

Longitudinal Analysis of Psychological Resilience and Mental Health in Canadian Military Personnel Returning From Overseas Deployment

Jennifer E. C. Lee, Kerry A. Sudom, and Mark A. Zamorski
Department of National Defence, Ottawa, Ontario, Canada

The relationship between exposure to combat stressors and poorer postdeployment health is well documented. Still, some individuals are more psychologically resilient to such outcomes than others. Researchers have sought to identify the factors that contribute to resilience in order to inform resilience-building interventions. The present study assessed the criterion validity of a model of psychological resilience composed of various intrapersonal and interpersonal variables for predicting mental health among Canadian Forces (CF) members returning from overseas deployment. Participants included 1,584 male CF members who were deployed in support of the mission in Afghanistan between 2008 and 2010. Data on combat experiences and mental health collected through routine postdeployment screening were linked with historical data on the intrapersonal and interpersonal variables from the model. The direct and moderating effects of these variables were assessed using multiple linear regression analyses. Analyses revealed direct effects of only some intrapersonal and interpersonal resilience variables, and provided limited support for moderating effects. Specifically, results emphasized the protective nature of conscientiousness, emotional stability, and positive social interactions. However, other variables demonstrated unexpected negative associations with postdeployment mental health (e.g., positive affect and affectionate social support). Ultimately, results highlight the complexities of resilience, the limitations of previous cross-sectional research on resilience, and potential targets for resilience-building interventions. Additional longitudinal research on the stability of resilience is recommended to build a better understanding of how resilience processes may change over time and contribute to mental health after adverse experiences.

Keywords: resilience, personality, military, combat stress, mental health

Exposure to trauma and adversity is an inevitable part of military combat and a potential threat to the health and well-being of military personnel. Military personnel also face many of the same occupational stressors as individuals in other occupations and, in some cases, perform their jobs under traumatic stress (Castro & Adler, 2010; Larner & Blow, 2011). In addition to these stressors, other aspects of military service, such as separation from family and friends, frequent moves, and austere living conditions, place a psychosocial burden on personnel and their families and contribute to the stresses and strains of everyday life. Although combat stress is recognized as a major cause of mental health disorders in service members (Callahan, 2010), any number of stressors may compromise mental health and, thereby, impact fitness for duty, operational effectiveness, and force sustainability (Adler, McGurk, Stetz, & Bliese, 2003). Military organizations therefore need psy-

chologically resilient personnel who can withstand the effects of a wide range of stressors both over the short term (to facilitate performance in demanding environments) and long term (to permit retention of expertise). Examining the factors and processes underlying psychological resilience is an important step toward identifying individuals at the greatest risk of psychopathology and designing and validating resilience-building interventions.

More than a decade of conflict in Southwest Asia has led to increased interest in psychological resilience in military personnel (Callahan, 2010; Green, Calhoun, Dennis, the Mid-Atlantic Mental Illness Research Education and Clinical Center Workgroup, & Beckham, 2010). Although multiple perspectives of this concept exist (Bartone, Hystad, Eid, & Brevik, 2012; Bonanno & Mancini, 2012; Bonanno et al., 2012; Green et al., 2010; Larner & Blow, 2011; Masten, Best, & Garmezy, 1990), psychological resilience has broadly been defined as “the sum total of dynamic psychological processes that permit individuals to maintain or return to previous levels of well-being and functioning in response to adversity” (The Technical Cooperation Program, 2012, p. 4). In fact, a number of intrapersonal characteristics have been found to be associated with better health, well-being, and functioning among military personnel, either directly or by moderating the impact of adverse experiences. By and large, resilient individuals have been noted for their outgoing and open nature, strong sense of control, as well as their keen ability to maintain a positive outlook and reflect on their surroundings (Bartone et al., 2012; Pietrzak & Southwick, 2011). Related attributes such as personal competence,

Jennifer E. C. Lee, Director General Military Personnel Research and Analysis & Directorate of Force Health Protection, Department of National Defence, Ottawa, Ontario, Canada; Kerry A. Sudom, Director General Military Personnel Research and Analysis, Department of National Defence; Mark A. Zamorski, Directorate of Mental Health, Department of National Defence.

Correspondence concerning this article should be addressed to Jennifer E. C. Lee, Director General Military Personnel Research and Analysis & Directorate of Force Health Protection, Department of National Defence, 1745 Alta Vista Drive, Ottawa, Ontario K1A 0K6, Canada. E-mail: Jennifer.Lee@forces.gc.ca

stress tolerance, acceptance of change, personal control, and spiritual orientation to the future have been directly associated with a number of indicators of psychological well-being, including lesser suicide ideation, lower alcohol consumption, lower depressive symptom severity, lower prevalence of posttraumatic stress disorder (PTSD), and fewer health complaints among U.S. military combat veterans (Green et al., 2010; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009b; Pietrzak, Russo, Ling, & Southwick, 2011; Pietrzak & Southwick, 2011). Green et al. (2010) also found that such factors moderated the relationship between combat experiences and PTSD diagnosis, such that high levels of resilience were most protective under high levels of combat exposure (Green et al., 2010).

