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Combat-Related Posttraumatic Stress Disorder Symptoms in Older Men

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Nearly 25% of U.S. men aged 55 or older served in combat, yet its impact on aging is unknown. The relationship of posttraumatic stress disorder (PTSD) symptoms to combat exposure was examined in 1,210 veterans of World War II (WWII) and the Korean War, who were participants in the Normative Aging Study. Over 54% of WWII and 19% of Korean veterans reported combat experience. The relationship between combat exposure and PTSD symptoms was stronger in the WWII cohort. The sample prevalence of PTSD by combat exposure ranged from 0% to 12.4%, differing by the PTSD measure. WWII veterans exposed to moderate or heavy combat had 13.3 times greater risk of PTSD symptoms measured 45 years later, compared with noncombat veterans. It is suggested that military service in general, and combat exposure in particular, is a "hidden variable" in the study of aging men.

Between 1990 and 2000, the number of veterans aged 65 years and older will increase by half, from 6 to 9 million (Department of Veterans Affairs, 1991). According to the third Survey of Veterans (SOV-III) in 1987, almost 65% of men over age 55 served in the military during World War II (WWII) or during the Korean conflict, and 52% of WWII veterans and 35.2% of Korean-conflict veterans were exposed to combat (Department of Veterans Affairs, 1989). Thus, as many as 25% of the current population of older American men may have been exposed to combat, an experience known to have deleterious effects on both physical and mental health (see the reviews by Boyle, Decouflé, & O'Brien, 1989; Schnurr & Aldwin, 1993). It is important to consider the effects of military service in general, and of combat exposure in particular, given the number of older men who have experienced them. It should be noted at the outset that the effects of military service can be positive as well as negative (e.g., Aldwin, Levenson, & Spiro, 1994; Elder & Clipp, 1989; Hastings, 1991; Schnurr, Rosenberg, & Friedman, 1993) and can have short- as well as long-term consequences. In addition, the effects of military service can be indirect as well as direct (Anderson & Mitchell, 1992). These effects on both physical and psychological health are so pervasive, yet so seldom studied, that we view them as the "hidden variable" in the aging of the current cohort of older men (cf. Elder & Clipp, 1988, 1989).

Psychologists often consider the nature of the aging process to be universal and rarely examine the roles that history and society play, despite repeated indications that human development is modified by sociohistorical processes (e.g., Baltes, 1987; Elder, 1974; Riley, 1987). As a result of this "historical parochialism" (Keniston, 1971), we have been slow to recognize that what we now know about aging is in large part based on the current generation of older persons and thus may not generalize to future generations. As Rossi (1980) has noted, most of our knowledge about adult development and aging is based on persons born during the 1920s and 1930s. Many of these persons experienced the Great Depression as children and adolescents, and the majority of men were of military age during WWII or during the Korean conflict. The unique historical circumstances of their lives have interacted with their subsequent development in innumerable ways to produce their current health and behavior (e.g., Elder, Gimbel, & Ivie, 1991; Elder, Shanahan, & Clipp, 1994).

Combat Exposure and Physical Health

One of the more obvious, short-term effects of military service on health is the increased risk of injury or death, especially during training exercises, deployment, or combat. Other effects of military service with long-term consequences include service-connected disabilities and having been a prisoner of war (POW). Although relatively few veterans experienced either (Department of Veterans Affairs, 1989), research clearly shows that POWs from WWII or Korea continue to suffer physical consequences of their captivity 40 to 50 years later (e.g., Beebe, 1975; Klonoff, McDougall, Clark, Kramer, & Horgan, 1976; Page, 1992).

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Typically, the most stressful aspect of military service is combat. Although the acute effects of combat on health are well-known (e.g., Rahe, 1988), its chronic or long-term effects on health are largely unexamined. A number of recent studies have found that combat veterans currently report more chronic health problems, more diagnosed illnesses, engage more often in risky health behaviors (e.g., smoking or drinking), and have poorer self-rated health (e.g., Boyle et al., 1989; Card, 1983; Kulka et al., 1990; Shalev, Bleich, & Ursano, 1990). Rosenheck and Fontana (in press) reported similar differences between combat and noncombat veterans for both WWII and Korea. However, a study of Vietnam veterans comparing self-reports of health with physical examinations did not reveal more physical illness in those exposed to combat (Centers for Disease Control, 1988b). In a study of Israeli veterans, Shalev et al. (1990) found that men with posttraumatic stress disorder (PTSD) displayed lower effort tolerance but did not differ from veterans without PTSD on physical examination.

Despite these and similar findings on the long-term consequences of military service, combat's effects may be even more far reaching. Research with Vietnam veterans has suggested that combat exposure may have long-term effects on cardiovascular health (e.g., Blanchard, 1990; Rosen & Fields, 1988). Recent studies of older veterans support these observations. For example, Falger et al. (1992) found that WWII Dutch Resistance veterans, compared with recent surgical and heart patients, had greater cardiovascular risk. On the basis of a combination of these and related findings (e.g., Orr, Pitman, Lasko, & Herz, 1993) and on our hidden variable conceptualization of military service, we propose that the heightened physiological reactivity that often results from combat exposure (e.g., Orr, 1990; ver Ellen & Van Kammen, 1990) may be associated with an increased risk of cardiovascular diseases in later life among combat veterans. One implication of this is that the declining association between Type A behavior and coronary heart disease (e.g., Miller, Turner, Tindale, Posavac, & Dugoni, 1991) might be an artifact of the decreasing proportion of veterans, especially those exposed to combat, in more recent studies. Although this possible effect of military service on long-term physical health remains speculative, the role of combat on subsequent psychological health has been studied more frequently.

