



# Psychometric Properties of Psychological Scales in the Recruit Health Questionnaire

## *Internal Consistency of Scales*

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*Conditions of Service 5*  
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*Conditions of Service 5-6*

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## Abstract

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The Recruit Health Questionnaire (RHQ) is a paper and pencil measure that was developed to gather general background information and assess current health status and practices among Canadian Forces (CF) recruits. This report documents the scoring methodology of psychological scales of the RHQ, presents a brief review of the literature on their psychometric properties in civilian and military populations, and further examines these properties in the CF recruit population. Psychometric analyses were performed on data from 1,120 CF recruits (68% non-commissioned member [NCM] and 32% Officer candidates) who completed the RHQ in their first week of Basic Training in 2003. The internal consistency of each scale was evaluated by examining Cronbach's alpha or Kuder-Richardson formula 20 coefficients, as well as item-total correlations. While all psychological scales included in the RHQ have been deemed psychometrically sound in previous research, a small number of these demonstrated marginal or low internal consistency when applied to the CF recruit population (e.g., subscales of the Posttraumatic Stress Disorder Checklist-Civilian Version and the 20-item Toronto Alexithymia scale, as well as the Patient Health Questionnaire 15-item somatic symptoms scale, the Childhood Adversity scale and the Exposure to Violence scale). Nevertheless, the vast majority of psychological scales demonstrated high internal consistency, indicating that the RHQ is a reliable tool to assess psychosocial aspects of health among CF recruits.

## Résumé

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Le Questionnaire sur la santé des recrues (QSR) est un outil papier et crayon qui vise à recueillir des renseignements généraux sur les recrues des Forces canadiennes (FC) et à évaluer leur état de santé et leurs pratiques en matière de santé à l'heure actuelle. Le présent rapport expose la méthode de cotation des échelles psychologiques du QSR, résume brièvement les études publiées sur leurs propriétés psychométriques dans les populations civiles et militaires et jette un regard approfondi sur ces propriétés chez les recrues des FC. On a mené des analyses psychométriques des données portant sur 1 120 recrues des FC (68 % étaient des militaires de rang [MR] et 32 %, des candidats au grade d'officier) ayant rempli le QSR la première semaine de leur instruction de base en 2003. On a examiné la cohérence interne de chaque échelle en évaluant le coefficient alpha de Cronbach, le coefficient KR-20 (formule de Kuder-Richardson) ainsi que les corrélations élément-total. Bien que toutes les échelles psychologiques incorporées dans le QSR aient été jugées psychométriquement valides dans des recherches antérieures, un faible nombre d'entre elles ont présenté une cohérence interne marginale ou faible lorsqu'elles étaient appliquées à la population des recrues des FC (p. ex., sous-échelles de la liste de vérification de l'état de stress post-traumatique [ESPT] – population civile et de l'échelle d'alexithymie de Toronto à 20 points, échelle d'évaluation de la gravité des symptômes physiques PHQ-15, échelle d'adversité durant l'enfance, échelle d'exposition à la violence). Cependant, la vaste majorité des échelles psychologiques ont présenté une grande cohérence interne, ce qui porte à croire que le QSR est un outil fiable pour évaluer les aspects psychosociaux de la santé chez les recrues des FC.

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## Executive summary

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The present report documents the scoring methodology of psychological scales embedded in the Recruit Health Questionnaire (RHQ), briefly reviews previous studies examining their psychometric properties in civilian and military populations, and further examines their internal consistency in a population of Canadian Forces (CF) recruits (non-commissioned members [NCM] and Officer candidates).

Respondents were 1,120 CF recruits (68% NCM and 32% Officer candidates) who completed the RHQ in 2003 in their first week of Basic Training. The RHQ includes 17 scales selected to assess: (i) psychological conditions (e.g., Patient Health Questionnaire scales of depression, other anxiety disorder, panic disorder, and somatic symptoms, as well as the Posttraumatic Stress Disorder [PTSD] Checklist-Civilian version); (ii) dispositional factors previously linked with health outcomes (e.g., Big Five Inventory, Positive and Negative Affect Schedule, Revised Life Orientation Test, 20-item Toronto Alexithymia Scale, as well as scales to assess Hardiness, Mastery, Personal Need for Structure, and Self-Esteem); and (iii) social environmental influences on health (e.g., Adverse Childhood Experiences scale, Exposure to Violence scale, Negative Life Events scale, and Social Support Survey). Internal consistencies of these scales were evaluated on the basis of either Cronbach's alpha or Kuder-Richardson formula 20 coefficients and item-total correlations.

The scoring methodologies and psychometric properties of the scales were well documented and established in previous studies (e.g., Smith, Smith, Jacobson, Corbeil, & Ryan, 2007; Thompson & Smith, 2002), with only a few exceptions (e.g., Exposure to Violence scale; Young, Leard, Hansen, Chervak, Hauret, Spooner, et al., 2004). Some scales involved more than one scoring approach (e.g., PTSD Checklist-Civilian version and the Social Support Survey; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996; Brewin, 2005; Sherbourne & Stewart, 1991). However, the merits and limitations of each scoring approach have generally been evaluated and outlined.

While all scales have demonstrated sound psychometric properties in previous research on civilian and military populations, the current analyses show that a small number of these have limited internal consistency when applied to the CF recruit population. More specifically, subscales of the PTSD Checklist-Civilian Version and 20-item Toronto Alexithymia scale, as well as the Patient Health Questionnaire 15-item somatic symptoms scale, the Childhood Adversity scale and the Exposure to Violence scale demonstrated low internal consistency.

From these observations, recommendations include the need for additional research on the predictive validity of the different scoring methodologies of the PTSD Checklist-Civilian version, slight scale refinement of the Big Five Inventory and Revised Life Orientation Test (i.e., removal of one or more items), and the acknowledgement of potential reporting bias in the Adverse Childhood Experiences and Exposure to Violence scales. Notwithstanding these observations, the vast majority of psychological scales in the RHQ were found to have good to excellent internal consistency, indicating that the RHQ is, on the whole, a reliable tool to assess psychosocial aspects of health among CF recruits.

## Sommaire

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Le présent rapport expose la méthode de cotation des échelles psychologiques incorporées dans le Questionnaire sur la santé des recrues (QSR), donne un aperçu des études publiées sur leurs propriétés psychométriques dans les populations civiles et militaires et évalue leur cohérence interne dans une population de recrues des Forces canadiennes (FC) constituée de militaires de rang (MR) et de candidats au grade d'officier.

Les répondants, qui consistaient en 1 120 recrues des FC (68 % étaient des MR et 32 %, des candidats au grade d'officier), ont rempli le QSR en 2003 durant la première semaine de leur instruction de base. Le QSR comprend 17 échelles qui visent à évaluer : i) l'état psychologique (p. ex., échelles relatives à la dépression, aux troubles anxieux, au trouble panique et aux symptômes physiques, liste de vérification de l'état de stress post-traumatique [ESPT] – population civile); ii) les facteurs liés au caractère qui ont une influence connue sur les résultats de santé (p. ex., test de personnalité Big Five, inventaire des affects positifs et négatifs [PANAS], version révisée du test d'orientation de vie [LOT-R], échelle d'alexithymie de Toronto à 20 points, échelles mesurant la vigueur, la maîtrise, le besoin personnel de structure et l'estime de soi); iii) les influences sociales du milieu sur la santé (p. ex., échelle d'adversité durant l'enfance, échelle d'exposition à la violence, échelle des événements négatifs de la vie et échelle du soutien social). La cohérence interne de ces échelles a été évaluée à l'aide du coefficient alpha de Cronbach, du coefficient KR-20 (formule de Kuder-Richardson) et des corrélations élément-total.

