

AN ABSTRACT OF THE DISSERTATION OF

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Title: Comparing Lifespan and Life Course Perspectives on Combat Exposure and PTSD Symptoms in Later Life: Findings from the Normative Aging Study.

Abstract approved:

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We examined how the experiences of World War II and Korean War veterans, including prewar, warzone, and postwar factors, affected PTSD symptoms in later life. This dissertation consists of two studies. In Study 1, four different hypotheses from a lifespan approach were examined (King et al., 1996): stress evaporation (only childhood experiences are important); residual stress (only warzone experiences are important); stress vulnerability (childhood and warzone experiences interact); and main effects (independent contribution) hypotheses. The main effects hypothesis was supported: we found independent contributions of prewar, warzone, and postwar

factors in predicting PTSD symptoms. However, there was stronger evidence for the stress vulnerability hypothesis, given that cohesive and conflictual childhood family environments, age at entry, negative homecoming, and additional stressful life events moderated the relationship between combat exposure and PTSD symptoms. Cohesive early childhoods mitigated the effects of combat exposure on PTSD symptoms, while the other variables increased the effects. The results supported King et al.'s (1996) previous research, but extended it by testing the vulnerability hypothesis, and identifying protective as well as risk factors.

In Study 2, we contrasted the utility of the continuity and discontinuity hypotheses from life course theory in modeling the impact of military service during war on PTSD symptoms in later life. From the discontinuity perspective (Elder & Shanahan, 2006), both positive turning points (difficult early childhood but positive military service appraisals leading to fewer PTSD symptoms) and life course disruption hypotheses (positive childhood but negative military service appraisals leading to more PTSD symptoms) were partially supported. Positive turning points were seen only in veterans who entered military service at an early age, whereas life course disruption was seen regardless of age at entry but primarily among those with conflictual childhood environments. Structural equation models found evidence for the cumulative advantage as well as cumulative disadvantage hypotheses, reflecting a continuity perspective (London & Wilmoth, 2006), but the timing of military service was not a significant factor in continuity hypothesis. This dissertation provided

evidence for the utility of both lifespan and life course approaches to understanding the effects of military service in late life.

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Comparing Lifespan and Life Course Perspectives on Combat Exposure and PTSD

Symptoms in Later Life: Findings from the Normative Aging Study

by

Sungrok Kang

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APPROVED:

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Chair of the Department of Human Development and Family Sciences

Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

Sungrok Kang, Author

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In both Study 1 and Study 2, Dr. Aldwin provided abundant ideas for the whole project, including research questions, theoretical background, data analysis, and discussion. Dr. Spiro permitted us use the archival data from Normative Aging Study, and advised us on solution for statistical problems.

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To the veterans in my dissertation, who fought for peace and liberty around the world
and my mother country, South Korea;
and to my father, who is a Vietnam War veteran.

CHAPTER 1

GENERAL INTRODUCTION

There has been an extraordinary increase in the number of studies on the impact of stressful life events on psychological well-being (Aldwin, 2007). Combat exposure of veterans during military service probably is a major determinant of psychological well-being in later life. A review of the literature suggested that exposure to combat-related stressors resulted in various physical and psychological symptoms in later life (Elder & Clipp, 1989; King, King, Foy, Keane, & Fairbank, 1999; Spiro, Schnurr, & Aldwin, 1994). Post-traumatic stress disorder (PTSD) is a good example of the types of psychological symptoms which are a sequela to trauma. We found that now 579 articles examined combat exposure and PTSD in the PsycInfo. However, relatively few numbers of these studies have been concerned with the effects of combat exposure on older adults.

PTSD is one type of anxiety disorder that is observed in persons who have experienced an extreme stressor that evokes feelings of "intense fear, helplessness, or horror" (American Psychiatric Association, 1994, p. 428). Typical symptoms of PTSD are reexperiencing the event through frightening dreams and intrusive recollections, avoidance of circumstances that might trigger a reexperiencing episode, emotional numbing and retreat from intimate relationships, and increased arousal.

U.S. prevalence estimates of lifetime PTSD were approximately 8% (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). However, there has been a drastic increase in the prevalence of PTSD among veterans who was exposed to war-related trauma. In

the National Vietnam Veterans Readjustment Study (NVVRS), 30.9 % of veterans who served during the Vietnam War had developed PTSD during their lifetimes (Kulka et al., 1990). Even though skeptics criticized that recall bias and other flaws inflated the results, Dohrenwend and colleagues (Dohrenwend, et al., 2006, 2007) found that 18.7% of the veterans reported lifetime PTSD using a new record-based exposure measure and diagnosis in an NVVRS subsample. Similarly, the Centers for Disease Control (CDC) reported that 14.7% of Vietnam War veterans have suffered from lifetime PTSD (Centers for Disease Control, 1988). In addition, 20.9% of Australian Vietnam veterans reported the lifetime PTSD (O'Toole et al., 1996). Particularly, older veterans who experienced a prisoner of war (POW) reported around 70 % of lifetime PTSD prevalence (Sutker, Allain, & Winstead, 1993).

It is not uncommon to find that combat exposure showed a positive relationship with PTSD symptoms (Aldwin, Levenson, & Spiro, 1994; Lee, Vaillant, Torrey, & Elder, 1995; Spiro et al., 1994). However, it seemed to be careful to interpret dose-response relationship between combat exposure and PTSD symptoms (King et al., 1999). Not all veterans who experienced combat exposure might develop PTSD. It was possible that some veterans did not develop PTSD following serious combat exposure, while other veterans developed PTSD with only a small dose of combat exposure (Kulka et al., 1990). These possibilities mean that we need to not only take diverse variables into consideration, but also to suppose non-linear relationships between combat exposure and PTSD symptoms.

Furthermore, veterans encountered complex experiences in military service,

including gains as well as losses (Spiro, Schnurr, & Aldwin, 1997). Some researchers, for instance, have found that veterans reported desirable as well as undesirable experiences from combat exposure (Aldwin & Levenson, 2005; Aldwin et al., 1994; Elder & Clipp, 1989; Fontana & Rosenheck, 1998). Some studies also presented that combat exposure was positively related to stress-related growth (Aldwin & Levenson, 2005; Aldwin, Levenson, & Kelly, 2008; Jennings, Aldwin, Levenson, Spiro, & Mroczek, 2006; Maguen, Vogt, King, King, & Litz, 2006).

In sum, it is raised questions regarding which factors lead to the development and maintenances of war-related PTSD symptoms, and which factors help protect veterans from enduring emotional sequelae after exposure to combat. Therefore, it is reasonable to consider diverse variables and sophisticated multivariate models in order to explain the development and maintenance of combat-related PTSD. In order to explain the relationship between combat exposure and PTSD, researchers have investigated risk and protective factors on PTSD, focusing on combat exposure itself as well as prewar, warzone, and postwar factors (King, King, Faibank, Keane, & Adams, 1998; King, King, Foy, & Gudanowski, 1996; King et al., 1999; Schnurr, Lunney, & Sengupta, 2004; Vogt & Tanner, 2007).

The primary focus of this study was to investigate risk and protective factors of U.S. combat veterans who participated in World War II and the Korean conflict, from both a lifespan and a life course perspective. Study 1 utilized a lifespan perspective, examining the degree to which various prewar, warzone, and postwar factors were related to PTSD symptoms in later life. Prewar factors included childhood family

environments (FES; Family Environment Scale), rank at entry, and age at entry. Warzone factors included combat exposure, perceived control, unit cohesion, and desirable and undesirable appraisals, while postwar factors included negative homecoming experiences, additional stressful life events, and social support. We examined four different lifespan hypotheses which contrasted the relative importance of events at different parts of the lifespan stress: evaporation hypothesis (childhood most important), residual stress hypothesis (warzone most important), stress vulnerability hypothesis (warzone moderates childhood effects), and main (independent) effects hypothesis. These will be explained in great depth below.

Study 2 utilized a life course perspective of the effects of military service on PTSD symptoms in later life. A life course perspective often utilizes the same types of variables as a lifespan perspective, but organizes in a different fashion (Elder & Shanahan, 2006; Settersten, 2005). In life course theory, there are two major perspectives, continuity (London & Wilmoth, 2006) and discontinuity theory (Elder, Gimbel, & Ivie, 1991).

Continuity theory holds that the different segments of the lifespan are connected in predictable ways. Specifically, life course trajectories can be characterized by cumulative advantage or cumulative disadvantage (Dannefer, 2003). That is, individuals with positive childhoods may be “set up” for more positive adaptation to adulthood in terms of both career and family relations, leading them to accumulate resources. In contrast, those with disadvantaged childhoods may struggle in the successful adaptation to adult roles.

In contrast, discontinuity theories focus more on turning points in life course trajectories (Elder, George, Shanahan, 1996). For example, military service can provide an opportunity for troubled youth to develop better adaptive strategies, allowing for more a more successful transition to adulthood (Laub & Sampson, 2005; Werner & Smith, 2001). In addition to positive turning points, however, there are also disruptions. Exposure to combat can seriously alter individuals' life course trajectories – not only disrupting career and family trajectories, but sometimes resulting in lifelong disabilities which can serious impair successful acquisition of adult roles.

In both theories, the timing of role acquisition can impact life course trajectories, stemming from Neugarten's (1968) categorization of events into on-time and off-time. On-time events reflect a society's normative expectation of the "appropriate" time to release old roles and acquire new ones, while role change which occurs either early – before normative expectations – or late may be more difficult. As the timing of role acquisition may influence both continuity and discontinuity patterns, age at entry into military service will be an important variable in Study 2.

LITERATURE REVIEW

In the literature review, we explained theories and variables related to Study 1 and Study 2. As seen above, the majority of research into war-related stress and PTSD symptoms has classified risk and protective factors into three periods of time: prewar, warzone, and postwar factors (Foy, Resnick, Sippelle, & Carroll, 1987; King et al., 1998; King et al., 1999; Lee et al., 1995; Maguen et al., 2006; Sharkansky et al., 2000).

Five hypotheses and the deviation amplification model were used to explore the relationship between these factors. Moreover, representative variables of prewar, warzone, and postwar factors were discussed to clarify the relation between combat exposure and PTSD symptoms in later life.

Theories of Combat Exposure and PTSD Symptoms

In early stages of this research area, studies focused on finding a positive association between extent of combat exposure and severity of PTSD (Foy & Card, 1987). That is, exposure to severe combat experience increased PTSD symptoms, as well as emotional or behavioral problems, immediately after combat and in later life (Elder & Clipp, 1989). However, other variables can affect on this association. For example, the Kings and their colleagues (King et al., 1996, 1998, 1999) have extended research to include the relationships among prewar, warzone, and postwar factors. Other researchers also have explored additional stressful life events and social support after homecoming and their relationship to PTSD (Fontana, Rosenheck, & Horvath, 1997; Lee et al., 1995; Solomon & Mikulincer, 1990; Solomon, Mikulincer, & Flum, 1988).

The five types of hypotheses are based on King et al.'s (1996) review of the stream of hypotheses on the role of pretrauma variables and traumatic event, as well as other researchers' explanation of postwar factors and levels of stressful exposure in influencing combat-related PTSD symptoms in later life. An application of deviation amplification model can also be used to explain relationships between prewar, warzone, and postwar variables on PTSD symptoms (Aldwin & Stokols, 1988).

Stress Evaporation Hypothesis

First, the “stress evaporation” hypothesis and the “residual stress” hypothesis explicated the relationship between prewar factor and combat exposure in the initial stage of relevant studies. According to the “stress evaporation” hypothesis, war-related symptoms might disappear shortly after the homecoming, and veterans who experienced combat exposure can display psychological problems in which prewar factors are more important than the trauma itself (Elder & Clipp, 1989; King et al., 1996).

Residual Stress Hypothesis

However, many researchers have provided evidence that warzone factors were more strongly related to PTSD symptoms than prewar factors (Foy & Card, 1987; Gallers, Foy, Donahae, & Goldfarb, 1988). Based on these results, the second hypothesis was established. That is, the “residual stress” hypothesis emphasizes the significance of the traumatic event itself, instead of preexisting conditions.

Stress Vulnerability Hypothesis

The third hypothesis, the “stress vulnerability” hypothesis, assumed that the predisposing factors can change the relationship between combat exposure and PTSD. In other words, under high stress, veterans were likely to negative outcomes as a function of the interaction between trauma level and prewar factors. Under low stress, those with more vulnerable prewar factors such as personal characteristics or preexisting conditions reported more PTSD symptoms (Foy et al., 1987).

Main Effect Hypothesis

The fourth hypothesis, the “main or independent effect” hypothesis, presented another possibility that prewar, warzone, and postwar factors could independently affect PTSD symptoms, regardless of the level of combat exposure. PTSD symptoms may take either a linear or nonlinear form. That is, in the linear form, PTSD symptoms will grow at an increasing rate, according to corresponding increases in each factor. The dose-response relationship between combat exposure and PTSD symptoms is a good example of this linear form. In the nonlinear form, on the other hand, PTSD symptoms might result in a U-shaped association with combat exposure. PTSD symptoms might be worse at high or low levels level of combat exposure than at moderate of combat exposure.

Indirect Association Hypothesis

Lastly, King et al. (1996) suggested that variables in each factor could have an “indirect association” with PTSD. For instance, younger and less educated solders showed higher warzone stressor levels, which in turn could cause PTSD (Green, Grace, Lindy, Gleser, & Leonard, 1990). In addition, King and colleagues (1996, 1998, 1999) examined direct and indirect effects of prewar factors, warzone factors, and postwar factors on PTSD using the Structural Equation Modeling (SEM).

However, there are other possible models to explain the long-term relationship between combat exposure and PTSD in later life.

Deviation Amplification Model

Zautra and Sandler (1983) developed two models of stress and outcomes: psychological distress model and psychological growth model. According to these

two complementary models, positive events can stimulate negative outcomes, if an individual appraised an event as a threat. On the other hand, negative events can lead to personal growth depending on whether it is appraised as a challenge or a threat. Zautra and Sandler also indicated that cognitive processes affected appraisals of events. For example, internal attributions and perceptions of control had an effect on gain or loss in well-being (Weiner, 1979). Aldwin, Sutton, and Lachman (1996), however, criticized that there was insufficient explanation of the process by which people could obtain positive benefits from stressful events.

Aldwin and Stokols (1988; Aldwin et al., 1996) have proposed a deviation amplification model for the long-term effects of stress, which adapted Maruyama's (1963) modification of systems theory consisting of two processes, *deviation countering* and *deviation amplification* (see Figure 1.1). Whereas deviation countering processes are related to negative feedback loops that bring about homeostasis, deviation amplification processes make positive feedback loops that cause a loss of homeostasis. Small changes in early stage regardless of positive or negative events can be magnified through deviation amplification processes. The results of deviation amplification processes, therefore, can be either adaptive or maladaptive spirals.

In deviation amplification model of stress and coping, Aldwin et al. (1996) pointed out that person characteristics played an important role in whether a particular deviation amplification process became positive or negative spirals. For negative spiral, lower coping resources in the early stage could serve to a further depletion of

resources. In turn, depleted resources became a cause of enlarged vulnerability to future stress. For positive spirals, on the other hand, high resources might lead to the development of further resources, which results in increased resilience to future stress.

We applied the deviation amplification model to the realm of prewar factor, warzone factor, postwar factors, and PTSD symptoms. For adaptive spiral, individual who had a positive environment such as cohesive FES may facilitate the process of adaptation and, therefore, experience more positive military experience such as higher unit cohesion and perceived control. High level of positive military experience may increase desirable appraisals of military service. These increased desirable appraisals may give rise to increase postwar adaptation. Increased resources through an adaptive spiral may function as a protective factor for PTSD symptoms in later life. On the other hand, individual who had a negative prewar factor such as conflictual FES that may imply depleted resources may enhance negative military circumstance such as low level of unit cohesion and perceived control, which in turn may increase undesirable appraisals of military service. Veterans with undesirable appraisals for military service may have a difficulty in gaining social support after homecoming and may experience increased additional stressful life events. These experiences can be accompanied with resource depletion. Finally, resource depletion can cause the high level of PTSD symptoms in later life.

Prewar Factors

Even though prewar vulnerability to the development of PTSD relatively has been studied poorly, preexisting characteristics may change the possibility that soldiers

would be exposed to various combat experiences (Lyons, Kremen, Grant, Boake, & Eisen, 2006). The initial studies mainly focused on the relationship between prewar factors and combat exposure *per se*, not the development of PTSD symptoms.

However, researchers have extended the effect of prewar factors to combat exposure, as well as PTSD in late life. For instance, King and colleagues examined interrelationships among risk and protective factors for PTSD in Vietnam veterans using structural equation modeling (SEM) (e.g., King et al., 1996, 1998, 1999).

Brewin and colleagues (2000) found risk factors for prewar factors for PTSD such as age at trauma, socioeconomic status (SES), previous psychiatric history, reported abuse in childhood, reports of other previous traumatization, reports of other adverse childhood factors, and family history of psychiatric disorder. Similarly, prior trauma (King et al., 1996; 1999), family instability (Jones, 1996; King et al., 1999), and demographic variables (Fontana & Rosenheck, 1993; Lyon et al., 2006) were mainly investigated in the war-related studies of PTSD.

Prior Trauma

Some researchers investigated the effect of prewar factors on PTSD (Brewin, Andrew, & Valentine, 2000; King et al., 1996, 1998, 1999). The most prominent risk factor was the prior history of highly stressful life events (prior trauma) (King et al., 1999). Early trauma history interacted with warzone stressor levels to exacerbate PTSD symptoms for high combat-exposed male veterans (King et al., 1996).

However, the function of prior trauma into later trauma was unclear. That is, it is possible that prior trauma may sensitize people to later traumatic experiences or, in

contrast, inoculate an individual (King, Vogt, & King, 2004). King et al. (2004) pointed out that the hypothesis, the high similarity of previous and current traumatic experiences can lead to inoculation effect, was not entirely supported and, therefore, needed to be proved by future research.

Family Environment

Family instability was associated with the development of PTSD (Brewin et al., 2000). King et al. (1996) found that family instability had large indirect effects on PTSD through childhood antisocial behavior, age at entry, previous trauma history, and traditional combat. Family instability had a direct and negative effect on social support (King et al., 1999). Higher level of family instability may decrease ability to make and maintain a social support network in later life (Jones, 1996).

Prior studies of family environments on PTSD have focused on serious problems such as trauma, while the present studies focused on family processes: conflictual and cohesive childhood family environments. Clearly, mental health in adulthood is be affected by family processes during childhood (Werner & Smith, 2001); however, less is known about whether these effects extend until late life.

The level of conflict within the family moderated the relationship between trauma exposure and PTSD symptoms (Constantine, 2006; Wasserstein & La Greca, 1998). In contrast, close relations within family, parental warmth and attention were associated with beneficial mental health outcomes (Bokszczanin, 2008). Seifer (2003) emphasized the importance of interpersonal relationships within the family throughout children's lifespan. Werner (1993) also suggested that positive parenting experiences

were important resources that were related to resilient outcomes in adulthood. Werner (1991) found that people who had higher resilience in adolescence had a tendency of sustaining resilience in adulthood, because developed resources in childhood promoted resilience through diverse adversity into adulthood. However, it is noteworthy that conflictual childhood family environments may be not always a vulnerability factor, while cohesive childhood family environments may not guarantee better mental health in later life. Werner (2005) found that some non-resilient adolescents became resilient adults in the process of the transition from adolescence to adulthood with military service providing one avenue to successful entry into adulthood for troubled youth.

Age at Entry

Younger age was a risk factor for the development of war-related PTSD (Brewin et al, 2000). For example, Elder and Clipp (1989) presented that men who entered the service at a relatively young age may have been especially vulnerable to combat trauma and to fundamental change in the course of their lives. King et al. (1996) presented that age at entry to Vietnam had a direct effect on PTSD as well as indirect effect on PTSD via traditional combat exposure. Lyons et al. (2006) argued that younger soldiers may not yet have developed adequate coping strategies for dealing either with the trauma of combat exposure or the social inhospitality after homecoming.

Military Rank and Education

In general, rank in military studies would be poor predictor of PTSD (Brewin

et al., 2000; Rona et al., 2009). However, higher education and military rank could serve as protective factors for the development of PTSD following combat exposure. For example, during the Vietnam War, the undereducated and the socially disadvantaged were at greatest risk for combat exposure (Fontana & Rosenheck, 1993). The people who had higher formal education and advantageous backgrounds could have an increased possibility of enlisting in branches of low-risk or avoiding military service altogether (Lyons et al., 2006). In the study of World War II aviator prisoners of war (POW) survivors, Sutker and Allain (1995) found that higher military rank and education levels were inversely related to PTSD symptoms.

Warzone Factors

Combat Exposure

Combat exposure is the stressor that has dominated military veteran research (Brewin et al., 2000; Kulka et al., 1990). Increased number and severity of combat exposure were positively related to a greater likelihood of PTSD in World War II or Korean War (Aldwin et al., 1994), Vietnam War (Fontana et al., 1997; Kulka et al., 1990), and Gulf War veterans (Wolfe, Erickson, Sharkansky, King, & King, 1999). Therefore, combat exposure can be a prominent factor in investigating multiple and interacting correlates of PTSD (Stein et al., 2005).

Perceived Control

The concept of “control” comes from various backgrounds and dimension (*see* Skaff, 2007). In general, a series of studies in control showed that control was highly positive related with health in later life (Krause & Shaw, 2003; Mirowsky, 1995).

Why does control have a beneficial effect on health? Clark and Dodge (1999) asserted that higher perceived control could increase the possibility of beneficial health behaviors. Some researchers have approached this question from the point of view that “control is a resource.” That is, control was an important resource that could manage the harmful effects of stressful life events (Krause, 1994). Pearlin and colleagues suggested that control beliefs worked as both mediator and moderator in the relationship between stressors and health (Pearlin, Lieberman, Menaghan, & Mullan, 1981).

Perceived control may be protective against the development of PTSD symptoms. Locus of control, for instance, has been shown to be negatively related to PTSD (Solomon & Mikulincer, 1990). Combat stress reaction (CSR) casualties were more likely to attribute failure to uncontrollable factors than were the decorated veterans (Ginzburg, Solomon, Dekel, & Neria, 2003).

Some researchers have proposed the necessity of studying specific domains of control instead of global sense of control, such as locus of control (Skaff, 2007). In particular, Krause and Shaw (2000, 2003) combined Schulz and Heckhausen’s (1996) life span model of successful aging with identity theory (Burke, 1991; Thoits, 1991) to explain the relationship between personal control and health in later life. As elderly people experienced age-related losses, they were more likely to use secondary control, changing themselves to adapt to the environment, than primary control in which they attempted to control the environment (Schulz & Heckhausen, 1996). However, according to identity theory, if older adults focused on some role-specific identities

from multiple identities, they could maintain primary control in some domains (Burke, 1991; Thoits, 1991). Krause and Shaw (2000, 2003) suggested that role-specific control in most salient roles was associated with health or mortality in later life. However, these results mainly focused on personal control of older adults in later life.

If that is the case, how does personal control in specific life domains relate to health in later life? Most studies of military experience in young age assumed that military experience is a low level of control situation (Buško & Kulenović, 2003; Suvak, Vogt, Savarese, King, & King, 2002). It is possible that soldiers may more frequently confront a situation of insufficient available resources, which is similar to age-related losses in later life. Therefore, under a situation of restricted resources, soldiers may concentrate on increasing role-specific control in the most salient role. In turn, the high level of control in the most salient role will decrease PTSD symptoms in later life (Krause & Shaw, 2000, 2003).

Primary and Secondary Appraisal

Role-specific control can be related to appraisals of military environments. Suppose soldiers served in a similar environment under one unit. However, it is noteworthy that their stress, appraisals, coping strategies and adaptation can be highly variable, although soldiers might have a lot of common experiences during military service. *The transactional theory of psychological stress*, proposed by Lazarus and colleagues, can provide a theoretical framework for those relations (Folkman & Lazarus, 1980; Lazarus & Folkman, 1984).

When an individual is confronted with a stressor, the first stage in the coping

process involves appraisal, which is defined as “the cognitive process through which an event is evaluated with respect to what is at stake (*primary appraisal*) and what coping resources and options are available (*secondary appraisal*)” (Folkman & Lazarus, 1980). Based on primary appraisal, a situation can be viewed as *stressful, benign-positive, or irrelevant*. In particular, stressful appraisal consists of the three different types: *harm/loss, threat, and challenge*. Harm/loss means damage that has already occurred. Threat stands for harm or loss that has not yet occurred but is anticipated, and challenge implies an anticipated opportunity for mastery or gain (Folkman & Lazarus, 1980). Secondary appraisal, on the other hand, is accomplished with the intention of evaluation of personal ability and resources using cognitive, affective, and behavioral efforts (Lazarus, 1999). In this process, people try to minimize harm and maximize gains through coping responses.

An important factor in transactional theory of stress and coping is the perceived controllability of the situation (Lazarus & Folkman, 1984). Lazarus and Folkman (1984) defined controllability as the amount of influence an individual believes he or she has in a given situation. Perceptions of control affect and are affected by the process of secondary appraisal (Lazarus & Folkman, 1984). That is, people with abundant resources will have more perceived control and, therefore, cope successfully with the stressor. Therefore, Wallston (2001) pointed out that some theoreticians considered perceived control and coping potential as identical concepts. Perceptions of control can be thought of as personal coping resources. However, Folkman (1984) noted that situations that are controllable are not always related to

lower stress. The belief that one has control over a situation may result in greater stress, possibly due to a feeling of personal responsibility or a fear of failure.

It seems that researchers acknowledged that soldiers basically experienced low-controllable situations in military service. As seen above, Suvak et al. (2002) did not use direct assessment of perceived control, because they implied that soldiers who had higher levels of combat exposure were considered to have little capability to control the situation. Buško and Kulenović (2003) also argued that the military environment is particularly suitable for the study of stress and coping, because of typically low level of control over events and their outcomes. However, it is noteworthy that there might be individual variability in appraisals of control, even though military personnel experienced similar situation and environment. Therefore, it is necessary to measure controllability of military service, in order to explain the effectiveness of combat exposure as a stress on PTSD symptoms.

Unit Cohesion

Cohesion is derived from the Latin, *cohaerere*, to stick together (Siebold, 2000). Unit cohesion has traditionally been considered important for unit performance and stress resistance (Griffith, 2002; Siebold & Lindsay, 2000). Similarly, Bliese and Halverson (1996) underlined the importance of cohesion that cohesion can improve the efficacy of the unit and the well-being of its members.