Combat Exposure and PTSD

PTSD is an anxiety condition that is seen in survivors of traumatic events such as military combat, natural disasters, and personal or sexual violence (American Psychiatric Association [APA], 1987; Davidson & Foa, 1993). The cardinal symptoms following such an exposure consist of three groups: "reexperiencing the traumatic event, avoidance of stimuli associated with the event or a numbing of general responsiveness, and increased arousal" (APA, 1987, p. 247).

Research conducted on veterans during the last 10 years, especially on veterans of the Vietnam War, has demonstrated that exposure to combat can have enduring negative psychological consequences, lasting from youth through midlife (e.g., Boyle et al., 1989; Card, 1983; Centers for Disease Control, 1988a; Davidson & Foa, 1993). The recent major epidemiological study (National Vietnam Veterans Readjustment Study, NVVRS) by Kulka et al. (1990) estimated that 31% of the 3.1 million men who served in the Southeast Asian theater during the Vietnam War have a lifetime history of PTSD. This study also estimated that 15% of male theater veterans, or almost 480,000 men, suffered from current PTSD; an additional 11% had partial symptoms of PTSD. Among theater veterans exposed to heavy war zone stress, the prevalence of current PTSD was 36%.

Relatively little is known about the prevalence of current traumatic stress symptoms in WWII and Korean-conflict veterans, although there is no doubt that many men experienced acute symptoms as a result of combat (e.g., Bartmeier, Kubie, Menninger, Romano, & Whitehorn, 1946; Swank, 1949). Twenty-three percent of the battlefield casualties in WWII were psychiatric in nature (Friedman, 1981). Investigators who studied combat veterans during the 1940s and 1950s described a condition termed *combat fatigue* that was quite similar to what we now recognize as PTSD (e.g., Brill & Beebe, 1955; Futterman & Pumpian-Mindlin, 1951; Kardiner & Spiegel, 1947). Early follow-up studies found this condition to persist more than 20 years after the initial traumatic exposure (e.g., Archibald & Tuddenham, 1965; Klonoff et al., 1976).

Perhaps the most well-studied group of older veterans is POWs (Page, 1992). Prevalence estimates of lifetime PTSD among this group range as high as 70% (e.g., Eberly & Engdahl, 1991; Sutker, Allain, & Winstead, 1993). Investigations also document the existence of PTSD in treatment-seeking older veterans. In a study of Department of Veterans Affairs medical patients, 18.5% of the WWII veterans and 30% of the Korean-conflict veterans had current PTSD (Blake et al., 1990); looking at those who had never sought psychiatric treatment, the authors found that 9% of WWII veterans and 7% of Korean-conflict veterans met criteria for a diagnosis (Blake, personal communication, 1991). Similar figures were reported for WWII veterans by Page (1992), although he reported a prevalence of 22% among Korean veterans. Prevalence estimates in psychiatric patients are extraordinarily high. Rosen, Fields, Hand, Falsettie, and Van Kammen (1989) reported that among WWII veteran psychiatric patients who had not previously been diagnosed with PTSD, 54% had a lifetime diagnosis, and 27% had current PTSD. Rosenheck and Fontana (in press) reported even higher figures for current prevalence among older veterans seen at a PTSD clinic: 55% for WWII veterans and 65% for Korean-conflict veterans.

Several recent case studies show that combat-related psychiatric symptoms can occur among previously asymptomatic veterans even 50 years after combat (Christenson, Walker, Ross, & Maltbie, 1981; Hamilton, 1982; Pary, Turns, & Tobias, 1986; Pomerantz, 1991; Richmond & Beck, 1986; Van Dyke, Zilberg, & McKinnon, 1985). It is important to note that reexposure to battle-related stimuli or even to a life-threatening situation did not occur in any of these cases, and only two cases (Pary et al., 1986; Richmond & Beck, 1986) seem to have experienced psychiatric symptoms previously. One hypothesis is that delayed onset may result from experiencing stressful events often associated with aging, such as retirement or bereavement (Archibald & Tuddenham, 1965; Elder & Clipp, 1989).

Despite clear evidence that a number of veterans from WWII and the Korean conflict currently experience symptoms of

PTSD 40 to 50 years after exposure to combat, existing data permit only limited inferences about the full extent of the problem. All of the available studies are based on either treatment-seeking veterans or POWs, both highly select groups. In addition, the nationally representative sample in the most recent SOV-III did not contain detailed questions about either PTSD or combat exposure (Department of Veterans Affairs, 1989).

Present Study

The present study is the first to address the lack of information about the long-term effects of combat exposure on the psychological health of community-residing older men. We examined the relationships between measures of PTSD and of combat exposure among WWII and Korean-conflict veterans. As indicators of PTSD, we considered both symptom scores on the PTSD measures and the sample prevalence, defined as the percentage of the sample whose score exceeded the cutpoints used by the NVVRS. Data from SOV-III have shown that WWII veterans were much more likely than Korean-conflict veterans to have been exposed to combat (Department of Veterans Affairs, 1989). Data from treatment-seeking veterans show that these cohorts may also differ in type of combat exposure; for example, WWII veterans are more likely to have participated in an amphibious invasion and less likely to have participated in atrocities (Rosenheck & Fontana, in press). It is an open question whether different aspects of combat are related to the subsequent development of PTSD in older veterans. Thus, we began by testing for differences between the two war cohorts in combat exposure to determine whether they could be pooled in subsequent analyses. On the basis of the outcome of these analyses (see below), we examined the sample prevalence of PTSD and its relationship to combat exposure separately within each cohort. The existing literature did not allow predictions about how many older men would meet the diagnostic criteria. However, on the basis of research with Vietnam veterans (Kulka et al., 1990), we expected that combat exposure would lead to increased risk of PTSD symptoms.