Les méthodes de cotation et les propriétés psychométriques des échelles ont été adéquatement décrites et établies dans des études antérieures (p. ex., Smith, Smith, Jacobson, Corbeil et Ryan, 2007; Thompson et Smith, 2002), mis à part quelques exceptions (p. ex., échelle d'exposition à la violence; Young, Leard, Hansen, Chervak, Hauret, Spooner et coll., 2004). Certaines échelles faisaient appel à plus d'une approche de cotation (p. ex., liste de vérification de l'ESPT – population civile et échelle du soutien social; Blanchard, Jones-Alexander, Buckley et Forneris, 1996; Brewin, 2005; Sherbourne et Stewart, 1991). Cependant, les mérites et les limites de chaque approche ont généralement été évaluées et décrites.

Bien que toutes les échelles psychologiques aient présenté des propriétés psychométriques satisfaisantes dans les recherches antérieures menées auprès de populations civiles et militaires, les analyses actuelles montrent qu'un faible nombre d'entre elles présentent une cohérence interne réduite lorsqu'elles sont appliquées à la population des recrues des FC. Plus spécifiquement, les sous-échelles de la liste de vérification de l'ESPT – population civile et de l'échelle d'alexithymie de Toronto à 20 points, l'échelle d'évaluation de la gravité des symptômes physiques PHQ-15, l'échelle d'adversité durant l'enfance et l'échelle d'exposition à la violence ont présenté une faible cohérence interne.

Les recommandations découlant de ces observations comprennent : mener des recherches supplémentaires sur la valeur prédictive des différentes méthodes de cotation de la liste de vérification de l'ESPT – population civile; ajuster l'échelle du test de personnalité Big Five et la version révisée du test d'orientation de vie (c.-à-d. enlever un ou plusieurs éléments) et prendre en compte le risque de biais de déclaration dans l'échelle d'adversité durant l'enfance et l'échelle

d'exposition à la violence. Exclusion faite de ces observations, la vaste majorité des échelles psychologiques incorporées dans le QSR ont présenté une bonne ou une excellente cohérence interne, ce qui porte à croire que, dans l'ensemble, le QSR est un outil fiable pour évaluer les aspects psychosociaux de la santé des recrues des FC.

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# 1. Introduction

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## 1.1 Background

Following the Gulf War, many reports of post-deployment illnesses emerged, the aetiology of which is not well known (Goss Gilroy Inc., 1998). Among some of the difficulties in arriving at an understanding of these illnesses is a lack of baseline information on exposure to potential risk factors and health characteristics in military personnel. The Recruit Health Questionnaire (RHQ) was developed as a research and surveillance tool for use in the Canadian Forces (CF) in order to address these concerns.

The RHQ is a paper-based measure developed to gather general background information and assess current health status and lifestyle among CF recruits. Ultimately, these data will allow for prospective examinations of relationships between baseline health characteristics of CF members and medical outcomes. Since several medical outcomes have also been linked to psychological factors, the RHQ includes a number of psychological scales assessing three broad categories of health-related factors: psychological conditions, psychological disposition, and social environment. Some of the scales were selected on the basis of a review of factors identified in the psychological and medical literature as correlates or predictors of post-deployment illness (Goss Gilroy Inc., 2001). Others were selected to assess variables identified as key psychosocial risk and resilience factors (Hyams, Barrett, Duque, Engel, Friedl, Gray, et al., 2002; Thompson & Gignac, 2001).

Most of the psychological scales included in the RHQ have demonstrated sound psychometric properties in previous studies of civilian and military populations. However, it remains to be determined whether these scales demonstrate similar properties among recruits, as this represents a distinct population. For instance, recruits differ from the general civilian population in that they have elected to join the military and have gone through the enlistment process (Stander, Merrill, Thompsen, & Milner, 2007). At the same time, they differ from the CF because they tend to be younger, have not successfully passed Basic and Occupational Training, and have not yet experienced deployment.

## **1.2 Aim**

This report presents an overview of the scoring methodology of each psychological scale of the RHQ and briefly reviews results of previous research on their psychometric properties. In addition, the report presents results of analyses that were carried out to examine the internal consistency of these scales in the CF recruit population. Determining whether these scales are internally consistent in this specific population is an important first step in evaluating and ameliorating the RHQ as a baseline health assessment tool.

## **2. Method**

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### **2.1 Procedure**

The RHQ has been administered on an ongoing basis since July 2003 to all non-commissioned member (NCM) and Officer candidates attending Basic Training. The tool is administered by representatives at the St-Jean CF Leadership and Recruit School in a group format in the first week of Basic Training. At the start of each session, the nature and purpose of the RHQ are briefly discussed, along with information that participation in the study is completely voluntary. Recruits are asked to provide informed consent by completing and signing a consent form. In addition, instructions are provided on how to complete some sections of the questionnaire. Recruits are encouraged to ask any question they might have regarding the study throughout the process. On the last page of the RHQ booklet, they are invited to comment on their experience of having completed the questionnaire.

All recruits are asked to provide their gender, rank (NCM or Officer candidate), and date of birth, even if they do not wish to participate, so that basic demographic profiles of respondents and non-respondents can be compared later. Questionnaire administration requires approximately one hour. Completed questionnaires are collected by representatives at the end of the sessions and mailed to the principal investigator at the Directorate of Force Health Protection to be scanned and entered into a secured database.

### **2.2 Measures**

Including all forms, questions, and scales, the RHQ is a 27 page, single-sided booklet. Questions were drawn from a variety of sources, including the Canadian Community Health Survey (CCHS; Statistics Canada, 2001), the Health and Lifestyle Information Survey (HLIS; Department of National Defence, 2000), the Medical Outcomes Study survey tool (MOS; Ware & Sherbourne, 1992), the National Population Health Survey (NPHS; Statistics Canada, 1999), the Patient Health Questionnaire (PHQ; Spitzer, Kroenke, Williams and the Patient Health Questionnaire Primary Care Study Group, 1999), the Peace Support Operations Predeployment Survey (PSOPS; Thompson & Smith, 2002), and the Recruit Assessment Program (RAP) (Hyams et al., 2002). In sum, the RHQ includes 17 psychological scales to assess one of three broad categories of health-related factors: psychological conditions, psychological disposition, and social environment. Scoring methodologies for these scales documented in previous studies, along with past evidence of their psychometric properties in civilian and/or military populations are outlined below.

### **2.3 Psychological Condition Scales**

Several of the indices used to assess psychological conditions (e.g., depression, other anxiety disorder [OAD], panic disorder, somatic symptoms) in the RHQ were drawn from the PHQ— a self-administered screening instrument developed for use by community-based general or family practitioners in primary care settings (Spitzer et al., 1999). In addition, post-traumatic stress disorder (PTSD) was assessed using the PTSD Checklist – Civilian Version (PCL-C).

For each of these measures, algorithms have been specified to identify individuals who meet the criteria for diagnosis. Sensitivity and specificity are therefore additional properties to consider in evaluating these measures.

