



Protective factors for posttraumatic stress disorder symptoms in a prospective study of police officers

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ABSTRACT

Although police officers are frequently exposed to potentially traumatic incidents, only a minority will develop chronic posttraumatic stress disorder (PTSD). Identifying and understanding protective factors could inform the development of preventive interventions; however, few studies have examined this. In the present prospective study, 233 police officers were assessed during academy training and again following 2 years of police service. Caucasian race, less previous trauma exposure, and less critical incident exposure during police service as well as greater sense of self-worth, beliefs of greater benevolence of the world, greater social support and better social adjustment, all assessed during academy training, were associated with lower PTSD symptoms after 2 years of service. Positive personality attributes assessed during training with the NEO Five-Factor Personality Inventory were not associated with lower PTSD symptoms. In a hierarchical linear regression model, only Caucasian race, lower critical incident exposure during police service, greater assumptions of benevolence of the world and better social adjustment during training remained predictive of lower PTSD symptoms after 2 years of police service. These results suggest that positive world assumptions and better social functioning during training may protect police officers from critical incident related PTSD.

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1. Introduction

Police officers are exposed to numerous potentially traumatic situations as a part of their duties including armed confrontation, witnessing violent death and motor vehicle accidents, and their own actual or threatened risk of serious injury or death (Carlier et al., 2000). Repeated exposure to such events can have adverse effects on the mental health of police officers, including the development of posttraumatic stress disorder (PTSD) (Liberman et al., 2002; Marmar et al., 2006). PTSD is one of the most common psychological disorders stemming from trauma exposure, with prevalence rates in police officers ranging from 7% to 19% (Carlier et al., 1997; Robinson et al., 1997; West et al., 2008; Marmar and co-workers, Impact of the World Trade Center attacks on the New York City Police Department: a

prospective study, unpublished results), and can lead to serious impairment in functioning. Police officers with PTSD are at greater risk for medical consultations, lifetime suicidal ideation, and are five times more likely to be divorced than officers who do not have PTSD (Maia et al., 2007).

Despite repeated exposure to potentially traumatic events, the majority of police officers do not develop chronic PTSD as shown by the studies quoted previously. Even following the September 11th terrorist attacks in New York City, resilience, defined as 1 or 0 PTSD symptoms, was common with more than 50% of police officers and 67% of civilians who witnessed or were physically injured in the attacks meeting criteria for resilience during the 6 months following the attacks (Bonanno et al., 2006). While most research has focused on the development of pathology, it is also important to better understand protective factors that may mitigate the development of PTSD.

The psychological construct of resilience, developed over the last decades, addresses this perspective. Resilience has been characterized by the ability to “bounce back from negative emotional experiences and by flexible adaptation to the changing demands of stressful experiences” (Tugade and Fredrickson, 2004). Luthar et al. presented

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an excellent overview of this construct and suggested using the term “protective factors” when describing processes that alter the effects of adversity (Luthar et al., 2000). Norris et al. emphasized different longitudinal trajectories of responses to stress and differentiated a) resistance as minimal dysfunction at all times because coping resources effectively block the stressor from b) resilience which involves only transient perturbations and c) recovery which implies a longer period of dysfunction, followed by a gradual return to pre-event functioning (Norris et al., 2009). The importance of resilience research is increasingly recognized and recent reviews summarize current knowledge including psychobiological underpinnings (Charney, 2004; Feder et al., 2009; Krystal and Neumeister, 2009). However, what constitutes a “protective factor” and how these factors protect individuals from PTSD, especially in high risk populations such as police officers, is not clear.

Protective factors described in the literature include constitutional variables like temperament and personality, basic attitudes of an individual toward him/herself and the world, and specific skills including the effective use of social support and coping skills (Magwaza, 1999; Campbell-Sills et al., 2006; Guay et al., 2006; Yehuda and et al., 2006). A study of college students using the NEO Five-Factor Inventory (NEO-FFI) showed that resilience was positively related to extraversion and conscientiousness, and negatively associated with neuroticism (Campbell-Sills et al., 2006). Lockenhoff et al. (2009) reported extraversion and conscientiousness to be associated with a more favorable trajectory of mental health (Lockenhoff et al., 2009). Conscientiousness is of particular interest as it has been conceptualized as an indirect measure of emotion regulation, which is believed to play an important role in moderating responses to traumatic stressors. Greater emotion regulation during traumatic exposure favors decreased fear conditioning and memory consolidation, factors related to PTSD risk.

A prospective study in firefighters showed that the tendency to engage in negative appraisals before trauma exposure predicted the development of PTSD after 4 years of service (Bryant and Guthrie, 2007). Retrospective studies demonstrated that trauma exposure and PTSD are associated with less positive assumptions about the benevolence of the world (Magwaza, 1999; Dekel et al., 2004). Several studies indicated that social support might relate to PTSD symptoms and that having more perceived social support might be a predictor of resilience (Guay et al., 2006).