Method

Sample and Procedure

In 1961, the Boston Veterans Administration Outpatient Clinic began screening participants for the Normative Aging Study (NAS), a lifelong study of aging in healthy men (Bossé, Ekerdt, & Silbert, 1984). Participants were recruited from the community by newspaper and radio advertisements, as well as from a major life insurance company and from postal, police, and fire departments. By 1968, over 6,000 men had been screened, and 2,280 men were selected to participate in the study, having passed the stringent health screening required for admission. The NAS men were born between 1884 and 1945, with the majority between 1915 and 1934. At study entry, their ages ranged from 22 to 82 years (M = 47.26, SD = 9.47); most (89%) were between the ages of 30 and 59 years.

The NAS is well-suited for studying the long-term effects of combat exposure, having begun with a panel of initially healthy men. Although being a veteran was not a criterion for admission to the NAS, over 95% of the men reported military service, with most (90%) having served during wartime. As reported in Butcher et al. (1991), the NAS men as a whole have Minnesota Multiphasic Personality Inventory—2 (MMPI-2) validity and clinical scale scores that are nearly identical to those of other community-residing men. Furthermore, their scores on other standardized measures of personality and mental health, such as the 16 Personality Factor Questionnaire (16PF; Cattell, Eber, & Tatsuoka, 1970) and the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1983) do not differ significantly from the respective standardization samples (Aldwin, 1990; Aldwin, Spiro, Bossé, & Levenson, 1989). Thus, the NAS sample, although initially selected for good physical health and for the absence of major mental illness, is representative of the older adult male population in terms of mental health and personality.

Subjects in the present study were selected from respondents to a questionnaire about military service that was sent to all participants who were alive as of February 1, 1990. Men who did not respond within 3 weeks were sent a reminder letter, and those who did not respond within 3 additional weeks were sent another copy of the questionnaire. Of the 1,778 surveys mailed, 36 were returned, either because the participant was deceased (23), too sick to complete it (5), or it was undeliverable (8). Of the remaining 1,742 surveys, 1,444 (83%) were completed.

Comparison of responders and nonresponders. We were concerned that asking men to recall their combat experiences might elicit dormant PTSD symptoms in some who might then refuse to respond. Thus, in our follow-up letters, we asked men to call us if they experienced any difficulties in completing the questionnaire. Over the next several months, 5 men or their families contacted us with reports of PTSD symptoms (e.g., flashbacks or nightmares) elicited by the questionnaire and were given support and referrals. Because some of these men were unable to complete the questionnaire, and there might have been others who did not choose to contact us, we were concerned that the findings we obtained might be underestimates; thus we conducted several analyses to determine whether this might be the case.

After omitting 63 nonveterans who responded, we used variables selected from the NAS longitudinal archive to compare the 1,381 responders with the 280 nonrespondent veterans, who were identified as such on the basis of information obtained at study entry (1961–1968). Chi-square tests and t tests were conducted for categorical and continuous variables, respectively, to compare these two groups on demographics, military experiences, and personality as measured by the MMPI-2 (Butcher et al., 1989).

According to data obtained at entry into the NAS (1961–1968), responders were slightly older (40.86 vs. 39.48), $t(1659) = 2.75$, $p < .01$, and better educated (4.98 vs. 4.74 on a 7-point scale), $t(1639) = 2.99$, $p < .01$. There was no difference between the groups on a dichotomous measure of combat exposure ("Were you in a combat area?"); 43.04% of responders and 41.73% of nonresponders reported exposure, $\chi^2(1, N = 1{,}635) < 1$, *ns*.

Analyses of data collected during recent mail surveys (1987–1992) revealed that nonresponders reported lower life satisfaction (7.00 vs. 7.35 on a 9-point scale), $t(1129) = 2.17$, $p < .05$, and were less likely to be retired (45.24% vs. 60.72%), $\chi^2(1, N = 1{,}105) = 7.73$, $p < .01$. There were no differences between groups in income level, percentage ever married, or self-rated health on a 5-point scale.

Responders (n = 1204) did not differ from nonresponders (n = 121) on the clinical or validity scales of the MMPI-2, administered in 1986 in conjunction with the MMPI Restandardization Project (Butcher et al., 1989). Although responders did have marginally lower scores on the Keane PTSD (Pk) scale (Keane, Malloy, & Fairbank, 1984; 5.25 vs. 6.12), $t(1323) = 1.69$, $p < .10$, they did not differ from nonresponders in the proportion meeting the diagnostic cutpoint for PTSD (6.98% vs. 9.09%, respectively), $\chi^2(1, N = 1{,}325) < 1$, *ns*.

On the basis of these analyses, we concluded that the men who responded to the military survey were generally representative of NAS veterans and that nonresponse would not distort our findings.

