critical incidents, the results of our study also lend empirical support to the calls of such researchers as Johns (2006) and Bliese and Jex (2002) to pay greater attention to the role of contextual moderators of taken-for-granted relations in organizational research in general, and occupational stress research in particular. At the broadest level, our results suggest the need for researchers to bridge the micro-macro gap in organizational studies since, as current analysis demonstrates, the assumed relations among what are strictly individual-level variables may often vary from one context to another. From the perspective of occupational stress theory, our findings suggest the need to consider the contextual dimensions of what are often considered individual-level theories. Thus, for example, although the Karasek model is often framed as an individual-level theory demanding a focus on individual perceptions of an individual's unique job characteristics or task environment, as we have demonstrated, conceptualizing control and support in terms of potentially protective climatic factors may offer additional insight into occupational stress phenomena and processes.

Third, although the multilevel moderated mediation model examined above is little more than an extension of the cross-level moderation model proposed by Kozlowski and Klein (2000), given the complexities involved in integrating such cross-level moderation into a mediation framework

(Kenny, 2006), this study may also have important methodological implications. Drawing from a number of sources (e.g., Edwards & Lambert, 2004; Langfred, 2004), we applied an analytical framework for decomposing cross-level moderation effects and examining just how (or more precisely, at what stage of the mediation) each group-level moderator may condition an individual-level association. If, as Bliese and Jex (2002: 274) suspected, limited statistical technologies are to blame for the underutilization of cross-level models, our hope is that our explicating an HLM framework for testing such models will increase the likelihood that organizational scholars will adopt such cross-level frameworks where and when they apply.

Finally, for managers and policy makers, the implications of these findings are substantial, because they suggest that regardless of individual-level risk factors, it may be possible to ameliorate the impact of critical incident involvement on first responders' emotional well-being by adopting policies and practices aimed at enhancing unit-level support and control climates. Moreover, our results indicate that such ameliorating effects are likely even if climate transformation efforts are undertaken *after* a critical incident occurs, since it was in fact the postincident support and control climates that conditioned the effects of critical incident involvement on anxiety and stress in the current case. This is not to say that climate-oriented interventions (e.g., giving firefighters greater input into purchasing decisions) should replace individual-oriented interventions (e.g., referral of an individual firefighter to the employee assistance program) typically enacted after a work-based critical incident. Rather, our findings point to the utility of supplementing such interventions with efforts aimed at assessing and (if necessary) transforming unit-level supervisory support and employee control climates. In this sense, we come to the same conclusion Bliese and Jex reached: "Group-level intervention may be far more effective than focusing on individuals" (2002: 274).

### Limitations

Nevertheless, several limitations of our study may offer additional research opportunities. First, given that our survey was conducted 18 months after the actual 9/11 incident, data for all of the behavioral variables (i.e., intensity and duration of involvement in 9/11) were collected on the basis of retrospective accounts. Such reports could conceivably be subject to post hoc rationalizations, with some respondents providing inaccurate reports of the extent of their involvement, yet for the reasons discussed earlier, we deemed such retro-

spective bias to be highly unlikely. Nevertheless, although it is nearly impossible to predict the occurrence of critical incidents, researchers may wish to have a research infrastructure prepared ahead of time and apply a longitudinal design, more precisely assessing preincident unit climates and measuring the intensity of unit members' incident involvement, and thus eliminating the need for collection of retrospective data. Such longitudinal designs would also facilitate the collection of baseline distress data. Unfortunately, although we controlled for counseling before 9/11 as a proxy for preexisting distress, our retrospective design did not allow us to truly take into account the possibility that firefighters, at the time of the incident, may have already been experiencing traumatic distress from some prior critical incident. According to the kindling hypothesis (McFarlane, 1998), any such preexisting distress would have exacerbated the effects of involvement in 9/11. Since we lack any data regarding pre-9/11 incidence exposure, we are unable to estimate the extent to which prior exposure might account for the relationships uncovered.

A longitudinal design might also enhance researchers' ability to control for a variety of confounding effects, such as the effects of involvement in other critical incidents over time. Although we included controls for involvement in work-based critical incidents during the four months prior to data collection, out of concern for retrospective bias, we opted not to attempt to control for involvement in incidents occurring in the year between 9/11 and the four-month period preceding data collection. Furthermore, although respondents were directed to respond to the distress items with a particular focus on 9/11 and its aftermath, it is still conceivable that involvement in other critical incidents during that same year might have confounded our results. A longitudinal design focusing on a particular critical incident but with periodic data collection could theoretically control for any such confounding effect.

Second, despite the use of multilevel (HLM) analyses and the assessment of supervisory support and employee control climates at the unit level, given that all data were collected via self-report questionnaires and that behavioral data were collected retrospectively, there remains a possibility that some reported associations were inflated owing to common method variance and/or retrospective bias. Still, we deem the possibility of common method bias to be remote in that had the relationships observed in this study been a function of common method bias, we would have found significant structural links among *all* of the distress involvement relations posited. The fact that several of

these relationships were insignificant suggests that it is unlikely that our significant findings can be solely attributed to method variance.

Finally, given the nature of the sample, we cannot attest to the generalizability of our findings to first responders who are not firefighters or to those exposed to critical incidents in roles other than emergency service worker. Unique aspects of the fire-fighting job and its occupational socialization process may preclude the generalization of our findings to other types of emergency service workers such as policemen and paramedics. Moreover, because firefighting in a city like New York and 9/11 also have unique characteristics, our findings may be specific to the NYC firefighters.