The majority of findings on protective factors are based on retrospective cross-sectional studies (Ozer et al., 2003; Guay et al., 2006; Alim et al., 2008) and these are unable to disentangle the temporal relationships between antecedents and consequences of trauma exposure. To determine the causal relationship between protective factors and the development of PTSD, prospective longitudinal studies are necessary. In this prospective longitudinal cohort study, it was hypothesized that after accounting for levels of trauma exposure prior to police academy and critical incident exposure during police service, low PTSD symptoms following 2 years of active police service would be predicted by baseline characteristics including personality factors (e.g., greater extraversion and conscientiousness), positive world assumptions, greater social support and better social adjustment.

There are two additional points worth noting. First, as this is an ongoing prospective longitudinal cohort study, baseline and 1-year data of $n=278$ participants have been previously reported (for example, McCaslin et al., 2008; Maguen et al., 2009; Pole et al., 2009; Inslicht et al., 2010; Wang et al., 2010). However, the focus on protective factors and the variables included in this article are novel as is the longer follow-up to 24 months of police service. Second, the terms “resilience” and “protective factors” have been used interchangeably to describe attributes of trauma survivors which mitigate the development of PTSD symptoms and are associated with the preservation of functioning following traumatic events. For the

purposes of this report we focus more narrowly on factors protecting against the development of PTSD symptoms.

2. Methods

2.1. Participants

Participating police officers were recruited during police academy training from four urban police departments (New York, Oakland, San Francisco, and San Jose). Two hundred and thirty-three officers, a subset of 400 participants who completed self-report data at baseline, were reassessed after 24 months of police service. The 233 officers did not differ from the full baseline sample of 400 on demographic characteristics including age, gender, education and marital status. However, they differed on ethnicity ($\chi^2=7.2$, $P=0.007$ two-sided), with the proportion of “Caucasian” being lower in the full baseline sample (37.7% vs. 42.9%). Therefore ethnicity was retained as a covariate in our multivariate models predicting resilience.

2.2. Procedures

Data were collected as part of a larger prospective longitudinal cohort study about stress and health of police officers. Police academy trainees were informed about the study by research team personnel during academy training classes. Study procedures were described in detail and written informed consent was obtained from all the participants. All procedures were approved by the University of California Human Subjects Committee and Institutional Review Board and a Federal Certificate of Confidentiality was obtained.

Exclusion criteria were psychotic or bipolar disorder and previous employment in the military, emergency services or law enforcement where individuals possibly would have been exposed to job related traumatic incidents. Participants were evaluated at baseline during their training at the police academy, and 24 months after commencement of police service. At each time point, a structured clinical interview was conducted by doctoral level clinicians and self-report questionnaires were completed by participants.

2.3. Initial assessment

2.3.1. Selected axis I disorders

The presence of current or past anxiety disorders, mood disorders and substance abuse disorders was determined using the *Structured Clinical Interview for DSM-IV (SCID)* (First et al., 1996).

2.3.2. Demographics

Information on age, gender, ethnic status, education, and marital status of all the participants was collected at baseline.

2.3.3. Previous trauma

The *Life Stressor Checklist-Revised* (LSC-R) was used to assess the experience of traumatic or stressful life events before entering the police academy. The LSC-R is a 30-item questionnaire which asks about stressful events such as natural disasters, physical or sexual assault in a yes/no format. We used a cumulative score adding up the number of stressful life events (Wolfe et al., 1996).

2.3.4. Personality

The *NEO Five-Factor Inventory* (NEO-FFI) was used to assess the personality characteristics of participants in the present study (Costa and McCrae, 1992). The NEO-FFI is a 60-item abbreviated version of the *NEO Personality Inventory-Revised* (NEO-PI-R) which is based on the Five Factor Model of personality: neuroticism, extraversion, openness, agreeableness and conscientiousness. Twelve questions for each factor are rated on a 5-point scale with responses ranging from “strongly agree” to “strongly disagree”.

2.3.5. World assumptions

The *World Assumptions Scale* (WAS) was used to assess fundamental assumptions about oneself and the world (Janoff-Bulman, 1989). Underlying this questionnaire is the idea that these assumptions constitute an emotionally potent conceptual system, developed over time, which provides expectations of oneself and the world (Janoff-Bulman, 1992). The World Assumptions Scale consists of 32 self-report items assessing eight categories of an individual's cognitive schemas of self and the world, which compose three main categories of assumptions: Self-worth, benevolence of the world and meaningfulness of the world (Elklit et al., 2007). Benevolence of the world is an abstract concept which refers to people and events and assumes that the world is a good place. Examples of questions are “There is more good than evil in the world” or “People are basically kind and helpful”. Participants are asked to indicate their beliefs on a 6-point Likert type scale ranging from “strongly disagree” to “strongly agree”. Internal consistency reliabilities of 0.67 to 0.78 have been reported for the subscales, and the measure has been determined to have good validity.

2.3.6. Social support

The *Sources of Social Support Scale* (SOS) was administered to assess perceived social support (Kulka et al., 1990). It is a 10-item measure of social support used in the National Vietnam Veterans Readjustment Study. Each item is rated on a 5-point scale

with responses ranging from “not at all true” to “extremely true”. In the current study coefficient alpha was 0.92.