Sample description. Of the 1,381 veterans who responded, 3 had served before WWII, 95 after the Korean conflict, and 20 did not provide dates of service, leaving 1,263 men who served in WWII or the Korean conflict. After omitting men with missing data on combat exposure or on the Mississippi scale, 809 WWII and 401 Korean veterans remained. The numbers reported below in analyses of the MMPI-2 Pk scale are smaller because of the greater extent of missing data.

At the time of the 1990 survey, the men in the final sample were 50 to 87 years old (M = 65.71, SD = 6.74). Using data collected at entry into the NAS, 23% of the men were high school graduates, 39% had some college, 14% were college graduates, and 14% had postcollege education. Slightly over 40% of the men were in white-collar occupations, 16% were clerks or salesmen, 18% were in manual jobs, and 25% were in protective or service occupations (e.g., firemen, policemen, or mailmen).

According to information from mail surveys conducted between 1987 and 1992, 53% of the men were working and over 90% were married. They rated their health as good (M = 4.07, SD = 0.67, on a 5-point scale) and their life satisfaction as high (M = 7.36, SD = 1.40, on a 9-point scale). Mean income was in the range of $40,000 to $44,000.

Measures

The 1990 survey collected information on military service, including type, location, and duration; degree of combat exposure; beliefs about the impact of military service; and current mental health (see also Aldwin et al., 1994). For the present study, we used data on military service, combat exposure, and PTSD.

Military service. This section included questions on characteristics at entry into service, dates, branches, locations of service, and rank at entry and exit. Dates of service were used to define length of service and era: WWII (served 1941–1946) and Korean conflict (served 1950–1955). Of the 121 men who served during both eras, 29 were included in the Korean cohort because this was their last exposure to combat or because their WWII service occurred after the cessation of hostilities; the remaining men were included in the WWII cohort because their combat experience occurred during that conflict.

Combat exposure. To assess combat exposure, we used Keane et al.'s (1989) Combat Exposure Scale (CES), which consists of seven items rated on a 5-point Likert scale. Scores on the CES were computed following Keane et al., who weighted items according to severity. For the men who completed only five or six items (n = 80, 7%), scores were computed as the mean of the items answered, multiplied by the number of items in the scale. For the men with complete data on the CES (n = 1,130, 93%), the alpha reliability was .92. The continuous scale was used to create an ordinal combat exposure scale, using levels suggested by Keane (personal communication, February 1991). Men with scores of 0 were considered to have no combat exposure; those with scores of 1–8, light; 9–16, light-moderate; 17–24, moderate; 25–32, moderate-heavy; and 33–41, heavy. We used this ordinal scale to examine the relationship of combat exposure to both PTSD symptom scores and sample prevalence, but because of small numbers in the heavy category (27 WWII veterans and 1 Korean veteran), we combined it with the moderate-heavy category.

Because we were concerned that the CES, developed on Vietnam veterans, might not adequately assess combat exposure among veterans of earlier wars, we also included two items adapted from Elder and Clipp (1988) on duration of time in combat conditions and on exposure to outcomes of combat (e.g., wounded or dead people).[1] In addition, the survey included items assessing whether one or one's unit had killed anyone in combat, whether one had been wounded, and experience of survival guilt. A dichotomous item indicating service in a combat area was available from a survey administered at time of entry into the NAS.

PTSD. Because so little is known about PTSD and its assessment in older men, we used two measures: the Mississippi Scale for Combat-Related PTSD (Keane, Caddell, & Taylor, 1988) and the MMPI-2 Pk scale (Keane et al., 1984; Lyons & Keane, 1992). The Mississippi scale consists of 35 items rated on a 5-point Likert scale.[2] Items assess each of the three cardinal features of PTSD (APA, 1987): intrusion (e.g., I have nightmares of experiences in the military that really happened), numbing or avoidance (e.g., it seems as if I have no feelings), and increased arousal (e.g., unexpected noises make me jump), as well as such associated features as depression and guilt (e.g., I wonder why I am still alive when others died).

For men who responded to all 35 items (n = 1,104, 91%), scores were computed as the sum of all items; for men who responded to 28 or more items (n = 109, 9%), scores were prorated for the number of items completed. For the men with complete data, the alpha reliability was .71. Using the cutpoint for community samples suggested by Kulka et al. (1991), a man was considered to have PTSD if his Mississippi score was 89 or greater. In his study of PTSD among older POWs and combat veterans, Page (1992) also used this cutpoint.

The MMPI-2 Pk scale had been administered in 1986; it consists of 46 true-false items (Butcher et al., 1989). This scale compares favorably with the original 49-item MMPI Pk scale (Keane et al., 1984), although the three items that were repeated in the original scale are now presented only once (Lyons & Keane, 1992). Litz and colleagues (Litz et al., 1991) reported good agreement between the two versions in discriminating between PTSD cases and comparisons in a sample of patients and normal controls.

For veterans who responded to all items (n = 977, 92%), scores were computed as the sum of keyed responses; for men who completed 75% (35 or more) of the items (n = 90, 8%), scores were prorated. In the present sample, the alpha reliability was quite good (.87), comparable with that reported by Graham (1990) for the MMPI-2 restandardization sample. A man was considered to have PTSD symptoms if his score was 15 or greater (Kulka et al., 1991; Watson, 1990).[3]

Results

Cohort Differences in Military Experience and Combat Exposure

Differences between war cohorts in military service characteristics and combat exposure were tested using t tests for con-

[1] The two items adapted from Elder and Clipp (1988) were highly correlated with CES scores for the combined sample (r = .81, n = 1,194, and .74, n = 1,130, respectively), and combining them in a scale with the CES items did not alter the results of any analyses. Accordingly, we present only the results of analyses based on the better known CES, but we are willing to make our findings based on the expanded CES available to interested readers.