Beyond intrapersonal characteristics, interpersonal variables, such as social support or other aspects of the social environment, have been thought to play a role in promoting and sustaining resilience in the face of adversity (Rutter, 1999). The quality of one's social environment, both before and after an overseas military deployment, has been found to be associated with mental health upon return from deployment (Brewin, Andrews, & Valentine, 2000; Fritch, Mishkind, Reger, & Gahm, 2010). In their study of reserve and National Guard Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans, for example, Pietrzak et al. (2009b) found that postdeployment social support was negatively associated with traumatic stress and depressive symptoms, even after adjusting for combat experiences. Additional analyses examining the characteristics of veterans who demonstrated a "resilient" mental health trajectory (i.e., they experienced high combat exposure and reported low PTSD symptoms) revealed that these individuals experienced fewer psychosocial stressors and greater family support and understanding (Pietrzak & Southwick, 2011). Hence, these findings reveal that interpersonal variables related to the social environment may also contribute to health and well-being, both directly and by moderating the impact of adverse experiences. Conversely, a poor social environment may be detrimental to health or may exacerbate the impact of adverse experiences on health (Mavandadi, Rook, Newsom, & Oslin, 2013; Mulligan, et al., 2012).

With so many intrapersonal and interpersonal variables having been linked with resilience, there is a clear need to better understand the relationships among these variables and identify which ones contribute most to better outcomes following adverse experiences. Recently, a conceptual and empirical analysis of several variables previously believed to contribute to resilience (Wald, Taylor, Asmundson, Jang, & Stapleton, 2006) was conducted to identify a more parsimonious set of relevant factors (Lee, Sudom, & McCreary, 2011). The resulting set included the Big Five personality dimensions (i.e., agreeableness, conscientiousness, extroversion, emotional stability,¹ and openness), positive affect, mastery, and social support. Based on further analysis, it was found that these distinct variables could be represented as latent factors representing both intrapersonal (i.e., the Big Five, positive affect, and mastery) and interpersonal (i.e., social support) aspects of resilience, as illustrated in Figure 1. In particular, intrapersonal resilience reflected a higher order latent factor consisting of an array of interrelated, yet conceptually distinct, individual traits, whereas interpersonal resilience was a latent factor defined by various forms of social support.

Although the model of resilience received empirical support (Lee et al., 2011), the involvement of its constituent variables in the process of resilience following an adverse experience was not fully explored. Cross-sectional analyses revealed that all of them were significantly associated with better health (Lee et al., 2011). However, these intrapersonal and interpersonal variables could also moderate the negative impact of adverse experiences on health and well-being in line with previous studies (Pietrzak & Southwick, 2011), ultimately influencing psychological resilience. In light of growing interest in the use of training programs to enhance psychological resilience by military organizations (e.g., Comprehensive Soldier Fitness, as discussed in Cornum, Matthews, & Seligman, 2011), understanding the role of these variables as moderators of the negative impacts of adverse experiences, such as combat experiences, on health and well-being would be of value. Specifically, determining which variables are stronger, independent predictors of health and well-being among military personnel having been deployed over time would help to develop a more efficient means of assessing resilience and to identify key targets for intervention.

To date, the vast majority of studies on psychological resilience in military personnel have been cross-sectional (Bartone et al., 2012; Goldmann et al., 2012; Green et al., 2010; Pietrzak et al., 2009b, 2011; Pietrzak & Southwick, 2011). This has resulted in difficulties with the interpretation of findings, as observed relationships may reflect the influence of resilience-related variables on health and well-being, the influence of health and well-being on resilience-related variables, or the sharing of a common substrate between the two. In addition, most studies have focused on psychopathology (e.g., the presence of PTSD or its symptoms) as opposed to general mental health. The latter encompasses several aspects of mental health in addition to symptoms of psychopathology, including vitality, social and role-related functional impairment, and subjective well-being (Ware & Sherborne, 1992). In an effort to address these research gaps, the aim of this study was to prospectively assess the criterion validity of intrapersonal and interpersonal variables from the model of resilience (Lee et al., 2011) for predicting mental health among Canadian Forces (CF) members upon their return from deployment. A conceptual framework of hypothesized relationships among variables is presented in Figure 2. Based on previous research (Green et al., 2010; Pietrzak et al., 2009b, 2011; Pietrzak & Southwick, 2011), it was expected that intrapersonal and interpersonal variables would have sizable direct effects on postdeployment mental health and would moderate the impact of combat experiences on mental health.

Method

Procedure

Baseline health data collected using the CF Recruit Health Questionnaire (RHQ) were linked with data collected, on average, 4 years later during the Enhanced Post-Deployment Screening

¹ Emotional stability was operationalized as the reverse of neuroticism—one of the Big Five personality dimensions (John & Srivastava, 1999).