2.3.7. Social functioning

The *Social Adjustment Scale-Self Report (SAS-SR)* was used to measure the social functioning of participants (Weissman and Bothwell, 1976). It is a 42-item self-report questionnaire that measures affective or instrumental performance over the past 2 weeks in six major areas of social functioning: work (as a worker, housewife or student), social and leisure activities, relationship with extended family, marital role as a spouse, parental role and membership in the family unit. Each item in the SAS-SR is scored on a five-point scale and lower scores indicate better social functioning. An overall score was computed by averaging all the subscales.

2.4. Twenty four month follow-up

2.4.1. Current PTSD Symptoms

The *Civilian Mississippi Scale (CMS)* was used to measure current PTSD symptoms (Vreven et al., 1995). The Civilian Mississippi Scale was revised from the Mississippi Scale for Combat-related PTSD, which was designed to capture diagnostic criteria and associated features of PTSD as specified in the Diagnostic and Statistical Manual (DSM)-III criteria for PTSD. It consists of 35 statements that are rated on a 5-point Likert scale, ranging from 1–“not at all true” to 5–“extremely true.” Examples are “I have nightmares of experiences that happened during my police service” or “Since becoming a police officer I have trouble concentrating on tasks”. The overall score is calculated by adding up the scores for each statement. A continuous measure of PTSD symptoms is obtained. The total score ranges from 35 to 175 points.

2.4.2. Critical incident exposure

The *Critical Incident History Questionnaire (CIHQ)* was used to measure cumulative critical incident exposure during the past two years (Weiss et al., 1999). It is a 34-item self-report measure assessing cumulative exposure to critical incidents experienced during police service. Participants tabulated the frequency of exposure to each critical incident during police service and rated coping difficulty for each of them, resulting in a total cumulative exposure score across all items. The CIHQ demonstrated good agreement on incident severity ratings (0.94), and adequate convergent and divergent validity.

2.5. Data analysis

All data were checked for expected ranges, outliers and abnormal values to determine whether the distribution of variables met assumptions of statistical tests. Pearson correlation analyses were used to determine associations of candidate factors with PTSD symptoms at 24-month follow-up (current PTSD symptoms). The Benjamini–Hochberg method was used to correct for multiple testing (Benjamini and Hochberg, 1995). To determine the contribution of each candidate protective factor, hierarchical linear regression analyses were conducted with the total Civilian Mississippi Scale score at 24 months as the dependent variable. Exposure to traumatic events prior to the police academy and cumulative critical incident exposure during the two years of police service were entered into the regression equation at the first step to control for level of trauma exposure. Because the PTSD symptom scores of Caucasians at 24 months was significantly different from other ethnic groups ($t = -3.6, P < 0.001$), ethnic status defined as “Caucasian versus others” was also entered at the first step to control the effect of ethnicity. The other factors were entered at subsequent steps, organized chronologically reflecting trait and state factors. All statistical analyses were conducted using SPSS for Windows (Version 16.0), Chicago, IL, USA.

3. Results

3.1. Participants characteristics

Demographics are listed in Table 1. The sample was predominantly male, under the age of 30, Caucasian, college educated and unmarried. SCID interviews conducted during academy training revealed no current Axis I disorders present in recruits. A minority of participants met criteria for prior lifetime diagnoses, all in full remission at the time of assessment, including several cases of prior major depression (6.3%, $n = 15$), PTSD (0.8%, $n = 2$), alcohol abuse (9.6%, $n = 23$), alcohol dependence (4.2%, $n = 10$) and anxiety disorders (7.1%, $n = 17$, including two participants with a history of PTSD). On average participants had experienced one stressful life event before academy training. At the 24-month follow-up police officers had experienced a multitude of critical incidents, as shown in Table 2. However, the average Civilian Mississippi Scale score was low: only one participant reached the cut-off point for a PTSD diagnosis with a score of 113. The five most frequently endorsed symptoms were problems falling and

Table 1
Demographics and test results ($n = 233$ participants).

	Mean or N	S.D. or %	Range
Age	27.2	4.6	21–43
Male gender	199	85.4%	
Ethnicity			
Caucasian	100	42.9	
Latino	55	23.6	
Asian American or Pacific Islander	32	13.7	
African American	28	12.0	
Other or multiple ethnicities	18	7.7	
Education			
<High school	2	0.9	
High school or equivalent	18	7.7	
2-year college or vocational training	76	32.6	
4-year college or bachelor's degree	126	54.1	
Post-graduate degree	11	4.7	
Marital status			
Married	49	21.0	
Living together	40	17.2	
Steady relationship	45	19.3	
Separated or divorced	8	3.4	
Single	91	39.1	
Life Stressor Checklist	0.9	0.96	0–4
NEO Five-Factor Personality Inventory			
Extraversion	29.4	5.1	16–49
Openness	25.0	4.3	15–38
Agreeableness	30.3	7.3	14–46
Conscientiousness	27.9	4.0	17–39
Neuroticism	13.1	5.8	0–25
World Assumptions Scale			
Self-worth	56.3	6.2	32–71
Benevolence of the world	36.4	5.9	20–48
Meaningfulness of the world	42.4	6.5	20–60
Sources of support	4.4	0.7	1.9–5
Social adjustment scale—overall	1.6	0.3	1–2.6
Critical incidents at 24 months	5.9	4.8	0–34
Mississippi scale at 24 months	61.7	11.9	36–113

staying asleep, difficulty getting emotionally close to others, feeling uncomfortable in a crowd, difficulty staying even-tempered and difficulty enjoying the company of others.