[2] The response format of the Mississippi scale was slightly modified to be more consistent with other measures administered to the NAS sample. All items were presented with the same 5-point format (1 = *not at all true*, 2 = *slightly true*, 3 = *somewhat true*, 4 = *very true*, and 5 = *extremely true*). The original version of the Mississippi scale also uses a 5-point response format, but the response anchors are not consistent across items.

[3] Note that the cutpoints for PTSD symptoms on both the Mississippi and the Pk scales were based on data from Vietnam veterans. Although the NVVRS (Kulka et al., 1990, 1991) is an excellent study and provides the best information currently available on the relationship between psychometric and clinical assessments of PTSD, the sample consisted of Vietnam veterans. Lacking any comparable data on older veterans, we were forced (as was Page, 1992) to use the best available information. However, it is possible that the cutpoints we have used are not optimal for older community-residing veterans and that we have consequently misestimated the prevalence of PTSD symptoms in this group.

tinuous variables and chi-square tests of independence for categorical variables.

The two war cohorts had similar demographic profiles, except that WWII veterans were older in 1990 (68.96 vs. 58.79), $t(1208) = 39.46, p < .001$, more likely to be retired (62.32% vs. 22.49%), $\chi^2(1, N = 926) = 126.17, p < .001$, reported a lower income range ($35,000–$39,000 vs. $50,000–$54,000), $t(902) = 12.09, p < .001$, and had poorer self-reported health (3.98 vs. 4.19 on a 5-point scale), $t(938) = 4.29, p < .001$. There were no differences between cohorts in the percentage ever married, life satisfaction, or in their educational level or occupational category at study entry (data not shown).

Table 1 shows that WWII and Korean-conflict veterans differed in many aspects of their military experience. WWII veterans were older at service entry, $t(1192) = 6.40, p < .001$, and spent more time overseas, $t(1197) = 4.48, p < .001$, but did not differ in total time in the service, $t(1186) < 1$, *ns*. Table 1 also shows that WWII veterans differed from Korean-conflict veterans in mode of service entry, $\chi^2(2, N = 1{,}201) = 13.55, p < .001$, branch of service, $\chi^2(3, N = 1{,}182) = 8.34, p < .05$, and theater of service, $\chi^2(2, N = 1{,}196) = 44.61, p < .001$. They did not differ in highest rank attained, $\chi^2(2, N = 1{,}201) = 2.60$, *ns*.

WWII veterans were more likely than Korean-conflict veterans to have killed the enemy in combat, either by personal action (11.72% vs. 3.62%), $\chi^2(1, N = 1{,}172) = 20.68, p < .001$, or by unit action (26.89% vs. 5.91%), $\chi^2(1, N = 1{,}170) = 71.64, p < .001$. WWII veterans were also more likely than Korean veterans to have been wounded in battle (7.31% vs. 2.54%), $\chi^2(1, N = 1{,}186) = 11.06, p < .001$, and to have experienced survival guilt (21.15% vs. 13.38%), $\chi^2(1, N = 1{,}195) = 10.56, p < .001$; data not shown.

Table 2 presents responses on the items and total score of the CES separately by cohort. WWII veterans had higher scores than Korean-conflict veterans on the items and on the total score, whether it was scored as a continuous, $t(1208) = 10.64, p < .001$, or as an ordinal variable, $\chi^2(4, N = 1{,}210) = 139.54, p < .001$. The difference in means (8.06 vs. 2.04) was due primarily to the fact that 54% of the WWII cohort but only 19% of the Korean cohort were exposed to combat. The difference was still apparent at the higher end of the exposure scale; almost 22% of the WWII veterans, but only 5% of the Korean veterans, had at least a moderate amount of combat exposure. Considering only combat veterans, the WWII veterans were exposed to higher levels of combat than were the Korean veterans (15.01 vs. 10.79), $t(509) = 3.37, p < .001$.

The two additional items adapted from Elder and Clipp (1988) assessing combat exposure also differed among cohorts. WWII veterans were in combat longer than were their Korean counterparts and were more often exposed to the outcomes of combat, even if they were not a direct combatant (e.g., a physician).

Given the differences in combat experience between the WWII and the Korean veterans, subsequent analyses were conducted separately for each cohort. Because so few men in the Korean cohort had any combat exposure, the ordinal scale was dichotomized for this group to contrast "no exposure" with "any exposure."