Since Shils and Janowitz's (1948) foundational work in current research on military unit cohesion, many researchers have studied cohesion (See Siebold, 2000). Particularly, applied researchers such as sport psychologists, the Walter Reed Army

Institute of Research (WRAIR), and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) had briskly studied unit cohesion in military small units or sport teams since the 1980s (Siebold, 2000). Although it is difficult to find agreement on the concept of unit cohesion and the measurement of cohesion, researchers have reached some areas of consensus on the feature of unit cohesion (Siebold, 2000).

In the literature, we can find similar, but slightly different definitions of cohesion. Carron (1982) wrote that “cohesion can be defined as a dynamic process that is reflected in the tendency for a group to stick together and remain united in the pursuit of its goals and objectives” (p. 124). Emphasizing mutual affection, interdependence, and trust and loyalty among group members, Ingraham and Manning (1981) defined cohesion as “feelings of belonging, of solidarity with a specifiable set of others who constitute ‘we’ as opposed to ‘them’” (p. 6). Siebold (1987) suggested that “the level of unit cohesiveness is defined as the degree to which mechanisms of social control operant in a unit maintain a structured pattern of social relationships between unit members, individually and collectively, necessary to achieve the unit’s purpose” (p. 5).

Researchers regarded cohesion as consisting of multidimensional factors (Bartone, Johnsen, Eid, Brun, & Laberg, 2002). In research on cohesion of sport teams, for example, Carron and Chelladurai (1981) chose five characteristics of cohesion: (a) the sense of belonging the person feels to the group, (b) the value attached to group membership, (c) the degree of enjoyment derived from participating

with group, (d) the level of teamwork present within the group, and (e) the degree of closeness within the group. Carron and Chelladurai (1981) divided the sense of belonging, the value of membership, and enjoyment into *individual-to-group-cohesion* and teamwork and closeness into *group-as-a-unit*. Siebold and Lindsay (2000) pointed out that military unit cohesion generally has affective (emotional or feeling) aspect and an instrumental (action or skill) aspect. Siebold (2000) indicated that there are three basic components of small unit cohesion: horizontal, vertical, and organizational. Further, these components involved affective and instrumental aspect together: (a) horizontal cohesion—peer bonding and teamwork; (b) vertical cohesion—leader caring and leader competence; and (c) organizational cohesion—pride and shared values, and attainment of needs and goals.

Unit cohesion during military service may be a protective factor (Lee et al., 1995; Shay, 1994). That is, high levels of unit cohesion should represent a major protective source for military-related stressors (Griffith & Vaitkus, 1999; Oliver, Harman, Hoover, Hayes, & Pandhi, 1999). For example, Brailey, Vasterling, Proctor, Constans, and Friedman (2007) found that unit cohesion attenuated the relationship between past stressor exposures and PTSD symptoms at moderate levels of exposure among Army soldiers with no history of contemporary war-zone deployment. Furthermore, unit cohesion as a resource during military service could enhance self-efficacy and diminish the negative effects of potential stressors (Britt & Dickinson, 2006; Maguen & Litz, 2006). On the other hand, Fontana et al. (1997) found that whereas low to moderate unit cohesion was related to lower rates of PTSD symptoms,

a high level of unit cohesion in combination with high war-zone stress was associated with the highest levels of PTSD symptoms among Vietnam combat veterans. It is possible that high unit cohesion might detrimental effect on mental health, because of the sense of loss and survivor guilt.

Desirable and Undesirable Appraisals of Military Service

Some researchers have found that there are positive effects of military service. Aldwin et al. (1994), for example, studied desirable and undesirable appraisals of military service. They reported that desirable appraisals and undesirable appraisals independently affected PTSD symptoms. Namely, desirable appraisals are negatively related to PTSD symptoms, whereas undesirable effects of military service are positively related to PTSD symptoms. Both desirable and undesirable appraisals mediated the effect of combat exposure on PTSD symptoms, but only undesirable appraisals moderated the effect of combat exposure on PTSD symptoms.

The association between combat exposure and positive benefits, however, has not been consistently found (Maguen et al., 2006). For instance, Aldwin et al. (1994) hypothesized that it is possible to have nonlinear relationship between combat exposure and perceived desirable effects, based on the deviation-amplification model (Aldwin & Stokols, 1988), even though they found a linear relationship (a inverted-U function) between combat exposure and positive developmental outcomes of older veterans who served during World War II and the Korean conflict. In addition, using British veteran sample, Aldwin and Levenson (2005) found a trend that increases in values buffered the impact of combat exposure on self-rated health in high combat

exposure, and emotional maturity moderated the impact of combat exposure on PTSD symptoms in low combat experiences. Schnurr, Rosenberg, and Friedman (1993) showed that peripheral combat exposure was associated with positive change in MMPI scores, whereas direct combat exposure and no combat exposure had little effect on change. Fontana and Rosenheck (1998) also found that there was a curvilinear trend (i.e., inverted U) between psychological benefits (solidarity with others) and combat exposure. That is, solidarity with others was stronger at intermediate compared to high and low levels of combat exposure. Therefore, Maguen et al. (2006) suggested that lower level of stressors may lead to growth, but higher level of stressors may be more complicated relationship with growth.

Suls & Mullen (1981a, 1981b) studied the relationship between controllability and desirability of life events in a college student sample. Interestingly, neither undesirability nor insufficient controllability over life events changes did result in psychological distress. Only both undesirable and uncontrollable life change was significantly related to psychological distress.

Postwar Factors

When soldiers returned home, their environments were very important to their mental health. Mainly, social support and stressful life events have received research attention in risk and protective factors of PTSD.

Additional Stressful Life Events

Additional stressful life events variable after homecoming was one of the important risk factors for PTSD (Brewin et al., 2000). As Green (1994) noted, PTSD

may be the outcome of a series of highly stressful life events. Therefore, it is natural that additional stressful life events after homecoming showed a strong positive association with PTSD. King et al. (1998) reported that additional stressful life events had significant direct as well as indirect effects on PTSD symptoms. That is, additional stressful life events were positively associated with PTSD symptoms, and postwar stressful life events had the indirect effect on PTSD through hardiness. Moreover, they emphasized the necessity of verifying the interaction effect of combat exposure and negative events in later life for men, although they failed to find this interaction effect. They argued that additional stressful life events seem to exhaust social resources, which could make PTSD symptoms worse.

Social Support

Social support after homecoming may protect veterans from developing PTSD symptoms (Brewin et al., 2000; Solomon & Milkulincer, 1990). For example, Elder and Clipp (1988) showed that sharing war experiences with supportive others such as wife and war friends lessened painful memories and current symptoms of stress. Foy et al. (1987) also emphasized the importance of immediate homecoming environments for adjustment of veterans. Generally, social support has been negatively correlated with PTSD symptoms (Fontana et al., 1997; Green et al., 1990; King et al., 1998). Moreover, social support may be another important moderator or mediator of the effects of combat-related stress on PTSD symptoms (King et al., 2004). Fontana et al. (1997) presented that homecoming support had a direct effect to PTSD as well as buffering effects on PTSD with both low and high combat exposure. However,

interestingly, Jankowski and colleagues (2004) found a positive correlation between social support and PTSD symptoms. They explained that veterans who have more PTSD symptoms may need more social support and, therefore, they utilized more social support relative to men who have none or few PTSD symptoms.

However, the directionality of the relationship between social support and postwar stressful life events is unclear. King et al. (1998) reported that postwar stressful life events were indirectly related to PTSD symptoms through functional social support (perceived emotional sustenance and instrumental assistance), whereas Fontana and Rosenheck (1994) showed that low social support had the indirect effect on PTSD via postwar traumas. Although, interestingly, these two studies used the same NVVRS database, the relationship between postwar stressful life events and social support was explicated by opposite paths. King et al. (1998) argued that structural equation modeling does not confirm a model and emphasized the importance of theory-based models. Therefore, these types of analyses must be guided by theoretical models.

In summary, in order to understand combat exposure and PTSD symptoms in later life as well as individual variability in similar situations, it is necessary that prewar factors, warzone factors, and postwar factors be taken into consideration. That is, to adequately appreciate the impact of combat exposure on PTSD symptoms, we should consider the relations among resources such as childhood family environment or unit cohesion, perceptions of control, appraisals, and environmental factors after homecoming as well as combat exposure, and PTSD symptoms.

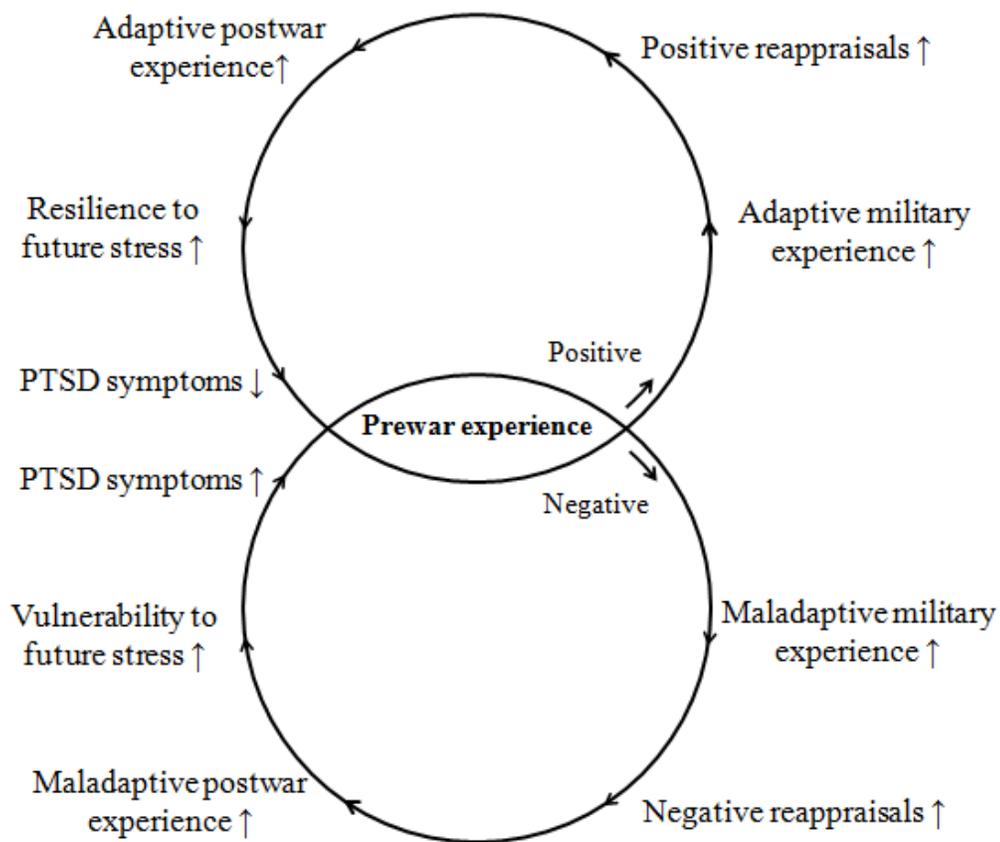


Figure 1.1. Applied deviation amplification model of prewar, warzone, postwar factor, and PTSD symptoms in later life.

CHAPTER 2

STUDY 1

RUNNING HEAD: Combat Exposure and PTSD Symptoms

A Lifespan Perspective of Combat Exposure on PTSD Symptoms in Later Life:
Findings from the Normative Aging Study

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Abstract for Study 1

The effects of prewar, warzone, and postwar factors on PTSD symptoms in later life were investigated among veterans of World War II or the Korean War. The present study included 947 veterans from the Normative Aging Study (*Mage* = 64.78).

Hierarchical multiple regression analyses revealed that PTSD symptoms in later life were predicted independently by prewar, warzone, and postwar factors; some were protective (cohesive childhood family environments, desirable appraisals, and social support) and others represented risk factors (conflictual childhood family environments, undesirable appraisals, negative homecoming experiences, and additional stressful life events). Type of childhood family environment, age at entry, negative homecoming, and additional stressful life events moderated the relationship between combat exposure and PTSD symptoms in later life. The findings highlight the importance of a lifespan perspective on understanding the long-term impacts of combat exposure.

A Lifespan Perspective of Combat Exposure on PTSD Symptoms in Later Life: Findings from the Normative Aging Study

Although military service is an important developmental experience that is perceived to have had significant lifelong effects on veterans' lives, it often remains a "hidden variable" in men's aging (Spiro et al., 1997). Because the developmental effects of military service are characterized by multidimensionality, multidirectionality, gains and losses, and variability both within and among persons (Spiro et al., 1997), their study must take into account both positive and negative effects as well as short- and long-term effects.

Despite the focus in numerous studies on the immediate postwar era of the influence of military experiences, some studies have found that exposure to extremely traumatic stressors may have long-term implications for mental and physical health. For example, post-traumatic stress disorder (PTSD) has been reported as much as 50 years later among Holocaust survivors (Kahana, Harel, & Kahana, 1988) and combat veterans (Spiro et al., 1994), or may emerge in late life after a long period of quiescence (King, King, Vickers, Davison, & Spiro, 2007).

From a developmental perspective, the purpose of the present study examined the relationship between combat exposure and risk and protective factors for PTSD symptoms in later life. Which features differentiate veterans with PTSD symptoms from veterans who do not develop PTSD symptoms in later life? Previous studies indicate that various prewar, warzone, and postwar factors were associated with PTSD symptoms in late life (Brewin et al., 2000; King et al., 2004; Ozer, Best, Lipsey, & Weiss, 2008). This study utilized archival data from the Normative Aging Study

(NAS), to examine prewar variables (i.e., cohesive and conflictual childhood family environments [FES; Family Environment Scale], age at entry, and rank at entry), warzone variables (i.e., combat exposure, perceived control, unit cohesion, and desirable and undesirable appraisals of military experiences), postwar variables (i.e., negative homecoming experiences, additional stressful life events, and social support), and PTSD symptoms in later life.

Prewar Factors

Previous studies have demonstrated that childhood family experience, age at entry, and rank at entry variables are associated with PTSD. Specifically, people who had adverse childhood family environments, were younger, and had lower rank were more likely to display PTSD symptoms (Brewin et al., 2000; Iversen et al., 2007; King et al., 1996, 1999). First, Brewin et al. (2000) found that family instability was related to the development of PTSD in a meta-analysis. Bremner and colleagues (1995) also reported that people who lived in a stressful childhood environment can amplify their risk of developing PTSD when exposed to severe trauma later in life. Second, younger age at entry also increased susceptibility to pathological stress reactions (Brewin et al., 2000). According to Lyons et al. (2006), people who entered the military service at a younger age may not have developed adequate strategies to cope with the trauma of combat exposure. In contrast, Elder (1987) pointed out that people who enter the military service later in life experienced a more disruptive impact of military service, because of its interruption of established work, family roles, and responsibilities. Finally, the relationship of rank to the development of PTSD is a

matter of debate. Generally, rank in military studies has been a poor predictor of PTSD (Brewin et al., 2000; Rona et al., 2009). However, some researchers found that higher military rank was negatively related to PTSD symptoms (Iversen et al., 2007; Sutker & Allain, 1995). It is possible that this relationship may be mediated and/or moderated by other variables.

Warzone Factors

Combat exposure is the most important stressor in military veteran studies (Brewin et al., 2000). Most research has indicated that combat exposure was positively associated with PTSD symptoms among veterans of World War II or the Korean conflict (Aldwin et al., 1994), the Vietnam War (Fontana et al., 1997; Kulka et al., 1990), and the Gulf War (Stein et al., 2005; Wolfe et al., 1999). Because of the consistent characteristic of combat exposure as a strong predictor of PTSD, combat exposure was also used as a moderating variable in the relationships between childhood trauma, coping strategies (Stein et al., 2005) and negative parenting behaviors in childhood (McCranie, Hyer, Boudewynes, & Woods, 1992) and PTSD. It is possible that perceived control is a protective factor for PTSD symptoms. Although people under the military circumstance are more likely to experience low control situations (Buško & Kulenović, 2003; Suvak et al., 2002), perceived control as an important resource is positively related to health in later life (Clark & Dodge, 1999; Krause & Shaw, 2003). Ginzburg and colleagues (2003) suggested that combat stress reaction (CSR) casualties attributed their failure to uncontrollable factors more than did decorated veterans.

It is also reasonable that unit cohesion is another protective factor that diminishes the negative effects of potential stressors (Britt & Dickinson, 2006; Griffith & Vaitkus, 1999; Lee et al., 1995). Brailey and colleagues (2007) proposed that the relationship between past stressor exposures and PTSD symptoms at moderate levels of exposure was attenuated by unit cohesion. However, Fontana et al. (1997) reported that Vietnam War combat veterans with a high level of unit cohesion and high warzone stress showed the highest levels of PTSD symptoms. They argued that veterans with high unit cohesion might harbor a higher sense of loss and survivor guilt. Aldwin et al. (1994) found that appraisals of military service were related to PTSD symptoms: Desirable appraisals were negatively related to PTSD symptoms, while undesirable appraisals were positively associated with PTSD symptoms. Further, the effect of combat exposure on PTSD symptoms was moderated by undesirable appraisals. In sum, combat exposure *per se* as well as such other variables as perceived control, unit cohesion, and appraisals have been used to explain the development of PTSD symptoms in later life.

Postwar Factors

Veteran's environments at the time of their return home have an effect on PTSD symptoms. Additional stressful life events as a risk factor and social support as a protective factor have been studied frequently (Brewin et al., 2000). In research of stressors after homecoming, some studies focused on the reception stage directly after homecoming (Foy et al., 1987; Lee et al., 1995), whereas other studies investigated stressors some time after homecoming (King et al., 1998, 1999; Schnurr et al., 2004;

Solomon, Zur-Noah, Horesh, Zerach, & Keinan, 2008). For instance, Foy et al. (1987) pointed out that feelings of alienation, cynicism, physical neglect, and demeaning experiences at the reception stage may exacerbate PTSD symptoms, and Solomon et al. (2008) found that stressful life events throughout the life cycle affected Israeli War veterans' PTSD symptoms. Stretch (1995) found that deteriorated public opinion and support for the war negatively affected stress-related symptoms of Vietnam veterans.

Social support after homecoming is a prominent protective factor for PTSD symptoms (Elder & Clipp, 1988; Fontana et al., 1997; Solomon & Milkulincer, 1990). However, Jankowski and colleagues (2004) found that social support was also positively associated with PTSD symptoms, observing that veterans with severe PTSD symptoms needed more social support and therefore used more social support than did veterans with no or few PTSD symptoms. In addition to a direct relationship, some researchers proposed that the influence of social support on PTSD symptoms might be moderated by combat exposure (Keane, Scott, Chavoya, Lamparksi, & Fairbank, 1985; King et al., 2004). Fontana et al. (1997) found that social support had a moderating effect on PTSD with both low and high combat exposure.

Therefore, this study included two different types of stressors: *negative homecoming experiences* at reception stage and *current stressful life events*. We also examined postwar social support.

Four Different Hypotheses

King and colleagues (1996) reviewed a series of hypotheses on the role of prewar, warzone, and postwar factors for PTSD symptoms in later life. In the early

stage, two contrasting hypotheses were mainly used to explicate the development of PTSD symptoms: the *stress evaporation hypothesis* (Worthington, 1978) and the *residual stress hypothesis* (Figley, 1978). The stress evaporation hypothesis emphasizes the importance of prewar factor in psychological problems. After a short period of readjustment, veterans can return to prewar conditions, regardless of the level of combat exposure. Several studies supported this hypothesis (Borus, 1975; Worthington, 1976; Zeidner & Ben-Zur, 1994). On the other hand, the residual stress hypothesis contends that combat exposure in and of itself is of primary importance in the development of PTSD symptoms; the psychological impact of combat exposure leaves lasting effects (Foy & Card, 1987; Solomon, Neria, Ohry, Waysman, & Ginzburg, 1994).

Several researchers have tried to integrate stress evaporation hypothesis and residual stress hypothesis (Foy et al., 1987; Helzer, 1981; McCranie et al., 1992). According to *stress vulnerability hypothesis* (also known as *person-event interaction model*), the relationship between combat exposure and PTSD symptoms is moderated by the level of prewar, other warzone, or postwar factors. Under the lower levels of prewar or postwar factors, combat exposure plays a greater role in increasing PTSD symptoms. In contrast, under the high levels of prewar or postwar factors, the influence of combat exposure is relatively small. In addition, Solomon and colleagues (1989) applied the stress vulnerability hypothesis to the perceived controllability of the situation.

The last possible hypothesis is the *main (or independent) effect hypothesis*.

According to this hypothesis, each prewar, warzone, and postwar factor has an effect on PTSD symptoms independently, regardless of the severity of combat exposure. For instance, King and colleagues (1999) found that the sum of the total effects of warzone stressors (1.36) was higher than that of postwar factors (.96) or prewar factors (.80) in men. Prewar-postwar associations were statistically independent of the influence of warzone stressors.

PRESENT STUDY

Previous research found that risk and protective variables in prewar, warzone, and postwar factors are positively and negatively associated with PTSD symptoms in later life. However, few studies have investigated various risk and protective variables concurrently. Furthermore, the relative importance of different variables in prewar, warzone, and postwar factors is a matter of debate.

The present study examined the relationship between prewar, warzone, and postwar factors and PTSD symptoms in later life. It also investigated whether different types of psychosocial risk and protective factors had a direct effect on PTSD symptoms, and whether they moderated the relationship between combat exposure and PTSD symptoms in later life in order to test four different hypotheses: stress evaporation hypothesis, residual stress hypothesis, stress vulnerability hypothesis, and main effects hypothesis. The hypotheses are based on and extend King et al.'s (1996) model.

Hypothesis 1: Only prewar factors such as family environments, age at entry, and rank at entry will be related to PTSD symptoms in later life (stress

evaporation).

Hypothesis 2: Only warzone factors will be positively related to PTSD symptoms in later life (residual stress).

Hypothesis 3: Prewar factors, warzone factors, and postwar factors will be related to PTSD symptoms independently (independent or main effects).

Hypothesis 4: The type of FES, unit cohesion, additional stressful life events after homecoming, and social support will moderate the relationship between combat exposure and PTSD symptoms. That is, the effect of those factors on PTSD symptoms will vary by the level of combat exposure (stress vulnerability).

METHOD

Sample and Procedure

We examined the consequences of combat exposure among veterans who participated in the Normative Aging Study (NAS) (Bossé, Ekerdt, & Silbert, 1984). The NAS is a longitudinal study initiated by the Department of Veterans Affairs in the 1960s. The volunteers were screened for good health and geographic stability, and most of them (95%) were military veterans (Spiro et al., 1994). The current study drew from three surveys: (1) the survey in 1990 for military service; (2) a follow-up survey in 1991 that included perceived control during military service; and (3) a survey in 1988 including an additional stressful life events variable. The 1990 questionnaires were mailed to 1,742 men and 1,444 (82.9%) responded. The questionnaires for a follow-up survey in 1991 were mailed to the same 1,725 men, and

1,396 (80.9%) responded. Finally, the survey in 1988 was sent to 1,799 men, and 1,490 (82.8%) responded.

The 1444 men who responded to the 1990 survey were used as the initial sample. After merging the surveys in 1990 and 1991 ($N = 1,444$), 431 participants were eliminated because they had no military service ($N = 55$) or no response in 1991 ($N = 376$), resulting in a sample size of 1,013. The individuals eliminated were older ($M = 66.56$) than the main sample ($M = 64.61$), $t(665) = -3.89, p < .001$. They also were older age at entry ($N = 21.26$) than the main sample ($N = 20.66$), $t(520) = -2.24, p < .05$. Furthermore, the individuals eliminated reported higher negative homecoming experiences, $t(1319) = -2.04, p < .05$, and PTSD symptoms, $t(1357) = -3.82, p < .001$, as well as lower desirable appraisals, $t(1352) = 2.92, p < .01$, and social support, $t(572) = 5.91, p < .001$. Next, we added the additional stressful life events variables from the 1988 survey; 66 people did not complete the survey, resulting in a sample size of 947. The age of the individuals eliminated was younger ($M = 62.18$) than that of the main sample ($M = 64.78$), $t(1011) = 2.83, p < .01$. However, there were no other differences in demographic data or prewar, warzone, and postwar factors. Therefore, the results from the main sample could be generalized to the NAS sample.

After omitting non-veterans and missing data, a sample of 947 men was used in the current study. Most of them participated in World War II or the Korean conflict. Over a third (39.2%) of the men served under combat conditions. Nearly all were European American and middle class.

Measures

All scales are shown in appendix A. Means, standard deviations, ranges and standardized coefficient alphas (i.e., Cronbach's alphas) for all total scale scores are displayed in Table 2.1. As can be seen, Cronbach's alphas were exceeded .60 (George & Mallery, 2003), except for cohesive FES ($\alpha = .55$). Cronbach's alpha is affected by the number of items and the inter-item correlations (Cortina, 1993). The measure with a small number of heterogeneous items is likely to underestimate the reliability. Further, dichotomous items also underestimate Cronbach's alpha (Gulliksen, 1945). Therefore, we believe Cronbach's alpha of cohesive FES, consisting of 4 dichotomous items, are meaningful in the present study.

Prewar Factors

Childhood family environments. The Family Environment Scale (FES), developed by Moos (1975) to measure social and environmental characteristics of families, was administered. The FES, a 40-item scale rated on a dichotomized scale, consists of three dimensions: the Relationship dimension (cohesion, expressiveness, and conflict), the Personal Growth dimension (independence, achievement orientation, intellectual-cultural orientation, active-recreational orientation, and moral-religious emphasis), and the System Maintenance dimension (organization and control). In this study, cohesion (e.g., "Family members really help and support each other.") and conflict (e.g., "We fight a lot in our family.") factors in the relationship dimension were used. Each factor consists of 4 items.

Warzone Factors

Combat exposure. Degree of combat exposure was assessed using Keane and colleagues' (1989) Combat Exposure Scale (CES), a 7-item scale 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, 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, the alpha reliability was .92. In order to examine nonlinear effects of military service, Spiro et al. (1994) created an ordinal combat exposure scale, using levels suggested by Keane. 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. However, because of small numbers in the heavy category, they combined it with the moderate-heavy category.

Perceived control. The men were asked to indicate which of 18 types of roles they performed in the military. Each role was rated on controllability using a 7-point Likert scale. A global controllability (GC) scale was assessed by summing these items. In addition, we asked two supplementary questions; which of the 18 roles the men spent the most time in (TC) and which was most important to them (CC). Considering the high correlation between three types of controllability, only CC was used in present study.