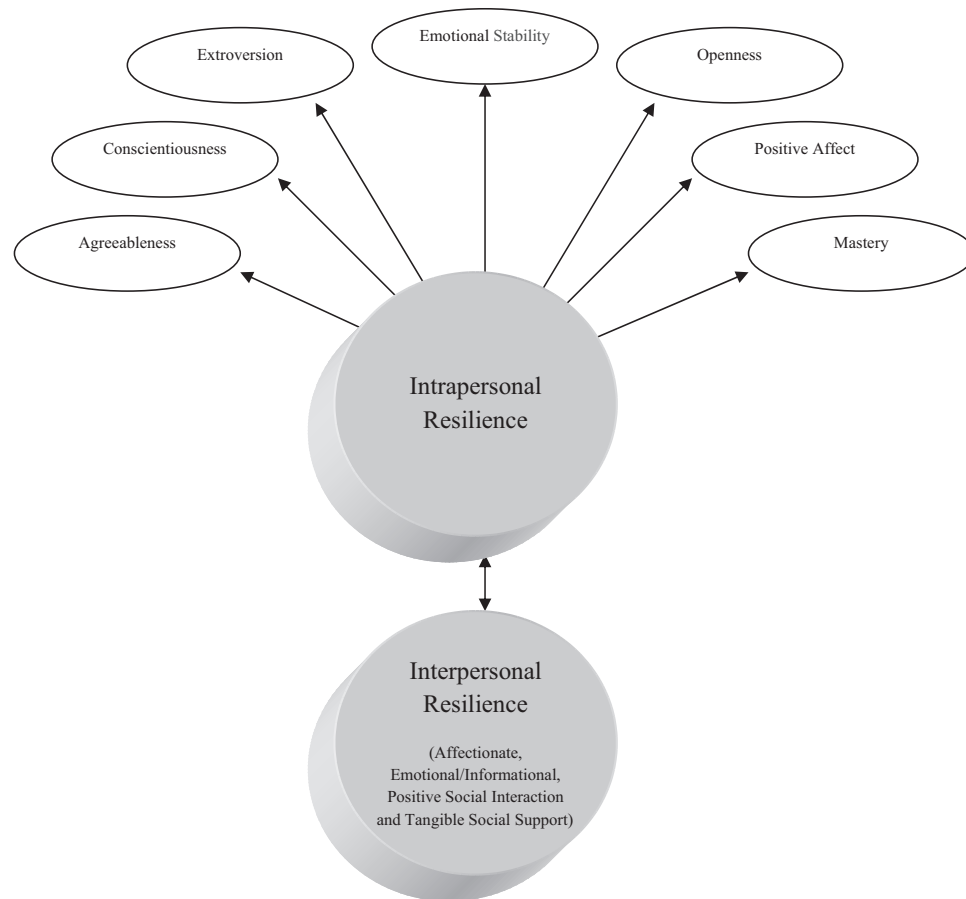


Figure 1. Model of psychological resilience. Adapted from “Higher-Order Model of Resilience in the Canadian Forces,” by J. E. C. Lee, K. A. Sudom, and D. R. McCreary, 2011, *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*, 43, p. 228.

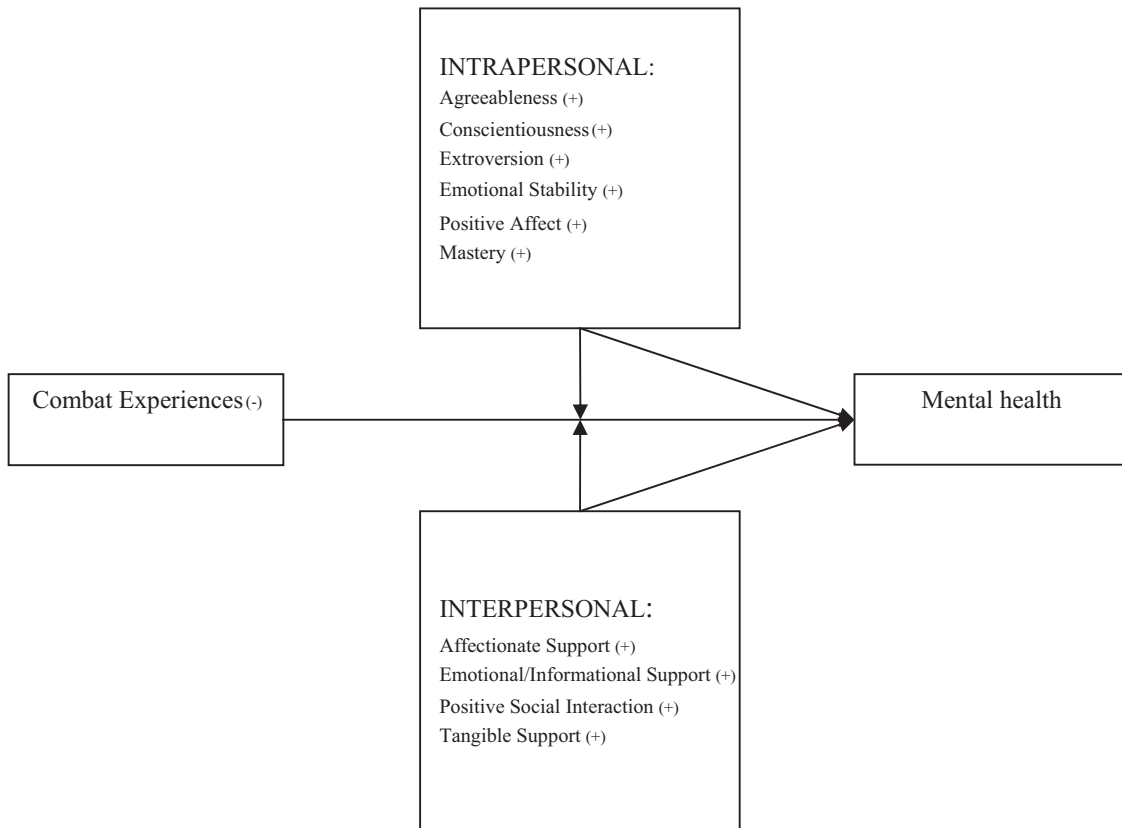
(EPDS) process. The RHQ is a paper-and-pencil tool that is administered to CF recruits during basic training over 45- to 60-min group sessions. Participation is voluntary, although the response rate has been high (i.e., close to 70%; Lee & Hachey, 2011). The study protocol was approved by the Defence Research and Development Canada (DRDC) Human Research Ethics Committee.