Sensitivity refers to a scale's ability to correctly identify a person meeting a particular condition, while specificity refers to a scale's ability to correctly identify a person not meeting a particular condition. Hence, a diagnostic measure of depression with high sensitivity would be expected to correctly yield a diagnosis in individuals suffering from depression. If it were high in specificity, this scale would be expected to correctly yield a non-diagnosis in individuals not suffering from depression.

### **2.3.1 PHQ Depression Scale**

The RHQ measures depression with nine items from the PHQ that reflect various symptoms of depression (PHQ-9). Respondents indicate the frequency with which they have experienced each symptom in the past two weeks using a 4-point scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). Scores of 5, 10, 15, and 20 represent mild, moderate, moderately severe, and severe depression (Kroenke, Spitzer, & Williams, 2001).

Kroenke et al. (2001) have found this instrument to have good internal consistency (Cronbach's alpha of .89). Also, due in part to its brevity, the PHQ-9 was identified as the best available depression-screening tool for primary care (Nease & Malouin, 2003). The tool has demonstrated high internal consistency in both civilian and military populations, having yielded a Cronbach's alpha of .89 in a primary care as well as a large military cohort study (Kroenke et al., 2001; Smith, Smith, Jacobson, Corbeil, & Ryan, 2007). Primary care evaluation of the PHQ-9 has revealed that scores greater than 15 reliably indicate satisfaction of depression criteria based on the *Diagnostic and Statistical Manual of Mental Disorders IV (DSM-IV)* with a moderate to severe level of impairment of daily functioning (Kroenke et al., 2001). Individuals with scores of 10 or more meet the diagnostic criteria for depression, although at a lower level of severity. With mental health professional interviews as a criterion, scores of 10 or more have demonstrated a sensitivity of 88% and specificity of 88% (Kroenke et al., 2001).

### **2.3.2 PHQ Other Anxiety Disorder Scale**

The OAD scale included in the RHQ consists of seven items from the PHQ designed to reflect various symptoms of anxiety (e.g., excessive worry, restlessness, or irritability) (Spitzer, Williams, Kroenke, Hornyak, & McMurray, 2000). Respondents rate how often they have experienced each symptom during the last four weeks on a 3-point scale (0 = not at all, 1 = several days, 2 = more than half the days). Scores are obtained by computing the sum of ratings. Respondents are identified as having an other anxiety disorder if they report "feeling nervous, anxious, on edge, or worrying a lot about different things" (the first item) "more than half the days", in addition to having experienced any three of the remaining six symptoms "more than half the days." Since the algorithm used to identify probable cases of other anxiety disorder with the PHQ OAD scale does not require the computation of a total score, internal consistency is not a critical criterion of its psychometric soundness. Still, the PHQ OAD scale has demonstrated good internal consistency in a large military cohort study (coefficient of .75; Smith et al., 2007). Used along with the PHQ panic disorder scale to

determine the presence of *any* anxiety disorder, this scale has yielded a sensitivity of .63 and specificity of .97 (Spitzer et al., 1999).

### **2.3.3 PHQ Panic Disorder Scale**

The PHQ panic disorder scale included in the RHQ consists of four questions related to the experience of one or more anxiety attacks (“In the last 4 weeks prior to starting recruit training, have you had an anxiety attack – suddenly feeling fear or panic?”, “Has this happened before?”, “Do some of these attacks come upon you quite suddenly – that is, in situations where you don’t expect to be nervous or uncomfortable?”, and “Do these attacks bother you a lot or are you worried about having another attack?”). In addition, respondents indicate whether they experienced 11 symptoms during their last bad anxiety attack. Responses to all items are coded as yes (score of 1) or no (score of 0). In line with the approach used by Spitzer et al. (1999), respondents are identified as having panic disorder if they answer yes to the four questions and experienced at least four symptoms during their last serious attack. This approach has yielded a sensitivity of 81% and specificity of 99% in a primary care evaluation (Katon, 2006; Spitzer et al., 1999). Similar to the PHQ OAD scale, the algorithm used to identify probable cases of panic disorder with the PHQ panic disorder scale does not require the computation of a total score for all 15 items. Nevertheless, the PHQ panic disorder scale has demonstrated good internal consistency in a large military cohort study (coefficient of .76; Smith et al., 2007).

### **2.3.4 PHQ Somatic Symptoms Scale**

Somatic symptoms are assessed in the RHQ using 15 items from the PHQ (PHQ-15). The PHQ-15 consists of a 13-item list of various somatic complaints. Respondents indicate the frequency with which they have experienced each symptom over the past month using a 3-point scale (0 = not at all bothered, 1 = bothered a little, 2 = bothered a lot). The additional two items are drawn from the PHQ-9 (“feeling tired or having low energy” and “trouble sleeping”). These two items are rescaled as 0 (not at all), 1 (several days), and 2 (more than half the days or nearly every day). Total scores are then obtained by computing the sum of ratings on the 15 items (Kroenke, Spitzer, & Williams, 2002). Scores range from 0 to 30, with higher values representing greater severity of somatic symptoms. Cutoff scores of 5, 10, and 15 are suggested by Kroenke et al. (2002) to indicate low, medium, and high severity of somatic symptoms, respectively.

Kroenke et al. (2002) found this scale to be useful for screening for somatization disorder (i.e., the experience of medically unexplained somatic symptoms along with high psychological distress). However, they acknowledge that the PHQ-15 does not necessarily diagnose somatization disorder because it cannot distinguish between medically explained and unexplained symptoms. Therefore, the PHQ-15 is better characterized as a measure of somatic symptom severity rather than a diagnostic tool for somatization disorder.

The PHQ-15 has been found to have good internal consistency, having demonstrated Cronbach’s alphas around .80 across varying civilian samples and of .76 in a large military cohort (Interian, Allen, Gara, Escobar, & Diaz-Martinez, 2006; Kroenke et al., 2002; Smith et al., 2007). In support of its convergent validity, the PHQ-15 has been strongly associated with functional status, number of disability days, and symptom-related difficulty (Interian et al., 2006; Kroenke et al., 2002). The scale has also demonstrated good

discriminant validity, having been associated with different outcomes than the PHQ-9 depression scale (Kroenke et al., 2002).

### **2.3.5 Posttraumatic Stress Disorder Checklist-Civilian Version**

The RHQ assesses PTSD with the PTSD Checklist-Civilian Version (PCL-C), a 17-item self report measure of PTSD among civilian populations. This scale was adapted from the general PCL, which was originally created as a diagnostic tool for Vietnam combat veterans (Weathers, Litz, Herman, Huska, & Keane, 1993). Specifically, the PCL-C is not military-specific and it assesses PTSD associated with a wider range of stressful life experiences (Orsillo, 2001). Items reflect various symptoms of PTSD based on the *DSM-IV*. Respondents indicate how much they have been bothered by symptoms in the past month using a 5-point scale (1 = not at all, 2 = a little bit, 3 = moderately, 4 = quite a bit, 5 = extremely). Total scores are obtained by computing the sum of ratings (range from 17 to 85), with higher scores reflecting more severe PTSD.