3.2. Correlation analyses

Being Caucasian was associated with lower PTSD symptoms after 2 years of police service ($r = -0.23, P < 0.01$). There were no other significant associations between the demographic variables and PTSD symptoms. Not surprisingly, less exposure to traumatic events prior to police academy as well as less cumulative critical incident exposure during the two years of police service were correlated with lower PTSD symptoms. Baseline measures of extraversion, openness, agreeableness and conscientiousness on the NEO were not significantly associated with PTSD symptoms, whereas neuroticism correlated significantly with more PTSD symptoms. Self-reports of higher self-worth, greater assumption of benevolence of the world, higher levels of social support, and better social adjustment (lower SAS score) during academy training were associated with lower levels of PTSD symptoms after 24 months of police service (r s varied from -0.23 to 0.24 ; presented in Table 3). When adjusted for multiple testing with the Benjamini–Hochberg method, the variables Caucasian versus other ethnicity, cumulative critical incident exposure, assumption of benevolence of the world and social adjustment were still significant.

3.3. Hierarchical linear regression analyses

Results of the hierarchical linear regression are presented in Table 4. Caucasian versus other ethnicity and cumulative critical incident exposure during the two years of police service entered at the first step, accounted for 9% of the variance of the CMS score at

Table 2
Percentage of police officers reporting the following Critical Incidences.

91.4%	Managing an aggressive crowd or riot
90.1%	Encountering the body of someone recently dead
82.8%	Encountering an adult who had been badly beaten
67.0%	Seeing someone dying
66.5%	Encountering an adult who had been sexually assaulted
64.8%	Encountering a decaying corpse
60.9%	Being exposed to serious risk of AIDS or other life-threatening diseases
56.2%	Being involved in a high speed chase where lives were in danger
52.8%	Encountering a child who had been sexually assaulted
45.1%	Making a death notification
39.5%	Seeing animals that had been severely neglected, intentionally injured, or killed
39.1%	Having your life threatened by an aggressive and dangerous animal
38.2%	Encountering a mutilated body or human remains
32.6%	Being trapped in a potentially life-threatening situation
32.2%	Being threatened with a knife or another weapon
30.0%	Encountering a child who was severely neglected or in dire need of medical attention because of neglect
28.8%	Encountering a child who had been badly beaten
26.6%	Being present when a fellow officer was seriously injured accidentally
26.2%	Receiving serious threats towards your loved ones as retaliation for your police work
22.3%	Being seriously injured accidentally
19.7%	Being present when a fellow officer was seriously injured intentionally
18.5%	Being threatened with a gun
17.2%	Being seriously injured intentionally
17.2%	Being exposed to a life-threatening toxic substance
13.3%	Having to kill or seriously injure someone
13.3%	Being in a serious car accident
12.4%	Being shot at
8.6%	Having to respond to a large-scale man-made disaster (i.e. bombing, plane crash)
7.3%	Encountering a SIDS death
6.0%	Being present when a fellow officer was killed intentionally
3.9%	Being seriously beaten
3.9%	Being present when a fellow officer was killed accidentally
3.9%	Having your life endangered in a large-scale man-made disaster (i.e. bombing, plane crash)
3.4%	Having your life endangered in a large-scale natural disaster
3.4%	Having to respond to a large-scale natural disaster
2.1%	Making a mistake, that lead to the serious injury or death of a fellow officer
0.9%	Making a mistake, that lead to the serious injury or death of a bystander
0.9%	Being taken hostage
0.9%	Having to shoot at someone without injuring them

24 months. For the following steps, only protective variables significantly (after adjustment for multiple testing) associated with current PTSD symptoms were included in the regression equation. Benevolence of the world, entered at the second step, accounted for an additional 4% of the variance, with greater benevolence of the world associated with lower PTSD symptoms. Social adjustment scale-overall, entered at the final step, accounted for an additional 3% of the variance, with better social adjustment associated with lower levels of PTSD symptoms. The tentative inclusion of any of the excluded variables did not improve the regression model.

The final regression model demonstrated that the greater assumption of benevolence of the world and better social adjustment (lower SAS score) during academy training had significant beta weights of -0.15 and 0.18 after controlling for ethnicity and cumulative critical incident exposure. Trauma history prior to police service, possibly protective personality factors, and social support at baseline did not account for a significant amount of variance in PTSD symptoms in the final model.

4. Discussion

The present study supports our hypotheses that a more benevolent world view and better social adjustment prior to police service may be protective against the development of PTSD symptoms in police officers, even after controlling for cumulative critical incident exposure.

Table 3
Correlation matrix of predictor variables with PTSD symptoms, not corrected for multiple testing ($n = 233$).