The EPDS process is mandatory for all members having gone on deployment overseas lasting 60 days or longer and takes place between 90 and 180 days after CF members return to Canada. It is carried out in order to identify those with deployment-related health problems so that they can be engaged in treatment as early as possible. The EPDS process consists of completion of a confidential (though not anonymous) health questionnaire, followed by an in-depth interview with a mental health clinician.

Participants

Using service numbers, it was possible to match RHQ and EPDS records for 1,926 CF members who were deployed in support of the mission in Afghanistan between 2008 and 2010. Participants reported between 0 and 29 (out of 30) combat expe-

riences during their deployment. However, those who reported no combat experiences ($n = 215$) were excluded from the analysis to ensure a minimum level of adversity among subjects, and because they were believed to reflect a separate group of individuals with largely distinct roles and responsibilities in the operation. In addition, the small number of females ($n = 169$) was excluded, as the mechanisms of resilience might differ between men and women. The analysis thus included 1,584 male CF members who reported at least one combat experience. Over this period, the mission was a combat and peace support operation in Kandahar Province in Southern Afghanistan. Most personnel were stationed there, although some supported the operation from elsewhere in the region. As well, mental health and resilience training practices evolved substantially in the CF over this timeframe. As a result, participants may differ in terms of their exposure to mental health and resiliency training: All would have received at least some basic mental health literacy training on PTSD and other service-related mental health problems. However, some may have had as much as 30 hr of training over the course of their basic training, pre- and postdeployment training, and career development training. As a rule, earlier cohorts received significantly less training than later cohorts.



(+)Variable hypothesized to be positively associated with post-deployment mental health.

(-)Variable hypothesized to be negatively associated with post-deployment mental health.

Figure 2. Conceptual framework of the direct and moderator effects of intrapersonal and interpersonal resilience variables and combat experience on postdeployment mental health.

At the time of postdeployment screening, participants were 26.2 years of age ($SD = 4.8$), on average, and had achieved a high school education or less (57.3%). The majority were in the Army (93.8% Army, 1.5% Navy, 4.7% Air Force) and were junior rank noncommissioned members (NCMs; 28.6% privates or the equivalent and 62.8% other NCMs). Participants had been in the CF for an average of 4.2 years ($SD = 1.7$) and a median of 3.8 years.² They reported a median of 12 combat experiences (out of 30) during their last deployment.

Overall, participants demonstrated a low level of psychopathology at the time of postdeployment screening. Based on results of the Patient Health Questionnaire (PHQ) 9-item depression screening tool (Kroenke, Spitzer, & Williams, 2001), 2.8% of participants had symptoms strongly suggestive of major depressive syndrome. Similarly, 2.8% of participants had symptoms strongly suggestive of PTSD (i.e., a PTSD Checklist for Civilians score of 50 or greater; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). Finally, 13.7% of participants were identified as high-risk drinkers according to the Alcohol Use Disorders Identification Test (score of 8 or higher; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001).

Measures

RHQ measures. Intrapersonal resilience variables were measured in the RHQ using validated scales that were found in a previous analysis to reflect unique dimensions of this higher order latent factor (Lee et al., 2011). Dimensions included mastery, which was assessed using a 7-item measure drawn from the Canadian Community Health Survey (CCHS; Statistics Canada, 2001). Items in this measure are presented in the form of statements to be rated in terms of level of agreement (e.g., “You can do just about anything you really set your mind to”). Additional intrapersonal dimensions were the Big Five personality traits (i.e., agreeableness, conscientiousness, extroversion, neuroticism [reverse-scored to reflect emotional stability], and openness), which were assessed using a 41-item measure adapted from the Big Five Inventory (John & Srivastava, 1999; Thompson & Smith, 2002), and positive affect, which was assessed with the 10-item

² Because the RHQ is administered early during basic training, the number of years in the military should approximate the number of years between the completion of the RHQ and the EPDS.

Positive Affect subscale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The Big Five Inventory includes a list of characteristics that reflect each of the personality traits (e.g., agreeableness: “is helpful and unselfish with others”; conscientiousness: “does a thorough job”; extroversion: “is outgoing, sociable”; neuroticism: “worries a lot”; openness: “is curious about many different things”). Respondents are asked to indicate whether each of these items is characteristic of them. Similarly, the Positive Affect subscale of the PANAS includes a list of adjectives reflecting pleasant emotional states (e.g., “enthusiastic”), and respondents are asked to indicate whether they agree that they experience each emotional state, on average. A 5-point rating scale was used for every scale (1 = *strongly agree*, 2 = *agree*, 3 = *neither agree nor disagree*, 4 = *disagree*, 5 = *strongly disagree*). Some items were reverse-scored, as required, and total scores were computed so that higher values reflect one’s greater propensity to act and think in accordance with the dimension in question. All scales used as indicators of intrapersonal resilience demonstrated adequate internal reliability (Cronbach’s alphas of .69 to .83).