Unit cohesion. Unit cohesion during military service was assessed by the sum of three questions: "How did you feel about belonging to this outfit?" "How did you get along with your service mates?" "How well did you to adjust to life in the armed

services?” These three questions came from attitude toward the military that rated men’s urge to join the military and their pride of organization (Lee et al., 1995). The outfit was rated from “generally disliked/had no respect for” to “extremely proud of the unit”; service mates were rated from “disliked everyone” to “excellent relations”, while for satisfaction the men rated their feelings from “hated everything” to “loved everything.” Each question was rated on a 7-point Likert scale in which higher scores mean high cohesion.

Appraisals of military service. Appraisals of the effects of military service were measured by Aldwin et al.’s (1994) 28 item scale, which was based on Elder and Clipp (1989). This scale rated on a 4-point scale ranging from 0 (*not at all*) to 3 (*a lot*). Desirable appraisals were composed of 14 items, *e.g.*, “learned cooperation, teamwork,” “broader perspective,” and “proud to be an American.” Undesirable appraisals also consisted of 14 items, *e.g.*, “separation from loved ones,” “disrupted my life,” and “delayed career.”

Postwar Factors

Negative homecoming experiences. The negative homecoming experiences questionnaire is a 5-item self-report assessment of negative homecoming experiences, originated by Laufer and colleagues (1981). Items are scored on a 4-point range: 1 for “Strongly disagree,” 2 for “Disagree,” 3 for “Agree,” and 4 for “Strongly agree.” Questions include: “People at home just didn’t understand what I had been through in the armed forces;” “People at home made me feel proud to have served my country in the armed forces;” and “In general, my feelings about my military service after being

discharged were very positive.” Two items were recoded, and total scores range from 5 to 20.

Additional stressful life events. The Elder’s Life Stress Inventory (ELSI: Aldwin, 1990) was used to assess major life events. The ELSI consists of 29 items of negative or stressful events that older people can experience in their lives. Respondents indicated whether they had experienced events such as death of spouse, friend, or other close family member; divorce; major decrease in activities; or retirement during the past year. These items were rated on a 1–5 scale, where 1 indicated “Not at all stressful,” and 5 indicated “Extremely stressful.”

Social support. Social support after homecoming was assessed using five questions which asked how frequently the respondent spoke about their military experience to family, friends with and without military experience. Each question was rated on a 4-point Likert scale (1 = *never*, 2 = *used to but stopped*, 3 = *occasionally*, and 4 = *frequently*).

PTSD symptoms. PTSD symptoms were assessed by the 35-item Mississippi Scale for Combat-Related PTSD (Keane, Caddell, & Taylor, 1988), scored on 5-point Likert scale. Kulka and colleagues (1991) suggested the cutoff point for community samples, suggesting that people whose Mississippi Scale score was 89 or greater were considered to have PTSD.

Analyses

Missing data. Overall, 3.56% of values were missing in the NAS data. Some variables on the FES, however, had a much higher rate of missingness: cohesive (13.8%

missing) and conflictual (13.8% missing). For these variables, typical approaches such as listwise deletion for handling missing data are problematic (Fox & Swatt, 2009). One of the most useful approaches for correcting missing data involves multiple imputation (Little & Rubin, 1987; Rubin, 1987).

Multiple imputation, consisting of imputation, analysis, and pooling steps, can provide a useful approach for analyzing incomplete data sets (Rubin, 1987). Following Acock's (2010) suggestion, we imputed 20 complete datasets using Stata 11 (StataCorp, 2009). In this study, we generally used Graham's (2009) process for multiple imputation. For example, because the total number of variables was over 100, scale scores of FES, combat exposure, unit cohesion, appraisals, negative homecoming experiences, additional stressful life events, social support, and PTSD symptoms were used for the multiple imputation analyses, the dependent variable (PTSD symptoms) as well as the independent variables were included in the imputation model. The value of a categorical variable, rank at entry, was imputed without rounding. In addition, interaction terms for verifying the stress vulnerability hypothesis were created in the original NAS dataset before performing the multiple imputations (von Hippel, 2000). This procedure allowed for the retention of all 947 men.

Analytic techniques. To test the four hypotheses that investigate the relationships between prewar, warzone, and postwar factors, and PTSD symptoms, hierarchical regression analyses were performed. Hierarchical regression analyses enabled us to determine the relative contributions of the variables in accounting for

PTSD symptoms. Further, this analysis can test the moderating effects in the amount of variance accounted for by the interaction terms.

The independent variables for verifying relative importance of factors were entered in three steps, as follows. Prewar factors such as childhood family environment, age at entry, and rank at entry were entered in Step 1. The main effects of warzone factors such as combat exposure, perceived control, unit cohesion, and desirable and undesirable appraisals were entered in Step 2. Finally, the main effects of postwar factors such as negative homecoming experiences, additional stressful life events, and social support were entered in Step 3.

Hierarchical regression analyses for moderation effects followed a similar process. Combat exposure was entered in Step 1 followed by variables of interest, such as cohesive and conflictual FES, unit cohesion, additional stressful life events, and social support after homecoming, in Step 2. Finally, interaction terms between combat exposure and variables in Step 2 were entered in Step 3. To reduce potential multicollinearity problems, the components of the interaction terms were centered (Aiken & West, 1991).

RESULTS

Sample Characteristics

The subject sample ($N = 947$) consisted of male veterans. The age of participants at 1990 ranged from 47 to 92 years, with a mean of 64.78 years ($SD = 7.20$). Age at entry ranged from 14 to 37 years, with a mean of 20.67 years ($SD = 3.60$). When they entered the service, most (88.2%) were not married. The

majority of the veterans served in the Army (47.8%), Navy (29.9%), and Air Force (19.7%), whereas only few veterans served in the Marines (7.0%) and Coast Guard (2.7%). Most of the veterans were enlisted men at entry (88.8%), with a relatively small number of noncommissioned officers (3.5%) and commissioned officers (6.2%).

In order to confirm that we could change these three categories into two categories (i.e., enlisted men versus commissioned and noncommissioned officers), rank differences were tested with a multivariate analysis of variance (MANOVA). The results of the MANOVA showed that the multivariate F for two categories was statistically significant, Wilks' $\lambda = .96$, $F(4, 897) = 9.75$, $p < .001$. Univariate F tests revealed that enlisted men reported more PTSD symptoms, $F(1, 900) = 5.99$, $p < .05$; and lower age at entry, $F(1, 900) = 29.08$, $p < .001$. However, there was no evidence for difference in combat exposure, $F(1, 900) = .11$, ns . The results of the MANOVA for three categories were similar to that of two categories. The multivariate F was statistically significant, Wilks' $\lambda = .94$, $F(8, 1792) = 6.89$, $p < .001$. Statistically significant univariate F s were obtained only for PTSD symptoms, $F(2, 899) = 3.35$, $p < .05$; and age at entry, $F(2, 899) = 17.46$, $p < .001$. Post hoc comparisons showed that enlisted men experienced significantly higher PTSD symptoms than did commissioned officers (mean difference = 3.53, $p < .05$). Also, commissioned officers showed higher age at entry than enlisted men (mean difference = 2.78, $p < .001$). There was no evidence for differences between noncommissioned and commissioned officers in combat exposure, and PTSD symptoms. Therefore, because of no significant differences between two categories and three categories, we

substituted two categories for three categories of rank at entry in further analyses.

Correlation Analyses

Intercorrelations among all of the measures before the multiple imputation analyses are presented in Table 2.2. The listwise was $N = 752$. As is evident from this table, the three factors (i.e., prewar, warzone, and postwar factors) showed multiple significant relations with PTSD symptoms. All such correlations pointed in the same direction: High levels of protective variables such as cohesive FES, $r = -.23, p < .001$, unit cohesion, $r = -.17, p < .001$, desirable appraisals, $r = -.09, p < .01$, and social support, $r = -.13, p < .001$, were significantly and negatively related to PTSD symptoms, while high levels of risk variables such as conflictual FES, $r = .21, p < .001$, combat exposure, $r = .25, p < .001$, undesirable appraisals, $r = .41, p < .001$, negative homecoming experiences, $r = .34, p < .001$, and additional stressful life events, $r = .21, p < .001$, were significantly and positively correlated with PTSD symptoms. However, neither age at entry nor perceived control showed direct correlations with PTSD symptoms.

Generally, there was a tendency for protective variables for PTSD symptoms to be positively correlated with other protective variables and to be negatively correlated with risk factors. Risk variables also were positively correlated with other risk variables, and negatively correlated with protective variables. However, cohesive FES was positively correlated with age at entry, $r = .11, p < .01$. Veterans with a higher age at entry reported lower levels of desirable appraisals and higher levels of undesirable appraisals as well as lower additional stressful life events, $r = -.09, p < .01$.

Interestingly, men with more combat exposure reported higher levels of risk, r 's = .28, $p < .001$, and .06, $p = .075$, respectively for undesirable appraisals and negative homecoming experiences as well as higher levels of protective factors, r 's = .09, $p < .01$, .18, $p < .001$, and .19, $p < .001$, respectively for perceived control, unit cohesion, and desirable appraisals. Contrary to expectations, perceived control was positively correlated with additional stressful life events, $r = .07$, $p < .05$.

As seen in Table 2.2 below, we also reported intercorrelations among variables after multiple imputation. In general, there were no remarkable differences between the intercorrelations before and after multiple imputation. That is, the relationship among protective and risk variables in three factors and PTSD symptoms were similarly related. Further, protective variables were positively associated with other protective variables, but negatively associated with risk factors. However, compared with intercorrelations before multiple imputation, some differences were found in intercorrelations. For instance, contrary to the intercorrelations before multiple imputation, perceived control was not significantly correlated with combat exposure, $r = .05$, *ns*. Further, social support was not related to additional stressful life events, $r = .06$, *ns*.

Main Effects

To determine if prewar, warzone, and postwar factors were significant predictors of PTSD symptoms, we conducted a hierarchical multiple regression. Table 2.3 shows the result of the hierarchical regression analysis for the PTSD symptoms. After Step 1, prewar factors made a significant contribution and accounted for 8.6% of

the variance, $R^2 = .086$, $F_{\text{change}}(4, 870.4) = 82.21$, $p < .001$. In Step 1, cohesive FES, $\beta = -.19$, $p < .001$, and rank at entry, $\beta = -.08$, $p < .05$, significantly and negatively predicted PTSD symptoms, whereas conflictual FES, $\beta = .15$, $p < .001$, and age at entry, $\beta = .09$, $p < .01$, were significantly and positively predicted PTSD symptoms.

Warzone factors accounted for 18.7% of the variance in Step 2, $R^2 = .273$, $F_{\text{change}}(9, 919) = 235.70$, $p < .001$. With respect to prewar factors, cohesive FES, $\beta = -.17$, $p < .001$, and rank at entry, $\beta = -.06$, $p < .05$, were negative predictors of PTSD symptoms, whereas conflictual FES, $\beta = .12$, $p < .001$, was a positive predictor of PTSD symptoms. Age at entry was not a positive predictor in Step 2, probably because of its significant correlation with desirable and undesirable appraisal. It seemed that these appraisals were better predictors for PTSD symptoms. With respect to warzone factors, combat exposure, $\beta = .19$, $p < .001$, and undesirable appraisals, $\beta = .35$, $p < .001$, were positive predictors of PTSD symptoms, while only desirable appraisals, $\beta = -.11$, $p < .01$, was a negative predictor of PTSD symptoms. Contrary to our hypothesis, perceived control and unit cohesion did not show statistically significant results.

After removing variance from the factors entered in Step 1 and Step 2, postwar factors in Step 3 accounted for 5.2% of variance, $R^2 = .325$, $F_{\text{change}}(12, 923.2) = 71.51$, $p < .001$. With all of the factors entered into Step 3, many variables remained significant predictors of PTSD symptoms: cohesive FES, $\beta = -.14$, $p < .001$, and conflictual FES, $\beta = .10$, $p < .01$, for prewar factors; combat exposure, $\beta = .20$, $p < .001$, desirable appraisals, $\beta = -.08$, $p < .05$, undesirable appraisals, $\beta = .28$,

$p < .001$, for warzone factors; and negative homecoming experiences, $\beta = .15, p < .001$, additional stressful life events, $\beta = .15, p < .001$, social support, $\beta = -.09, p < .01$, for postwar factors. In postwar factors, negative homecoming experiences and additional stressful life events revealed significant positive relationship with PTSD symptoms, indicating that more stressed veterans were more likely to have PTSD symptoms. On the other hand, social support as a negative predictor could attenuate PTSD symptoms in later life.

In sum, the results from Table 2.3 supported the main effects hypothesis. As we expected, prewar, warzone, and postwar factors independently were associated with PTSD symptoms in later life. Warzone factors were the strongest predictor of PTSD symptoms, followed by prewar and postwar factors.

Moderation Effects

In order to examine the stress vulnerability hypothesis, hierarchical regressions analyses were conducted to test whether prewar, warzone, and postwar factors moderated the relationships between combat exposure and PTSD symptoms. In each of these analyses, combat exposure was entered in Step 1. The main variables of interest were then entered in Step 2. In Step 3, each predictor's interaction with combat exposure was examined.

As shown in Table 2.4, the total variance in PTSD symptoms explained by these equations ranged from 8.1% to 13.1%. Combat exposure was entered on Step 1, and accounted for significant 6.3% of the variance in PTSD symptoms. Five variables in prewar, warzone, and postwar factors were entered at Step 2. The addition of each

factor accounted for 1.8% to 6.3% of the variance in PTSD symptoms. Individual who reported greater cohesive FES, $\beta = -.26, p < .001$, unit cohesion, $\beta = -.22, p < .001$, and social support, $\beta = -.13, p < .001$, as well as lower conflictual FES, $\beta = .21, p < .001$, and additional stressful life events, $\beta = .23, p < .001$, experienced lower PTSD symptoms. However, the size of the increment in explained variance was small (cohesive FES, $\Delta R^2 = .063$; conflictual FES, $\Delta R^2 = .044$; unit Cohesion, $\Delta R^2 = .045$; additional stressful life events, $\Delta R^2 = .051$; social support, $\Delta R^2 = .018$).

At Step 3, the combat exposure \times five variables interaction terms were added, in order to evaluate the role of five variables as a moderator. Three out of five had significant small interaction terms: cohesive FES, $\beta = -.08, p < .01, \Delta R^2 = .006$; conflictual FES, $\beta = .09, p < .001, \Delta R^2 = .008$; and additional stressful life events, $\beta = .10, p < .001, \Delta R^2 = .009$. These significant interactions indicate that the relationship between combat exposure and PTSD symptoms were conditional upon the level of these three independent variables.

The significant interactions were graphed following the procedures recommended by Aiken and West (1991), and are presented in Figures 2.2 and 2.3. The significant interaction term for cohesive FES \times combat exposure indicates that when combat exposure was high, PTSD symptoms was higher when cohesion of FES was low, and it was lower when cohesion of FES was high. In contrast, individual who had conflictual FES shows that, although higher levels of combat exposure were associated with higher PTSD symptoms, this effect was more pronounced for individual who experienced high conflictual FES (see Figure 2.1).

As seen in Figure 2.2, the interaction between additional stressful life events after homecoming and combat exposure was generally similar to the interaction effect between conflictual FES and combat exposure. That is, the higher levels of PTSD symptoms were reported by individual who experienced higher additional stressful life events in high level of combat exposure.

Exploratory Moderation Effects

Hierarchical multiple regressions were also used to evaluate the exploratory moderating effect of other prewar, warzone, and postwar factors on the association between combat exposure and PTSD symptoms (see Table 2.5). These equations explained 6.6% to 19.9% of the variance in PTSD symptoms. Individual who reported lower perceived control, $\beta = -.06, p < .05, \Delta R^2 = .003$, as well as higher age at entry, $\beta = .07, p < .05, \Delta R^2 = .003$; and negative homecoming experiences, $\beta = .31, p < .001, \Delta R^2 = .104$, had higher levels of PTSD symptoms in later life. Two interaction terms revealed significant results: age at entry, $\beta = .07, p < .01, \Delta R^2 = .004$; and negative homecoming experiences, $\beta = .18, p < .001, \Delta R^2 = .032$. These findings indicate that these three variables are moderating the effects of combat exposure on PTSD symptoms.

Figure 2.3 and 2.4 illustrate the interaction. As seen in Figure 2.3, individuals who entered into military service at older ages had the highest levels of PTSD symptoms with the highest levels of combat exposure. The significant interaction term for negative homecoming experiences \times combat exposure in Figure 2.4 indicates that PTSD symptoms increased as combat exposure increased, regardless of levels of

negative homecoming experiences. However, the slope of high levels of negative homecoming experiences increased more drastically than that of low levels of negative homecoming experiences.

SUMMARY

In this study, we investigated the relative contribution of prewar, warzone, and postwar factors in predicting PTSD symptoms in later life. We also expected to find how combat exposure was related to PTSD symptoms in later life through direct or moderation effects of various risk and protective factors in prewar, warzone, and postwar factors. For these purposes, four hypotheses provided theoretical background for this study: stress evaporation hypothesis, residual stress hypothesis, stress vulnerability hypothesis, and main effects hypothesis.

The results of the present study did not support residual stress hypothesis as well as stress evaporation hypothesis, because prewar factors or warzone factors by themselves did not predict PTSD symptoms in later life. Instead, the main effects hypothesis was supported by the results. Namely, prewar, warzone, and postwar factors independently predicted PTSD symptoms. In addition, warzone factor were the strongest predictors of PTSD symptoms in later life. This finding is consistent with results obtained in the combat-related PTSD literature (Green et al., 1990; King et al., 1999). As we expected from previous research, some variables in each factor were protective factors for PTSD symptoms (i.e., cohesive FES, desirable appraisals, and social support), while other variables were risk factors for PTSD symptoms (i.e., conflictual FES, combat exposure, undesirable appraisals, negative home coming, and

additional stressful life events).

In addition, stress vulnerability hypothesis was partially supported by some variables. Namely, the relationship between combat exposure and PTSD symptoms varied across different levels of various variables (i.e., cohesive and conflictual FES, and additional stressful life events as well as age at entry, and negative homecoming experiences in exploratory analysis).

DISCUSSION

This study examined four different models of the relationship between prewar, warzone, and postwar factors and PTSD in late life. Neither the stress evaporation hypothesis (only prewar events are important) nor the residual stress hypothesis (only warzone events are important) can explain exclusively the development of PTSD symptoms. The present study found support for the main effects hypothesis—that multiple factors affect PTSD symptoms: Prewar, warzone, and postwar factors were all significant predictors.

While war zone factors were the most important, accounting for 19% of the variance, prewar and postwar factors independently made a significant contribution to the prediction of PTSD symptoms in later life, accounting for 9% and 5%, respectively. This finding is consistent with results obtained by Green et al. (1990) and King et al. (1999) which indicated that warzone factors were the strongest contributors for PTSD symptoms. However, postwar factors appeared to play a greater role in predicting PTSD symptoms than prewar factors in both studies. For instance, Green et al. (1990) reported significant contributions of 9%, 19%, and 12%, respectively, for prewar,

warzone, and postwar factors. In contrast, prewar factors played a larger role than postwar factors in the present study.

One possible explanation is that people's attitude toward the war differed across wars. Respondents in Green et al. (1990) and King et al. (1999) were veterans who served during the Vietnam War, whereas subjects of the present study served in World War II or the Korean War. Compared to World War II or Korean War veterans, Vietnam War veterans were placed in more antagonistic environments after homecoming (Stretch, 1995). It is possible that the negative impact of combat exposure coupled with a worse social atmosphere after homecoming put Vietnam veterans in a relatively high-risk and low-protective situation. Therefore, postwar factors could be a more significant contributor for PTSD symptoms than prewar factors in Vietnam War veterans.

We also found support for the stress vulnerability hypothesis that prewar, warzone, and postwar factors can moderate the effects of combat experience on PTSD symptoms. Both prewar variables (i.e., cohesive and conflictual FES and age at entry) and postwar factors (i.e., negative homecoming experiences and additional stressful life events) moderated the effect of combat exposure on PTSD symptoms in later life. Only cohesive FES had a buffering effect for PTSD symptom; the rest appeared to exacerbate the effect. The existence of significant moderation effects suggests that the data are more supportive of the vulnerability hypothesis, rather than the main effects hypothesis. For example, combat exposure is a strong predictor of PTSD symptoms in later life. Veterans with lower levels of cohesive childhood family environments showed the highest PTSD symptoms under higher levels of combat exposure.

However, the severity of PTSD symptoms between veterans with higher levels of cohesive childhood family environments under higher levels of combat exposure and veterans with lower levels of cohesive childhood family environments under lower levels of combat exposure was similar (see Figure 2.1). Therefore, the effects of combat exposure on PTSD symptoms became clear, when we took other moderators into consideration.

Results from previous studies (McCranie et al., 1992; Stein et al., 2005) showed that among veterans with high levels of prewar risk factors, the influence of combat exposure was less important than prewar or postwar risk factors *per se*. In contrast, among veterans with low prewar risk factors, combat exposure had a pivotal role in the development of PTSD symptoms. The result from these previous studies under high levels of combat exposure can be explained by *stress inoculation theory* (Mechanic, 1978): Veterans who experienced prior stress could have solidified coping strategies and increased resources and, therefore, could overcome later stress. Moreover, the *suppressor model* proposed by Solomon and Flum (1988) can explain the result for low levels of combat exposure: Veterans with high levels of negative childhood experiences had higher PTSD symptoms than veterans with low levels of negative childhood experiences under low levels of combat exposure.

The present study, however, showed different results. There were no significant differences among various levels of independent variables under low combat exposure. On the other hand, at high levels of combat exposure, veterans who had high levels of risk factors had significantly greater PTSD symptoms in later life

than veterans with low levels of risk factors. These results can be interpreted as a synergistic effect, as suggested by Helzer (1981). This is similar to *stress sensitization theory* in that veterans who experienced repeated exposure to stress are more susceptible to later stress (Bremner et al., 1995). Thus, the results of this study were more supportive of stress sensitization than stress inoculation theory.

One possible explanation of this discrepancy between McCranie et al.'s (1992) study, which found stress inoculation, and this study, which supported stress sensitization, may come from the characteristics of the samples used. McCranie's subjects consisted of 57 Vietnam War veterans who were receiving inpatient treatment in a PTSD treatment unit. Both Helzer's (1981) study and the present research used large, non-clinical samples of Vietnam and World War II veterans, respectively, and supported the stress sensitization model.

Stein et al. (2005) used a nonclinical sample of Gulf War veterans and found the evidence that supported the stress inoculation theory. However, Stein et al. did find that avoidant coping exacerbated the relationship between combat exposure and PTSD symptoms, which is also supportive of the stress-sensitization model. Stein et al. (2005) argued that "avoidant coping is only problematic for those experiencing high levels of combat, because they fail to deal appropriately or have no prior model for dealing with the severe trauma they encounter" (p. 873). This reflects Aldwin's (2007) argument that how one copes with the trauma is more important than the experience of the trauma itself.

Contrary to expectations that people who entered the military service at

younger age would have higher levels of PTSD symptoms (Brewin et al., 2000), age at entry did not predict PTSD symptoms under the main effects hypothesis (see Table 2.3). However, when examining the interactions in separate regression equations, the main effect of age at entry in Table 2.5 was significant and positively related to PTSD symptoms, supporting Elder & Clipp's (1988) observations on the Berkeley/Oakland Study.

The discrepancy between the two sets of analyses may have been caused by the possibility that age at entry was correlated with other variables that were better predictors of PTSD symptoms. Further examination of Table 2.5 shows that age at entry was a significant predictor in Step 1 but was no longer significant once war zone factors were included. Table 2.2 shows that age at entry was moderately correlated with appraisal of military experience; individuals who were older when they entered the serve were less likely to have desirable appraisals and more likely to have undesirable appraisals. Therefore, it is likely that the appraisals mediated the effect of age at entry on PTSD symptoms in later life. In addition, there was a significant interaction effect between combat exposure and age at entry. People who entered into military service at older ages reported highest levels of PTSD symptoms at the highest levels of combat exposure; age at entry was not significantly associated with PTSD symptoms for those who had experienced low levels of combat exposure. Therefore, it is possible that the disruptive effect of military service can be restricted to late entry veterans with the higher levels of combat exposure. Further, the effect is mediated by appraisals of military service.

Consistent with prior work, combat exposure was a strong risk factor for PTSD symptoms (Brewin et al., 2000; King et al., 2004; Stein et al., 2005). However, this study found that the beta for undesirable appraisals was nearly twice as large as the beta for combat exposure, suggesting that how veterans appraised their military service was a stronger predictor of PTSD symptoms than combat exposure *per se*.

Previously, Aldwin et al. (1994) found a significant moderation effect of undesirable appraisals and combat exposure on PTSD symptoms. Namely, for low levels of undesirable appraisals, increasing levels of combat exposure were not associated with levels of PTSD symptoms, whereas for high levels of undesirable appraisals, increasing levels of combat exposure were associated with increasing levels of PTSD symptoms. If so, what kind of characteristics would veterans with lower undesirable appraisals have? In this study, negative appraisals were correlated with a variety of other prewar, warzone, and postwar factors, including positive correlations with combat exposure, negative homecoming experiences, and postwar stressful life events, and were negatively correlated with unit cohesion. Note that combat exposure had a positive correlation with undesirable appraisals as well as with protective factors such as perceived control, unit cohesion, and desirable appraisals. Thus, it is possible that if veterans shared and overcame their adversity with their comrades when facing serious combat exposure, they could have strengthened their bonds and therefore had high levels of unit cohesion and perceived control. Those veterans might appraise their military service in terms of higher desirable appraisals.

Another possibility is that veterans who experienced high unit cohesion and

perceived control before combat exposure would not report high levels of undesirable appraisals, regardless of the severity of combat exposure. Therefore, although we cannot confirm the causal direction of variables in these NAS data, the meaning of combat exposure and appraisals for military service can be affected by veterans' circumstances and experiences during military service.

Similar discrepancies between the correlation, main effect, and interaction effects analyses were also found for unit cohesion and perceived control. For example, unit cohesion was inversely associated with PTSD in the correlation matrix but was non-significant in the main effects hierarchical regressions. It is likely that this is due to the overlap in variance between cohesive FES and unit cohesion ($r = .24, p < .001$). In the interaction hierarchical regressions, cohesive FES was not in the model, and thus unit cohesion once again showed a main effect on PTSD symptoms.