	Caucasian versus not exposure	Previous trauma	Critical incidents	Extra version	Open ness	Agreeableness	Conscientiousness	Neuroticism	Self-worth	Benevolence	Meaningfulness	Social support	Social Adjustment	
Caucasian versus not	1.0													
Previous trauma exposure	-0.13*	1.0												
Critical incidents	0.14*	-0.03	1.0											
Extraversion	0.15*	-0.04	0.21**	1.0										
Openness	0.04	0.10	0.09	0.02	1.0									
Agreeableness	0.06	-0.10	0.11	0.47***	-0.25***	1.0								
Conscientiousness	0.0	-0.01	0.13	0.14*	0.76***	-0.08	1.0							
Neuroticism	-0.13*	0.16*	-0.08	-0.42***	0.21**	-0.45***	0.02	1.0						
Self-worth	-0.06	0.0	-0.06	0.14*	-0.00	0.05	0.13*	-0.26***	1.0					
Benevolence of the world	0.10	-0.10	-0.02	0.23***	0.03	0.16*	0.11	-0.27***	0.30***	1.0				
Meaningfulness of the world	0.05	-0.01	-0.02	0.05	-0.17*	0.09	-0.05	-0.13	0.16*	0.12	1.0			
Social support	0.05	-0.14*	0.03	0.18**	0.06	0.02	0.14*	-0.29***	0.27***	0.28***	-0.04	1.0		
Social Adjustment	-0.05	0.21**	0.01	-0.13	0.11	-0.14*	-0.01	0.39***	-0.10	-0.20**	-0.07	-0.43***	1.0	
PTSD Symptoms	-0.23***	0.14*	0.18*	-0.07	0.06	-0.11	0.0	0.24***	-0.15*	-0.22***	0.06	-0.13*	-0.43***	1.0
PTSD Symptoms														0.25

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Note: PTSD symptoms and Critical incidents were assessed at 24 months follow-up.

Table 4
Summary of hierarchical regression analysis for protective factors with PTSD symptoms at 24 months as dependent variable ($n = 233$).

Independent variables	Adjusted R^2	ΔR^2	F change	β (Step 1)	β (Step 2)	β (Step 3)
Step 1 Control variables	0.09	0.10	12.7***			
Caucasian vs. other ethnicity				−0.26***	−0.24***	−0.24***
Critical incidents				0.22***	0.21***	0.21***
Step 2	0.12	0.04	9.5**			
Belief in the benevolence of the world #					−0.19**	−0.15*
Step 3	0.15	0.03	8.6**			
Social adjustment scale #						0.18**

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. # measured during academy training.

The majority of prior studies have focused on risk factors for PTSD diagnosis or PTSD symptoms (Brewin et al., 2000; Ozer et al., 2003; Marmar et al., 2006) but few examined protective factors. To our knowledge, the present study is one of the first prospective longitudinal studies which focused on factors that may protect police officers from the development of PTSD symptoms following 2 years of active police duty. In this study, the assumption of benevolence of the world and better social adjustment during academy training were predictive of lower PTSD symptoms following subsequent critical incident exposure in the first 2 years of police service.

Several previous studies indicated that certain personality traits might protect individuals from PTSD (Fauerbach et al., 2000; Chung et al., 2007). A prospective study in firefighters which primarily examined risk factors suggested that low levels of hostility and high levels of self-efficacy may be protective factors for PTSD (Heinrichs et al., 2005). A study of burn victims found that those with higher extraversion scores had lower PTSD symptom severity (Fauerbach et al., 2000). However, a prospective study in civilians experiencing air attacks failed to identify a significant association between personality traits before air attacks and PTSD symptoms afterwards (Knezevic et al., 2005). Consistent with Knezević's research, the present study also failed to confirm factors of the NEO inventory such as extraversion, openness, agreeableness, or conscientiousness as protective factors for PTSD symptoms.

Previous studies have indicated that traumatic events might change an individual's world assumptions. A study in South African adults demonstrated that traumatized victims of apartheid government had more negative basic assumptions about the meaning and benevolence of the world than non-traumatized controls (Magwaza, 1999). But the cross sectional nature of Magwaza's study did not allow the authors to determine the causal direction of the association between world assumption and PTSD. A study of psychosocial predictors of resilience after the 9/11 attacks in New York found that fewer negative worldview changes in the first weeks following the traumatic experience predicted lower global distress and more psychological wellbeing at 6 months follow-up and therefore are a predictor for resilience (Butler et al., 2009). Consistent with previous research, the present study showed that the assumption of greater benevolence of the world during academy training was associated with less PTSD symptoms after two years of active police service. A more positive world view is believed to influence the stress appraisal process and be helpful in coping with traumatic events as well as favoring posttraumatic growth (Agaibi and Wilson, 2005; Engelkemeyer and Marwit, 2008).

Social support is a complex construct which includes actual versus perceived support, quality of support (positive, negative or neutral), size of support network, and type of support (material, emotional and advice). The impact of social support on PTSD symptoms is also complex. Many studies have reported that lower levels of social support are associated with greater PTSD symptoms (Brewin et al., 2000; Guay et al., 2006). Bonanno et al. (2007) found that greater perceived social support was a resilience factor in their study of survivors of the 9/11 attack in New York (Bonanno et al., 2007). In OEF/OIF veterans lower post-deployment social support was associated with increased PTSD and depressive

symptoms and with decreased resilience (Pietrzak et al., 2009 a,b). In contrast, there are also studies that failed to find protective effects of social support on PTSD. For example, a study of veterans showed that initial levels of perceived social support and stressors did not predict the course of chronic PTSD symptoms (Laffaye et al., 2008). In this study we investigated social support during academy training, before the participants had been exposed to critical incidents and found that this social support did not predict fewer PTSD symptoms after 24 months. However, this result has to be interpreted within this limitation and the assessment of support during acute stress may be a better predictor. Also, highly resilient populations, including first responders early in their careers, have low levels of PTSD symptoms, resulting in reduced variability with limited power to detect a protective effect of social support.