The 19-item Social Support Scale (SSS) was used to assess affectionate support (e.g., behavioral manifestations of love), emotional/informational support (e.g., intimate and supportive communication), positive social interaction (e.g., social companionship and integration), and tangible support (e.g., reliable help or material support) dimensions of interpersonal resilience (Sherbourne & Stewart, 1991). Respondents used a 5-point scale to indicate the extent that different types of social support provided in the list of items (e.g., affectionate support: “someone who shows you love and affection”; emotional/informational support: “someone to confide in or talk about your problems”; positive social interaction: “someone to do something enjoyable with”; tangible support: “someone to take you to the doctor if you needed it”) would be available to them, if needed (1 = *none of the time*, 2 = *a little of the time*, 3 = *some of the time*, 4 = *most of the time*, 5 = *all of the time*). Subscales demonstrated adequate internal reliability, with Cronbach’s alphas ranging from .86 to .95.

Self-rated health was assessed with one item from the Canadian Community Health Survey (Statistics Canada, 2001): “In general, would you say your health is . . .,” which was rated on a 5-point scale (1 = *excellent*, 2 = *very good*, 3 = *good*, 4 = *fair*, 5 = *poor*) and subsequently reverse-scored.

Enhanced postdeployment screening measures. A modified version of a 34-item scale developed by Walter Reed Army Institute for Research was used to assess the extent of combat exposure during the EPDS. Providing an assessment of combat events that were experienced during the deployment (e.g., being attacked or ambushed, having hostile reactions from civilians, shooting or directing fire at the enemy), this scale has been found to be a strong predictor of postdeployment mental health (Killgore et al., 2008). Four items of the original scale were removed due to concerns that they might require investigation into potential misconduct (e.g., witnessing mistreatment of noncombatants). Each item was a yes/no question, and the scale score was simply the sum of positive responses (range 0 to 30). The internal reliability of this scale was excellent (Kuder–Richardson Coefficient 20 of .89).

Mental health status was determined using the Mental Health Component Summary (MCS) score derived from the SF-36 (Ware & Sherborne, 1992). This score is computed using the factor scores

yielded by a factor analysis of items that were designed to assess various facets of psychological health and well-being, including vitality (e.g., feeling energetic and peppy), health-related social functioning impairment (e.g., extent and frequency of feeling like emotional problems have interfered with normal social activities), mental health-related role impairment (e.g., feeling like emotional problems have interfered with time, accomplishments or being careful at work), symptoms of anxiety and depression (e.g., feeling nervous or downhearted), and general health (e.g., self-evaluations regarding one’s level of health). A detailed description of this widely used measure and its psychometric properties is available online (Ware, n.d.). In brief, its reliability estimates have been found to be excellent in a variety of contexts (Ware, n.d.).

Statistical Analyses

Sequential multiple linear regression was used to explore the association of intrapersonal and interpersonal resilience variables and combat exposure with postdeployment mental health, controlling for age, rank, years of service, and baseline self-rated health in the first step.³ The role of intrapersonal and interpersonal variables as moderators in the relationship between combat experiences and postdeployment mental health was tested using the PROCESS macro for SPSS. This macro facilitates the analysis of moderation, mediation, and conditional process modeling among variables (Hayes, 2012). A separate sequential multiple linear regression was performed for each potential moderator to optimize power and simplify interpretation. Moderator effects that yielded a significant improvement in prediction over and above the direct effects of control variables, intrapersonal and interpersonal resilience variables, and combat experiences were further explored by examining the conditional effect of combat experiences on postdeployment mental health at different values of the moderator(s) (this output is generated using PROCESS).

Results

Variables were screened for missing values and violations of assumptions inherent to the analyses. Missing values were consistent with data being missing completely at random. Therefore, listwise deletion was used, resulting in a final sample of 1,315.⁴ Binary correlations between each model variable are presented in Table 1, along with means and standard deviations. The regression model included the control variables, intrapersonal variables (e.g., Big Five, positive affect, mastery), interpersonal variables (e.g., the various forms of social support), and combat experiences as direct predictors (Table 2).

Of the intrapersonal variables, only conscientiousness, emotional stability, and mastery were correlated with postdeployment mental health, with emotional stability demonstrating the largest correlation ($r = .17$). Of the interpersonal variables, positive social interaction had a small correlation with postdeployment mental health ($r = .08$). Combat exposure was negatively correlated with postdeployment mental health ($r = -.18$).

³ Data on age and years of service were collected at the time of the EPDS, while data on rank (NCM or Officer) was collected in the RHQ.

⁴ Analyses were also carried out using mean substitution and multiple imputation, with both approaches yielding results similar to the analysis with listwise deletion.

Table 1
Descriptive Statistics and Correlations Among Model Variables

	M	SD	Bivariate correlations														
			1	2	3	4	5	6	7	8	9	10	11	12	13		
1. Agreeableness	34.0	4.2	—														
2. Conscientiousness	33.5	4.7	.32**	—													
3. Extroversion	27.4	5.2	.14**	.26**	—												
4. Emotional stability	28.3	4.9	.29**	.39**	.33**	—											
5. Openness	23.7	2.9	.15**	.27**	.37**	.23**	—										
6. Mastery	20.4	4.4	.21**	.43**	.35**	.45**	.24**	—									
7. Positive affect	39.8	4.9	.23**	.41**	.45**	.34**	.42**	.37**	—								
8. Tangible support	15.5	4.3	.15**	.10**	.15**	.15**	.09**	.16**	.16**	—							
9. Emotional/Informational support	32.4	7.9	.19**	.14**	.26**	.16**	.10**	.22**	.24**	.75**	—						
10. Positive social interaction	12.9	2.7	.14**	.15**	.28**	.21**	.13**	.24**	.24**	.62**	.75**	—					
11. Affectionate support	12.2	3.4	.19**	.13**	.24**	.14**	.07**	.18**	.19**	.67**	.76**	.75**	—				
12. Combat experiences	11.2	6.1	-.03	.05	.07*	.06*	.04	.03	.12**	.02	.01	.04	.02	—			
13. Mental health	50.5	9.5	.05	.10**	.02	.17**	-.01	.11**	-.02	.03	.04	.08**	.01	-.18**	—		

* $p < .05$. ** $p < .01$.