In previous research, the PCL-C has demonstrated excellent internal consistency (e.g., Cronbach's alpha of up to .94 in civilian and military samples) and high correlation with the Clinician Administered PTSD Scale ( $r = .93$ ; Blanchard Jones-Alexander, Buckley, & Forneris, 1996; Ruggiero, Ben, Scotti, & Rabalais, 2003; Smith et al., 2007). With civilians, a recommended cutoff score of 50 or higher for the presence of PTSD has yielded a sensitivity of 78% and specificity of 86% (Blanchard et al., 1996; Weathers et al., 1993). However, it has been suggested to use a lower cutoff score of 44 to achieve more optimal screening (Brewin, 2005). This approach has resulted in a sensitivity of 94% and specificity of 86% (Blanchard et al., 1996).

In addition to total scores, a symptom cluster method of scoring can also be taken where endorsement of *DSM-IV* symptom criteria B (persistent re-experiencing), C (persistent avoidance of stimuli associated with the trauma), and D (persistent symptoms of increased arousal) of PTSD is considered, rather than a total scale score (Brewin, 2005). The approach deems ratings of 3 or greater, for specific items, to represent endorsement of that symptom. Hence, endorsement of one Cluster B, three Cluster C, and two Cluster D symptoms indicates the presence of PTSD. Although computation of a total score is not necessary with this approach, subscales have demonstrated high internal consistency (coefficients of .94, .82 and .84 for Criteria B, C, and D, respectively; Blanchard et al., 1996). Also, this approach has resulted in a sensitivity of 100% and specificity of 92% (Brewin, 2005).

## **2.4 Dispositional Indices**

In line with the notion that specific character traits are associated with illness (Smith & Williams, 1992), a number of measures of personality or psychological disposition were embedded into the RHQ. Such measures were included because of their hypothesized role as dispositional factors placing individuals at risk of ill physical and psychological health or as psychological resilience factors (Smith & Williams, 1992; Thompson, Gignac, & McCreary, 2004).

### **2.4.1 Big Five Inventory**

The RHQ assesses each of the major personality traits specified in the Five-Factor model of personality. According to this model, personality consists of five relatively strong and recurring factors: Agreeableness (i.e., the tendency to be pleasant and accommodating in social situations), Conscientiousness (i.e., having a dependable and careful nature while completing tasks), Extroversion (i.e., the tendency to be expressive and energetic), Neuroticism (i.e., a proneness for general emotional instability), and Openness (i.e., the tendency to seek out and accept novel experiences) (John & Srivastava, 1999). The Big Five Inventory (BFI) was used to assess these factors. In its original form, this scale consists of 44 items and five subscales (9 items measuring Agreeableness, 9 items measuring Conscientiousness, 8 items measuring Extroversion, 8 items measuring Neuroticism, and 10 items measuring Openness). Items are presented as a series of short statements following the broader statement “I see myself as someone who...” Respondents are asked to rate each statement in terms of the degree to which it describes them using a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree).

Scores for each subscale are computed by reverse-scoring specified items and summing over ratings on constituent items. For each subscale, a higher score indicates a greater tendency for respondents to demonstrate the personality dimension under consideration. Subscales have been found to be reliable, having yielded Cronbach’s coefficients from .75 to .80 as well as test-retest coefficients from .80 to .90 in Canadian and U.S. civilian samples (John & Srivastava, 1999). In addition, high convergent validity has been observed with other methods of assessment, including peer ratings, the NEO-Five Factor Index (Costa & McRae, 1992), and the Trait Descriptive Adjectives (Goldberg, 1992).

More recently, the BFI was adapted for use in the military population. In particular, a modified version was used in the Peace Support Operations Predeployment Survey (PSOPS) to assess personality in CF members (Thompson & Smith, 2002). This version was similar to the original scale, although four items of the Openness subscale were omitted because of their questionable applicability in the military context (i.e., “Has few artistic interests”, “Has an active imagination”, “Values artistic, aesthetic experiences”, “Is sophisticated in art, music, or literature”) and an additional item (generated from group discussions) was included (“Is Open to New Experiences”). In analyses of the PSOPS (2002), the five subscales yielded Cronbach’s reliability coefficients between .71 and .85. This last version of the BFI is used to assess the “Big Five” personality traits in the RHQ.

### **2.4.2 Hardiness Scale**

Hardiness refers to the tendency to have a high sense of commitment, strong sense of control, and to be open to change (Maddi, Khoshaba, Persico, Lu, Harvey, & Bleecker, 2002). The 11-item scale used to assess hardiness in the RHQ was also drawn from the PSOPS (Thompson & Smith, 2002). The scale was adapted from Bartone’s 15-item Hardiness scale that was developed and validated among military personnel (Bartone, 1999). Specifically, Thompson and her colleagues removed four items from the scale because preliminary analyses of data from their sample indicated improved internal consistency with these items removed. Respondents rate items on a 4-point scale (1 = not true at all, 2 = a little true, 3 = quite true, 4 = completely true). Scores are obtained by reverse-scoring specified items and computing the sum of ratings on all items. Higher scores reflect greater hardiness.

Previous studies examining the psychometric properties of this scale in CF members have revealed a high internal consistency (Cronbach's alphas ranging from .77 to .78; Thompson et al., 2004; Thompson & Smith, 2002).

### **2.4.3 Mastery Scale**

Mastery refers to one's tendency to view life as being under his or her control (Pearlin & Schooler, 1978). The mastery index used in the RHQ was drawn from the CCHS (Statistics Canada, 2008). The scale is based on the work of Pearlin and Schooler (1978). Seven items assessing individuals' sense of control over their life circumstances are rated using a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree). Some items are first reverse-coded and a total score is obtained by computing the sum of ratings on all items. Higher scores reflect greater mastery. One factor has been found to underlie the seven items in a principal components analysis performed by Pearlin and Schooler (1978). This scale has demonstrated high internal consistency (Cronbach's alpha of .78) in a sample of CF members (Thompson & Smith, 2002).

### **2.4.4 Personal Need for Structure Scale**

Hypothesized to lead to inefficient decision-making in complex situations, Personal Need for Structure (PNS) is conceptualized as a cognitive style characterized by a preference for structure and clarity (Thompson & Smith, 2002). The RHQ measures PNS using a scale developed by Thompson, Naccarato, and Parker (as cited in Thompson, Naccarato, Parker & Moskowitz, 1992). This scale consists of 12 items assessing one's desire for clarity, certainty, as well as a parallel aversion to ambiguity. Items are presented in the form of statements to be rated by respondents in terms of level of agreement. Scores are obtained by reverse-scoring specified items and computing the sum of ratings across items. Higher scores reflect a greater PNS. In the original scale, items are rated using a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree). In a previous study of CF members, this scale was found to have high internal consistency, yielding a Cronbach's coefficient of .78 (Thompson & Smith, 2002).

The scale used to assess PNS in the RHQ includes items similar to the one developed by Thompson et al. (1992). However, a 5-point Likert scale is used (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree).