Nonetheless, we did not find a significant moderating effect of unit cohesion, in contrast to Fontana et al. (1997), who found a moderation effect of unit cohesion and warzone stress for PTSD and psychopathology in a sample of Vietnam War veterans. That is, when warzone stress was high, veterans who experienced high levels of unit cohesion reported higher PTSD. Fontana et al. (1997) suggested that high levels of unit cohesion had harmful effects because it led to an increased sense of loss and survivor guilt. However, the results of the present study may have differed from Fontana et al.'s study, because of a *cohort effect*. Veterans in this sample may have experienced lower levels of survivor guilt than Vietnam War veterans and, therefore, they did not experience the detrimental effects of unit cohesion.

Perceived control was another variable that demonstrated inconsistent results across analyses. It was not significantly related to PTSD in either the correlation or main effects analyses, but its main effect was significant in the interaction analyses (although the interaction effect was not in itself significant). Thus, controlling for level of combat exposure uncovered a weak negative effect of perceived control on PTSD symptoms in later life. In other words, control was weakly positively correlated with combat exposure, which in turn was positively correlated with PTSD symptoms. However, once controlling for combat exposure, the negative association between control and PTSD emerged. These “contradictory” associations thus “cancel each other out” in the zero-order correlations. One could speculate that individuals who were more capable and in better control would be chosen for combat missions and thus have gained more exposure to combat trauma.

Postwar factors showed the smallest contribution to the prediction of PTSD symptoms. As mentioned earlier, this can be explained by the fact that World War II veterans were accepted by their society and experienced a more positive economic situation, while Vietnam War veterans were far less supported by the general U.S. populace after 1968 (Settersten, 2006). Compared with Vietnam War veterans, it was certainly possible that World War II veterans integrated into their country easily after homecoming and experienced less stressful life events.

However, this does not mean that World War II veterans did not suffer from negative adversity in postwar. In the present study, negative homecoming experiences at the reception stage as well as current stressful life events showed significant results in

both main effects and moderation effects. Social support was a typical protective factor of PTSD symptoms.

As Foy et al. (1987) suggested, the directionality of the relationship between PTSD symptoms and adjustment situation is unclear. That is, negative life events after homecoming could decrease social support (King et al., 1998). In contrast, low social support could increase stressful life events (Fontana & Rosenheck, 1994). These different cases, in the long run, would increase the possibility of PTSD symptoms in later life. Therefore, further study is needed to investigate veterans' environments after homecoming and their directionality for PTSD symptoms.

In summary, our study found support for both the main effects and the stress vulnerability hypotheses. As we expected, prewar, warzone, and postwar factors independently predicted PTSD symptoms in later life. Some variables of prewar, warzone, and postwar factors provided evidence that those variables moderated the relationship between combat exposure and PTSD symptoms in later life in some interesting and complex fashions.

Strengths and Limitations

This study yielded several noteworthy findings. First, the present study used four different hypotheses that could allow for drawing firm conclusions about the development of PTSD symptoms in later life. Since the beginning of two major perspectives in the middle of 1970s, many previous studies have focused on verifying the relative importance of prewar factors and/or warzone factors in the development of PTSD symptoms. In contrast, other researchers extended the realm of research into

postwar factors and provided evidence of main effects hypothesis and stress vulnerability hypothesis. However, only few studies investigated these four hypotheses in combination. Second, it is also important to note that the results of this study involve various variables that were rarely used in previous studies. For instance, we included resilience as well as risk variables, such as cohesive FES in prewar factors, as well as perceived control and unit cohesion in warzone factors. Taking the findings of prior studies into consideration, as well as significant correlations with other variables, those variables could become protective factors for PTSD symptoms.

Despite these strengths, some caveats need to be pointed out in interpreting these results. First, it is necessary to use more reliable measures of perceived control, cohesion, and social support. For instance, King and colleagues (1998, 1999) divided social support into structural social support and functional social support in their series of studies on PTSD research. Keane and colleagues (1985) also used various types of social support, including social network size, material support, physical support, sharing, advice, and positive social interactions. In addition, we used broad perceived control during military service rather than perceived control in specific condition such as role-specific control in most salient role (Krause & Shaw, 2000, 2003), which may have concealed significant relation between perceived control and PTSD symptoms as well as other related variables.

Furthermore, the Mississippi PTSD scale was developed for Vietnam War Veterans, based on DSM-III (American Psychiatric Association, 1980). However, the American Psychiatric Association published a series of DSM-III-R (1987), and DSM-

IV (1994). Brewin et al. (2000) pointed out that change in the impairment criterion in the DSM-IV might be a cause of difference in risk factor estimates. Further, it is possible that the characteristics of veterans from different wars could be of an entirely different nature. Davidson and colleagues (1990) found that Vietnam veterans showed higher levels of PTSD symptoms as well as survivor guilt, avoidance of reminders of trauma and detachment/estrangement from others. They also suggested that emotional injury of Vietnam veterans was related to interpersonal problems, while World War II veterans perceived their trauma as a personal threat. Therefore, we have to interpret results in the present study carefully.

Second, it is difficult to determine causal directionality because the NAS data used in the present study were from a cross-sectional, retrospective study. For example, it is unknown whether unit cohesion or perceived control preceded combat exposure or vice versa. In addition, self-reports of experiences in military service can bring about distortion of response or poor recall. However, Brewin et al. (2000) found that retrospective reports of childhood stress were often quite accurate. Furthermore, the effect sizes of prospective versus retrospective designs did not differ from each other. Nonetheless, more longitudinal or prospective studies of PTSD symptoms and prewar, warzone, and postwar factors are needed.

Third, the sample had only limited generalizability. That is, participants of this study mainly consisted of European American and middle class males in World War II or the Korean War. Different types of war or socioeconomic status, as well as cultural differences, may also affect PTSD symptoms.

Future Studies

The present study sheds light on the influence of prewar, warzone, and postwar factors in the relationships between combat exposure and PTSD symptoms in later life. From the present study, we can understand the relative contribution of prewar, warzone, and postwar factors for PTSD symptoms and what moderates the effects of combat exposure. However, we also found some limitations of this study. More sophisticated models should be used to explain the relationships among various variables and PTSD symptoms. For example, there were suggestions in the data of possible mediating pathways which would require further study. Structural equation modeling can suggest significant implication on these issues. Structural equation models may also provide possible causal ordering among the variables, as well as yield information on direct and indirect effects. Given the high level of conflict in the world today, it is important to understand both protective and risk factors for PTSD symptoms, and whether these are still applicable to current wars.

Table 2.1

Summary Statistics for Scales of Prewar, Warzone, and Postwar Factors

Scales	<i>n</i> of items	<i>M</i>	<i>SD</i>	Range	Standardized coefficient alpha
<u>Prewar factors</u>					
FES					
Cohesion	4	3.09	1.08	0 / 4	.55
Conflict	4	.94	1.16	0 / 4	.70
Age at entry	1	20.67	3.60	14 / 38	N/A
Rank at entry	1	1.10	.30	1 / 2	N/A
<u>Warzone factors</u>					
Combat exposure	7	5.70	9.42	0 / 41	.93
Perceived control	1	4.26	2.12	0 / 7	N/A
Unit cohesion	3	17.34	2.59	3 / 21	.74
Desirable appraisals	14	27.76	8.48	0 / 42	.91
Undesirable appraisals	14	7.01	6.05	0 / 42	.83
<u>Postwar factors</u>					
NHE	5	9.62	2.61	5 / 20	.66
ELSI	30	2.38	2.31	0 / 17	N/A
Social support	5	11.12	3.66	0 / 20	.77
PTSD symptoms	35	57.33	10.34	35 / 175	.84

Note. FES: Family Environment Scale, NHE: Negative Homecoming Experiences, ELSI: Additional stressful life events, PTSD: Posttraumatic Stress Disorder.
Rank at entry: 1 (Enlisted man), 2 (Noncommissioned and commissioned officer)

Table 2.2

Intercorrelations Among Prewar, Warzone, and Postwar Factors Before Multiple Imputation (N = 752) and After Multiple Imputation (N = 947)

	Prewar factors				Warzone factors					Postwar factor			
	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Cohesive FES	—	-.31***	.11**	.09*	.05	.11**	.24***	.12**	-.04	-.17***	-.08*	.12**	-.24***
2. Conflictual FES	-.32***	—	-.03	.00	.00	-.02	-.06	.01	.09*	.11**	.10**	-.02	.21***
3. Age at entry	.11***	-.04	—	.22***	-.02	.03	-.04	-.15***	.29***	.02	-.06	.03	.06
4. Rank at entry	.08*	.00	.17***	—	.00	.05	.05	.06	.03	-.04	-.02	.06†	-.09*
5. Combat exposure	.06†	-.02	-.03	.01	—	.06	.13***	.17***	.32***	.07†	-.03	.02	.26***
6. Perceived control	.11***	-.03	.00	.03	.09**	—	.21***	.15***	.09*	-.04	.10**	.10**	-.01
7. Unit cohesion	.24***	-.06†	-.06†	.04	.18***	.23***	—	.42***	-.21***	-.25***	-.03	.12**	-.18***
8. Desirable appraisals	.11***	-.01	-.21***	.05†	.19***	.18***	.42***	—	.03	-.12**	.04	.19***	-.09*
9. Undesirable appraisals	-.02	.07*	.30***	.02	.28***	.05	-.19***	.03	—	.35***	.16***	.07†	.43***
10. NHE	-.17***	.12***	.03	-.04	.06†	-.03	-.23***	-.11***	.32***	—	.15***	-.12**	.35***
11. ELSI	-.08*	.10**	-.09**	-.01	-.06†	.07*	-.04	.04	.15***	.15***	—	.06	.23***
12. Social support	.14***	-.03	-.03	.06†	.02	.10**	.12***	.25***	.06†	-.13***	.07*	—	-.10**
13. PTSD symptoms	-.23***	.21***	.05†	-.08*	.25***	-.04	-.17***	-.09**	.41***	.34***	.21***	-.13***	—

Note. Intercorrelations after multiple imputation were shown below the diagonal. FES: Family Environment Scale, NHE: Negative Homecoming Experiences, ELSI: Additional stressful life events, PTSD: Posttraumatic Stress Disorder. † < .10; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2.3

Hierarchical Regression Analysis for Variables Predicting PTSD Symptoms

Variable	Step 1			Step 2			Step 3		
	B	SE B	β	B	SE B	β	B	SE B	β
<u>Prewar Factors</u>									
Cohesive FES	-1.840	.342	-.192***	-1.629	.320	-.170***	-1.325	.311	-.138***
Conflictual FES	1.305	.308	.147***	1.087	.278	.122***	.924	.266	.104**
Age at entry	.266	.093	.093**	-.101	.092	-.035	-.012	.090	-.004
Rank at entry	-2.688	1.105	-.078*	-2.025	.993	-.058*	-1.853	.960	-.054†
<u>Warzone Factors</u>									
Combat exposure				.207	.034	.189***	.220	.033	.201***
Perceived control				-.084	.143	-.017	-.123	.139	-.025
Unit cohesion				-.141	.136	-.035	-.064	.132	-.016
Desirable appraisals				-.130	.040	-.107**	-.093	.039	-.077*
Undesirable appraisals				.597	.057	.349***	.472	.058	.277***
<u>Postwar Factors</u>									
NHE							.606	.119	.153***
ELSI							.660	.128	.147***
Social support							-.255	.081	-.091**
ΔR^2						.187***			.052***
Total R^2		.086***			.273***			.325***	
Adjusted R^2		.082***			.266***			.316***	

Note. FES: Family Environment Scale, NHE: Negative Homecoming Experiences, ELSI: Additional stressful life events, PTSD: Posttraumatic Stress Disorder.

† < .10; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2.4

Summary of Hierarchical Regression Equations of PTSD Symptoms on Combat Exposure, Prewar/warzone/postwar Factors, and Interactions

	B	SE	β	ΔR^2	<i>df</i>	<i>F_{ch}</i>
Equation 1						
CE	.301	.034	.274	.063	1, 928.1	62.218***
Cohesive FES	-2.455	.312	-.256	.063	2, 837.8	59.935***
CE × Cohesive FES	-.081	.035	-.076	.006	3, 822.2	5.438**
Equation $R^2 = .131$, $F(3, 822.2) = 42.93$, $p < .001$						
Equation 2						
CE	.280	.034	.255	.063	1, 928.1	62.218***
Conflictual FES	1.873	.293	.211	.044	2, 816.5	39.856***
CE × Conflictual FES	.082	.032	.088	.008	3, 779.4	6.878***
Equation $R^2 = .114$, $F(3, 779.4) = 35.97$, $p < .001$						

Note. CE: Combat exposure, FES: Family Environment Scale, ELSI: Additional stressful life events.

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

Table 2.4 (Continued)

	B	SE	β	ΔR^2	<i>df</i>	<i>F_{ch}</i>
Equation 3						
CE	.333	.037	.303	.063	1, 928.1	62.218***
Unit cohesion	-.869	.126	-.217	.045	2, 931.4	46.845***
CE × Unit cohesion	-.019	.014	-.045	.002	3, 930.4	1.855
Equation $R^2 = .109$, $F(3, 930.4) = 38.00$, $p < .001$						
Equation 4						
CE	.298	.034	.271	.063	1, 928.1	62.218***
ELSI	1.043	.138	.233	.051	2, 931.4	53.870***
CE × ELSI	.047	.015	.096	.009	3, 930.1	9.680***
Equation $R^2 = .123$, $F(3, 930.1) = 43.39$, $p < .001$						
Equation 5						
CE	.281	.035	.256	.063	1, 928.1	62.218***
Social support	-.379	.090	-.134	.018	2, 930.9	17.726***
CE × Social support	-.007	.010	-.023	.001	3, 929.9	.550
Equation $R^2 = .081$, $F(3, 929.9) = 27.15$, $p < .001$						

Note. CE: Combat exposure, FES: Family Environment Scale, ELSI: Additional stressful life events.

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

Table 2.5

Summary of Exploratory Hierarchical Regression Equations of PTSD Symptoms on Combat Exposure, Warzone Factors, and Interactions

	B	SE	β	ΔR^2	<i>df</i>	<i>F_{ch}</i>
Equation 1						
CE	.288	.035	.262	.063	1, 928.1	62.218***
Age at entry	.190	.094	.065	.003	2, 921.3	3.323*
CE × Age at entry	.024	.012	.067	.004	3, 923.5	4.290**
Equation $R^2 = .071$, $F(3, 923.5) = 23.09$, $p < .001$						
Equation 2						
CE	.284	.035	.258	.063	1, 928.1	62.218***
Perceived control	-.276	.155	-.057	.003	2, 931.8	3.217*
CE × Perceived control	-.010	.016	-.021	.000	3, 930.8	.423
Equation $R^2 = .066$, $F(3, 930.8) = 22.07$, $p < .001$						

Note. CE: Combat exposure, NHE: Negative Homecoming Experiences.

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

Table 2.5 (Continued)

	B	SE	β	ΔR^2	<i>df</i>	F_{ch}
Equation 3						
CE	.238	.033	.216	.063	1, 928.1	62.218***
NHE	1.226	.117	.309	.104	2, 929.5	116.054***
CE \times NHE	.069	.011	.181	.032	3, 927.0	37.475***
Equation $R^2 = .199$, $F(3, 927.0) = 76.21$, $p < .001$						

Note. CE: Combat exposure, NHE: Negative Homecoming Experiences.

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

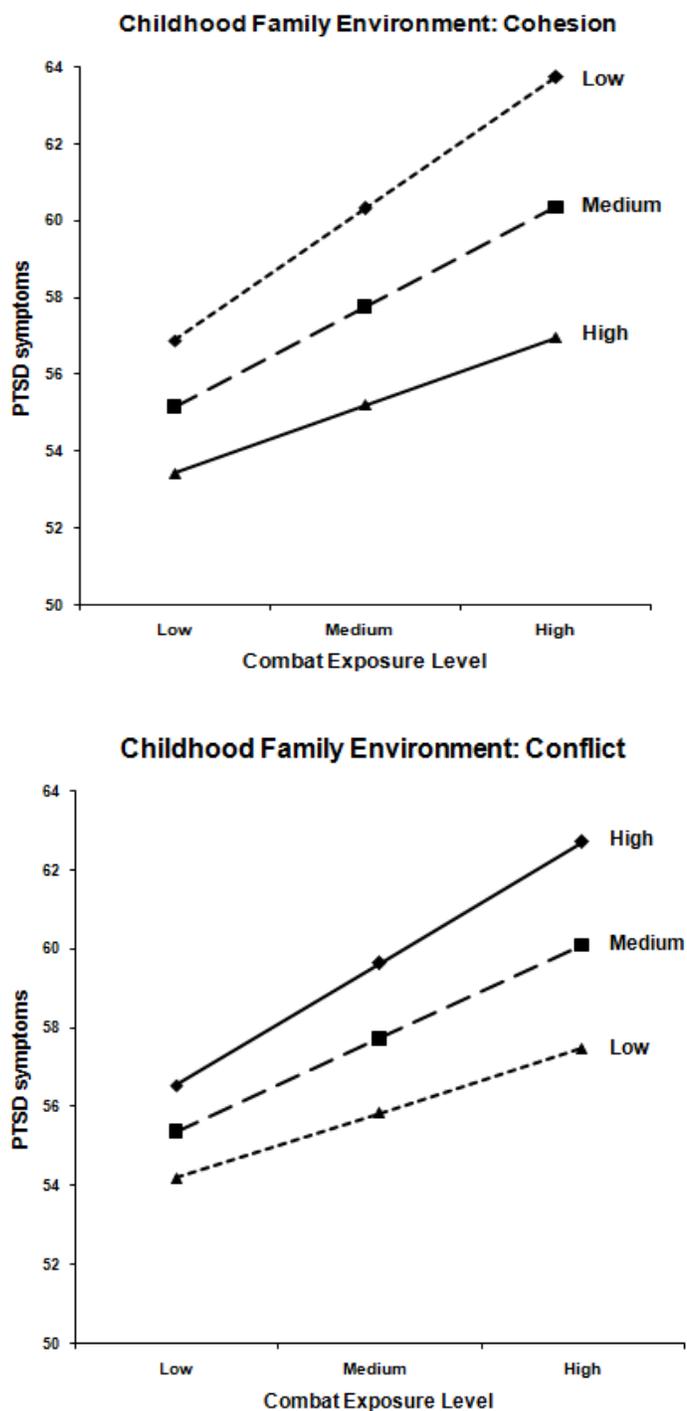


Figure 2.1. Significant interaction effects between combat exposure and FES.

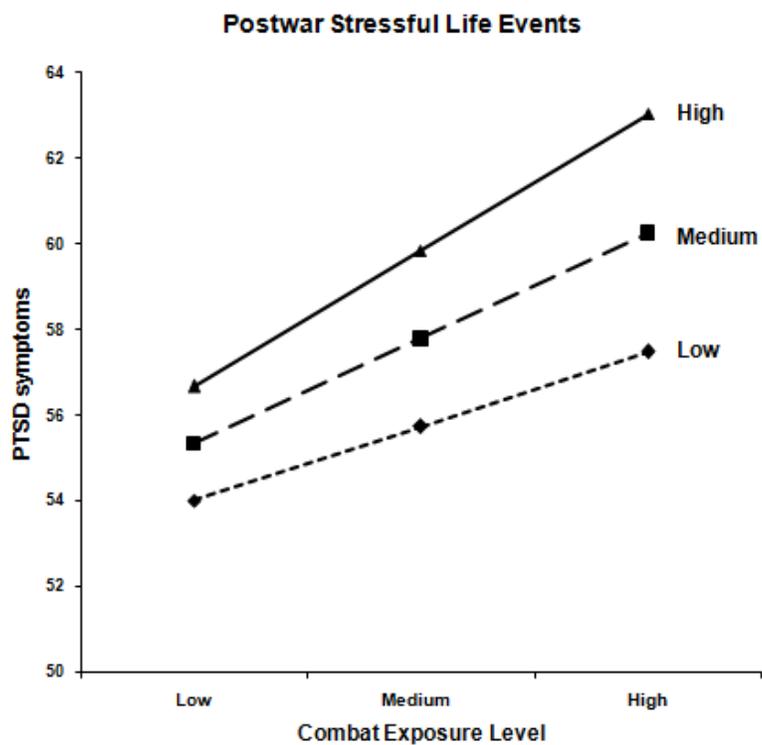


Figure 2.2. Significant interaction effects between combat exposure and additional stressful life events.

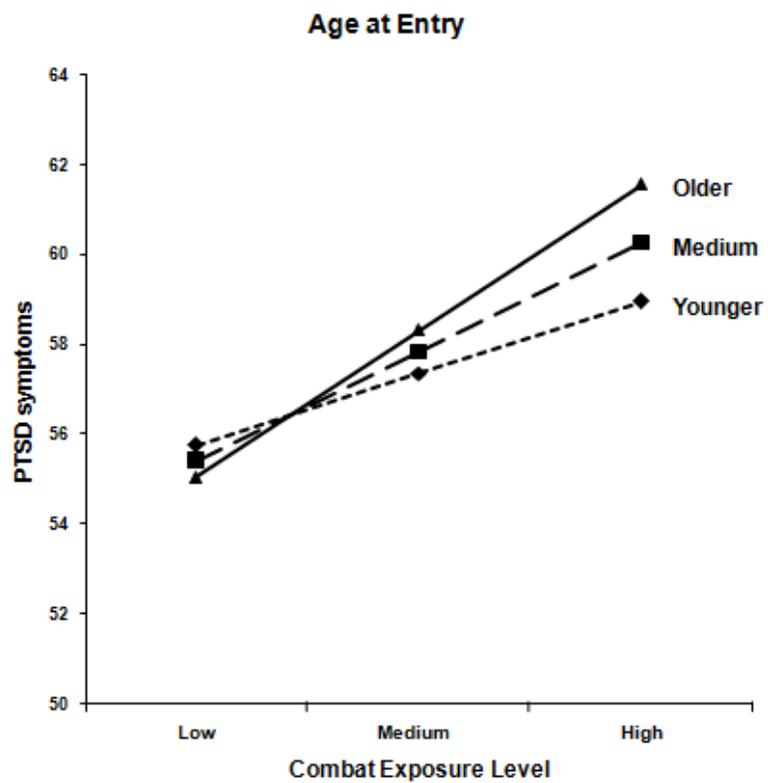


Figure 2.3. Significant interaction effects between combat exposure and age at entry.

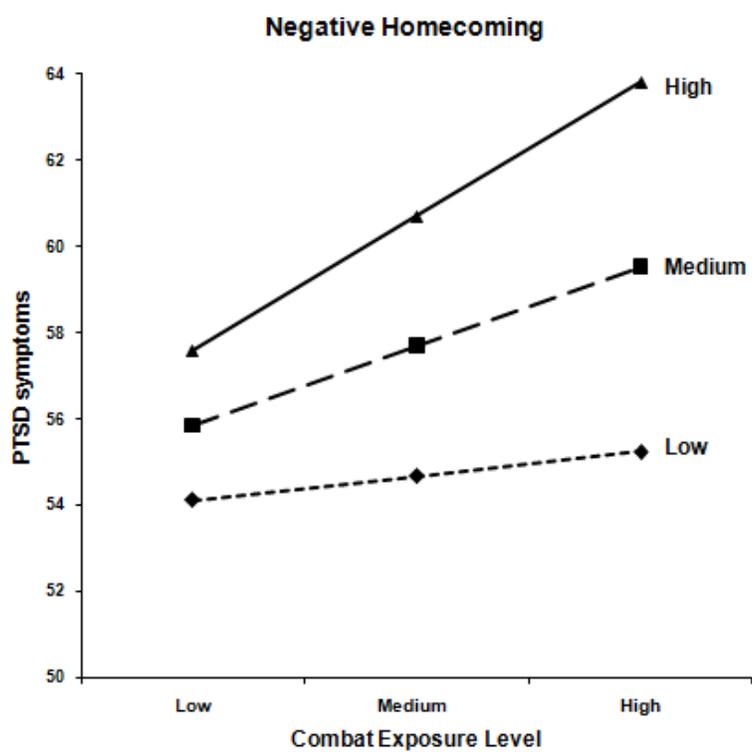


Figure 2.4. Significant interaction effects between combat exposure and negative homecoming experiences.

CHAPTER 3

STUDY 2

RUNNING HEAD: Combat Exposure and PTSD Symptoms

A Life Course Perspective on the Impact of Military Service on PTSD Symptoms:
Findings from the Normative Aging Study

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Abstract for Study 2

We utilized a life course perspective on the effects of combat exposure on PTSD symptoms in later life. The discontinuity (positive turning point vs. life-course disruption) and continuity (cumulative advantage vs. cumulative disadvantage) hypotheses were tested on a sample of 947 World War II or Korean War veterans ($M_{age} = 64.78$). The relationships between childhood family environments and PTSD symptoms were moderated by appraisals of military service. The positive turning point hypothesis was supported only in men who entered the service at an early age, but the disruptive effects of military service were seen regardless of age at entry. Structural equation modeling provided evidence of cumulative advantage as well as cumulative disadvantage, regardless of the timing of military service. The present study showed that the discontinuity and continuity hypotheses in life course theory can be extended into mental health areas.

A Life Course Perspective on the Impact of Military Service on PTSD Symptoms: Findings from the Normative Aging Study

War experiences, as well as other related variables, have been associated with PTSD symptoms in later life (Brewin et al., 2000; Spiro et al., 1994). In order to assess the impact of military service during wartime on PTSD symptoms in later life, researchers generally have divided related variables into prewar, warzone, and postwar factors. For example, prewar factors implicated in the development of war-related PTSD symptoms in veterans are: unstable childhood family environments (Fontana & Rosenheck, 1994); younger age at entry (King et al., 1996, 1999); and lower rank (Fear et al., 2009; Sutker & Allain, 1995). Similarly, veterans with warzone experience of higher combat exposure (King et al., 1996, 1998, 1999), lower unit cohesion (Rona et al., 2009), and lower desirable appraisals and higher undesirable appraisals of military service (Aldwin et al., 1994) experienced higher PTSD symptoms. Further, for postwar factors, previous studies found that exposure to additional stressful life events (Brewin et al., 2000; King et al., 1998) and lower social support (King et al., 1999; Solomon & Mikulincer, 1990) led to increased risk for PTSD.