Controlling for age, rank, years of service and baseline health in Step 1, the model with intrapersonal and interpersonal resilience variables and combat exposure, added in Step 2, was found to significantly predict postdeployment mental health, $R^2 = .09$, $F(16, 1298) = 7.93$, $p < .001$. These variables contributed to a significant improvement in prediction above control variables, $\Delta R^2 = .08$, $F(12, 1298) = 9.80$, $p < .001$. With higher scores representing better mental health, it was found that younger age,

higher conscientiousness, higher emotional stability, lower positive affect, lower affectionate social support, higher positive social interaction, and fewer combat experiences each uniquely predicted better postdeployment mental health. The magnitude of the main effects of intrapersonal and interpersonal variables was small (standardized regression coefficients of $\beta \leq .15$). Combat exposure had a larger main effect ($\beta = -.20$).

To identify significant moderators of the relationship between combat exposure and postdeployment mental health, interaction terms between combat experiences and each of the intrapersonal and interpersonal resilience variables were entered separately after control variables, intrapersonal and interpersonal resilience variables, and combat experiences (Step 3). A significant interaction between agreeableness and combat experiences was observed, although it only marginally improved prediction, $\Delta R^2 = .003$, $F(1, 1297) = 3.94$, $p = .05$. Further analysis revealed a tendency for combat experiences to be more strongly associated with postdeployment mental health at higher levels of agreeableness. None of the other hypothesized interactions with combat exposure significantly improved model prediction. Thus, the effects of combat exposure were only moderated by agreeableness, albeit not extensively and not in the expected manner. Because this interaction only marginally improved prediction, and estimates for other effects were similar than those observed in the preceding step, only results of the analysis after Step 2 are presented in Table 2.

Table 2
Results of Sequential Multiple Linear Regression Analysis Predicting Postdeployment Mental Health

	Mental health		
	ΔR^2	β	t
Step 1	.01		
Age		-.03	-0.88
Rank		.04	1.35
Years of service		-.02	-0.51
Baseline self-rated health		.07	2.33*
Step 2	.08**		
Age		-.07	-2.43*
Rank		.03	1.06
Years of service		-.05	-1.72
Baseline self-rated health		-.03	-1.12
Intrapersonal resilience variables			
Agreeableness		<.01	-0.14
Conscientiousness		.08	2.55*
Extroversion		-.02	-0.47
Emotional stability		.15	4.67***
Openness		-.03	-1.00
Mastery		.04	1.24
Positive affect		-.10	-3.05**
Interpersonal resilience variables			
Emotional/Informational support		<.01	-0.06
Positive social interaction		.14	3.12**
Affectionate support		-.12	-2.52*
Tangible support		.02	0.40
Combat experiences		-.20	-7.14***

Note. The final model significantly predicted postdeployment mental health, $R^2 = .09$, $F(16, 1298) = 7.93$, $p < .001$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The present study prospectively assessed the criterion validity of a model of psychological resilience (Lee et al., 2011) for predicting the mental health of CF members returning from overseas deployment. As expected, several of the intrapersonal and interpersonal variables believed to underlie psychological resilience in this model demonstrated significant bivariate correlations with postdeployment mental health (i.e., conscientiousness, emotional stability, mastery, positive social interaction). However, only a few of these significantly predicted this outcome in the hypothesized manner in the adjusted multiple linear regression model, and the magnitude of these effects was small. Postdeployment mental

health was better among military personnel who reported higher conscientiousness and emotional stability, but lower among those who reported higher positive affect after controlling for other variables. Postdeployment mental health was also better among military personnel who reported a high level of positive social interaction, but lower among those who reported a high level of affectionate social support at baseline. Also, contrary to expectations, only agreeableness was found to moderate the relationship between combat experiences and postdeployment mental health, albeit not in the hypothesized manner.

The significant associations of mental health with conscientiousness, emotional stability, and positive social interaction reported in this study are in line with results reported in other work. The positive effect of emotional stability and of social support on mental health is well documented in both civilians coping with adversity and military personnel returning from deployment (Ibarra-Rovillard & Kuiper, 2011; Klein, Kotov, & Bufferd, 2011; Kotov, Gamez, Schmidt, & Watson, 2010; Paykel, 1994; Pietrzak et al., 2009b, 2011; Pietrzak & Southwick, 2011; Polusny et al., 2011). However, the observed relationships of positive affect and affectionate social support with mental health in the final adjusted model were not in line with expectations. In addition to having been associated with better health outcomes based on a variety of indicators in community samples (Cohen & Pressman, 2006), positive affect has been found to be associated with lower scores on a measure of PTSD symptoms in U.S. military personnel (Maugen et al., 2008). The benefits of social support on postdeployment health outcomes have also been documented (Brewin et al., 2000; Fritch et al., 2010; Pietrzak et al., 2009b; Pietrzak & Southwick, 2011).