### **2.4.5 Positive and Negative Affect Schedule**

The experience of feeling or emotion, known as *affect*, can be either positive (pleasant emotional states) or negative (unpleasant emotional states). It can also be a temporary state (state affect) or relate to one's overall tendency to experience affect in a stable, predictable way over time (trait affect). Watson and his colleagues developed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) as a brief and easy to administer measure of affect. The scale consists of 20 items: 10 items are adjectives representing positive affect and 10 items are adjectives reflecting negative affect. Respondents rate the degree to which they have felt in line with each adjective over a specified period of time using a 5-point scale (1 = very slightly or not at all, 2 = a little, 3 = moderately, 4 = quite a bit, 5 = extremely). The period of time may range from how they feel at that very moment to how they feel in general. As such, affect may either be measured as a state or as a trait. Scores are computed on separate Positive Affect (PA) and Negative Affect (NA) subscales

by calculating the sum of ratings on positive and negative adjectives, respectively. Higher scores are indicative of the tendency for respondents to experience greater positive or negative affect (according to whether the scale is composed of positive or negative adjectives, respectively). An analysis by Watson et al. (1988) provided support for this two-factor structure of affect. The subscales demonstrated high internal consistency, with the scale for trait-PA yielding a Cronbach's alpha of .88 and the scale for trait-NA yielding a Cronbach's alpha of .87. The scales were also found to have high convergent and discriminant validity (Watson et al., 1988).

The version of the PANAS used in the RHQ asks respondents to indicate the extent to which they feel in line with each adjective, on average. The scale thus assesses affect as a trait. While this version includes the same items as the original scale, the specific anchors of the 5-point rating scale used to provide answers are different (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree).

#### **2.4.6 Revised Life Orientation Test**

The Revised Life Orientation Test (LOT-R) is a measure used to assess dispositional optimism (Scheier & Carver, 1985) – the generalized tendency to expect positive outcomes. The LOT-R consists of six items and four “filler” items. These four items do not assess dispositional optimism, but are included in the measure because of their supposed beneficial effect on target item measures (e.g., by attenuating potential measurement artifacts such as effects stemming from item proximity; Vautier, Raufaste, & Cariou, 2003). As a scale, the 6-items have demonstrated adequate internal consistency (Cronbach's alpha of .78; Scheier, Carver, & Bridges, 1994). All items are presented in the form of statements to be rated by respondents in terms of level of agreement on a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree). Scores are obtained by reverse-scoring specified items and computing the sum of ratings on the six constituent items. Higher scores indicate that respondents have a more optimistic outlook on life.

The version of the LOT-R used in the RHQ includes the six constituent items, but only one of the “filler” questions (“I don't get upset easily”). A previous study of CF members has found this 7-item scale to have high internal consistency, as indicated by a Cronbach's alpha of .79 (Thompson & Smith, 2002).

#### **2.4.7 Self-Esteem Scale**

Self-esteem refers to a person's self-appraisal of his or her overall worth. It is considered an enduring personality dimension, although short-term variations in self-esteem may occur. The self-esteem index used in the RHQ was drawn from the CCHS (Statistics Canada, 2001, 2008). The scale includes five items representing various positive attributes and one item representing a negative attribute. These were selected from the Rosenberg self-esteem scale (1965). A principal components analysis performed by Pearlin and Schooler (1978) on these six items revealed that they could be represented by one underlying factor (Statistics Canada, 2008). Respondents rate the extent to which they believe each item describes them on a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree,

5 = strongly disagree). Specified items are reverse-coded and scores are obtained by computing the sum of ratings on all items. Higher scores represent higher self-esteem

### **2.4.8 Toronto Alexithymia Scale**

Alexithymia is a personality trait characterized by a state of deficiency in understanding, processing, and describing emotions (Sifneos, 1973). In order to measure this trait, Bagby and his colleagues designed the Toronto Alexithymia Scale (TAS) using a combined empirical and rational method (Bagby, Parker, & Taylor, 1994). The version of the TAS used in the RHQ includes 20 items (TAS-20) to be rated on a 5-point Likert scale (1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree). Its subscales include Difficulty Describing Feelings (5 items), Difficulty Identifying Feelings (7 items), and Externally-Oriented Thinking (8 items). Specified items are reverse-coded and scores on each subscale are obtained by computing the sum of constituent items. A total score can also be obtained by computing the sum of subscale scores. Respondents with higher scores on the TAS-20 or on its subscales are expected to experience more pronounced alexithymia.

In Bagby et al.'s (1994) study, the overall scale as well as subscales for Difficulty Describing Feelings and Difficulty Identifying Feelings demonstrated high internal consistency (Cronbach's alphas of .81, .75, and .78, respectively). However, internal consistency of the Externally-Oriented thinking subscale was modest (alpha of .66). Still, the TAS-20 has demonstrated a test-retest reliability of .77 over 3-weeks, as well as a stable three-factor structure across clinical and non-clinical populations of Canadian civilians (Bagby et al., 1994).

## **2.5 Social Environmental Indices**

The remaining scales of the RHQ were developed to tap into social environmental factors associated with physical and psychological functioning. Three scales (e.g., Adverse Childhood Experiences scale, Exposure to Violence scale, and Negative Life Events scale) assess important past experiences that have been found in previous studies to be associated with increased risk of negative mental health outcomes following deployment (Fikretoglu, Brunet, Poundja, Guay, & Pedlar, 2006). A last scale assesses social support, which is recognized as a key factor fostering health and resilience (Sherbourne & Stewart, 1991).

### **2.5.1 Adverse Childhood Experiences (ACE) Items**

The RHQ includes eight items from the U.S. Army's RAP tool to assess adverse childhood experiences (ACE; Young, Hansen, Gibson, & Ryan, 2006; Young, Leard, Hansen, Chervak, Hauret, Spooner, & Ryan, 2004). Two items measure childhood neglect ("you felt loved", "there was someone there to take care of you and protect you"), while four items measure childhood experience of abuse prior to the age of 17 years (i.e., emotional abuse, domestic violence, childhood physical abuse, childhood sexual abuse). These items are rated on a 5-point scale (1 = never true, 2 = rarely true, 3 = sometimes true, 4 = often true, 5 = very often true). Another two items assess whether respondents lived with a depressed or mentally ill individual and with a problem drinker or alcoholic during childhood. Respondents answer these last two items on a 2-point scale (0 = no, 1 = yes).

In previous studies, a scale for Childhood Adversity was computed using all items but those measuring childhood neglect. No specification is made on why these items were omitted from that index. In order to compute scores on the Childhood Adversity scale, items rated on the 5-point scale are first rescaled as yes (ratings of 1) or no (ratings of 2 or more). A total score is then computed by counting the number of “yes” responses on the six items (Cabrera, Hoge, Bliese, Castro, & Messer, 2007; Gahm, Lucenko, Retzlaff, & Fukada, 2007). Thus, respondents with higher scores on this scale are believed to have experienced more childhood adversity. This Childhood Adversity scale has demonstrated good internal consistency, having yielded a KR-20 coefficient of .74 (Gahm et al., 2007).

### **2.5.2 Exposure to Violence Scale**

In addition to childhood adversity, the RHQ assesses lifetime exposure to various life events. Items drawn from the RAP assess whether respondents have ever experienced seven events: being in an accident where they could have been killed but were not badly hurt, being in an accident where they were injured and had to spend at least one night in the hospital, seeing a close family member or friend being badly injured or killed, seeing a stranger being badly injured or killed, being seriously attacked, beaten up, or assaulted, being threatened with a knife, gun, club, or other weapon, and being raped. Answers are provided on a 2-point scale (0 = no, 1 = yes). To date, information regarding the psychometric properties of these items is lacking.