PTSD and PTSD Symptoms in Relationship to Combat Exposure

The correlation between scores on the Mississippi and the Pk PTSD scales was significant for both cohorts (WWII: $r = .52$, *n*

Table 1
Characteristics of Military Service by War Cohort

Service characteristic	World War II		Korean			
	M	*SD*	*M*	*SD*	*t*	*p*
Age at entry	21.35	4.40	19.82	2.59	6.40	.001
Years overseas	1.26	1.38	0.90	1.14	4.48	.001
Years in service	3.91	4.69	3.76	3.92	0.57	*ns*
	%	*n*	%	*n*	χ^2	*p*
Service entry					13.55	.005
Enlisted	57.55	461	58.50	234		
Drafted	36.83	295	30.50	122		
ROTC–Reserves	5.62	45	11.00	44		
Branch					8.34	.039
Army	47.28	374	50.90	199		
Navy	35.02	277	27.11	106		
Marines	5.96	45	7.42	29		
Air Force	12.01	95	14.58	57		
Theater					44.61	.001
Stateside	24.66	197	42.57	169		
European–African	36.05	288	32.49	129		
Asian–Pacific	39.30	314	24.94	99		
Rank					2.60	*ns*
Enlisted	37.41	300	36.59	146		
Noncommissioned	48.88	392	52.63	210		
Officer	13.72	110	10.78	43		

Note. The maximum *N* for the World War II cohort is 809 and for the Korean conflict cohort is 401; numbers vary because of missing data. ROTC = Reserve Officer's Training Corps.

Table 2
Characteristics of Combat Exposure by War Cohort

Characteristic	World War II *n*	World War II *M*	World War II *SD*	Korean *n*	Korean *M*	Korean *SD*	*t*
Combat Exposure Scale items							
Go on combat patrols	799	0.95	1.36	399	0.27	0.82	9.18
Under enemy fire	800	1.19	1.57	401	0.26	0.82	11.16
Surrounded	796	0.31	0.80	399	0.04	0.24	6.38
% unit casualties	788	0.51	0.85	399	0.12	0.36	8.98
Fire at enemy	803	0.74	1.13	400	0.20	0.74	7.54
See someone hit by fire	806	0.55	1.03	400	0.15	0.54	7.25
Danger of injury or death	793	1.00	1.29	398	0.25	0.74	10.69
Combat Exposure Scale scores							
Total sample	809	8.06	10.60	401	2.04	5.73	10.64
Combat veterans only	435	15.01	10.23	76	10.79	8.94	3.37
Additional items							
How long in combat	797	1.64	1.76	397	0.45	1.14	12.27
Exposed to outcomes	732	0.92	1.30	398	0.31	0.86	8.32

Note. All combat exposure items were presented with a 5-point Likert response format, with higher scores indicating greater exposure. All *p* values are significant at or beyond the .001 level.

= 731; Korean: $r = .62$, $n = 337$), suggesting agreement between the two measures of PTSD. The correlation of the Mississippi scale with combat exposure (as measured by the CES) was significant for both WWII ($r = .22$, $n = 809$) and Korean-conflict veterans ($r = .17$, $n = 401$). In contrast, the MMPI-2 Pk scale was uncorrelated with combat exposure in either cohort (WWII: $r = .03$, $n = 731$; Korean: $r = -.05$, $n = 337$). When the sample was restricted to combat veterans only, the correlations changed only slightly.

Mean scores for both PTSD scales are presented in Table 3. One-way analyses of variance (ANOVAs) showed that in both cohorts, scores on the Mississippi scale varied as a function of combat exposure level; WWII: $F(4, 804) = 9.17$, $p < .001$; Korean: $F(1, 399) = 12.42$, $p < .001$. For the WWII data, planned comparisons with the no-exposure group as the reference category revealed that Mississippi scores were significantly higher in all of the exposed categories except the light category, ranging from 59.79 in the light–moderate category, $F(1, 804) = 6.79$, $p < .01$, to 63.41 in the moderate–heavy category, $F(1, 804) = 29.49$, $p < .001$.

For the Korean-conflict veterans, Mississippi scores were higher in the combat-exposed group than in the unexposed group (60.45 vs. 56.22), $F(1, 399) = 12.42$, $p < .001$. Scores on the Pk scale did not differ among combat exposure groups in either cohort; WWII: $F(4, 726) < 1$, *ns*; Korean: $F(1, 335) < 1$, *ns*.

The percentage of men whose scores exceeded the respective cutoffs for a PTSD diagnosis (hereinafter referred to as *prevalence*) by cohort is also presented in Table 3. On the Mississippi scale, the overall prevalence of PTSD was 0.74% (6 of 809) in WWII veterans and 0.25% (1 of 401) in Korean-conflict veterans. On the MMPI-2 Pk scale, the overall prevalence in these

Table 3
Posttraumatic Stress Disorder (PTSD) Scores by Combat Exposure and War Cohort

Cohort	Combat exposure	Mississippi *n*	Mississippi Score *M*	Mississippi Score *SD*	Mississippi ≥89[a] %	Mississippi ≥89[a] *SE*	MMPI-2 Pk *n*	MMPI-2 Pk Score *M*	MMPI-2 Pk Score *SD*	MMPI-2 Pk ≥15[b] %	MMPI-2 Pk ≥15[b] *SE*
World War II	None	374	56.91	8.63	0.27	0.27	340	4.94	4.92	6.18	1.31
	Light	153	57.29	8.36	0.00		137	4.76	4.66	5.84	2.01
	Light–moderate	106	59.79	10.45	0.94	0.94	93	5.38	5.27	5.38	2.35
	Moderate	89	60.25	11.38	1.12	1.12	81	5.81	6.19	12.35	3.68
	Moderate–heavy	87	63.41	15.33	3.45	1.97	80	4.80	5.26	6.25	2.72
	Pooled	809	58.42	10.27	0.74	0.30	731	5.11	5.11	6.70	0.93
Korean	None	325	56.22	9.23	0.31	0.31	277	5.57	5.52	6.86	1.52
	Exposed	76	60.45	10.17	0.0		60	4.95	5.36	5.00	2.84
	Pooled	401	57.02	9.55	0.25	0.25	337	5.46	5.52	6.53	1.35

Note. MMPI-2 = Minnesota Multiphasic Personality Inventory—2; Pk = Keane MMPI-2 PTSD scale.
[a] Percentage of men whose scores exceeded the National Vietnam Veterans Readjustment Study (NVVRS) threshold for PTSD caseness on the Mississippi scale. [b] Percentage of men whose scores exceeded the NVVRS threshold for PTSD casesness on the Pk scale.

cohorts was 6.70% (49 of 731) and 6.53% (22 of 337), respectively.