Given that positive affect and affectionate social support were not significantly associated with mental health in the binary correlations, the present findings could reflect spurious relationships or the presence of a suppressor variable in the model. More importantly, the nature of the relationship between these variables and mental health could be more complex than originally anticipated. Although they recognize the general role of positive emotions in mental health, Fredrickson and Losada (2005) found, in their research on flourishing, that an excessively high degree of positive affect in the absence of negative affect may actually be problematic. These researchers also noted the importance of the situational appropriateness of the positivity, arguing that feigned positivity may do more harm than good (Fredrickson & Losada, 2005). If this were in fact the case, any social desirability that may have biased the assessment of positive affect may have had a particularly pronounced impact on results.

Similarly, there is recognition that specific types of social support may, in some instances, contribute to increased distress (Robitaille, Orpana, & McIntosh, 2012). However, a reliance on cross-sectional analyses and failure to make the distinction between different types of support has made it difficult to understand the specific pathways and processes involved in this relationship (Robitaille et al., 2012). In their longitudinal analysis, which examined reciprocal relationships between social support and distress across multiple time points, Robitaille et al. found that affectionate social support predicted later increases in distress. They also found that positive social interaction predicted decreases in later distress at one time point, whereas neither tangible nor emotional/informational social support predicted later distress. Al-

though these analyses focused on older Canadians, the consistency with results reported here is encouraging. Still, additional research is warranted to further investigate the mechanisms that may account for the negative associations of affectionate social support, as well as positive affect, with mental health.

In addition to revealing some surprising findings, some of the hypothesized relationships did not achieve significance, despite the generous sample size, precise and valid measurement of constructs, and adequate variability in predictors and outcomes. In contrast to other work (Klein et al., 2011), there was no independent association of mental health with the other Big Five personality traits or mastery. As well, the effect sizes of intrapersonal and interpersonal resilience variables that did achieve significance were smaller than those reported in cross-sectional military studies (Green et al., 2010; Peng, Riolli, Schaubroeck, & Spain, 2012; Pietrzak et al., 2009b, 2011; Pietrzak & Southwick, 2011; Polusny et al., 2011). Peng and her colleagues, for example, found standardized regression coefficients of between .39 and .49 for the association of emotional stability and physical and mental health outcomes (Peng et al., 2012). Meanwhile, social support has been found to predict PTSD severity among OEF/OIF veterans, with a standardized regression coefficient of .31 (Green et al., 2010; Pietrzak et al., 2009b).

Last, converse to findings reported elsewhere (Green et al., 2010; Pietrzak & Southwick, 2011), there was limited support for the moderating role of intrapersonal and interpersonal resilience variables in the relationship between combat experiences and postdeployment mental health. Other than a marginally significant interaction between agreeableness and combat experiences, none of the interactions significantly improved the prediction of mental health. In addition, combat experiences were more strongly associated with mental health in military personnel with high rather than low levels of agreeableness. Of note is the fact that similar results were obtained in a cross-sectional analysis on the role of these intrapersonal and interpersonal variables in resilience to stressful life events among military recruits (Watkins, Lee, & Sudom, 2012). Possibly, highly agreeable individuals, who have positive expectations of others and the world around them, react more strongly to adverse experiences because these more prominently challenge their worldviews. A similar argument was made regarding the role of secure attachment in individuals' responses to psychological trauma (Kanninen, Punamaki, & Quota, 2003).

Limitations

Several factors may have contributed to the modesty of findings relative to previous studies. Because the tools used for data collection were not anonymous, participants may have underreported mental health symptoms. Nonanonymous reporting of postdeployment mental health problems, in particular, is subject to substantial underreporting (Warner et al., 2011). However, the use of a dimensional and less transparent measure of mental health as an outcome may have limited the effects of underreporting. As well, no information on exposure to mental health and resilience training was collected such that it was not possible to control for variation across participants. If such training were effective, this could contribute to the modest effects of intrapersonal and interpersonal resilience variables on mental health.

Results may also have been impacted by the timing at which measures were taken. For instance, because social support was assessed during the very early phases of basic military training, it likely inaccurately reflected the degree of social support that participants were receiving upon their return from deployment. On the other hand, the early assessment of social support ensured that observed relationships more purely reflect the influence of social support on mental health rather than being confounded by the influence of mental health on social support seeking.

Last, the extent that findings may be generalized to all CF personnel who were deployed overseas remains unclear, as it was only possible to include individuals for whom data were available in the present analyses. Due to the nature of the data, it was not possible to obtain an accurate comparison of participants and non-participants. Participants nevertheless appeared to demonstrate a similar level of mental health as all CF personnel who were deployed overseas.

Implications

These limitations aside, the findings have important implications for the development of resilience-building interventions. At first glance, the small and conflicting effects of intrapersonal and interpersonal resilience variables on postdeployment mental health would appear to provide limited support for resilience-building interventions targeting these variables. Effect sizes observed in previous cross-sectional studies have been more encouraging, but their intrinsic biases (e.g., failure to control for baseline health status, common method variance, and conflation of predictors and outcomes) likely resulted in overestimated effect sizes. Still, the present findings also point to the possibility that intrapersonal and interpersonal resilience variables can change over time. Indeed, there is evidence that many of the characteristics underlying dispositional resilience are in fact more akin to a state than a trait (Hourani, et al., 2012; Luthar, Chichehti, & Becker, 2000; Watson, Ritchie, Demer, Bartone, & Pfefferbaum, 2006).