### **2.5.3 Negative Life Events Scale**

The RHQ also assesses negative life events experienced in the past year. Items were drawn from the Life Events Survey, a checklist of 98 stressful events that may occur in various domains: work or school, finances, health, romantic relationships, personal events, as well as home, friends and family life (Hammen, Marks, Mayo, & de Mayo, 1985).

The checklist used in the RHQ includes only 50 of the stressful events, selected to represent each of the aforementioned life domains. In a previous study, these events were among those perceived by the majority of respondents as either “moderately negative” or “strongly negative” (McCreary & Sadava, 1998). Respondents indicate which events they have experienced in the past year by checking them off. The number of events checked off is recorded and used as an index of negative life events. Given that these events were rated in the previous study as moderately to strongly negative, higher scores are also assumed to indicate a higher subjective experience of negative events. Studies using similar indices have found life events to be related to several health outcomes (Tosevski & Milovancevik, 2006). The psychometric properties of the particular checklist used in the RHQ have yet to be evaluated.

### **2.5.4 Social Support Survey**

Finally, the extent to which individuals have people or resources on which they can rely for support has been found to be a reliable predictor of morbidity and mortality (Uchino, 2006). The RHQ therefore includes the Social Support Survey (SSS). This brief instrument was developed for the MOS (Sherbourne & Stewart, 1991) and consists of 19 items reflecting various types of social support, to be rated by respondents on a 5-point scale in terms of how often each is available to them in times of need (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). An overall functional social support index can be obtained by computing the sum of all items. However, the measure includes separate subscales to assess Affectionate Support (3 items), Emotional/Informational Support (8 items), Positive Social Interaction (3 items), or Tangible Support (4 items). Scores for each subscale are obtained by computing the sum of constituent items. Higher scores represent greater availability of social support.

In a study of civilians visiting clinics participating in the MOS, the four scales demonstrated excellent internal consistency (Cronbach's alphas ranging from .91 to .96), as did the overall functional social support index (Cronbach's alpha of .97). Test-retest reliability was also good over one year (ranging from .72 to .78). The scales were found to be highly correlated with measures of loneliness, emotional ties, family and marital functioning, as well as mental health, thus demonstrating convergent validity (Sherbourne & Stewart, 1991). More recently, the SSS was included in the CCHS as well as the CCHS Canadian Forces Supplement (CCHS-CF; Fikretoglu, Brunet, Guay, & Pedlar, 2007). However, information pertaining to its psychometric properties in these samples is not available.

## 2.6 Analyses

For the purpose of the present report, only RHQ data collected in 2003 were analyzed. Specifically, internal consistency of each of the psychological scales presented above was assessed by examining either Cronbach's alpha or Kuder-Richardson formula 20 (KR-20)<sup>1</sup> coefficients, as well as item-total correlations computed using SPSS 16.0. Internal consistency refers to the extent to which items on a particular scale or subscale measure the same construct. Scales are considered to demonstrate adequate internal consistency if they yield an internal consistency coefficient greater than .70 (Streiner, 2003) and constituent items have high item-total correlations (that is, a strong relationship with the total scale). Item-total correlations of .20 and less are considered to be indicative of a poor item. It is recommended that such items be removed from the scale (Nunnally & Bernstein, 1994).

Results of these analyses helped to identify scales in need of refinement for use in the CF recruit population, as well as problematic items that might be removed to improve the scale. In addition to providing item-total correlations for each constituent item, SPSS 16.0 provides internal consistency coefficients of scales with each item removed. Items yielding greater values upon removal, as well as item-total correlations below .20 were removed, and psychometric properties of revised scales were subsequently examined.

## 2.7 Respondents

Participants were 1,120 CF recruits who completed the RHQ between July and October 2003, representing a response rate of 95%. Sixty-eight (68) percent of respondents were NCM candidates, while the remaining 32% were Officer candidates. The majority of participants were men (83%), were single or never married (75%), and had English as a first official language (75%). A complete breakdown of participants by these demographic groupings, as well as age, education, and household income prior to Basic Training is presented in Table 1.

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<sup>1</sup> Kuder-Richardson formula 20 (KR-20) is a measure of internal consistency analogous to Cronbach's alpha for scales involving dichotomous responses.

**Table 1. Demographic Profile of Recruit Health Questionnaire Respondents**

Demographic Variable	Frequency	Percent
<b>Age</b>		
17 to 19 years	368	33.8
20 to 24 years	369	33.9
25 to 29 years	199	18.2
30 to 34 years	82	7.5
35 to 39 years	50	4.6
40 to 44 years	15	1.4
45 to 50 years	7	0.6
<b>Gender</b>		
Men	911	83.0
Women	187	17.0
<b>Rank</b>		
NCM candidate	610	67.9
Officer candidate	289	32.1
<b>First official language</b>		
English	272	74.5
French	93	25.5
<b>Marital status</b>		
Married	112	10.6
Living with a partner	129	12.2
Single/Never married	796	75.2
Other (divorced, separated, or widowed)	22	2.0
<b>Education</b>		
Some secondary	124	11.8
Completed secondary	438	41.8
Some community college/CEGEP	108	10.3

Demographic Variable	Frequency	Percent
Completed community college/CEGEP	159	15.2
Some university courses	59	5.6
Completed university degree	143	13.6
Postgraduate studies	18	1.7
Household income		
Less than \$20,000	184	21.5
20,000\$ to \$49,999	275	32.1
50,000\$ to \$100,000	258	30.1
More than \$100,000	139	16.2

## 3. Results

### 3.1 Psychological Condition Scales

As noted in the methods section, the identification of probable cases of psychological conditions with some measures involves prespecified algorithms rather than the computation of a total score (e.g., PHQ OAD scale and PHQ panic disorder scale). As such, internal consistency is not a critical criterion of psychometric soundness for these scales. It can nevertheless be examined to get an indication of the appropriateness of using total scores on these scales as composite indices of symptoms of the respective psychological conditions.

#### 3.1.1 PHQ Depression Scale

Favoring its use in the CF recruit population, the PHQ-9 demonstrated an excellent Cronbach's alpha of .80 (Table 2). Item-total correlations in the range of .38 to .61 were also suggestive of good internal consistency.

**Table 2.** Properties of Patient Health Questionnaire 9-item Depression Scale (PHQ-9)

PHQ-9 scale item (Cronbach's alpha = .80)	Mean	SD	Item-total correlation	Alpha if item deleted
Little interest or pleasure in doing things	1.25	0.57	0.49	0.78
Feeling down, depressed, or hopeless	1.21	0.51	0.60	0.77
Trouble falling or staying asleep, or sleeping too much	1.50	0.75	0.52	0.79
Feeling tired or having little energy	1.41	0.67	0.61	0.77
Poor appetite or overeating	1.30	0.64	0.52	0.78
Feeling bad about yourself – or that you are a failure or have let yourself or your family down	1.14	0.48	0.54	0.78
Trouble concentrating on things, such as reading the newspaper or watching television	1.21	0.53	0.51	0.78
Moving or speaking so slowly that other people could have noticed	1.04	0.24	0.38	0.80
Thoughts that you would be better off dead or of hurting yourself in some way	1.04	0.28	0.42	0.80

### 3.1.2 PHQ Other Anxiety Disorder Scale

Only respondents who indicated “feeling nervous, anxious, on edge, or worrying a lot about different things” “most of the time” in the four weeks prior to Basic Training were required to respond to all questions of the PHQ OAD scale. Analyses of internal consistency were therefore carried out among a notably smaller number of respondents ( $n = 465$ ). As shown in Table 3, the PHQ OAD scale demonstrated adequate internal consistency, yielding item-total correlations greater than .20 and an alpha coefficient of .74.