## Conclusion

Overall, the findings presented above are largely consistent with our context theory of the psychological impact of involvement in work-related critical incidents, suggesting that postincident unit support and control climates are likely to serve as important protective factors for first responders involved in catastrophic critical incidents such as 9/11. However, we encourage others to adopt similar cross-level, moderated mediation analyses in order to assess the generalizability of our findings to work-related critical incidents experienced by those employed in non-first-responder occupations (Bamberger, 2005), as well as to examine whether (and if so, just how) such group-level climatic factors may attenuate the psychological consequences of more chronic workplace stressors.

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## APPENDIX A

### Scale Items for Climate Measures

#### Employee Control Climate

In general, please indicate how much input you ACTUALLY have regarding the following decisions in your job as a firefighter:

1. Who gets assigned to which work tasks and field assignments (i.e. positions on the truck, etc.)
2. Which tools, equipment and resources to stock
3. Training policies and procedures.
4. Job safety precautions.
5. Work rules and regulations.
6. Staff transfers between companies

#### Supervisory Support Climate

1. How often can your company officers be counted on to listen, show understanding or show they care when things get tough at work?
2. How often can you rely on your company officers for advice or information when things get tough at work?
3. How often do your company officers go out of their way to do things to make your work-life easier?
4. How often could you rely on your company officers to assist you with practical matters/minor emergencies off-duty?

## APPENDIX B

### Analytical Procedures

In the context of HLM, the moderating effect of two unit-level variables ( $G_1$  and  $G_2$ ) on an individual level  $X \rightarrow Y$  relationship would be represented by the coefficients  $\gamma_{11}$  and  $\gamma_{12}$  in the following set of equations:

$$Y_{ij} = b_{y0j} + b_{y1j}X_{ij} + r_{yij}. \quad (1)$$

$$b_{y0j} = \gamma_{y00} + \gamma_{y01}G_{1j} + \gamma_{y02}G_{2j} + u_{y0j}, \quad (1a)$$

$$b_{y1j} = \gamma_{y10} + \gamma_{y11}G_{1j} + \gamma_{y12}G_{2j} + u_{y1j}. \quad (1b)$$

In this sense, Equation 1 may be expanded to be written as:

$$Y_{ij} = (\gamma_{y00} + u_{y0j}) + \gamma_{y01}G_{1j} + \gamma_{y02}G_{2j} + (\gamma_{y10} + u_{y1j})(X_{ij}) + \gamma_{y11}G_{1j}X_{ij} + \gamma_{y12}G_{2j}X_{ij} + r_{yij}, \quad (2)$$

where  $(\gamma_{y00} + u_{y0j})$  expresses the random intercepts;  $\gamma_{y01}G_{1j}$  and  $\gamma_{y02}G_{2j}$  express the fixed effects of the two moderators;  $(\gamma_{y10} + u_{y1j})(X_{ij})$  expresses the random slope of  $Y$  regressed on  $X$ ; and  $\gamma_{y11}G_{1j}X_{ij}$  as well as  $\gamma_{y12}G_{2j}X_{ij}$  express the fixed interactions. Similarly, the moderating effect of the two unit-level variables ( $G_1$  and  $G_2$ ) on an individual level  $X \rightarrow M$  relationship (where  $M$  is the mediating variable) may be expressed as:

$$M_{ij} = (\gamma_{m00} + u_{m0j}) + \gamma_{m01}G_{1j} + \gamma_{m02}G_{2j} + (\gamma_{m10} + u_{m1j})X_{ij} + \gamma_{m11}G_{1j}X_{ij} + \gamma_{m12}G_{2j}X_{ij} + r_{mij}. \quad (3)$$

Further, although in the following equation specifying a level 2 moderation of a level 1 mediation model, the moderating effect of the unit-level variables  $G_1$  and  $G_2$  on an individual level  $X \rightarrow Y$  relationship would still be represented by the coefficients  $\gamma_{11}$  and  $\gamma_{12}$ , the effect of moderators  $G_1$  and  $G_2$  on the relationship between mediator  $M$  and  $Y$  would be represented by  $\gamma_{21}$  and  $\gamma_{22}$ :

$$Y_{ij} = b_{y0j} + b_{y1j}X_{ij} + b_{y2j}M_{ij} + r_{yij}, \quad (4)$$

$$b_{y0j} = \gamma_{y00} + \gamma_{y01}G_{1j} + \gamma_{y02}G_{2j} + u_{y0j}, \quad (4a)$$

$$b_{y1j} = \gamma_{y10} + \gamma_{y11}G_{1j} + \gamma_{y12}G_{2j} + u_{y1j}, \quad (4b)$$

$$b_{y2j} = \gamma_{y20} + \gamma_{y21}G_{1j} + \gamma_{y22}G_{2j} + u_{y2j}, \quad (4c)$$

In this sense, Equation 3 may be expanded to be written as:

$$Y_{ij} = (\gamma_{y00} + u_{y0j}) + \gamma_{y01}G_{1j} + \gamma_{y02}G_{2j} + (\gamma_{y10} + u_{y1j})X_{ij} + \gamma_{y11}G_{1j}X_{ij} + \gamma_{y12}G_{2j}X_{ij} + (\gamma_{y20} + u_{y2j})M_{ij} + \gamma_{y21}G_{1j}M_{ij} + \gamma_{y22}G_{2j}M_{ij} + r_{yij}. \quad (5)$$

Finally, to take covariates into account, we expanded Equations 2, 3, and 5 to include the following term:  $\sum^{kc} b_{kj}X_{ikj}$ , where  $X_{ikj}$  denotes the value of the  $k$ th control variable observed for the  $i$ th individual in the  $j$ th unit, and  $kc$  is the number of control variables.



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