Table 3 also presents the sample prevalence of PTSD by level of combat exposure, for both measures and both war cohorts. For the WWII veterans, PTSD as measured by the Mississippi scale generally increased with combat exposure. For the Pk scale, the trend suggested an inverse U, being highest for men with moderate exposure. For the Korean veterans, the prevalence of PTSD according to both scales was higher in the group with no combat exposure than it was in the exposed group.

Logistic regression was used to test the significance of differences in the prevalence of PTSD as a function of combat exposure level, separately for each war cohort. Results demonstrated that for WWII veterans, the likelihood of a PTSD diagnosis according to the Mississippi scale varied with combat exposure, $\chi^2(4, N = 809) = 11.18$, $p < .05$. Among the four dummy variables representing levels of combat exposure, only moderate–heavy was significantly different from the reference category of no exposure. A diagnosis of PTSD was 13.3 times more likely in moderate–heavy combat veterans than in nonexposed veterans, 95% confidence interval = 1.4 to 129.7, $p < .05$. For Korean-conflict veterans, there was only one case of PTSD according to Mississippi score; thus the logistic model was inestimable.

As in the analyses of Pk scale scores, the likelihood of a PTSD diagnosis according to the MMPI–2 Pk scale was not associated with combat exposure in either the WWII, $\chi^2(4, N = 731) = 3.99$, *ns*, or the Korean cohort, $\chi^2(1, N = 337) < 1$, *ns*.

We were unable to examine the relationship between combat exposure and diagnoses of PTSD on both the Mississippi and the Pk scales because there was so little agreement between them. In the WWII cohort, a joint diagnosis was present in only 3 (6%) of the 51 men who had PTSD according to either measure. In the Korean cohort, only 1 (5%) of the 22 men diagnosed by either measure was diagnosed by both as having PTSD.

Discussion

The present results indicate a clear relationship between self-reports of combat exposure 45 to 50 years ago and current PTSD symptoms among older men, with men who reported more combat exposure also reporting more PTSD symptoms on the Mississippi scale but not on the Pk scale. In contrast with what might have been expected on the basis of prior research on Vietnam veterans, the number of men whose scores exceeded the cutpoints suggesting a PTSD diagnosis was quite low in this sample of older veterans from the NAS. Using the cutoffs recommended by Kulka et al. (1991) based on the NVVRS, the prevalence was less than 1% for both war cohorts using the Mississippi scale and 6–7% using the Pk scale. These findings raise two questions. First, why were the two PTSD measures, the Mississippi and the Pk, so discrepant in their association with combat exposure and with regard to prevalence? Second, how does the prevalence in this sample of PTSD according to the Mississippi scale compare with that found in other samples of combat veterans?

With regard to the first question, the correlation between the two PTSD scales was "large" (Cohen, 1988) in both war cohorts. However, the correlations, ANOVAs, and the logistic regression analyses all indicated that although combat exposure was related to PTSD symptoms as measured by the Mississippi scale, it was unrelated to the Pk scale. Combined with the higher prevalence of PTSD on the Pk than on the Mississippi scale, we interpret these results as suggesting several possibilities. The first is that the Pk scale does not assess combat-related PTSD in this sample. Such a possibility has been suggested by Moody and Kish (1989), who concluded that "the [Keane MMPI] PTSD scale is less a measure of Post-traumatic Stress Disorder than it is a measure of general psychopathology and dysphoric feelings" (p. 544). A second possibility, suggested by a reviewer, is that scores on the Pk scale were restricted in range, compared with those seen in other samples. This would account for the attenuated correlation with combat exposure. However, if range restriction were the case, we would not have expected to observe the relatively high correlations between the two PTSD scales that we did. A third possibility is that the cutpoint used to determine presence of PTSD on the Pk scale should be higher for older veterans. In a recent study, Hyer et al. (1992) found that, for older veterans with clinical diagnoses of PTSD, a higher cutoff on the Pk scale had better sensitivity and specificity. However, it should be noted that we used the 46-item MMPI–2 version of the Pk scale, whereas the NVVRS (Kulka et al., 1991) and Hyer et al. (1992) used the original 49-item version. Because our Pk scale contained fewer items and we used the NVVRS cutoff established on the longer version, in effect we were following Hyer et al.'s recommendation. A final possibility is that the discrepancy between the two scales simply reflects the fact that the Pk scale was developed empirically by selecting items that distinguished PTSD cases from veterans with other psychiatric diagnoses. In contrast with the Mississippi scale, items on the Pk scale do not refer to military experience or to combat; rather they assess symptoms such as arousal or numbing that are associated with PTSD as well as with other forms of psychopathology.