**Table 3.** Properties of Patient Health Questionnaire Other Anxiety Disorder Scale

PHQ OAD scale item (Cronbach's alpha = .74)	Mean	SD	Item-total correlation	Alpha if item deleted
Feeling nervous, anxious, on edge, or worrying a lot about different things	2.02	0.50	0.46	0.71
Feeling restless so that it is hard to sit still	1.47	0.60	0.49	0.70
Getting tired very easily	1.35	0.54	0.51	0.69
Muscle tension, aches, or soreness	1.29	0.52	0.42	0.71
Trouble falling asleep or staying asleep	1.58	0.64	0.41	0.72
Trouble concentrating on things, such as reading a book or watching TV	1.28	0.50	0.43	0.71
Becoming easily annoyed or irritable	1.50	0.59	0.45	0.71

### 3.1.3 PHQ Panic Disorder Scale

Similar to the PHQ OAD scale, the panic disorder scale was presented in such a way that only respondents who reported a panic attack in the month prior to Basic Training (the first item listed in Table 4) were asked to respond to the 14 remaining questions. Not surprisingly, few respondents completed the full scale, such that analyses could only be carried out on data from 93 individuals. A KR-20 coefficient of .78 suggested that internal consistency was good.

**Table 4.** Properties of Patient Health Questionnaire Panic Disorder Scale

PHQ panic disorder scale item (KR-20 alpha = .78)	% Yes	% No	Item-total correlation	KR-20 if item deleted
In the last 4 weeks prior to starting recruit training, have you had an anxiety attack – suddenly feeling fear or panic	86	14	0.23	0.78
Has this ever happened before	66	34	0.31	0.78
Do some of these attacks come upon you quite suddenly – that is, in situations where you don't expect to be nervous or uncomfortable	42	58	0.34	0.78

PHQ panic disorder scale item (KR-20 alpha = .78)	% Yes	% No	Item-total correlation	KR-20 if item deleted
Do these attacks bother you a lot or are you worried about having another attack	18	82	0.44	0.77
Think about your last bad anxiety attack....				
Were you out of breath	24	76	0.43	0.77
Did your heart race, pound, or skip	54	46	0.45	0.76
Did you have chest pain or pressure	12	88	0.38	0.77
Did you sweat	50	51	0.44	0.77
Did you feel as if you were choking	12	88	0.41	0.77
Did you have hot flashes or chills	36	65	0.52	0.76
Did you have nausea, an upset stomach, or the feeling that you were going to have diarrhea	36	65	0.26	0.78
Did you feel dizzy, unsteady, or faint	18	82	0.42	0.77
Did you have tingling or numbness in parts of your body	15	85	0.35	0.77
Did you tremble or shake	32	68	0.50	0.76
Were you afraid you were dying	11	89	0.39	0.77

### 3.1.4 PHQ Somatic Symptoms Scale

Despite having demonstrated high Cronbach's alpha values in previous studies, the PHQ-15 only demonstrated marginal internal consistency in this sample of CF recruits (Cronbach's alpha of .68) (Table 5). Two items yielded item-total correlations inferior to .20. However, removal of these items from the scale did not improve internal consistency.

**Table 5.** Properties of Patient Health Questionnaire 15-item Somatic Symptoms Scale (PHQ-15)

PHQ-15 scale item (Cronbach's alpha = .68)	Mean	SD	Item-total correlation	Alpha if item deleted
Stomach pain	1.18	0.40	0.35	0.66
Back pain	1.39	0.52	0.31	0.66

PHQ-15 scale item (Cronbach's alpha = .68)	Mean	SD	Item-total correlation	Alpha if item deleted
Pain in your arms, legs, or joints (knees, hips, etc.)	1.37	0.53	0.27	0.67
Menstrual cramps or other problems with your periods	1.11	0.37	0.20	0.67
Pain or problems during sexual intercourse	1.02	0.15	0.15	0.68
Headaches	1.36	0.52	0.37	0.65
Chest pain	1.05	0.22	0.21	0.67
Dizziness	1.11	0.32	0.37	0.66
Fainting spells	1.29	0.50	0.35	0.66
Feeling your heart pound or race	1.01	0.12	0.19	0.68
Shortness of breath	1.15	0.37	0.33	0.66
Constipation, loose bowels, or diarrhea	1.22	0.45	0.38	0.65
Nausea, gas, or indigestion	1.25	0.48	0.29	0.66
Trouble falling or staying asleep, or sleeping too much*	1.46	0.66	0.31	0.67
Feeling tired or having little energy*	1.40	0.62	0.33	0.66

Note. \*Item from PHQ-9 depression scale.

### 3.1.5 Posttraumatic Stress Disorder Checklist-Civilian Version

To a greater degree than PHQ scales, the total PCL-C demonstrated excellent internal consistency. Consistent with previous studies (Blanchard et al., 1994), the full scale yielded a Cronbach's alpha of .89 (Table 6).

Analyses were also carried out on subscales representing each PTSD symptom cluster. Prior to doing so, answers to items were rescaled to distinguish those who experienced each symptom (ratings of 2 or more) from those who have not experienced each symptom (ratings of 1). As shown in Table 7, internal consistency was adequate for subscales assessing *DSM-IV* criteria B and C (KR-20 coefficients of .77 and .74, respectively). However, the subscale assessing *DSM-IV* criterion D demonstrated a modest level of internal consistency (KR-20 coefficient of .64).

**Table 6.** Properties of Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C)

PCL-C scale item (Cronbach's alpha = .89)	Mean	SD	Item-total correlation	Alpha if item deleted
Repeated, disturbing memories, thoughts or images of a stressful experience from the past	1.44	0.78	0.59	0.88

PCL-C scale item (Cronbach's alpha = .89)	Mean	SD	Item-total correlation	Alpha if item deleted
Repeated disturbing dreams of a stressful experience from the past	1.21	0.57	0.51	0.88
Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)	1.26	0.63	0.53	0.88
Feeling very upset when something reminded you of a stressful experience from the past	1.36	0.71	0.65	0.88
Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience from the past	1.16	0.48	0.49	0.89
Avoiding thinking about or talking about a stressful experience from the past or avoiding having feelings related to it	1.45	0.84	0.61	0.88
Avoiding activities or situations because they reminded you of a stressful experience from the past	1.23	0.62	0.53	0.88
Trouble remembering important parts of a stressful experience from the past	1.22	0.62	0.44	0.89
Loss of interest in activities that you used to enjoy	1.26	0.63	0.48	0.89
Feeling distant or cut off from other people	1.52	0.91	0.56	0.88
Feeling emotionally numb or being unable to have loving feelings for those close to you	1.36	0.82	0.59	0.88
Feeling as if your future will somehow be cut short	1.29	0.74	0.63	0.88
Trouble falling or staying asleep	1.53	0.89	0.45	0.89
Feeling irritable or having angry outbursts	1.40	0.72	0.52	0.88
Having difficulty concentrating	1.45	0.75	0.58	0.88
Being "super alert" or watchful or on guard	1.56	0.96	0.50	0.89
Feeling jumpy or easily startled	1.37	0.71	0.52	0.88