Study 1 partially supported previous studies that prewar factors (lower cohesive and higher conflictual FES), warzone factors (higher combat exposure, lower desirable and higher undesirable appraisals), and postwar factors (lower readjustment at the time of homecoming, higher additional stressful life events, and social support) significantly predicted PTSD symptoms in later life in hierarchical multiple regression analysis. Furthermore, we examined the stress vulnerability hypothesis that suggested

that the relationships between prewar (cohesive and conflictual FES, and age at entry) and postwar factors (readjustment at the time of homecoming, and additional stressful life events), and PTSD symptoms were moderated by combat exposure.

Study 1 as well as most of earlier studies described above, were limited in that they merely contrasted different models. That is, Study 1, which contrasted four different hypotheses and found support for two of them, the independent effects and stress vulnerability hypotheses. However, life course theory raises additional hypotheses that can best be by addressed by a more synthesized approach. This perspective raises a necessity of synthesizing military service can cause negative outcomes as well as positive outcomes for veterans (Aldwin et al., 2008; Settersten, 2006), and combat exposure and its effects are regarded as “hidden variables” in older adults (Spiro et al., 1997). Some researchers have started to examine the stream of prewar, combat exposure itself and other warzone factors, as well as postwar factors (King et al., 1996, 1998, 1999; Vukšić-Mihaljević, Mandić, Benšić, & Mihaljević, 2000). In sum, it is necessary to study prewar, warzone, and postwar factors in a cohesive model in order to integrate related variables.

For this purpose, the theoretical foundation of explaining how prewar, warzone, and postwar factors go together was provided by *life course theory*. The life course theory accounts for the framework of the timing of military service and PTSD symptoms, as well as protective and risk pathways of PTSD symptoms.

The Assumptions of Life Course Theory

How does military service during wartime affect mental health in later life?

Compared with life span theory in developmental psychology that emphasizes age-related biological and behavioral changes, life course theory addresses the importance of social pathways and settings in historical time and place (Elder & Johnson, 2003). There are five general principles of the life course: (1) human development and aging as lifelong processes; (2) human agency and social constraints in choice making; (3) human lives in historical time and place; (4) the timing of lives; and (5) linked or interdependent lives (Elder & Johnson, 2003).

It has been emphasized that human development has to be studied in view of a lifelong perspective instead of an age-specific perspective (Elder & Johnson, 2003; Elder & Shanahan, 2006). Therefore, human behavior can be affected by early experiences as well as current environments. Elder and Shanahan (2006) stated that:

Human development in life-course theory represents a process of organism-environment transactions over time in which the organism plays an active role in shaping its own development. The developing individual is viewed as a dynamic whole, not as separate strands, facets or domains, such as emotion, cognition, and motivation. The course of development is embedded in a dynamic system of social interchanges and interdependencies across and within level (p. 679).

According to the linked or interdependent lives assumption, “significant others” play an important role in regulating and shaping the timing of life trajectories (Elder & Shanahan, 2006). Family members, mainly in early stages, as well as extended networks of people, such as friends or neighbors, can be significant others. Elder and

colleagues (1996) pointed out that the assumption of linked lives is integral to the studies of military service and the impact of war. Furthermore, given human agency, people make a choice to enter into military service, influenced by opportunities or constraints (MacLean & Elder, 2007).

Wars are major historical events, and therefore can affect the trajectories of people's lives (MacLean & Elder, 2007). Previous research found that the effect of military service is influenced by its historical era (MacLean & Elder, 2007; Spiro et al., 1997). For instance, the age range of veterans who served in World War II is broader than that of Vietnam War veterans (Elder, Shanahan, & Clipp, 1994). In general, older veterans showed a negative effect of military service in their life (Elder, 1986, 1987). Moreover, veterans of World War II experienced fewer social stress reactions such as feelings of isolation and alienation (Elder & Clipp, 1988). In contrast, Vietnam War veterans had to face more difficult situations after homecoming than World War II veterans because the general public objected to the war, and therefore they did not treat veterans in a welcoming way (Stretch, 1995).

The timing of military service is also very important in determining the effects of military service (Elder, 1986, 1987; Elder et al., 1994). For example, the transition to adulthood may be later for younger-entry soldiers who delay marriage and parenthood, and who also possibly develop both social independence from family and social interdependence with, or responsibility to, one's fellow recruits (Elder, 1987; Elder et al., 1994). In contrast, older-entry soldiers, who often had started families of their own, reported that their lives were interrupted by military service (Elder, 1986,

1987). And older-entry veterans showed worse health patterns in later life than younger-entry veterans, even though they had a higher education level and occupational status before the war (Elder et al., 1994). However, such negative change is only found in physical health, not emotional health.

In sum, human development is a series of transitions and choices that are affected by social context and sociohistorical period. Life course theory enables us to tie together the different life stages, using both continuity and discontinuity theory.

Continuity and Discontinuity Theories of the Life Course Theory

Based on these assumptions, life course theorists suggest that war experience, in combination with their prewar factors, can affect veteran's lives differently (Elder & Clipp, 1988). Life course encompasses both continuity processes from childhood to old age and discontinuities in the form of turning points (Elder, 1986). Continuity theory is composed of two hypotheses: *cumulative disadvantage hypothesis* and *cumulative advantage hypothesis*, while discontinuity theory consists of two hypotheses: *positive turning point* and *life-course disruption hypothesis* (London & Wilmoth, 2006). Thus, there are four distinct life course models.

According to Elder and colleagues (1987, 1991), discontinuity theory is more applicable to younger-entry soldiers. The direction of the life course after military service depends on war experience in addition to what they experienced before military service. On the one hand, the positive turning point hypothesis suggests that war experience can cause a redirection of the trajectories of veteran's lives. The positive turning point hypothesis has mainly been applied to children at risk (Elder,

1974; Elder et al., 1991). In research on the children of the Great Depression, Elder (1974) found that deprived middle class children tolerated financial hardships well, and had better economic success in later life than the non-deprived middle class children. Similarly, younger-entry soldiers who experienced family hardship during the Depression recalled their military service as a positive turning point (Elder et al., 1991). In general, at risk children can receive positive benefits from military service (Werner & Smith, 2001). On the other hand, the life-course disruption hypothesis suggests that people who have already started families and occupational careers are more likely to be disrupted and therefore disadvantaged by war and/or combat exposure. London and Wilmoth (2006) found that younger-entry veterans who presumably experienced life-course disruption did exhibit higher later life mortality. Additionally, Dohrenwend and his colleagues (2008) found that younger-entry veterans had higher levels of PTSD symptoms in mid-life, suggesting that older veterans' mental health is more protected. It is possible that this life-course disruption hypothesis of mental health can be restricted to younger-entry soldiers, because they would be less likely to learn efficient coping strategies before military service than older-entry soldiers (Settersten, 2006).

In continuity theory, the cumulative disadvantage hypothesis suggests that historical events such as war and combat exposure negatively affect veterans with larger prewar disadvantage. For instance, when people who had fewer resources encounter combat, they may be overwhelmed by the negative effects of combat exposure. Alternatively, the cumulative advantage hypothesis suggests that war

positively affects veterans with greater prewar advantages. London and Wilmoth (2006) suggested that:

If a social institution is not organized to ameliorate the effects of, or otherwise reproduces, existing systems of social stratification, then participation in that social institution is unlikely to enable individuals to overcome early-life disadvantage, which creates continuity in the life course and may serve to reinforce processes of cumulating (dis)advantage. Therefore, the cumulative-(dis)advantage perspective reminds us that for military service generate life-course discontinuity, the military as a social institution must enable individuals to overcome early-life disadvantage by providing opportunities that alter life chances and choices (p. 139).

However, Elder (1987) found that older-entry veterans appraised their lives as less affected by the military service than younger-entry veterans, although the former were more likely to report experiencing job disruption and separation from family and friends. That is, older-entry soldiers might have maximized continuity and minimized discontinuity of their life trajectory. Therefore, both cumulative advantage and cumulative hypotheses are more appropriate for older-entry veterans.

Research into the four different life course models mentioned above primarily focuses on social inequality (MacLean & Elder, 2007). Only a few researchers have studied the impact of military service on mental health in later life from the point of view of life course theory. For instance, Elder and Clipp (1989), using archival data from the Berkeley Guidance and Growth Studies and the Oakland Growth Study,

reported that veterans with heavy combat exposure had both higher levels of resilience at age 40 and a higher possibility of emotional problems in postwar life. Elder and colleagues (1994), using the Terman Study archives, found that older-entry veterans experienced negative effects in regard to physical health in support of the life-course disruption hypothesis, but there was no difference between older-entry veteran and younger-entry veterans in regards to emotional health. It is possible that differences between the samples used in the two studies could have caused this discrepancy. Further, these studies did not use the timing of military service as a predictor variable to examine serious mental health problems (i.e., PTSD symptoms) in later life.

Several researchers found that prewar factors influenced PTSD symptoms via warzone factor and postwar factors. For instance, King et al. (1996), using data from the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990), found an indirect effect between younger age at entry and PTSD symptoms through combat exposure. In the study of Gulf War veterans, Vogt and Tanner (2007) found that the effect of childhood family environments on PTSD was mediated by postwar social support, as well as postwar stressors. Furthermore, exposure to combat indirectly predicted PTSD through postwar stressors (Vogt & Tanner, 2007). However, these studies do not shed light on the continuity or discontinuity perspective of life course theory, as they did not use the timing of military service.

There has been little research from a life course theory perspective examining whether the timing of war experience is mediated by other warzone environments and experiences. That is, past research has not examined the military experiences that

could have changed the meaning of military service. For example, it is possible that younger-entry soldiers will experience more unit cohesion and perceived control, protecting them from PTSD symptoms, while older-entry soldiers may experience less perceived control and be less likely to bond with their fellow soldiers.

Evidence from studies of veterans suggests that perceived control and unit cohesion are protective factors against PTSD symptoms. Generally, the perception of personal control results in positive outcomes, whereas the perception of loss of control results in negative consequences to well-being (Burger, 1989; Skinner, 1996). For some people, perceived control is a resource that can diminish the deleterious effects of stressful life events, such as combat exposure (Krause, 1994). Unit cohesion is also considered a typical protective factor against PTSD. Findings have consistently indicated that unit cohesion is negatively associated with PTSD symptoms (Brailey et al., 2007; McTeague, McNally, & Litz, 2004). Some researchers also have studied the relationship between stressful events, such as combat exposure or individual adjustment of wartime and post-wartime, and unit cohesion. For instance, some researchers have suggested that conflict and external threat (Coser, 1956; Stein, 1976), shared stressful events (Manning, 1991), and the combined effects of familiarity and stressful experiences (Barton et al., 2002) had a positive influence on unit cohesion.

Taken together, the available evidence suggests that unit cohesion and perceived control can be protective factors for PTSD symptoms. However, researchers have generally failed to address the relationship among combat exposure, unit cohesion, perceived control during military service, and PTSD symptoms in later

life. How do psychological resources reduce the negative effects of combat exposure on PTSD symptoms? A latent variable, *positive military experience*, will be created in the present study In order to connect unit cohesion and perceived control during military service. We anticipate that the direct effects of combat exposure on PTSD symptoms in later life will be offset by positive military experiences.

In sum, the purpose of this study is to examine the four different hypotheses of continuity and discontinuity theory, as applied to mental health in late life. In particular, we will examine the moderation effects of FES and appraisals of military service on PTSD symptoms in later life. We will also examine prewar, warzone, and postwar factors together to examine how the various factors create vulnerability or resilience dynamics for future trajectories, as well as how they mediate the influence of different transition types on later outcomes.

PRESENT STUDY

Military service as a transition can change the direction of human development positively or negatively, with implications for well-being in later life. In the present study, we propose to examine the four different models of life course transitions: positive turning point vs. disruption, and cumulative advantage or disadvantage. This generates two major hypotheses, and several small hypotheses. Life course theorists found that social context factors can moderate the effects of stress on health outcomes (Elder et al., 1996). For example, Elder (1986) noted military service can be a positive turning point for American veterans who had a disadvantaged background, because they were more likely to amplify individuals' chances for forming life goals and

obtaining necessary skills. Therefore, we proposed that the relationship between conflict in childhood family environments and PTSD symptoms in later life may be moderated by desirable appraisals. Further, the relationship between cohesive FES and PTSD symptoms may be moderated by undesirable appraisals (see Figure 3.2a).

The general framework is presented in Figure 3.1, which shows that the impact of combat exposure is moderated by both age at entry and FES, which in turn leads to either positive or negative trajectories. Positive trajectories are characterized by positive military experience, desirable appraisals of military experience and higher levels of social support, and thus lower levels of PTSD symptoms in late life. Negative trajectories are characterized by undesirable appraisals, negative homecoming experiences, more stressful live events after military service, and higher levels of PTSD symptoms. We hypothesize that there will be both positive and negative trajectories for PTSD symptoms in later life (see Figure 3.2b).

The type of transition is influenced by the timing of military service (London & Wilmoth, 2006; MacLean & Elder, 2007). Though life course theorists have emphasized the importance of age at entry into military service for men's lives (Elder, 1986, 1987; Elder et al., 1994; London & Wilmoth, 2006), no research has explored the processes of prewar, warzone, and postwar factors for PTSD symptoms in view of the timing of military service.

Elder and colleagues (Elder, 1974; Elder et al., 1991) found that the pattern of results for younger-entry veterans who experienced adversity in childhood supported the positive turning point hypothesis. As Settersten (2006) suggested, it is possible

that older-entry soldiers more effectively developed coping strategies before military service than younger-entry soldiers. In contrast, younger-entry soldiers have higher possibility of enhancing both social independence from family and social interdependence with, or responsibility to, one's fellow recruits during military service (Elder et al., 1994). If they appraised their military service positively, they may be more likely to better adjust to new circumstances after homecoming. In the long run, PTSD symptoms in later life may be less severe for younger-entry veterans with conflictual FES. In contrast, younger-entry veterans without childhood adversity may not develop adequate coping skills, and therefore may have difficulty adapting to military circumstances. Therefore, they might not undergo positive military experience. In turn, they might appraise their military service as undesirable and, would be more likely to have difficulty adjusting to the homecoming situation. If so, they would show a higher level of PTSD symptoms in later life.

If older-entry soldiers felt pressed into military service, separation from their family and occupation could jeopardize their adjustment to the military. Therefore, it is quite reasonable for them to appraise their military service as an undesirable experience. The disruption to family and career may lead to higher stressful life events and lower social support after homecoming. Finally, stressful life events and lower social support can lead to higher PTSD symptoms in later life. On the other hand, older-entry veterans who experienced a cohesive childhood family environment and developed coping strategies to endure traumatic stresses, such as combat exposure, as proposed by Settersten (2006), and/or a experienced beneficial environment during

military service as well as after homecoming, may have lower PTSD symptoms in later life.

Specific hypotheses are as follows:

Hypothesis 1: Discontinuity Theory – Positive Turning Point and Disruption (Figure 3.2a)

Hypothesis 1a. Military service will be a positive turning point in some individuals' lives. That is, there will be an interaction between childhood environment and appraisals of military service, such that individuals with high conflictual FES and who have positive appraisals of military service will have lower levels of PTSD.

Hypothesis 1b. Military service can also be a source of disruption in individuals' lives. Individuals with cohesive FES and who have undesirable appraisals of military service will have higher levels of PTSD in late life.

Hypothesis 1c. Discontinuity theory will be especially true for those with early age at entry.

Hypothesis 2: Continuity theory -- Cumulative Advantage and Disadvantage (Figure 3.2b)

Hypothesis 2a. FES with high levels of cohesion will be associated with positive life course trajectories, that is, more desirable appraisals, social support, and lower PTSD symptoms in late life.

Hypothesis 2b. FES with high levels of conflict will be associated with negative trajectories, that is, high levels of undesirable appraisals, negative

homecoming experiences, more stressful life events post-war, and higher PTSD symptoms in late life.

Hypothesis 2c. Individuals with older age at entry into military service will be more likely to exhibit continuity than individuals who entered into military service at younger ages.

METHOD

Sample and Procedure

The sample in the present study originates from the Normative Aging Study (NAS) (Bossé et al., 1984). Most of the volunteers in the NAS (95%), who were screened for health and geographic stability, were military veterans (Spiro et al., 1994). The present study is based on three surveys: (1) a survey in 1990 for military service; (2) a follow-up survey in 1991 including positive military experiences; and (3) a survey in 1988 including an additional stressful life events variable. The questionnaires were mailed to 1,742 men, and 1,444 men (82.9%) of those surveyed in 1990 responded. The questionnaires for a follow-up survey in 1991 were mailed to the 1,725 men, and 1,396 men (80.9%) responded. The survey in 1988 was sent to 1,799 men, and 1,490 men (82.8%) responded. After omitting non-veterans and missing data, a sample of 947 men was used in the current study (see Study 1). Most of them participated in World War II or the Korean War. Over a third (38.3%) of the men served under combat conditions. Nearly all were European American and middle class.

Measures

Based on previous empirical work, and a theoretical model on combat exposure and PTSD symptoms, we determined that ten constructs with historically temporal ordering were relevant to combat veterans: (a) cohesive FES, (b) conflictual FES, (c) age at entry, (d) rank at entry, (e) combat exposure, (f) positive military experience, (g) desirable appraisals, (h) undesirable appraisals, (i) additional stressful life events, and (j) postwar social support.

Prewar Factors

Childhood family environments. Cohesive and conflictual childhood family environments were measured using the Family Environment Scale (FES), developed by Moos (1975), to measure social and environmental characteristics of families. From the original FES consisting of 40 dichotomous items, four items of cohesion (e.g., “Family members really help and support each other.”) and four items of conflict (e.g., “We fight a lot in our family.”) were selected for this study. One item of the cohesion subscale and two items of conflict subscale were recoded in this study.

Age at entry. In order to evaluate the hypotheses which are related to the timing of military service, the total data were divided by age at entry. The previous studies divided the age at entry groups differently. For instance, Elder and colleagues separated veterans into two groups: early (before 21, 36%) versus late entry (21 years or older, 64%) in Elder (1986) and early (before 22, 56%) versus late entry (22 years or older, 44%) in Elder et al. (1991). Elder (1987) used three groups: early (before 21, 40%), average (21 years old, 28%), and late entry (22 years or older, 32 %). London and Wilmoth (2006) divided veterans into three different groups using two

longitudinal data sets: young (before 20), middle (20 – 23), and old (24 years or older). When we utilized Elder's categories, the results of t-tests and a univariate *F*-test showed that the differences among groups were not statistically significant for PTSD symptoms. In contrast, the results of a multivariate analysis of variance (MANOVA) using London and Wilmoth' (2006) categories showed that the multivariate *F* was statistically significant, Wilks' $\lambda = .84$, $F(22, 1478) = 6.24$, $p < .001$. Statistically significant univariate *F*s were obtained only for desirable appraisals, $F(2, 749) = 10.58$, $p < .001$; and undesirable appraisals, $F(2, 749) = 33.97$, $p < .001$. Cohesive FES, $F(2, 749) = 2.67$, $p = .07$; unit cohesion, $F(2, 749) = 2.33$, $p = .10$; and PTSD symptoms, $F(2, 749) = 2.95$, $p = .05$ were marginally significant. Post hoc comparisons showed that older-entry veterans experienced significantly higher PTSD symptoms than younger or middle-entry veterans. Therefore, we follow London and Wilmoth's (2006) classification in the present study.

Warzone Factors

Combat exposure. Degree of combat exposure was assessed using Keane et al.'s (1989) Combat Exposure Scale (CES), a 7-item scale 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, 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, the alpha reliability was .92.

Positive military experience. Positive military experience consists of perceived control and unit cohesion. In perceived control, the men were asked to

indicate which of 18 types of roles they performed in the military. Each role was rated on controllability using a 7-point Likert scale. A global controllability (GC) scale was assessed by summing these items. In addition, we asked two supplementary questions: which of the 18 roles the men spent the most time in (TC), and which was most important to them (CC). The CC score is used in this analysis.

Unit cohesion can provide a sense of belonging (Bales, 1950) and satisfaction in personal needs (Bass, 1960) at the individual level, and interpersonal closeness (Lott & Lott, 1965) at the group level. Each component was assessed by three questions: “How did you feel about belonging to this outfit?” “How did you get along with your service mates?” “How well did you to adjust to life in the armed services?” A sense of belonging was rated from, “generally disliked/had no respect for” to “extremely proud of the unit.” Closeness with service mates was rated from, “disliked everyone” to “excellent relations.” For satisfaction, men rated their feelings from “hated everything” to “loved everything.” Each question was rated on a 7-point Likert scale, and the sum of these three questions is a unit cohesion score in which higher scores mean higher cohesion.

Appraisals of military service. Appraisals of the effects of military service were measured by Aldwin et al.’s (1994) 28-item scale, which was based on Elder and Clipp (1989). This scale rated on a 4-point scale ranging from 0 (*not at all*) to 3 (*a lot*). Desirable appraisals were composed of 14-items (e.g., “learned cooperation, teamwork,” “broader perspective,” and “proud to be an American”). Undesirable appraisals also consisted of 14-items (e.g., “separation from loved ones,” “disrupted

my life,” and “delayed career”).

Postwar Factors

Negative homecoming experiences. The negative homecoming experiences questionnaire is a 5-item self-report assessment of negative homecoming experiences, originated by Laufer and colleagues (1981). Items are scored on a 4-point range: 1 for “Strongly disagree,” 2 for “Disagree,” 3 for “Agree,” and 4 for “Strongly agree.” Questions include, “People at home just didn’t understand what I had been through in the armed forces,” “People at home made me feel proud to have served my country in the armed forces,” and “In general, my feelings about my military service after being discharged were very positive.” Two items were recoded, and total scores range from 5 to 20.

Additional stressful life events. Elder’s Life Stress Inventory (ELSI; Aldwin, 1990) was used to assess major life events. The ELSI consists of 29 items of negative or stressful events that older people may experience in their lives. Respondents indicated whether they had experienced the events such as death of spouse, friend, or other close family member, divorce, major decrease in activities, or retirement during the past year. These items were rated on a 1-5 scale, where 1 indicated “Not at all stressful,” and 5 indicated “Extremely stressful.”

Social support. Social support after homecoming was assessed using five questions which asked how frequently the respondent spoke about their military experience with family, and friends with and without military experience. Each question was rated on a 4-point Likert scale (1 = *never*, 2 = *used to but stopped*, 3 =

occasionally, and 4 = *frequently*).

PTSD symptoms. PTSD symptoms were assessed using the 35-item Mississippi Scale for Combat-Related PTSD (Keane et al., 1988), scored on a 5-point Likert scale. According to Kulka et al. (1991) who suggested a cutoff point for community samples, people whose Mississippi Scale scores were 89 or greater were considered to have PTSD.

Analyses

Overall, 3.56% of values were missing in the NAS data. Some variables on the FES, however, had a much higher rate of missingness: cohesive (13.8% missing) and conflictual (13.8%). One of the most useful approaches for correcting missing data involves multiple imputation (Little & Rubin, 1987; Rubin, 1987). We imputed 100 complete datasets using Stata 11 (StataCorp, 2009).

Hierarchical regression analyses were performed to test the two discontinuity hypotheses (i.e., positive turning point hypothesis and life-course disruption hypothesis). This analysis can test the moderating effects in that the amount of variance accounted for by the interaction terms. In order to verify hypothesis 1, the independent variables were entered in three steps, as follows. Conflictual FES for positive turning point hypothesis and cohesive FES for life-course disruption hypothesis were entered in Step 1; the main effect of the timing of military service was entered in Step 2; the main effects of desirable appraisals for positive turning point hypothesis and undesirable appraisals for life-course disruption hypothesis were entered in Step 3; interaction terms between FES, age at entry, and appraisals (i.e.,

FES \times age at entry, FES \times appraisals, and age at entry \times appraisals) were entered in Step 4; three-way interaction terms of age at entry, FES, and appraisals of military service were entered in Step 5. To reduce multicollinearity, the components of the interaction terms were centered (Aiken & West, 1991).

SEM will be used to examine hypothesis 2. Prewar, warzone, and postwar factors have a historical ordering, although the NAS archives' data used for this study are cross-sectional and retrospective. Based on this historical ordering, the causal paths in SEM were developed (Vukšić-Mihaljević, 2000). King et al. (1996) also pointed out that SEM is an effective method to reveal multifaceted relationships among a large number of variables.

All scale scores were computed using the Michigan (75% validity) criterion. For SEM method, raw data was entered into Mplus, Version 5.21 (Muthén & Muthén, 2009). The maximum likelihood method was used as the estimator in SEM analysis. In SEM, several indices are used to assess model fit of the data. First, the model chi-square is a measure of overall fit of the model to the data. Although a large chi-square with a low p value indicates a poor fit, this is often the case with a large sample size (Anderson, 1987). Second, the Steiger-Lind root mean square error of approximation (RMSEA; Steiger, 1990) is a parsimony-adjusted index and estimates the amount of error of an approximation. If RMSEA is less than .80, it is an adequate fit (Kline, 2005). Third, the standardized root mean square residual (SRMR) is the mean absolute value of the residual correlations (Kline, 2005). The SRMR $<$.10 indicates a good fit for the model (Kline, 2005). Finally, the Bentler comparative fit index (CFI;

Bentler, 1990) is used for comparing the model to a baseline model. Kline (2005) suggests that $CFI > .90$ is a reasonable fit.

Prior to computing structural models, we computed measurement models to test the adequacy of the hypothesized latent variable models for explaining the observed data (see Figure 3.2b). A series of structural models were then specified to test hypothesis 2. Further, multiple group analysis was performed to evaluate hypothesis 2c.

RESULTS

This results section will be presented in three sections. First, we will examine the sample characteristics. Second, we will examine Hypothesis 1, examining military services as a positive turning point for individuals with difficult childhoods and as a disruption for individuals with more positive beginnings. Third, we will examine hypothesis 2, examining military service in terms of cumulative advantage and disadvantage theories.

Sample Characteristics

The sample ($N = 947$) consisted of male veterans, whose ages at 1990 ranged from 47 to 92 years, with a mean of 64.78 years ($SD = 7.20$). Age at entry into military service ranged from 14 to 37 years, with a mean of 20.67 years ($SD = 3.60$). Almost half of the veterans (45.6%) entered military service in their teens, with a third entering in their early twenties (20 - 23) (36.4%) and a fifth in their late twenties (24 years or older) (16.2%). Half of the sample served in the Army (47.8%); 29.9% were in the Navy, 19.7% were in the Air Force, 7.0% were in the Marines, and only 2.7%

were in the Coast Guard. Most of the veterans were enlisted men at entry (88.8%), with a relatively small number of noncommissioned officers (3.5%) and commissioned officers (6.2%). Because we did not find any evidence for differences between noncommissioned and commissioned officers in combat exposure and PTSD symptoms, we merged noncommissioned officers and commissioned officers (see Study 1).