While it is widely accepted that PTSD symptoms can have devastating consequences on social functioning (Stellman et al., 2008) the effects of prior social functioning on PTSD symptoms are less well understood. For example, a randomized controlled study demonstrated that after effective psychotherapy, general social functioning, assessed by the Social Adjustment Scale, improved significantly with the decline of chronic PTSD (Rauch et al., 2009). However, since social adjustment before trauma exposure was not assessed, it is not known whether this association is a pre-existing protective factor. In the present study, the use of a prospective design with assessment of social adjustment at baseline permits us to infer that higher levels of social adjustment prior to police service serve as a protective factor.

There are several limitations to our study that should be noted. First, as would be expected, the levels of PTSD symptoms in our sample are low after 2 years of police service. A study of firefighters indicated that posttraumatic stress symptoms were low at 6 months of service but increased significantly after 4 years of fire fighting duties (Bryant and Guthrie, 2005, 2007). We will follow our cohort up to 7 years of police service. Second, it is well known that police officers will minimize symptom reporting for a range of reasons. It is possible that some denied or minimized problems and were rated as healthy and PTSD-resistant because they were responding in a biased manner rather than because they were actually asymptomatic. Third, the majority of the police officers in our sample were male (85%) and 43% were Caucasian. Additional research should be done to explore the effect of gender and ethnicity on these resilience factors. Finally, police officers are a special population who have deliberately chosen a stressful profession, and have passed a selection process. Some who cannot cope with the dangerous world of police work drop out from the academy or very early in their career. Those who complete 24 months of service are better able to tolerate repeated critical incident exposure, an example of survival of the fittest for a specific high risk occupation. By virtue of self-selection, screening, training and camaraderie, findings with police officers may not generalize to other populations.

Despite these limitations, we provide the strongest evidence to date that greater belief in benevolence of the world and higher levels of social

adjustment, assessed during training and prior to critical incident exposure, may protect police officers from duty related PTSD symptoms.