With regard to the second question, the prevalence of PTSD in this sample, there are relatively few comparable studies. In our sample, the prevalence of PTSD according to the Mississippi scale was 1.15% among WWII combat veterans; among those exposed to moderate or heavy combat, the prevalence was 3.45%. One of the few studies to examine PTSD in older combat veterans using the Mississippi scale was conducted by Blake et al. (1990), who reported prevalences of 7% and 9% in WWII and Korean-conflict combat veterans who had never sought psychiatric treatment. Similar figures were reported by Page (1992) for WWII veterans, although the prevalence of PTSD among Korean veterans was 22%. Using another PTSD scale, Norris (1992) reported a multisite study of PTSD among adults in four southern cities. Among men aged 60 and older, 20% reported combat exposure; the prevalence of combat-related PTSD among these men was 2.2%. Thus, the prevalence of combat-related PTSD among NAS men is roughly comparable to that reported in other samples of community-residing older veterans, but much lower than that among medical and psychiatric inpatients or former POWs where prevalence estimates range as high as 70%.

We wondered whether the military experience of the NAS men, and their combat exposure in particular, might have been atypical. To address this, we examined aspects of the military

experience in other samples of community-residing veterans. Compared with the Oakland-Berkeley sample of WWII and Korean veterans studied by Elder and Clipp (1988, 1989), there were virtually no differences in mode of service entry, in branch of service, or in percentage exposed to combat. The NAS men were more likely to have served in the European-African theater than in the Asian-Pacific theater. Compared with the national sample from the 1987 SOV-III (Department of Veterans Affairs, 1989), the NAS included fewer Korean-era veterans who served overseas (55% vs. 76%) and who were exposed to combat (19% vs. 35%). For both war cohorts, men in the NAS were more likely to have attained a higher rank than were men in the national sample. About 50% of the NAS men attained the rank of noncommissioned officers, and 10–14% were officers; in the national sample, the comparable figures are 1% and 11%, respectively. Unfortunately, data on PTSD are unavailable for both the SOV-III and for the Oakland-Berkeley samples.

On the basis of these results, we draw the following conclusions about current combat-related PTSD in older veterans. First, the prevalence in these healthy, community-residing veterans of WWII or Korea is quite low, comparable to the rates found in other community surveys (e.g., Norris, 1992). Second, it is likely that in this sample, the MMPI-2 Pk scale is measuring exposure to more general trauma than combat, in contrast with the Mississippi scale, which is related to combat exposure. We conclude that the Pk scale may not be an adequate measure of combat-related PTSD in community samples of older veterans.

Several limitations of this study should be considered. First, as is common in most studies of PTSD, data were collected retrospectively, long after the event of combat exposure; thus recall of military experience and combat exposure may be biased (but cf. Aldwin et al., 1994). Second, there are two additional implications of the long interval between the event and the assessment of its impact. Selective mortality may have operated such that the men most likely to have experienced PTSD as a result of combat exposure may have been less likely to have survived and participated in this study. Although some evidence suggests that veterans enjoy lower mortality than do nonveterans (the "healthy soldier" effect), at least for some causes of death (Seltzer & Jablon, 1974), the long-term mortality of veterans discharged with "psychoneuroses" does not differ from that of other veterans (Keehn, Goldberg, & Beebe, 1974). This suggests to us that the proper reference group for the NAS sample is not the general U.S. population but rather the veteran population, which has been subject to some of the same selection factors as has the NAS. With a longer interval between combat exposure and assessment of PTSD, the likelihood increases that other traumatic exposures might have occurred. It is possible that in this sample, the Pk scale was assessing the effects of exposure to traumatic events in general, rather than the effects of combat in particular. Third, as a result of the physical and mental health screening that NAS men underwent at study entry, those most likely to then have or later develop PTSD may have been excluded. However, our finding evidence of current PTSD in such a selected sample as the present one suggests that it may be more prevalent in the general veteran population. This possibility is suggested by recent studies of more vulnerable men such as POWs or patient groups (Blake et al., 1990; Page, 1992; Rosen et al., 1989; Sutker et al., 1993).

Another limitation is that assessment of PTSD was based solely on questionnaire responses and not on the more accepted multimodal approach (Kulka et al., 1990, 1991), which combines questionnaires, clinical interviews, and sometimes physiological measurements (e.g., Orr, 1990). In future research, we plan to conduct diagnostic interviews, at least for a sample of men, and examine the accuracy of our questionnaire-based diagnoses. In the meantime, however, we rely on the fact that Kulka et al. (1991), Watson (1990), and others have found the Mississippi scale to be the best questionnaire measure of PTSD currently available.

In conclusion, we wish to emphasize that among the multitude of studies on the health and well-being of older men, few have examined the effects of military service on these outcomes, despite it being a "turning point" in the lives of many (Elder et al., 1991). Sociologists have shown that military service has effects on the timing and sequencing of adult roles and on educational and occupational attainment (e.g., Anderson & Mitchell, 1992; Elder et al., 1991, 1994; Hastings, 1991). As psychologists, we suggest that military service is a hidden variable in psychological aging. There are many components of military service in general, and of war-zone deployment in particular (Wolfe, Brown, & Kelley, 1994). The effects of these different components are likely to vary depending on the domain under study. With respect to mental health, it is likely that combat exposure is particularly "toxic." Other effects of military service may affect cognitive processes, coping style, personality, and affect, perhaps positively as well as negatively (e.g., Elder & Clipp, 1989). In the future, research on aging men should consider the possible effects of military service on the outcomes considered and bring this hidden variable into the light.

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