Discontinuity Theory (Hypothesis 1)

In order to test the two perspectives of discontinuity theory (positive turning points and life-course disruption), two hierarchical regression analyses were conducted. The analyses examine the interaction between childhood environments and appraisals, pairing conflictual FES with desirable appraisals for the positive turning point, and cohesive FES with undesirable appraisals for life course disruption. We further examined the effect of age at entry to see if off-time ages exacerbated these effects. Specifically, we hypothesized that turning points and disruptions would be more likely to be seen among individuals who entered into the service early than those who entered late.

Table 3.1 presents the hierarchical regression equation examining the positive turning point hypothesis. The variables in this equation only accounted for 7% of the variance, $p < .001$. As hypothesized, conflictual FES was positively associated with PTSD symptoms, $\beta = .225, p < .001$, while age at entry was weakly associated, $\beta = .064, p = .05$. Desirable appraisals were protective, $\beta = -.087, p < .01$. Contrary to our hypothesis, the two-way interaction between conflictual FES and desirable

appraisals was not significant. However, the three-way interaction between FES conflict, age at entry, and desirable appraisals was significant, $\beta = .100, p < .01$.

Figure 3.3 shows the three-way interaction effect examining the positive turning point hypothesis on PTSD symptoms. For low conflictual FES, appraisals of military service did not affect the severity of PTSD symptoms. In contrast, those with high conflictual FES and high desirable appraisals, and with low age at entry had lowest PTSD symptoms. Further, those with high conflictual FES and low desirable appraisals, and with high age at entry had highest PTSD symptoms.

We examined significant differences between the slopes based on Dawson and Richter's (2006) suggestion (<http://www.jeremydawson.co.uk/slopes.htm>, accessed July 26, 2010). As seen in Table 3.2, the slope of low age at entry and high desirable appraisals was significantly different from the other three slopes. In other words, veterans from highly conflictual FES who entered the service at an early age and who saw desirable aspects of their military service had lower levels of PTSD than individuals in the other groups. These findings support Werner and Smith's (2001) observation that some adolescents use the military service as a way of escaping troubled families.

There was stronger support for the disruption hypothesis. As shown in Table 3.3, cohesive FES was protective against PTSD symptoms, $\beta = -.220, p < .001$, while undesirable appraisals were a risk factor, $\beta = .402, p < .001$. In this instance, age at entry was not significant. There was a significant two-way interaction between cohesive FES and undesirable appraisals, $\beta = -.066, p < .05$, supporting our

hypotheses. However, the three-way interaction between cohesive FES, age at entry, and undesirable appraisals was not significant.

As can be seen in Figure 3.4, individuals with low levels of cohesion in their families and high levels of undesirable appraisals were most likely to have PTSD symptoms. Even for those with highly cohesive families, having undesirable appraisals put them at higher risk for PTSD symptoms, supporting the disruption hypothesis. This provides partial support for hypothesis 1b – undesirable appraisals were important disruptors, but age at entry did not alter this relationship.

In summary, the positive turning points were primarily seen among individuals who entered the military early, but the disruptiveness of military service could be seen regardless of age.

Continuity Theory (Hypothesis 2)

To examine continuity theory, we constructed structural equation models to examine both positive (cumulative advantage) and negative (cumulative disadvantage) pathways. The variables used in the model, as well as their internal reliabilities, are presented in Table 3.4. Internal reliability coefficients of all instruments range from a low of .55 for cohesive FES to a high of .93 for combat exposure. Before conducting those analyses, however, we needed to examine the underlying measurement model.

Measurement model. This measurement model includes three latent variables: the three endogenous latent variables, positive military experience, social support, and PTSD symptoms (see Table 3.4). Three latent variables were the maximum allowed by the power of the sample size.

Preliminary principle axis factor analyses were conducted, using the Mplus program, Version 5.21 (Muthén & Muthén, 2009). For positive military experience, we used the three items from the unit cohesion scale (Lee et al., 1995) and perceived control. For social support, we used four of the items from the social support scale (Lee et al., 1995); the fifth, military friends, did not load well in preliminary analyses. For PTSD, the four subscales constituted the indicator variables (Keene et al., 1988). Confirmatory factor analyses of all three latent variables provided support for their acceptability, with RMSEA values below the recommended maximum of .08, SRMR values below the recommended maximum of .10, and CFI values above the recommended minimum of .90 (see Appendix B for full details).

Next, a measurement model was constructed to assess whether the indicator variables load on their respective three latent variables (see Figure 3.5). All estimates of each parameter were statistically significant. Although the chi-square test, $\chi^2 (50, N = 947) = 116.219, p < .001$, was significant for all models, this is common in larger samples. The other fit indices, RMSEA = .04, SRMR = .03, and CFI = .97, indicated very good fits of this measurement model.

Structural models. Structural models that integrated all hypothesized paths were examined. Figure 3.6 depicts the initial structural model (Model 1) hypothesized to account for the association among the prewar, warzone, and postwar factors and PTSD symptoms in later life. In this model, cohesive and conflictual FES, and combat exposure were exogenous variables. This structural model fit the data inadequately: $\chi^2 (144, N = 947) = 803.047, p < .001$, RMSEA = .07, SRMR = .09, and CFI = .81.

Cohesive FES was not associated with desirable appraisals of military service. That is, it was inconsistent with the idea that cohesive FES may exert an influence on PTSD symptoms by either direct or indirect effects.

The modification of the initial structural model was performed based on both theoretical considerations and the modification indices (Breckler, 1990). The original theoretical model specified a chain of events, with childhood variables leading to warzone experiences, which in turn lead to post-war events, which in turn lead to PTSD. However, the results of Study 1 suggested that these variables could have independent effects on PTSD symptoms. Therefore, we expanded the complexity of the model in a series of steps to examine more direct effects of the study variables on the outcomes (see Table 3.5). In Model 2, we added three paths in the cumulative disadvantage pathway: undesirable and negative homecoming experiences to PTSD symptoms, and negative homecoming experiences to stressful life events, in accordance with the modification indices. Adding these three paths significantly increased model fit, $\Delta\chi^2(4, N = 947) = 188.755, p < .005$, and all three paths were significant, with β s ranging from .11 to .32 (data not shown).

In Model 3, we deleted a path from cohesive FES to positive military experiences and added two paths in the cumulative advantage pathway: cohesive FES to positive military experiences and positive military experiences to PTSD symptoms. Analysis of the Model 3 revealed increased model fit from base model (Model 1), $\Delta\chi^2(5, N = 947) = 252.071, p < .005$, and from Model 2, $\Delta\chi^2(1, N = 947) = 63.316, p < .005$. However, CFI (.88) was lower than the recommended minimum of .90.

Therefore, in Model 4, three paths were included: positive military experiences to undesirable appraisals, cohesive FES to social support, and conflictual FES to additional stressful life events. The fit indices for this modified structural model were significantly increased compared with the base model (Model 1), $\Delta\chi^2(10, N = 947) = 325.912, p < .005$, and Model 3, $\Delta\chi^2(5, N = 947) = 78.841, p < .005$. The final modified model is presented in Figure 3.7.

There was also support for the cumulative advantage theory, and the pathway can be seen at the top of the model (London & Wilmoth, 2006). Cohesive FES was associated with social support, $\beta = .17, p < .001$, and positive military experiences, $\beta = .28, p < .001$, which in turn was associated with desirable appraisals, $\beta = .49, p < .001$, which lead to more social support, $\beta = .25, p < .001$, which lead to fewer PTSD symptoms, $\beta = -.18, p < .001$. In addition, there was a direct protective effect of positive military experiences on PTSD symptoms, $\beta = -.13, p < .01$.

There was also support for the cumulative disadvantage theory (London & Wilmoth, 2006). Specifically, combat exposure lead to undesirable appraisals, $\beta = .34, p < .001$, which in turn created a cascade effect with: more difficult homecomings, $\beta = .32, p < .001$; more additional stressful life events, $\beta = .11, p < .01$; and more PTSD symptoms, $\beta = .29, p < .001$. Both negative homecoming experiences and additional stressful life events led to PTSD symptoms, $\beta = .19, p < .001$, and $.18, p < .001$, respectively, and negative homecoming experiences lead to more additional stressful life events, $\beta = .11, p < .01$.

Table 3.6 presents the direct and indirect effects from this model. As can be seen, there were many indirect effects. Most important were the indirect effects of early childhood family environments, which had no direct effects. For example, cohesive FES had significant indirect and protective effects on PTSD symptoms via positive military experiences, $\beta = -.034, p < .01$, and social support, $\beta = -.030, p < .01$. Interestingly, there were four significant indirect effects indicating suppression of the cumulative disadvantage pathway; that is, of cohesive FES on PTSD symptoms through positive military experiences and undesirable appraisals, $\beta = -.020, p < .001$; positive military experiences, undesirable appraisals, and negative homecoming experiences, $\beta = -.004, p < .001$; positive military experiences, undesirable appraisals, and additional stressful life events, $\beta = -.001, p < .05$; and positive military experiences, undesirable appraisals, negative homecoming experiences, and additional stressful life events, $\beta = .000, p < .05$. On the other hand, conflictual FES had positive indirect effects on PTSD symptoms through additional stressful life events, $\beta = .015, p < .05$.

Multiple group analyses. There was some indication that the age at entry into military service affected these veterans' experience. We had hypothesized (2c) that older age-at-entry veterans would show more continuity than the other two groups. We divided the veterans into three groups by London and Wilmoth's (2006) categorization: younger-entry ($N = 342$), middle-entry ($N = 345$), and older-entry ($N = 153$) veterans group. Using a MANOVA on the variables in the model, we found significant overall group differences, Wilks' $\lambda = .84, F(22, 1478) = 6.24, p < .001$. Examination of the

univariate F s revealed that desirable and undesirable appraisals were the most different between the groups, $F(2, 749) = 10.58, p < .001$, and $F(2, 749) = 33.97, p < .001$, respectively. Two other variables were marginally significant, cohesive FES, $F(2, 749) = 2.67, p = .07$, and PTSD symptoms, $F(2, 749) = 2.95, p = .053$. Inspection of Scheffé's post-hoc comparisons showed that the younger-entry group was significantly lower than the older-entry group in desirable appraisals, while all three groups differed in undesirable appraisals, with both variables increasing with age. In PTSD symptoms, the older-entry group was marginally greater than the younger two groups, $ps = .075$ and $.083$, respectively.

Therefore, we conducted exploratory multiple group analyses by age at entry into military service. As seen in Table 3.7, we used the process of exploratory multiple group analysis suggested by Brown (2006). First, we tested the model separately in each group. Overall model fits for the single group solution showed fairly good model fit for all groups. While all the χ^2 s were significant, as is to be expected in analyses with large sample sizes, the RMSEA was .55 or less, although the CFI for the older-entry group did not quite reach acceptable limits (.895). Second, we conducted the simultaneous analysis of equal form (identical factor structure). The results of equal form will be used as the baseline model for subsequent test of measurement invariance. The fits of this analysis demonstrated good fit to the data: $\chi^2(595, N = 947) = 1095.455, p < .001$, RMSEA = .05, SRMR = .07, and CFI = .91. Third, we tested the equality of factor loadings. This analysis assessed whether or not the factor loadings were comparable across groups. A similar fit was obtained: $\chi^2(615,$

$N = 947$) = 1123.757, $p < .001$, RMSEA = .05, SRMR = .07, and CFI = .91. Further, compared with the equal form solution, the fit indices for this equal factor loadings model did not become worse: $\Delta\chi^2$ (20, $N = 947$) = 28.302, *ns*. Finally, we tested the equality of indicator intercepts. The equal measurement intercepts model had good fit indices, but significantly degraded fit compared with equal factor loadings solution: $\Delta\chi^2$ (24, $N = 947$) = 42.733, $p < .05$. Therefore, the equal factor loadings suggested that there were no significant differences in paths between the groups, and our hypothesis was not supported.

DISCUSSION

The present study examined how war experiences affected PTSD symptoms in later life. From the viewpoint of human development as a lifelong process, and the linked perspectives, experience across the lifespan is connected (Elder & Shanahan, 2006). Therefore, we examined early childhood environments, warzone experience such as exposure to combat or military environments, and postwar factors such as social support and stressful life events. Further, the timing of military service was included, given its potential importance for patterns of change and continuity across time (Dannefer, 2003; Elder et al., 1996; London & Wilmoth, 2006). Different analyses were conducted to investigate the relationships among these variables, based on discontinuity and continuity hypotheses in life course theory.

Discontinuity Findings

For the two discontinuity hypotheses, we examined how the relationships between family environments in childhood and PTSD symptoms were moderated by

appraisals of military service and age at entry into military service. We examined two types of discontinuity hypotheses, turning points and disruption. For turning points, we examined whether positive experiences in the military mitigated the effect of conflictual FES on PTSD symptoms in later life, following Werner and Smith (2001). For disruption, we examined whether negative military experiences would “override” the protective effects of cohesive family environments for PTSD symptoms in later life.

In this study, the discontinuity hypothesis was supported, as indicated by results from hierarchical multiple regressions. The positive turning point hypothesis was found only among younger-entry veterans. In other words, for young adults with conflictual FES and early entry into military service, combined with positive appraisals of their military service, lead to lower PTSD symptoms in late life. However, for later age at entry groups, positive appraisals did not mitigate the adverse effects of early childhood environments.

Our finding of positive turning points is consistent with results obtained by Elder and colleagues (1974, 1987, 1991), who showed that the positive turning points can apply to younger-entry veterans who were considered deprived middle class children. Even though Elder and colleagues used financial hardship in childhood and economic success in later life, their results indicate that the process of overcoming adversity can solidify the foundation of resources to deal with future difficulties. Similarly, younger-entry veterans who experienced conflictual FES might obtain psychological resources such as coping strategies through successfully dealing with

conflict in family environments.

This finding is consistent with Aldwin and Stokols' (1988) explanation for Elder's (1974) research on children of the Great Depression. According to Elder (1974), the deprived middle class children tolerated financial hardships well, and had better economic success in later life than the non-deprived middle class children. Aldwin and Stokols (1988, p. 69) explained Elder's (1994) work as follow:

In deviation-amplification terms, the experience of successfully coping with adversity may have encouraged more adaptive orientations among these individuals, thereby allowing them to become more successful than their non-deprived counterparts. Economically-deprived lower class children, however, continued to fare poorly throughout their lives in contrast with non-economically-deprived lower class children. These children and their families may have had insufficient material and psychosocial resources to successfully rebound from these experiences, and a negative deviation-amplification process may have been set in motion. Thus, a deviation-amplification model can incorporate developmental processes and contextual factors in stress research.

It is noteworthy that the positive turning point hypothesis was found only in younger-entry veterans, as mentioned earlier. Contrary to Settersten's (2006) expectation that older-entry veterans might develop coping strategies more effectively than younger-entry veterans, the current results suggest that younger-entry veterans benefited most, and thus might have changed most in their coping strategies. Presumably, younger-entry veterans had a greater possibility of benefiting from this

opportunity that could transform their lives (Elder, 1986), or benefitted more from the social independence from family and social interdependence with their new military colleagues (Elder et al., 1994; Laub & Sampson, 2005). These characteristics might stimulate them to adjust to military environments, and therefore lead to a more positive appraisal of their military service. These changes could also lead to better situations after homecoming, and finally might decrease PTSD symptoms in later life.

The life-course disruption hypothesis was partially supported. For all groups, having negative experiences in the military over-rode the positive effects of cohesive FES. These results extend the work of other studies applying discontinuity hypotheses to mental health outcomes (see Settersten, 2006). The three-way interaction effect of life-course disruption hypothesis including the timing of military service was not significant. However, there were significant interaction between cohesive FES and undesirable appraisals. In other words, veterans with lower levels of cohesive FES, and who had undesirable appraisals of military service, were most likely to exhibit PTSD symptoms in later life. Although we did find that veterans who were older when they entered the service had more undesirable appraisals, presumably related to the disruptive impact of late entry on established work and family roles and responsibilities (Elder, 1987; Elder et al., 1991), this did not differentially translate into higher PTSD in later life for this group of veterans.

In summary, military service appeared to be a positive turning point primarily for young men coming from difficult family backgrounds who found positive aspects of their military experience. However, the effect of military disruption on the lives of

these men was the stronger influence (as indicated by higher levels of variance explained), and negative military experiences clearly had lifelong adverse effects (see also Aldwin et al., 1994; Boscarino, 2006; Kahana, 1992; King et al., 1996, 1998, 1999).

Continuity Findings

One question addressed in the present study was whether prewar experience through military service and postwar environments placed veterans at higher risk for PTSD symptoms in later life. Iversen and colleagues (2007) emphasized that the family relationships factor is related to trauma exposure itself, as well as to PTSD. Namely, individuals with early adversity can be more susceptible to being exposed to trauma during military service and developing PTSD symptoms in later life. We did find indirect effects of FES on PTSD symptoms, however the path via combat exposure was not significant. Instead, FES showed indirect effects on PTSD symptoms through positive military experience or undesirable appraisals.

Strengths and Limitations

We should be careful interpreting the results from the present study, given its limitations. First, the NAS is a relatively select sample which may limit the generalizability of this study to other populations. Most of the NAS men were World War II veterans, and thus these results may not generalize to veterans of other theaters. Further, the NAS men were selected for good physical health and thus may not be representative of World War II veterans as a whole, although their mental health appears comparable to other samples (Butcher, Aldwin, Levenson, Ben-Porath, Spiro, Bossé,

1991). Further, NAS men are largely European American and middle class, therefore these results should be replicated in more diverse groups.

The NAS men who were World War II veterans were adolescents during the Great Depression. This may have affected both the cohesion and the conflict levels in their childhood family environments (Elder, 1988). Further, the homecoming experience of World War II veterans was better than that of the Vietnam War veterans (Settersten, 2006).

Causal directionality was another limitation. Even though the paths in SEM were based on the historical ordering, it does not prove causality. The NAS archives used in this study were basically cross-sectional retrospective, and thus interpretations of causality among these variables should be made cautiously. It is possible that current PTSD symptoms may influence respondents' recollections of events earlier in their lives, including their war zone experience, homecoming, and even early childhood experiences (but see Brewin, 2003). However, in a study using same data set, Aldwin et al. (1994) found that controlling for current depressive symptom levels did not alter the relationships among appraisals and PTSD symptoms, although they did not examine the full range of variables in the present study.

Moreover, there are possible confounding variables that could alter the interpretation. For example, education levels may have differed among the age-at-entry groups. It is also possible that personality characteristics such as neuroticism may also be a confounding influence. However, Aldwin et al. (1994) examined the influence of some MMPI subscales (e.g., L, F, and K scales), and the results among

the appraisal and PTSD variables still held, suggesting that the results are unlikely to only be due to the confounding influences of personality.

Finally, we need to consider limitations of the measures used in the present study. For example, the latent variable of positive military experience was unique to this study, and research should further examine its reliability and validity. A version of the unit cohesion measure was used in earlier work (Lee et al., 1995), although our measure of perceived control is new. Further, there is some slight item overlap for some variables used in different measures. For example, one item in the undesirable appraisals measure lists “bad memories or nightmares,” while the PTSD measure includes two items also referencing nightmares, “I have nightmares of experiences in the military that really happened” and “My dreams at night are so real that I waken in a cold sweat and force myself to stay awake.” Therefore, we examined the correlations between these measures with and without the nightmare item in undesirable appraisals, and correlations with PTSD symptoms were very similar ($r = .41, p < .001$ vs. $r = .38, p < .001$). Therefore, we decided to retain the validated versions of these scales, which have been used in other studies for the sake of comparability.

Despite these limitations, the present study provides evidence that the continuity and discontinuity hypotheses in life course theory extend to mental health areas. That is, the present study explained the relationship between warzone factors as well as related prewar and postwar factors, and PTSD symptoms in later life, whereas original continuity and discontinuity hypotheses were used to elucidate economic situations and

social inequality.

Future Studies

The primary purpose of this study was to investigate the effect of military service as a transition on PTSD symptoms in later life. That is, military service affected veteran's lives in both continuous and discontinuous ways. Although hierarchical multiple regression and SEM helped to understand the relationships among variables, there was a limitation of causality and generalizability. Specifically, the development and maintenance of PTSD symptoms have features that change over time which were not addressed in this study. Future work should examine the trajectories of PTSD, for example, sudden onset, gradual onset and/or late onset (Aarts et al., 1996; King et al., 2007). Therefore, longitudinal studies that can shed light on causal directionality as well as change over time are needed.

We need to enlarge the realm of interests to understand the relationship between warzone experience and PTSD symptoms. For instance, conflictual and cohesive FESs were used as representatives of positive and negative aspects of prewar status. More direct measures such as early trauma history (King et al., 1999) or childhood antisocial behavior (King et al., 1996) may be more related. Further, more direct measures of positive variables such as childhood social support might also be important to assess (Werner & Smith, 2001). Finally, how veterans cope with war trauma is also an important variable which should be included in future studies. Nonetheless, this is the first study to examine how life course factors play out through prewar, warzone, and post-war experiences to affect PTSD in later life.

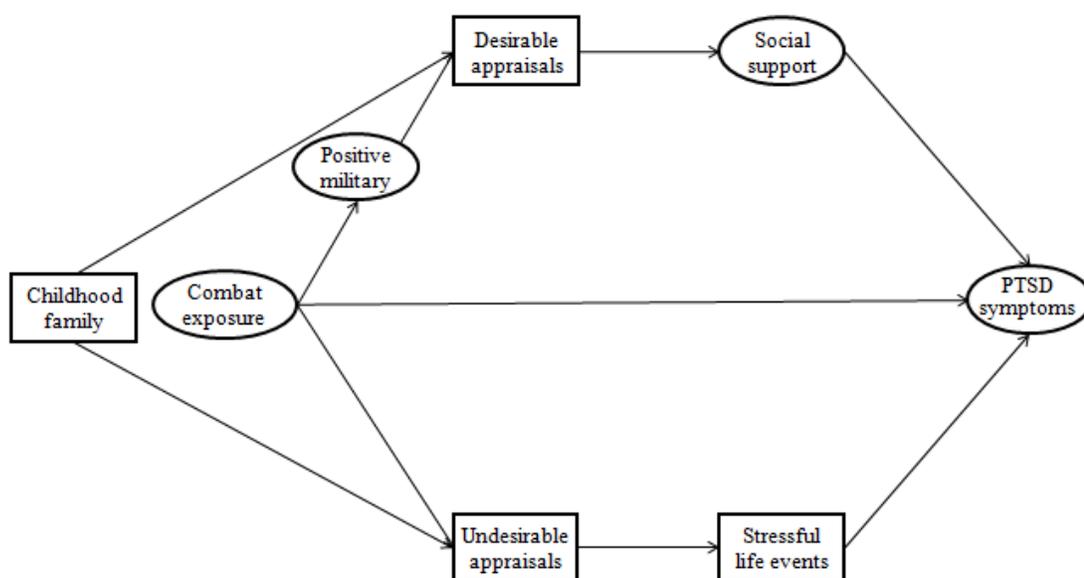


Figure 3.1. Conceptual model of the associations among prewar, warzone, and postwar factors, and PTSD symptoms.

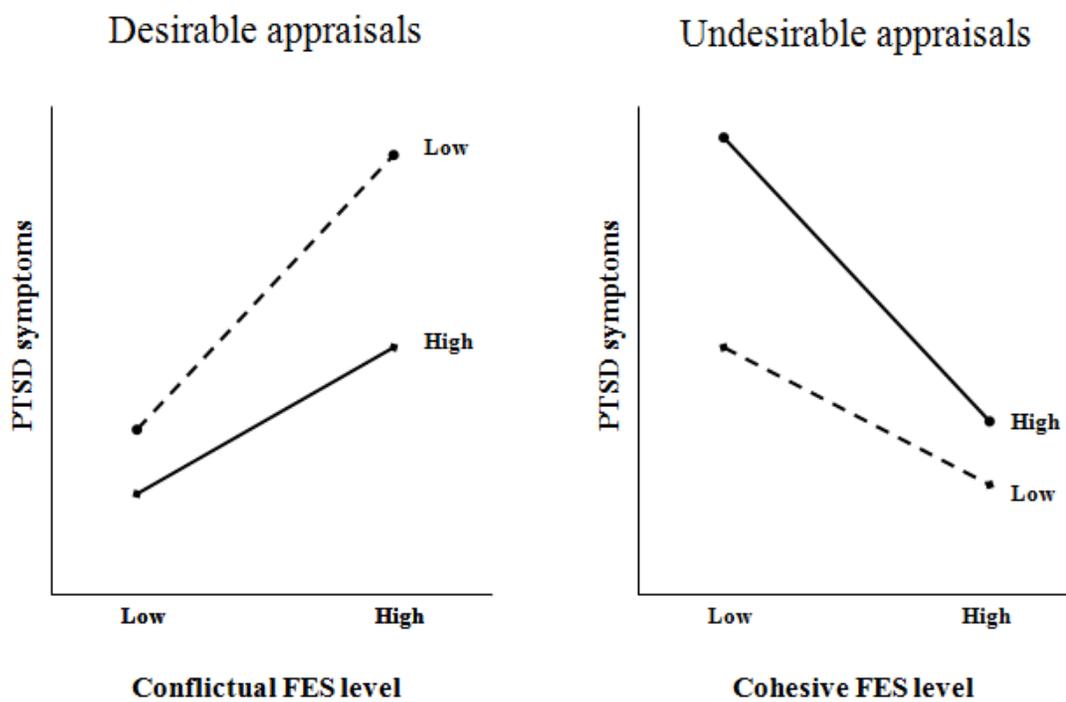


Figure 3.2a. Discontinuity model of the associations among prewar, warzone, and postwar factors, and PTSD symptoms.