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References

- Agaibi, C.E., Wilson, J.P., 2005. Trauma, PTSD, and resilience: a review of the literature. *Trauma, Violence & Abuse* 6, 195–216.
- Alim, T.N., Feder, A., Graves, R.E., Wang, Y., Weaver, J., Westphal, M., Alonso, A., Aigbogun, N.U., Smith, B.W., Doucette, J.T., Mellman, T.A., Lawson, W.B., Charney, D.S., 2008. Trauma, resilience, and recovery in a high-risk African-American population. *The American Journal of Psychiatry* 165, 1566–1575.
- Benjamini, Y., Hochberg, Y., 1995. Controlling the false discovery rate: A practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society* 57, 289–300.
- Bonanno, G.A., Galea, S., Bucciarelli, A., Vlahov, D., 2006. Psychological resilience after disaster: New York City in the aftermath of the September 11th terrorist attack. *Psychological Science* 17, 181–186.
- Bonanno, G.A., Galea, S., Bucciarelli, A., Vlahov, D., 2007. What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *Journal of Consulting and Clinical Psychology* 75, 671–682.
- Brewin, C.R., Andrews, B., Valentine, J.D., 2000. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology* 68, 748–766.
- Bryant, R.A., Guthrie, R.M., 2005. Maladaptive appraisals as a risk factor for posttraumatic stress: a study of trainee firefighters. *Psychological Science* 16, 749–752.
- Bryant, R.A., Guthrie, R.M., 2007. Maladaptive self-appraisals before trauma exposure predict posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology* 75, 812–815.
- Butler, L.D., Koopman, C., Azarow, J., Blasey, C.M., Magdalene, J.C., DiMiceli, S., Seagraves, D.A., Hastings, T.A., Chen, X.H., Garland, R.W., Kraemer, H.C., Spiegel, D., 2009. Psychosocial predictors of resilience after the September 11, 2001 terrorist attacks. *The Journal of Nervous and Mental Disease* 197, 266–273.
- Campbell-Sills, L., Cohan, S.L., Stein, M.B., 2006. Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behaviour Research and Therapy* 44, 585–599.
- Carlier, I.V., Lamberts, R.D., Gersons, B.P., 1997. Risk factors for posttraumatic stress symptomatology in police officers: a prospective analysis. *The Journal of Nervous and Mental Disease* 185, 498–506.
- Carlier, I.V., Lamberts, R.D., Gersons, B.P., 2000. The dimensionality of trauma: a multidimensional scaling comparison of police officers with and without posttraumatic stress disorder. *Psychiatry Research* 97, 29–39.
- Charney, D.S., 2004. Psychobiological mechanisms of resilience and vulnerability: implications for successful adaptation to extreme stress. *The American Journal of Psychiatry* 161, 195–216.
- Chung, M.C., Berger, Z., Rudd, H., 2007. Comorbidity and personality traits in patients with different levels of posttraumatic stress disorder following myocardial infarction. *Psychiatry Research* 152, 243–252.
- Costa Jr., P., McCrae, R., 1992. Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional Manual. Psychological Assessment Resources, Odessa, FL.
- Dekel, R., Solomon, Z., Elklit, A., Ginzburg, K., 2004. World assumptions and combat-related posttraumatic stress disorder. *The Journal of Social Psychology* 144, 407–420.
- Elklit, A., Shevlin, M., Solomon, Z., Dekel, R., 2007. Factor structure and concurrent validity of the world assumptions scale. *Journal of Traumatic Stress* 20, 291–301.
- Engelkemeyer, S.M., Marwit, S.J., 2008. Posttraumatic growth in bereaved parents. *Journal of Traumatic Stress* 21, 344–346.
- Fauerbach, J.A., Lawrence, J.W., Schmidt Jr., C.W., Munster, A.M., Costa Jr., P.T., 2000. Personality predictors of injury-related posttraumatic stress disorder. *The Journal of Nervous and Mental Disease* 188, 510–517.
- Feder, A., Nestler, E.J., Charney, D.S., 2009. Psychobiology and molecular genetics of resilience. *Nature Reviews. Neuroscience* 10, 446–457.
- First, M., Spitzer, R., Gibbon, M., Williams, J., 1996. Structured Clinical Interview for DSM-IV Axis I Disorders—Non-Patient Edition (SCID-I/NP, Version 2.0). Biometrics Research Department, New York State Psychiatric Institute, New York.
- Guay, S., Billette, V., Marchand, A., 2006. Exploring the links between posttraumatic stress disorder and social support: processes and potential research avenues. *Journal of Traumatic Stress* 19, 327–338.
- Heinrichs, M., Wagner, D., Schoch, W., Soravia, L.M., Hellhammer, D.H., Ehler, U., 2005. Predicting posttraumatic stress symptoms from pretraumatic risk factors: a 2-year prospective follow-up study in firefighters. *The American Journal of Psychiatry* 162, 2276–2286.
- Inslicht, S.S., McCaslin, S.E., Metzler, T.J., Henn-Haase, C., Hart, S.L., Maguen, S., Neylan, T.C., Marmar, C.R., 2010. Family psychiatric history, peritraumatic reactivity, and posttraumatic stress symptoms: a prospective study of police. *Journal of Psychiatric Research* 44, 22–31.
- Janoff-Bulman, R., 1989. Assumptive worlds and the stress of traumatic events: applications of the schema construct. *Social Cognition* 7, 113–136.
- Janoff-Bulman, R., 1992. *Shattered Assumptions: Towards a New Psychology of Trauma*. Maxwell Macmillan International, New York.
- Knezevic, G., Opacic, G., Savic, D., Priebe, S., 2005. Do personality traits predict post-traumatic stress? A prospective study in civilians experiencing air attacks. *Psychological Medicine* 35, 659–663.
- Krystal, J.H., Neumeister, A., 2009. Noradrenergic and serotonergic mechanisms in the neurobiology of posttraumatic stress disorder and resilience. *Brain Research* 1293, 13–23.
- Kulka, R., Schlenger, W., Fairbank, J., Hough, R., Jordan, B., Marmar, C., Weiss, D., 1990. Trauma and the Vietnam War Generation: Report of the findings from the National Vietnam Veterans Readjustment Study. Brunner/Mazel, New York.