Genetic predispositions (Caspi, Roberts, & Shiner, 2005) and processes, such as seeking out environments that reinforce personality tendencies (Caspi, Bem, & Elder, 1989), may maintain individual differences, but individual characteristics may also be amenable to change under certain conditions. Longitudinal research has shown that changes in personality are particularly pronounced during early adulthood (Ardelt, 2000; Vaidya, Gray, Haig, Mroczek, & Watson, 2008), under conditions of significant stress (Aldwin, Sutton, Chiara, & Spiro, 1996), and during periods of transition (Park, Cohen, & Murch, 1996). Such observations have obvious relevance for military members in the early years of their career (Jackson, Thoemmes, Jonkmann, Ludtke, & Trautwein, 2012). Indeed, decreases in neuroticism and increases in conscientiousness have been found in military recruits across the very brief basic training period (Vickers, Hervig, Paxton, Kanfer, & Ackerman, 1993), as have decreases in hardiness as a result of higher stress reactions in military recruits (Vogt, Rizvi, Shipherd, & Resick, 2008). Deployment-related stressors, such as exposure to combat, may also increase the likelihood of changes in intrapersonal aspects of resilience.

Taken together, the research suggests that the ideal time to implement resilience-building interventions is at recruitment or early in a military career. Existing interventions have focused on

addressing both intrapersonal and interpersonal aspects of resilience (Cornum et al., 2011). With conscientiousness and emotional stability emerging as the only intrapersonal variables that were independently associated with better postdeployment mental health, results suggest that emotion regulation is of central importance in intrapersonal resilience. It may therefore be appealing for resilience-building interventions to target emotion regulation processes, possibly by enhancing mental health literacy and emotional fitness or by encouraging proactive approaches for sustaining and improving well-being (Algoe & Fredrickson, 2011; Kelly, Jorm, & Wright, 2007; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009a). Given the beneficial influence of positive social interaction on mental health, it may also be of value to focus on facilitating this form of social support over and above, perhaps, other forms of social support in such interventions.

One implication of the fact that the intrapersonal and interpersonal variables exerted a broader influence on postdeployment mental health (rather than simply moderating the impact of combat experiences) is that it might be possible to build resilience in ways that are not directly related to specific adverse events, for example, through positive psychology interventions (Seligman, 2011). The limited evidence for the moderating role of intrapersonal and interpersonal resilience variables in the relationship between combat experiences and mental health also suggests the need to look beyond such factors to enhance and maintain the well-being of military personnel. In particular, these findings contrast starkly with the powerful moderating effect of perceptions of leadership in military settings (Greenberg & Jones, 2010): In the best-led units, rates of psychological problems in heavily combat-exposed personnel are the same as in those with little or no combat exposure (Mental Health Advisory Team [MHAT] IV, 2006). This finding points to the greater potential value to well-being of interventions that improve leadership (and perhaps cohesion and support among peers) over interventions that promote intrapersonal psychological variables.

Future Research

In order to determine the extent to which resilience changes over time and in response to stressors, additional longitudinal research on the stability of resilience variables is needed, particularly those of an intrapersonal nature. Specifically, research in this area could help to guide training and intervention efforts by helping to identify which characteristics, if any, are most amenable to change. Given that military personnel are receiving more and more routine resilience training, and that such training may influence intrapersonal resilience, exposure to such training should be considered. If intrapersonal resilience is then found to be stable or not strongly linked to mental health outcomes, intervention efforts can be focused elsewhere. In addition, longitudinal research involving more phases of data collection would shed light on possible nonlinear relationships among variables, and would be useful to disentangle and quantify the dynamic and complex relationships between mental health and social support. While limited support was found for the moderating role of the variables considered in this study, other mechanisms, such as mediation, may be involved. It would also be helpful if additional variables (e.g., appraisals, coping) were examined in future longitudinal research in order to thoroughly investigate such mechanisms. Ultimately, the design of

interventions will depend upon a deeper understanding of these psychological processes.

Finally, these findings pertain to a very specific population under very specific circumstances (male CF members who have been deployed in support of a combat and peace support mission). It remains to be determined whether similar variables predict mental health among female CF members upon their return from deployment. Because data were available for only a small number of women, it was not feasible to carry out the same analysis and compare results with that of men. However, future work focusing on a smaller set of variables and a simpler model is planned to explore resilience and postdeployment mental health among female CF personnel. With regard to other occupations, the greatest applicability would be to other military organizations or to recruits in other cohesive occupational groups that experience traumatic stress as part of their job (e.g., police, firefighters, first responders). Hence, future research comparing other occupational groups and work environments may be of value to determine which aspects of the resilience process are unique and shared across occupations.

Conclusions

The present study helped address several gaps in previous work in this area, given its longitudinal nature, generous sample size, basis in an empirically validated conceptual model of resilience, use of broad and precise measures, focus on broader aspects of postdeployment mental health, and the substantial range of trauma exposure in the study population. Furthermore, it was possible to partially control for variation in mental health attributable to differences in baseline health. In the end, results highlighted the complexities of resilience, the limitations of previous cross-sectional research on resilience, and the potential targets for resilience-building interventions. On the face of it, the small effect sizes and limited support for the moderating role of intrapersonal and interpersonal resilience variables point to a narrow potential impact of resilience-building interventions; yet the possibility that resilience is amenable to change, particularly among younger individuals experiencing life-changing events, provides room for cautious optimism. Additional longitudinal research on the stability of resilience-related variables is essential to build a better understanding of how processes may change over time and contribute to mental health after adverse experiences.

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