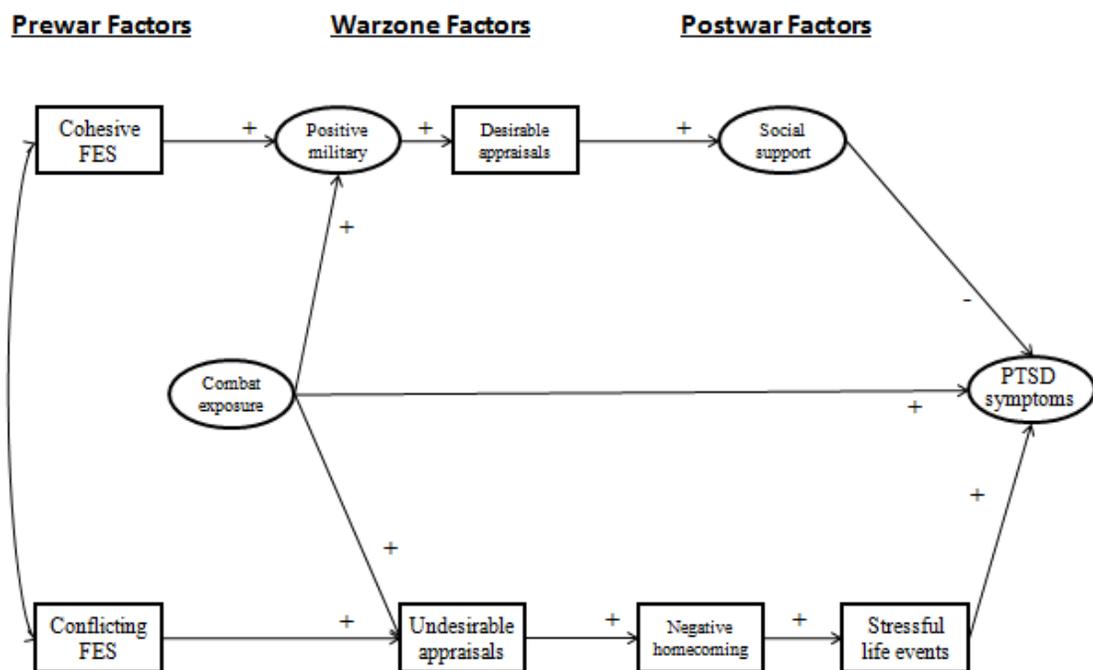


Figure 3.2b. Continuity model of the associations among prewar, warzone, and postwar factors, and PTSD symptoms.

Table 3.1

Positive Turning Point: Summary of Three-way Interaction Effect on PTSD Symptoms

	B	SE	β	<i>p</i>	ΔR^2	<i>df</i>	F_{ch}	<i>p</i>
Equation 1: Positive turning point								
1 st step								
Conflictual FES	1.988	.303	.225	< .001	.043	1, 715.3	36.61	< .001
2 nd step								
Age at entry	.186	.098	.064	.058	.003	2, 900.2	3.30	< .05
3 rd step								
DA	-.106	.041	-.087	< .01	.006	3, 919.8	6.14	< .001
4 th step								
Conflictual FES × Age at entry	.194	.093	.074	< .05				
Conflictual FES × DA	-.050	.037	-.046	ns				
Age at entry × DA	.013	.010	.047	ns	.009	6, 915.9	6.05	< .001
5 th step								
Conflictual FES×Age at entry×DA	.028	.010	.100	< .01	.010	7, 914.1	9.62	< .001
Equation $R^2 = .072$, $F(7, 914.1) = 9.16$, $p < .001$								

Note. FES: Family environment Scale, DA: Desirable appraisals.

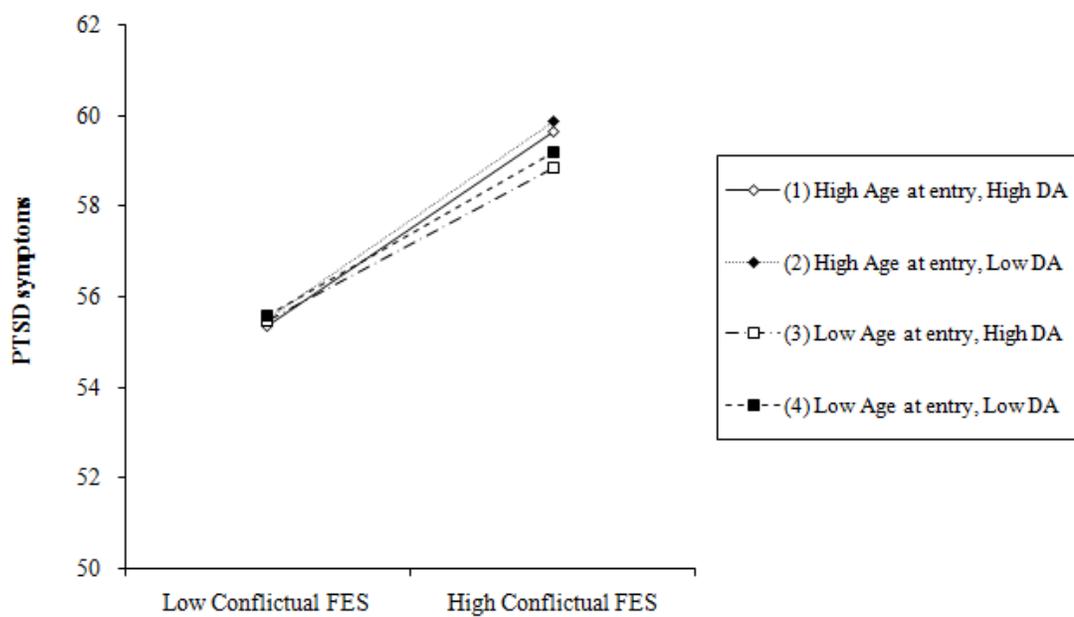


Figure 3.3. Significant three-way interaction effects between conflictual FES, age at entry, and desirable appraisals of military service.

Table 3.2

Slope Difference Tests of Three-way Interaction for Positive Turning Point Hypothesis

Pair of slopes	t-value for slope difference
(1) and (2)	-.657
(1) and (3)	2.469*
(1) and (4)	1.507
(2) and (3)	2.698**
(2) and (4)	1.886†
(3) and (4)	-2.495*

Note. (1): high age at entry and high desirable appraisals,
 (2): high age at entry and low desirable appraisals,
 (3): low age at entry and high desirable appraisals,
 (4): low age at entry and low desirable appraisals.
 † $p < .10$; * $p < .05$; ** $p < .01$.

Table 3.3

Life-course Disruption: Summary of Three-way Interaction Effect on PTSD Symptoms

	B	SE	β	<i>p</i>	ΔR^2	<i>df</i>	<i>F_{ch}</i>	<i>p</i>
Equation 2: Life-course disruption								
1 st step								
Cohesive FES	-2.103	.319	-.220	< .001	.054	1, 754.9	47.77	< .001
2 nd step								
Age at entry	-.103	.096	-.035	ns	.006	2, 907.9	5.84	< .01
3 rd step								
UA	.685	.053	.402	< .001	.157	3, 920.1	185.15	< .001
4 th step								
Cohesive FES × Age at entry	-.149	.105	-.050	ns				
Cohesive FES × UA	-.098	.050	-.066	< .05				
Age at entry × UA	-.003	.014	-.006	ns	.010	6, 912.6	11.59	< .001
5 th step								
Cohesive FES×Age at entry×UA	-.006	.013	-.017	ns	.000	7, 910.1	.50	ns
Equation $R^2 = .228$, $F(7, 910.1) = 34.56$, $p < .001$								

Note. FES: Family environment Scale, UA: Undesirable appraisals.

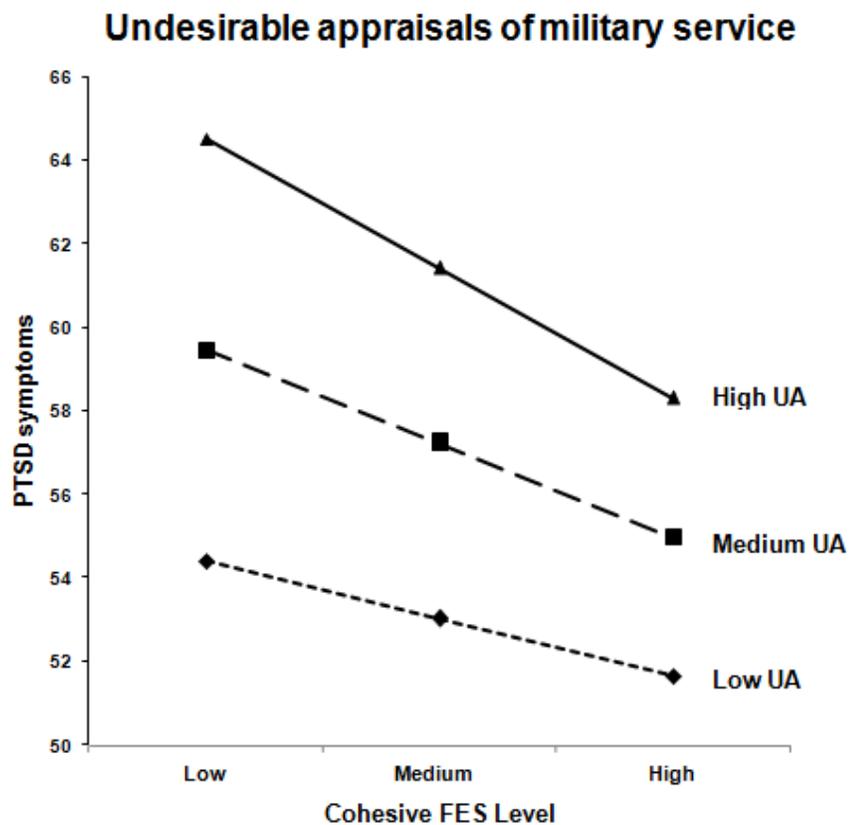


Figure 3.4. Significant two-way interaction effects between cohesive FES and undesirable appraisals of military service.

Table 3.4

Variables in the Model

Measure	No. items	Description of indicators	α
Cohesive FES	4	Help and support each other, and A feeling of togetherness	.55
Conflictual FES	4	Fight a lot in our family, rarely become openly angry, get so angry they throw things, and hardly ever lose their tempers.	.70
Combat Exposure	7	Combat patrols or dangerous duty, surrounded by the enemy, fire rounds at the enemy, and someone hit by incoming or outgoing rounds	.93
PME*	4	Belonging, mate, adjustment, and perceived control	.67
Desirable appraisals	14	Life long friends, became more independent, and value life more, etc.	.91
Undesirable appraisals	14	Economic problems, disrupted my life, and death and destruction, etc.	.82
NHE	5	People at home just didn't understand, I felt left out of everything, Readjusting to civilian life was more difficult, People made me feel proud to have served my country, and my feelings were very positive.	.66
ELSI	29	Deterioration of memory, death of a spouse, and Institutionalization of spouse, etc.	N/A
Social Support*	4	Talking to parents, spouse, children, and friends without military experience	.73
PTSD Symptoms*	4	Arousal, avoid, guilty, and numb	.70

Note. FES: Family Environment Scale, NHE: negative homecoming experiences,
PME: Positive military experience, ELSI: Additional stressful life events,
PTSD: Posttraumatic stress disorder.

*Latent variables.

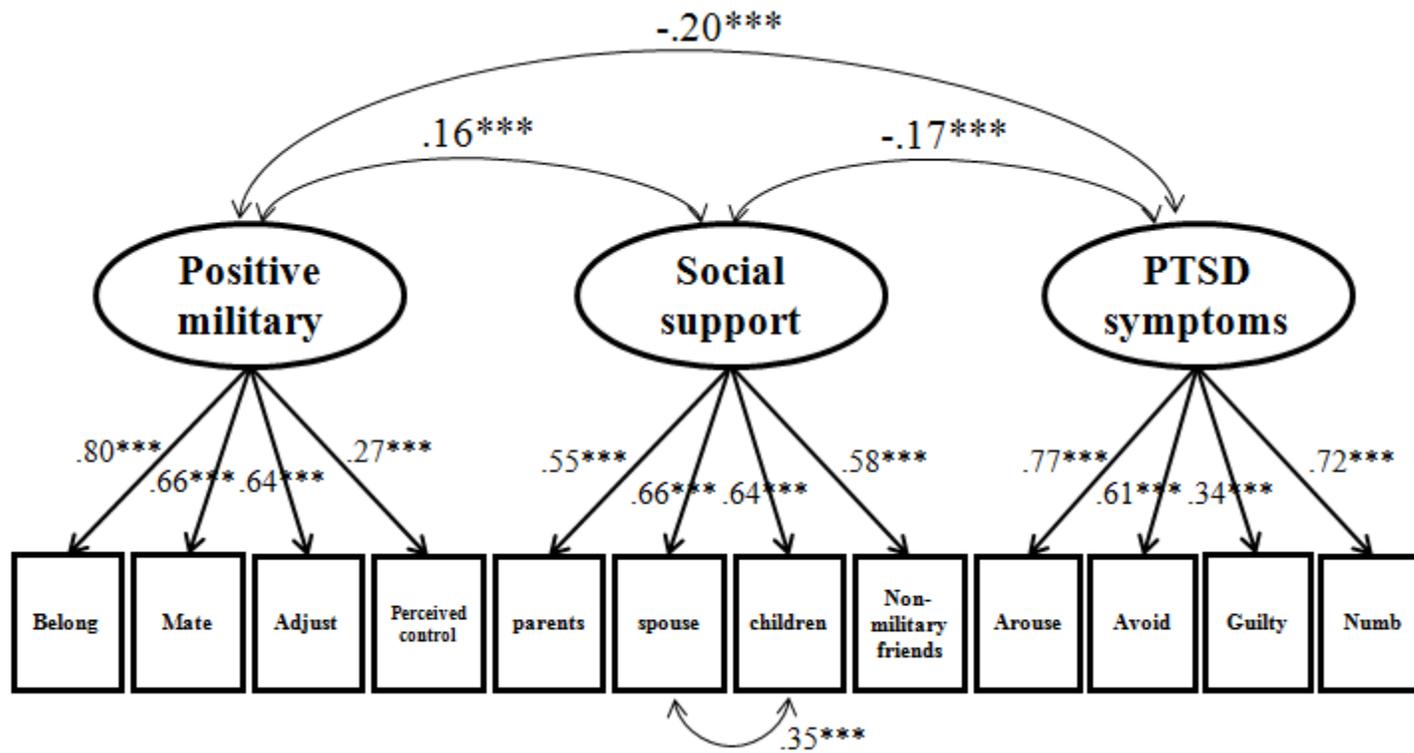


Figure 3.5. Measurement model. Circles represent latent variables, and rectangles represent observed variables. *** $p < .001$.

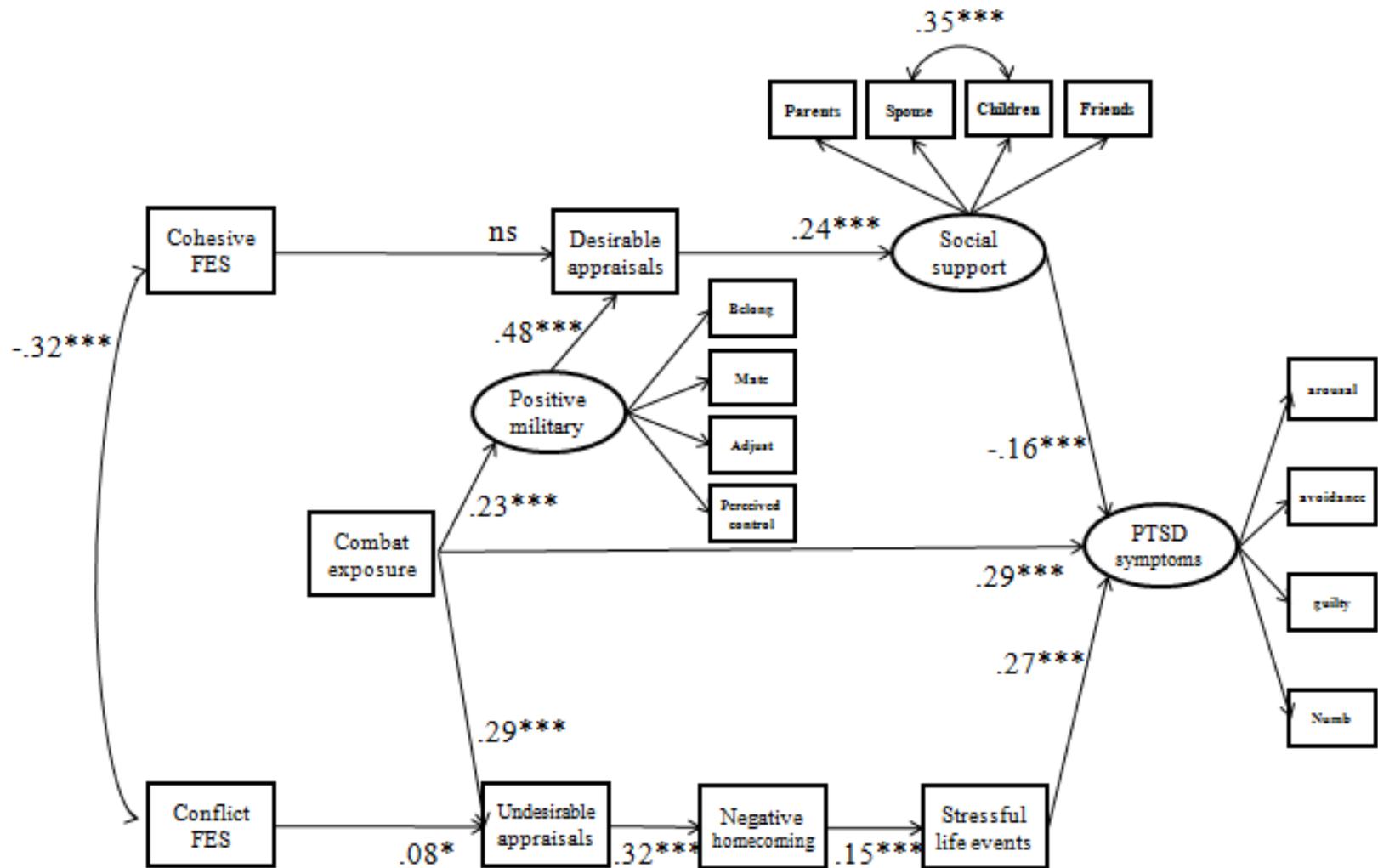


Figure 3.6. Initial structural model. * $p < .05$; *** $p < .001$.

Table 3.5
Sequential Chi-Square Difference Tests for Structural Models

Model	<i>Model fit</i>					Δ from base			Δ from previous		
	χ^2	<i>df</i>	<i>RMSEA</i>	<i>SRMR</i>	<i>CFI</i>	χ^2	<i>df</i>	<i>p</i>	χ^2	<i>df</i>	<i>p</i>
1.	803.047	144	.07	.09	.81						
2.	614.292	140	.06	.08	.86	188.755	4	<.005			
3.	550.976	139	.06	.06	.88	252.071	5	<.005	63.316	1	<.005
4.	477.135	134	.05	.05	.90	325.912	10	<.005	73.841	5	<.005

Note. 1: Hypothesized structural model,
 2: add 3 paths (UA and NHE to PTSD symptoms, and NHE to SLE) and 1 correlation,
 3: delete 1 path (cohesive FES to PME), add 2 paths (cohesive FES to PME; PME to PTSD symptoms),
 4: add 3 paths (PME to UA; cohesive FES to SS; conflictual FES to SLE) and 2 correlations.

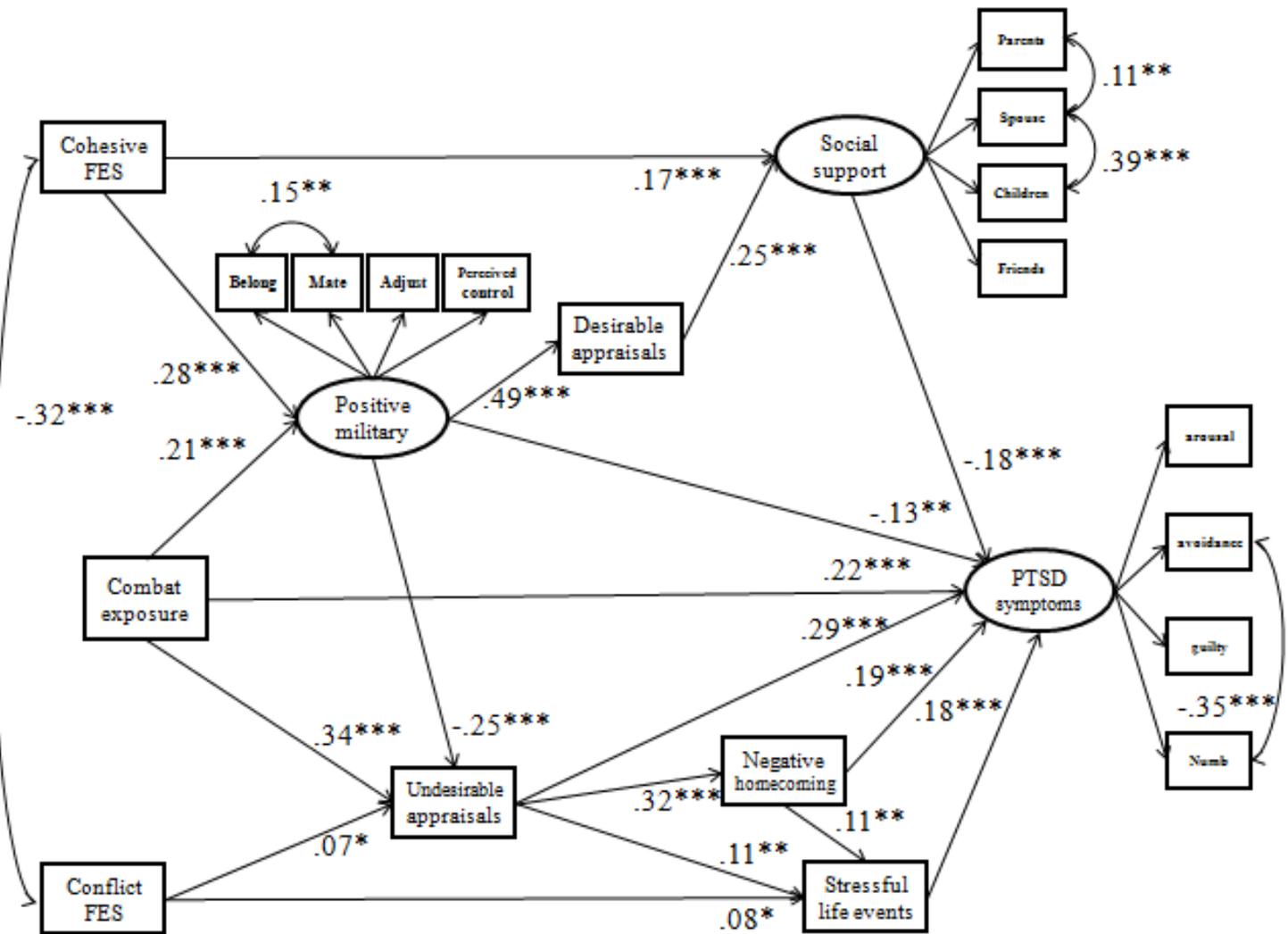


Figure 3.7. Final structural model. * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3.6

Direct and Indirect Effects of PTSD symptoms in Continuity Hypothesis

Variables	Effects		
	Direct	Indirect	Total
Cohesive FES to PTSD		-.096***	-.096***
FES → PME → PTSD		-.034**	-.034**
FES → SS → PTSD		-.030**	-.030**
FES → PME → DA → SS → PTSD		-.006**	-.006**
FES → PME → UA → PTSD		-.020***	-.020***
FES → PME → UA → NHE → PTSD		-.004***	-.004***
FES → PME → UA → ELSI → PTSD		-.001*	-.001*
FES → PME → UA → NHE → ELSI → PTSD		.000*	.000*
Conflictual FES to PTSD		.040**	.040**
FES → ELSI → PTSD		.015*	.015*
FES → UA → PTSD		.019†	.019†
FES → UA → NHE → PTSD		.004†	.004†

Note. FES: Family Environment Scale, PTSD: Posttraumatic stress disorder symptoms, CE: combat exposure, PME: positive military experience, DA: desirable appraisals, UA: undesirable appraisals, NHE: negative homecoming experiences, SS: social support, and ELSI: Additional stressful life events.

† < .10; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 3.7

Tests of Measurement Invariance of Age-at-entry and PTSD symptoms

	χ^2	<i>df</i>	$\Delta \chi^2$	Δdf	<i>CFI</i>	<i>RMSEA</i>	<i>SRMR</i>
<u>Single Group Solutions</u>							
Younger-entry (<i>N</i> = 432)	378.114***	196			.928	.049	.061
Middle-entry (<i>N</i> = 345)	403.849***	196			.904	.055	.075
Older-entry (<i>N</i> = 153)	279.067***	196			.895	.053	.085
<u>Measurement Invariance</u>							
Equal form	1095.455***	595			.909	.052	.071
Equal factor loadings	1123.757***	615	28.302	20	.907	.052	.073
Equal factor loadings & intercepts	1166.479***	639	42.722*	24	.904	.052	.074

Note. * $p < .05$; *** $p < .001$.

CHAPTER 5

GENERAL DISCUSSION

The primary purpose of both Study 1 and Study 2 was to examine whether war experience of veterans who served in World War II or the Korean War affected PTSD symptoms in later life. It was not difficult to find studies that link combat exposure and PTSD (e.g., King et al., 2004; Ozer et al., 2008). Clearly, exposure to combat is a strong predictor of PTSD symptoms (Brewin et al., 2000). However, studies of predictors of PTSD in later life are less common (see Aldwin et al., 1994; Kahana, 1992; King et al., 1996, 1998). There are a wide range of predictor variables that can be categorized into prewar, warzone, and postwar factors (Foy et al., 1987). Further, different theories have provided unique approaches for understanding the relationships between prewar, warzone, and postwar factors on PTSD symptoms in later life. What is missing from the literature are studies which contrast and synthesize different theoretical models of understanding the long-term effects of combat exposure on PTSD symptoms in later life.

Summary of Findings

In Study 1, we took a lifespan approach to this question. Following King et al. (1996, 1998), we used four different hypotheses: stress evaporation, residual stress, stress vulnerability, and main effects. Stress evaporation holds that only childhood stress is important for symptoms in later life, while residual stress argues that it is primarily combat exposure that creates this vulnerability. The stress vulnerability hypothesis argues for interaction effects between early childhood and combat, while the main effects hypothesis argues that all of these variables contribute independent

variance.

The results of this study showed that prewar, warzone, and postwar factors have relatively independent contributions in predicting PTSD symptoms, supporting the main effects hypothesis. Further, the relationship between combat exposure and PTSD symptoms in later life is moderated by childhood family environments, age at entry, negative homecoming, and additional stressful life events, supporting the stress vulnerability hypothesis. Thus, we show that both the main effects and vulnerability hypotheses are relevant to understanding the long-term effects of early childhood family environments on PTSD symptoms in later life. Further, we show that positive early childhood factors are protective against the development of PTSD in later life.