- Laffaye, C., Cavella, S., Drescher, K., Rosen, C., 2008. Relationships among PTSD symptoms, social support, and support source in veterans with chronic PTSD. *Journal of Traumatic Stress* 21, 394–401.
- Lieberman, A., Best, S., Meltzer, T., Fagan, J., Weiss, D., Marmar, C., 2002. Routine occupational distress in police. *Policing: An International Journal of Police Strategies and Management* 25, 421–441.
- Lockenfort, C.E., Terracciano, A., Patriciu, N.S., Eaton, W.W., Costa Jr., P.T., 2009. Self-reported extremely adverse life events and longitudinal changes in five-factor model personality traits in an urban sample. *Journal of Traumatic Stress* 22, 53–59.
- Luthar, S.S., Cicchetti, D., Becker, B., 2000. The construct of resilience: a critical evaluation and guidelines for future work. *Child Development* 71, 543–562.
- Maguen, S., Metzler, T.J., McCaslin, S.E., Inslicht, S.S., Henn-Haase, C., Neylan, T.C., Marmar, C.R., 2009. Routine work environment stress and PTSD symptoms in police officers. *The Journal of Nervous and Mental Disease* 197, 754–760.
- Magwaza, A.S., 1999. Assumptive world of traumatized South African adults. *The Journal of Social Psychology* 139, 622–630.
- Maia, D.B., Marmar, C.R., Metzler, T., Nobrega, A., Berger, W., Mendlowicz, M.V., Coutinho, E.S., Figueira, I., 2007. Post-traumatic stress symptoms in an elite unit of Brazilian police officers: prevalence and impact on psychosocial functioning and on physical and mental health. *Journal of Affective Disorders* 97, 241–245.
- Marmar, C.R., McCaslin, S.E., Metzler, T.J., Best, S., Weiss, D.S., Fagan, J., Lieberman, A., Pole, N., Otte, C., Yehuda, R., Mohr, D., Neylan, T., 2006. Predictors of posttraumatic stress in police and other first responders. *Annals of the New York Academy of Sciences* 1071, 1–18.
- McCaslin, S.E., Inslicht, S.S., Metzler, T.J., Henn-Haase, C., Maguen, S., Neylan, T.C., Choucrun, G., Marmar, C.R., 2008. Trait dissociation predicts posttraumatic stress disorder symptoms in a prospective study of urban police officers. *The Journal of Nervous and Mental Disease* 196, 912–918.
- Norris, F.H., Tracy, M., Galea, S., 2009. Looking for resilience: understanding the longitudinal trajectories of responses to stress. *Social Science & Medicine* 68, 2190–2198.
- Ozer, E.J., Best, S.R., Lipsey, T.L., Weiss, D.S., 2003. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin* 129, 52–73.
- Pietrzak, R.H., Johnson, D.C., Goldstein, M.B., Malley, J.C., Rivers, A.J., Morgan, C.A., Southwick, S.M., 2009a. Psychosocial buffers of traumatic stress, depressive symptoms, and psychosocial difficulties in veterans of Operations Enduring Freedom and Iraqi Freedom: the role of resilience, unit support, and postdeployment social support. *Journal of Special Operations Medicine* 9, 74–78.
- Pietrzak, R.H., Johnson, D.C., Goldstein, M.B., Malley, J.C., Southwick, S.M., 2009b. Psychological resilience and postdeployment social support protect against traumatic stress and depressive symptoms in soldiers returning from Operations Enduring Freedom and Iraqi Freedom. *Depression and Anxiety* 26, 745–751.
- Pole, N., Neylan, T.C., Otte, C., Henn-Haase, C., Metzler, T.J., Marmar, C.R., 2009. Prospective prediction of posttraumatic stress disorder symptoms using fear potentiated auditory startle responses. *Biological Psychiatry* 65, 235–240.
- Rauch, S.A., Grunfeld, T.E., Yadin, E., Cahill, S.P., Hembree, E., Foa, E.B., 2009. Changes in reported physical health symptoms and social functioning with prolonged exposure therapy for chronic posttraumatic stress disorder. *Depression and Anxiety* 26, 732–738.
- Robinson, H.M., Sigman, M.R., Wilson, J.P., 1997. Duty-related stressors and PTSD symptoms in suburban police officers. *Psychological Report* 81, 835–845.
- Stellman, J.M., Smith, R.P., Katz, C.L., Sharma, V., Charney, D.S., Herbert, R., Moline, J., Luft, B.J., Markowitz, S., Udasin, I., Harrison, D., Baron, S., Landrigan, P.J., Levin, S.M., Southwick, S., 2008. Enduring mental health morbidity and social function impairment in world trade center rescue, recovery, and cleanup workers: the psychological dimension of an environmental health disaster. *Environmental Health Perspectives* 116, 1248–1253.
- Tugade, M.M., Fredrickson, B.L., 2004. Resilient individuals use positive emotions to bounce back from negative emotional experiences. *Journal of Personality and Social Psychology* 86, 320–333.
- Vreven, D.L., Gudanowski, D.M., King, L.A., King, D.W., 1995. The civilian version of the Mississippi PTSD scale: a psychometric evaluation. *Journal of Traumatic Stress* 8, 91–109.
- Wang, Z., Inslicht, S.S., Metzler, T.J., Henn-Haase, C., McCaslin, S.E., Tong, H., Neylan, T.C., Marmar, C.R., 2010. A prospective study of predictors of depression symptoms in police. *Psychiatry Research* 175, 211–216.
- Weiss, D., Brunet, A., Metzler, T., Best, S., Fagan, J., Marmar, C., 1999. Critical incident exposure in police officers: frequency, impact and correlates. Meeting of the International Society for Traumatic Stress Studies, Northbrook (IL).
- Weissman, M.M., Bothwell, S., 1976. Assessment of social adjustment by patient self-report. *Archives of General Psychiatry* 33, 1111–1115.
- West, C., Bernard, B., Mueller, C., Kitt, M., Driscoll, R., Tak, S., 2008. Mental health outcomes in police personnel after Hurricane Katrina. *Journal of Occupational and Environmental Medicine* 50, 689–695.
- Wolfe, J., Kimerling, R., Brown, P.J., Chesman, K.R., Levin, K., 1996. The Life Stressor Checklist - Revised. In: Stamm, B.H. (Ed.), *Instrumentation in stress, trauma, and adaptation*. Sidran Press, Lutherville, MD, pp. 144–151.
- Yehuda, R., Flory, J.D., Southwick, S., Charney, D.S., 2006. Developing an agenda for translational studies of resilience and vulnerability following trauma exposure. *Annals of the New York Academy of Sciences* 1071, 379–396.