In Study 2, we utilized life course theory which emphasizes social situation in historical time and place (Elder & Shanahan, 2006; Settersten, 2006) to provide a theoretical foundation for synthesizing perspectives. Within the life course perspective, two distinct stances can be found (London & Wilmoth, 2006). On the one hand, there is the potential for historical events, such as World War II, to provide discontinuities in individuals' lives. Positive turning points refer to events or conditions that allow disadvantaged individuals to change their life course trajectories in a more positive manner. Werner and Smith (2001) have argued that military service may be one way in which disadvantaged youth can distance themselves from troubled family environments and develop new skills and attitudes towards life, which provide better career and marital opportunities (see also Laub & Sampson, 2005; Settersten, 2006). On the other hand, historical events may also prove to be disruptive and result in worsened

trajectories (Elder, 1987; Elder et al., 1991).

In contrast, the other stance that can be found in the life course literature refers to continuity over time. Specific, cumulative advantage theory argues that positive childhood experiences may provide advantages in terms of education, careers, and marital choices which lead over time to cumulative advantages (Dannefer, 2003; Elder & Shanahan, 2006). Conversely, a disadvantaged childhood may lead to cumulative problems or disadvantages.

Thus, Study 2 contrasted two discontinuity hypotheses (positive turning points and life-course disruption) and continuity hypotheses (cumulative advantage and cumulative disadvantage). In particular, we were interested in individual differences in the applicability of these models. In other words, who was most likely to show positive turning points or life-course disruption, and who was likely to show cumulative advantage or disadvantage?

To examine these hypotheses, we used a measure of early childhood environments, indexed by two subscales of the Moos' (1975) Family Environment Scale, conflict and cohesion. This allowed us to look at both positive and negative early childhoods. Using moderation analyses to examine the discontinuity hypotheses, we found that the relationship between FES and PTSD symptoms in later life was conditional upon the levels of appraisals of military service. That is, positive appraisals of military service mitigated the adverse effects of conflictual childhood environments on PTSD symptoms in later life, but only among veterans who entered into military service at younger ages. Thus, the positive turning point hypothesis was

supported only for young men making a transition to early adulthood (cf., Furtstenberg, Rumbaut, & Settersten, 2005). Only partial support was seen for the disruption hypothesis – that is, individuals with cohesive early childhoods and who had undesirable appraisals of their military service experienced relatively high levels of PTSD symptoms, although the effects were highest among those with low levels of cohesion. Timing of military service did not affect this relationship.

Using structural equation models, we showed evidence for both continuity hypotheses. That is, there was evidence for both cumulative advantage and disadvantage, regardless of timing of entry into the military service.

Comparison of Results across Studies

Prewar factors showed an independent contribution to PTSD symptoms in Study 1, although the stress evaporation hypothesis was not supported. Similarly, childhood family environments, as well as age at entry, were important variables in examining the continuity and discontinuity models. Specifically, from a developmental perspective, prewar factors can help us to understand and anticipate the relationship with other factors, as well as the development of PTSD symptoms in later life. Cohesive and conflictual childhood family environments were consistent positive and negative predictors in predicting PTSD symptoms in later life.

Contrary to our expectations, age at entry did not show consistent results in each study. For instance, in Study 1, age at entry was not significant in predicting PTSD symptoms (see Table 2.3), while there was a significant main effect on PTSD symptoms in the moderation model. In contrast, in Study 2, age at entry was

marginally significant in positive turning points, and not significant in life-course disruption hypothesis. One possibility can be explained by high kurtosis of the age at entry variable (2.69), indicating that the distribution of age at entry clustered around on younger ages. On the other hand, the strength of correlation between age at entry and other related variables could have an effect on the contradictory results. For instance, in Table 2.3, age at entry was significant in step 1, while it was not significant in step 2 and step 3. When we added warzone and postwar factors, other variables that correlated with age at entry, and that were better predictor of PTSD symptoms, negatively affected age at entry on PTSD symptoms.

The warzone factor was the strongest predictor of PTSD symptoms. As mentioned, combat exposure, as well as desirable and undesirable appraisals, were strong predictors of PTSD symptoms in later life. The relationship between combat exposure and PTSD symptoms was significantly moderated by undesirable appraisals (Aldwin et al., 1994). Both desirable and undesirable appraisals showed significant moderation effects on the relationship between childhood family environments and PTSD symptoms in Study 2.

In contrast, unit cohesion and perceived control showed discrepant main effects on PTSD symptoms in Study 1, even though both unit cohesion (Firedman, 2007; Griffith & Vaitkus, 1999) and perceived control (Buško & Kulenović, 2003; Solomon & Mikulincer, 1990) were protective factors against the development of PTSD symptoms. That is, these two variables were found to have significant main effects in hierarchical multiple regressions for moderation effects. However, the

relationship between combat exposure and PTSD symptoms was not moderated by unit cohesion or perceived control.

Contribution of the Present Studies

Previous studies of the warzone factor were focused on the negative aspects of warzone circumstance, such as the severity of combat exposure itself, abusive violence (Foy et al., 1987), and perceived threat or malevolent environment (King et al., 1996). In contrast, we highlighted the positive aspects of warzone circumstances, in order to find alleviating effects on PTSD symptoms in the present studies. Thus, the latent variable consisting of unit cohesion and perceived control, named as positive military experience in Study 2, was unique to this study. Therefore, further research needs to be conducted to clarify the concept of positive military experience. Also, it is necessary to conduct additional research on the efficient coping strategies or personality factors of people serving in the military. This is consistent with the current approach by the US military to identify resilience factors (<https://www.resilience.army.mil>, accessed July 26, 2010).

Clearly, the results of postwar factors in the present studies are consistent with previous studies (Lee et al., 1994), indicating that social support is a protective variable, whereas both negative homecoming experience and additional stressful life events are risk factors for PTSD symptoms. Considering that public attitudes and political or economic situations may affect the adaption of veterans after homecoming (Settersten, 2006; Stretch, 1995), postwar factors should be studied cautiously. It is necessary to pay more attention to understanding the characteristics of veterans from

different wars and different times and places. Through such efforts, we can provide adequate psychological help and preventive interventions.

Similarly, we need to extend our studies of veterans to various war zones as well as diverse cultural and ethnic backgrounds. For instance, an ethnocultural factor was found in the expression of distress, which in turn could increase the diagnosis of PTSD (Dohrenwend et al., 2008; Ortega & Rosenheck, 2000). Friedman and colleagues argued that there were ethnic differences in the amount of combat exposure, which could confound the relationship between ethnicity and PTSD (Friedman, Schnurr, Sengupta, Holmes, & Ashcraft, 2004). Additionally, the meaning of perceived control and unit cohesion (Fontana et al., 1997), including feelings of guilt in diverse cultures, can be different from that of Western cultures. For example, Asian cultures are based on collective orientation, whereas Western cultures are focused on individualistic orientation (Markus & Kitayama, 1991). Therefore, personal control has priority over collaborative control in Western culture, whereas it is desirable to use collaborative control in Asian cultures (Weisz, Rothbaum, & Blackburn, 1984).

Limitations of the Present Studies

There are four over-arching limitations to this research approach taken in these two studies. First, the NAS is an exceptionally healthy sample, for two reasons. First, military veterans tend to be healthier than their civilian peers (Seltzer & Jablon, 1974). Second, because the NAS was initially conceived as a study of healthy aging, the men were selected for absence of chronic illness, regardless of age, and high levels of social integration. Therefore, it is possible that these studies underestimated the long-

term adverse effects of both combat exposure and difficult early childhood environments.

Second, these studies utilized a retrospective design. While some researchers have argued that retrospective designs are reliable (Brewin et al., 2000; Yancura & Aldwin, 2009), it is also likely that PTSD might affect recollection of traumatic experiences (for a review, see Brewin, 2001). In a meta-analysis of risk factors of PTSD, Brewin and colleagues (2000) compared estimates of effect size of prospective and retrospective designs. They found that retrospective reports were similar to prospective designs. Yancura and Aldwin (2008) also found that the use of retrospective reports of childhood was reliable. Nonetheless, prospective research using standard measures of combat exposure and PTSD would be helpful.

Thus, causal directionality cannot be assumed. Given that the data were not longitudinal, the SEM models used to analyze the data also cannot assume causal directionality, although the models constructed were theoretically based on existing literature, and were also based on historical ordering (Vukšić-Mihaljević, 2000).

Third, the current studies only assessed PTSD symptoms at one point in time; different results may have been found if we had been able to examine the trajectory of PTSD symptoms across the lifespan. For example, Spiro, Schnurr, and Aldwin (1997) found individual differences in their review of longitudinal studies of PTSD, with some individuals showing immediate onset and others delayed onset. Further, there were differences in terms of continuity versus intermittent symptoms. It would be interesting to see if there are discontinuous effects of early childhood environments in

terms of vulnerability to a new onset of PTSD symptoms in late life (King et al., 2007), or if only the cumulative disadvantage model holds.

Fourth, the use of age at entry in the life course models is limited. Age at entry into military service might differ from the actual age at which these veterans faced combat. Some soldiers might encounter combat exposure at early stage of military service, whereas other soldiers might experience exposure to combat at late stage of military service. In the former case, soldiers who did not have a chance to adjust into military service and develop adequate coping strategies in military circumstance might be seriously affected by combat exposure. In contrast, soldiers who had a sufficient time and environments for adjustment into military service might be less likely to induce detrimental results of combat exposure. Therefore, additional study needs to elucidate the difference between the age at entry into military service and the age of experiencing combat exposure on PTSD symptoms in later life.

Further, age is at best a proxy variable, presumably referencing other factors such as emotional maturity. Thus, we assume that those who are younger when they enter military service are less emotionally-mature than older individuals, but this is an assumption that may or may not be warranted. Clearly, there are individual differences in the age of emotional maturity. The assumption that emotional maturity protects soldiers from the adverse effects of combat exposure should be more systematically tested in future research (Aldwin & Levenson, 2005).

Future Studies

As mentioned earlier, studies that utilize longitudinal designs are needed in

order to address the limitations of retrospective cross-sectional studies. However, the longitudinal study will provide stronger evidence of the roles that prewar, warzone, and postwar factors play in the etiology of PTSD symptoms. Further, a variety of early childhood experiences exert a powerful influence on health outcomes in later life (Kendall-Tackett, 2003), and designs which include childhood trauma as well as family dynamics might help to disentangle the relative contributions of different childhood factors to the aging process.

Additionally, the development and maintenance of PTSD symptoms can be affected by different wars, types of combat exposure, and homecoming situations. Some soldiers developed PTSD after combat exposure or homecoming, whereas other veterans showed the delayed onset of posttraumatic symptomatology in later life. Further, physical decline and illness in the midst of the transition of middle to late life might affect recollection of combat exposure (Aarts et al., 1996). While the present studies examined this from both lifespan and life course perspectives, future research might consider more explicitly utilizing a resilience framework to gain a stronger perspective on resilience as a developmental process (Rutter, 2007).

It is especially important to understand the role that culture plays in risk and resilience to combat exposure. There are extremely few cross-cultural studies of the effect of combat, and the ones that do exist focus on American and European soldiers (Aldwin & Levenson, 2005). To our knowledge, almost no studies exist on the long-term effect of combat on veterans from Asian countries (but see Kim et al., 2002). As mentioned earlier, it is unclear whether the protective and risk factors vis-à-vis control

and perhaps support as well work the same way in different cultures. Thus, it is important to identify what factors contribute to risk and resilience for soldiers and veterans in other countries. In particular, Korean soldiers have had extensive service in most of the major wars of the past century, and very little is known about the long-term effects of such combat exposure, nor what factors may mitigate this. Given the advanced ages of the World War II, Korea-era, and Vietnam Veterans in Asian countries, especially Korea, such studies should be conducted as soon as possible.

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APPENDICES

APPENDIX A

Questionnaire

Name _____

Date _____

NORMATIVE AGING STUDY HEALTH AND SOCIAL BEHAVIOR SURVEY

These are questions about your living arrangements, activities, and social relationships. This information will be helpful in understanding how peoples' lives change over time and what effect this might have on health.

For the questions that follow, either write your answer in the blank, or circle the number of the answer that best applies.

- EXAMPLE: 1. No
 2. Yes
3. Uncertain

The information obtained from this survey is confidential and made available only to qualified researchers at the Normative Aging Study.

Cohesive Family Environment Scale (FES)

Below are statements about families. Please circle T if you think the statement is TRUE or mostly TRUE. Circle F if you think the statement is FALSE or mostly FALSE. You may feel that some of the statements are true for some family members and false for others. Circle T if the statement is true for most members; circle F if the statement is false for most members. Do not try to figure out how other members see your family, but do give us your general impression of your families for each statement. Please answer each question.

1.	Family members really help and support each other.	T	F
2.	We often seem to be killing time at home.	T	F
3.	We put a lot of energy into what we do at home.	T	F
4.	There is a feeling of togetherness in our family.	T	F

Conflictual Family Environment Scale (FES)

1.	We fight a lot in our family.	T	F
2.	Family members rarely become openly angry.	T	F
3.	Family members sometimes get so angry they throw things.	T	F
4.	Family members hardly ever lose their tempers.	T	F

Combat Exposure

The following questions deal with combat experience. We would like to know how many times (indicated by an “x”) you found yourself in the following situations.

						If more, how many?	
1.	Did you ever go on combat patrols or have other very dangerous duty?	1 No	2 1-2X	3 3-12X	4 13-50X	5 51+	
2.	Were you ever under enemy fire?	1 Never	2 <1 mo.	3 1-3 mos.	4 4-6 mos.	5 7+ mos.	
3.	Were you ever surrounded by the enemy?	1 No	2 1-2X	3 3-12X	4 13-25X	5 26+	
4.	What percentage of the men in your unit were killed (KIA), wounded, or missing in action (MIA)?	1 None	2 1-25%	3 26-50%	4 51-75%	5 76%+	
5.	How often did you fire rounds at the enemy?	1 Never	2 1-2X	3 3-12X	4 13-50X	5 51+	
6.	How often did you see someone hit by incoming or outgoing rounds?	1 Never	2 1-2X	3 3-12X	4 13-50X	5 51+	
7.	How often were you in danger of being injured or killed (i.e., pinned down, overrun, ambushed, near miss, etc.)?	1 Never	2 1-2X	3 3-12X	4 13-50X	5 51+	
8.	Over how long a period did you serve under combat conditions or subject to enemy action?	1 Never	2 <1 wk.	3 1-4 wks.	4 2-6 mos.	5 7+ mos.	
9.	Even if you were not directly in combat (e.g., a physician), how many times were you exposed to the outcomes of combat (wounded or dead people)?	1 No	2 1-2X	3 3-12X	4 13-50X	5 51+	

Unit Cohesion

-
1. How did you feel about belonging to this outfit? Please rate your feelings on a scale of 1 to 7, where 1 = Generally disliked and/or had no respect for outfit and 7 = Extremely proud to belong to outfit.

	Generally Disliked						Extremely Proud
1	2	3	4	5	6	7	

-
2. How did you get along with your service mates? Please rate your feelings on a scale of 1 to 7, where 1 = Disliked everyone in the unit and 7 = Had excellent relations with everyone in the unit.

	Disliked Everyone						Excellent Relations
1	2	3	4	5	6	7	

-
3. How well did you to adjust to life in the armed services? Please rate your feeling on a scale of 1 to 7, where 1 = Hated nearly everything about military life and 7 = Loved nearly everything about military service.

	Hated Everything						Loved Everything
1	2	3	4	5	6	7	

Perceived Control

We are interested in the types of jobs you held in the military. For each job, please indicate whether or not you held that position by circling YES or NO. If you circled YES, please rate that position on a scale from 1 to 7, where 1 indicates that you felt you had very little control over your own actions in that job, and 7 indicates that you felt that you had a great deal of control or autonomy in that job.

Did you have any of the following jobs? If YES, how much control do you feel you had in that job?

				Very little control							A great deal of control
		No	Yes:	1	2	3	4	5	6	7	
1.	Student / trainee	No	Yes:	1	2	3	4	5	6	7	
2.	Noncombatant (e.g., clerical)	No	Yes:	1	2	3	4	5	6	7	
3.	Instructor in combat techniques / drill sgt.	No	Yes:	1	2	3	4	5	6	7	
4.	Army of occupation	No	Yes:	1	2	3	4	5	6	7	
5.	Military police	No	Yes:	1	2	3	4	5	6	7	
6.	Noncombat medical job (e.g., dental technician)	No	Yes:	1	2	3	4	5	6	7	
7.	Medic / combat physician	No	Yes:	1	2	3	4	5	6	7	
8.	Ordnance specialist	No	Yes:	1	2	3	4	5	6	7	
9.	Intelligence analyst	No	Yes:	1	2	3	4	5	6	7	
10.	Field intelligence	No	Yes:	1	2	3	4	5	6	7	
11.	Combat support (e.g., ground crew, supply in war zone)	No	Yes:	1	2	3	4	5	6	7	
12.	Engineering corps	No	Yes:	1	2	3	4	5	6	7	
13.	Noncombat shipboard duties (e.g., boiler room)	No	Yes:	1	2	3	4	5	6	7	
14.	Merchant marine	No	Yes:	1	2	3	4	5	6	7	
15.	Bomber crew	No	Yes:	1	2	3	4	5	6	7	
16.	General combat jobs (e.g., infantry, air crew)	No	Yes:	1	2	3	4	5	6	7	
17.	Combat jobs with a high degree of independence of action (e.g., fighter pilot, ranger)	No	Yes:	1	2	3	4	5	6	7	
18.	Other (Please describe:)	No	Yes:	1	2	3	4	5	6	7	
19.	Of the jobs listed above, please write in the letter corresponding to the one that you spent the most time in										
20.	Of the jobs listed above, please write in the letter corresponding to the one that was most important to you.										

Desirable and Undesirable Appraisals

Life experiences often have some mixture of the desirable and undesirable. The following are experiences that some individuals feel resulted from their military service. From the two lists of desirable and undesirable experiences, please indicate to what extent you experienced each one, using the following response codes:

1 = Not at all
2 = A little

3 = Somewhat
4 = A lot

<u>Desirable Experiences</u>		Not at all	A little	Some-what	A lot
1.	Life long friends	1	2	3	4
2.	A broader perspective on things	1	2	3	4
3.	Learned to cope with adversity	1	2	3	4
4.	Greater self-discipline, dependability	1	2	3	4
5.	Became more independent	1	2	3	4
6.	Improved life changes through education	1	2	3	4
7.	Value life more	1	2	3	4
8.	Positive feelings about self	1	2	3	4
9.	Became proud to be an American	1	2	3	4
10.	Clearer direction and purpose in life	1	2	3	4
11.	Better job skills and options	1	2	3	4
12.	Rewarding memories	1	2	3	4
13.	Learned cooperation, teamwork	1	2	3	4
14.	Appreciate peace more	1	2	3	4
15.	Other (explain):	1	2	3	4

<u>Undesirable Experiences</u>		Not at all	A little	Some- what	A lot
1.	Economic problems for me or my wife	1	2	3	4
2.	Disrupted my life	1	2	3	4
3.	Lonely for my wife, children	1	2	3	4
4.	Delayed career, put me behind age mates	1	2	3	4
5.	Combat anxieties, apprehensions	1	2	3	4
6.	Hurt my marriage	1	2	3	4
7.	Waste of time, boredom	1	2	3	4
8.	Misery, discomfort	1	2	3	4
9.	Loss of friends	1	2	3	4
10.	Lost my good health	1	2	3	4
11.	Separation from loved ones	1	2	3	4
12.	Drinking problem	1	2	3	4
13.	Bad memories or nightmares	1	2	3	4
14.	Death and destruction	1	2	3	4
15.	Other (explain):	1	2	3	4

Negative Homecoming Experiences (NHE)

Thinking back to your discharge, what feelings did you have at the time? Please circle the appropriate response, using the following response codes:

1 = Strongly disagree

3 = Agree

2 = Disagree

4 = Strongly agree

		Strongly disagree	Disagree	Agree	Strongly agree
1.	People at home just didn't understand what I had been through in the armed forces.	1	2	3	4
2.	Having been away for a while, I felt left out of everything that was going on at home.	1	2	3	4
3.	Readjusting to civilian life was more difficult than most people imagine.	1	2	3	4
4.	People at home made me feel proud to have served my country in the armed forces.	1	2	3	4
5.	In general, my feelings about my military services after being discharged were very positive.	1	2	3	4

Elder's Life Stress Inventory (ELSI)

Below is a list of events which some people find troublesome or require major adjustments. Have you experienced these events in the past year, or in the past two or three years? Circle the answer that best applies.

<u>Have you experienced?</u>	Yes, in the past year	Yes, in the past 2 or 3 years	No, not in the past 3 years
1. Deterioration of memory	2	1	0
2. Death of a spouse	2	1	0
3. Institutionalization of spouse	2	1	0
4. Death of a son or daughter	2	1	0
5. Death of parent	2	1	0
6. Death of other close family member	2	1	0
7. Major personal injury or illness	2	1	0
8. Retirement (yours)	2	1	0
9. Divorce (yours)	2	1	0
10. Major deterioration in financial state	2	1	0
11. Marital separation (yours)	2	1	0
12. Marriage (yours)	2	1	0
13. Death of friend	2	1	0
14. Major deterioration in health or behavior of a family member	2	1	0
15. Major decrease in activities that you really enjoyed	2	1	0
16. Child's divorce or marital separation	2	1	0
17. <u>Decrease</u> in responsibilities or hours at work (or where you volunteer)	2	1	0

<u>Have you experienced?</u>		Yes, in the past year	Yes, in the past 2 or 3 years	No, not in the past 3 years
18.	<u>Increase</u> in responsibilities or hours at work (or where you volunteer)	2	1	0
19.	Move to a less desirable residence	2	1	0
20.	Change to a less desirable line of work	2	1	0
21.	Spouse retired	2	1	0
22.	Deterioration in living conditions	2	1	0
23.	Troubles with the boss or co-workers	2	1	0
24.	Worsening relationship with your child	2	1	0
25.	Worsening relationship with your wife	2	1	0
26.	Assuming major responsibility for a parent	2	1	0
27.	Institutionalization of a parent	2	1	0
28.	Loss of a very close friend due to a move or break in friendship	2	1	0
29.	Being burglarized or robbed	2	1	0
30.	Loss of prized possessions due to a move or change in residence	2	1	0
31.	Other: (explain)	2	1	0

Social Support

How often have you talked to your family and friends about your military experience?

		N/A	Never	Used to but stopped	Occasio- nally	Freque- ntly
1.	Parents	0	1	2	3	4
2.	Spouse	0	1	2	3	4
3.	Children	0	1	2	3	4
4.	Friends with military experience	0	1	2	3	4
5.	Friends without military experience	0	1	2	3	4

PTSD Symptoms

Please indicate by circling the appropriate number how true or applicable each of the following statements are to you. The response categories are:

1 = Not at all true 3 = Somewhat true 4 = Very true
2 = Slightly true 5 = Extremely true

		Not at all true	Slightl y true	Somew hat true	Very true	Extrem ely true
1.	Before I entered the military I had more close friends than I have now.	1	2	3	4	5
2.	I do not feel guilty over things that I did in the military.	1	2	3	4	5
3.	If someone pushes me too far, I am likely to become violent.	1	2	3	4	5
4.	If something happens that reminds me of the military, I become very distressed and upset.	1	2	3	4	5
5.	The people who know me best are afraid of me.	1	2	3	4	5
6.	I am able to get emotionally close to others.	1	2	3	4	5
7.	I have nightmares of experiences in the military that really happened.	1	2	3	4	5
8.	When I think of some of the things that I did in the military I wish I were dead.	1	2	3	4	5
9.	It seems as if I have no feelings.	1	2	3	4	5
10.	Lately, I have felt like killing myself.	1	2	3	4	5
11.	I fall asleep, stay asleep and awaken only when the alarm goes off.	1	2	3	4	5
12.	I wonder why I am still alive when others died in the military.	1	2	3	4	5
13.	Being in certain situations makes me feel as though I am back in the military.	1	2	3	4	5
14.	My dreams at night are so real that I waken in a cold sweat and force myself to stay awake.	1	2	3	4	5
15.	I feel like I cannot go on.	1	2	3	4	5
16.	I do not laugh or cry at the same things that other people do.	1	2	3	4	5

		Not at all true	Slightl y true	Somew hat true	Very true	Extrem ely true
17.	I still enjoy doing many things that I used to enjoy.	1	2	3	4	5
18.	Daydreams are very real and frightening.	1	2	3	4	5
19.	I have found it easy to keep a job since my separation from the military.	1	2	3	4	5
20.	I have trouble concentrating on tasks.	1	2	3	4	5
21.	I have cried for no good reason.	1	2	3	4	5
22.	I enjoy the company of others.	1	2	3	4	5
23.	I am frightened by my urges.	1	2	3	4	5
24.	I fall asleep easily at night.	1	2	3	4	5
25.	Unexpected noises make me jump.	1	2	3	4	5
26.	No one understands how I feel, not even my family.	1	2	3	4	5
27.	I am an easy-going, even-tempered person.	1	2	3	4	5
28.	I feel that are certain things that I did in the military that I can never tell anyone, because no one would ever understand.	1	2	3	4	5
29.	There have been times when I used alcohol (or other drugs) to help me sleep or make me forget about things that happened while I was in the service.	1	2	3	4	5
30.	I feel comfortable when I am in a crowd.	1	2	3	4	5
31.	I lose my cool and explode over minor everyday things.	1	2	3	4	5
32.	I am afraid to go to sleep at night.	1	2	3	4	5
33.	I try to stay away from anything that will remind me of things which happened while I was in the military.	1	2	3	4	5
34.	My memory is as good as it ever was.	1	2	3	4	5
35.	I have a hard time expressing my feelings, even to the people I care about.	1	2	3	4	5

APPENDIX B

Confirmatory Factor Analyses of Latent Variables

Confirmatory factor analyses of latent variables

Latent variable	<i>Model fit</i>					
	χ^2	<i>df</i>	<i>p</i>	<i>RMSEA</i>	<i>SRMR</i>	<i>CFI</i>
Positive military experience	.754	2	<i>ns</i>	.000	.006	1.000
Social support	4.567	1	< .05	.062	.010	.996
PTSD symptoms	.884	2	<i>ns</i>	.000	.005	1.000