**Table 7. Properties of Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C) Subscales**

PCL-C subscale item	% Yes	% No	Item-total correlation	KR-20 if item deleted
PTSD criterion B (persistent re-experience) (KR-20 = .77)				
Repeated, disturbing memories, thoughts or images of a stressful experience from the past	10	90	0.58	0.72

PCL-C subscale item	% Yes	% No	Item-total correlation	KR-20 if item deleted
Repeated disturbing dreams of a stressful experience from the past	5	95	0.53	0.73
Suddenly acting or feeling as if a stressful experience were happening again (as if you were reliving it)	6	94	0.58	0.71
Feeling very upset when something reminded you of a stressful experience from the past	7	93	0.66	0.68
Having physical reactions (e.g., heart pounding, trouble breathing, sweating) when something reminded you of a stressful experience from the past	4	96	0.36	0.78
PTSD criterion C (persistent avoidance) (KR-20 = .74)				
Avoiding thinking about or talking about a stressful experience from the past or avoiding having feelings related to it	12	88	0.46	0.71
Avoiding activities or situations because they reminded you of a stressful experience from the past	6	94	0.45	0.72
Trouble remembering important parts of a stressful experience from the past	5	95	0.32	0.74
Loss of interest in activities that you used to enjoy	6	94	0.37	0.73
Feeling distant or cut off from other people	12	88	0.54	0.69
Feeling emotionally numb or being unable to have loving feelings for those close to you	9	91	0.52	0.70
Feeling as if your future will somehow be cut short	7	93	0.56	0.69
PTSD criterion D (persistent increased arousal) (KR-20 = .64)				
Trouble falling or staying asleep	13	88	0.35	0.61
Feeling irritable or having angry outbursts	8	92	0.44	0.57
Having difficulty concentrating	9	91	0.42	0.57
Being "super alert" or watchful or on guard	16	84	0.36	0.61
Feeling jumpy or easily startled	8	92	0.42	0.57

## 3.2 Dispositional Indices

Prior to computing coefficients of internal consistency of dispositional indices, some scale items were reverse-coded in accordance with documented scoring methodologies. These were always reverse-coded so that computation of total scores for each scale or subscale would represent a greater presence of the personality trait.

### 3.2.1 Big Five Inventory

As shown in Table 8, Cronbach's alphas were .72 for Agreeableness, .81 for Conscientiousness, .83 for Extroversion, .80 for Neuroticism, and .67 for Openness. Consistent with previous findings (Thompson & Smith, 2002), one item of the Openness subscale achieved a low item-total correlation ("Prefers work that is routine"). Removal of this item from the subscale also resulted in an improved alpha of .74, suggesting that use of this revised subscale might be more appropriate to assess Openness in the CF recruit population.

**Table 8.** Properties of Big Five Inventory (BFI) Subscales

BFI subscale item	Mean	SD	Item-total correlation	Alpha if item deleted
Agreeableness (Cronbach's alpha = .72)				
Tends to find fault with others	3.21	0.94	0.39	0.69
Is helpful and unselfish with others*	4.17	0.61	0.41	0.69
Starts quarrels with others	4.26	0.80	0.44	0.68
Has a forgiving nature*	3.88	0.97	0.34	0.70
Is generally trusting*	4.10	0.81	0.31	0.71
Can be cold and aloof	3.42	1.06	0.31	0.71
Is considerate and kind to almost everyone*	4.21	0.67	0.53	0.67
Is sometimes rude to others	3.67	0.97	0.48	0.67
Likes to cooperate with others*	4.21	0.61	0.41	0.69
Conscientiousness (Cronbach's alpha = .81)				
Does a thorough job*	4.10	0.66	0.51	0.80
Can be somewhat careless	3.47	0.96	0.52	0.79
Is a reliable worker*	4.44	0.62	0.49	0.80
Tends to be disorganized	3.61	1.03	0.58	0.79
Tends to be lazy	3.87	0.93	0.58	0.78
Perseveres until the task is finished*	4.16	0.74	0.50	0.80
Does things efficiently*	4.10	0.64	0.51	0.80
Is easily distracted	3.31	1.01	0.50	0.80
Makes plans and follows through with them*	3.98	0.68	0.47	0.80

BFI subscale item	Mean	SD	Item-total correlation	Alpha if item deleted
Extroversion (Cronbach's alpha = .83)				
Is talkative*	3.63	0.97	0.63	0.80
Is reserved	2.88	1.05	0.52	0.82
Is full of energy*	3.97	0.75	0.42	0.83
Generates a lot of enthusiasm*	3.65	0.83	0.57	0.81
Tends to be quiet	2.99	1.13	0.65	0.80
Has an assertive personality*	3.78	0.87	0.50	0.82
Is sometimes shy, inhibited	2.92	1.13	0.57	0.81
Is outgoing, sociable*	3.90	0.92	0.61	0.80
Neuroticism (Cronbach's alpha = .80)				
Is depressed, blue*	1.91	0.90	0.46	0.78
Is relaxed, handles stress well	2.18	0.89	0.58	0.77
Can be tense*	3.19	0.93	0.51	0.78
Worries a lot*	2.85	1.12	0.59	0.76
Is emotionally stable	1.88	0.85	0.42	0.79
Can be moody*	2.84	1.07	0.48	0.78
Remains calm in tense situations	2.04	0.78	0.45	0.79
Gets nervous easily*	2.75	1.07	0.58	0.76
Openness (Cronbach's alpha = .67)				
Is original, comes up with new ideas*	3.84	0.77	0.47	0.61
Is curious about many different things*	4.42	0.64	0.44	0.62
Is ingenious, a deep thinker*	3.76	0.82	0.47	0.60
Is inventive*	3.79	0.82	0.48	0.60
Prefers work that is routine	3.15	1.20	0.16	0.73
Likes to reflect, play with ideas*	3.95	0.76	0.44	0.62
Is open to new experiences*	4.48	0.65	0.36	0.64

BFI subscale item	Mean	SD	Item-total correlation	Alpha if item deleted
Revised Openness (Cronbach's alpha = .74)				
Is original, comes up with new ideas*	3.84	0.77	0.51	0.69
Is curious about many different things*	4.42	0.64	0.46	0.70
Is ingenious, a deep thinker*	3.75	0.82	0.51	0.69
Is inventive*	3.79	0.82	0.52	0.68
Likes to reflect, play with ideas*	3.95	0.76	0.46	0.70
Is open to new experiences*	4.48	0.65	0.37	0.72

Note. \*Reverse-coded item.

### 3.2.2 Hardiness

In a previous study of CF members, internal consistency was low for one item of the Hardiness scale (“I don’t like to make changes to my everyday schedule”) (Thompson & Smith, 2002). However, the initial 11-item scale demonstrated excellent internal consistency in this sample of CF recruits (Cronbach’s alpha of .90), with scale items demonstrating an acceptable range of item-total correlations (Table 9).

**Table 9. Properties of Hardiness Scale**

Hardiness scale item (Cronbach's alpha = .90)	Mean	SD	Item-total correlation	Alpha if item deleted
Most of my life gets spent doing things that are worthwhile	2.74	0.80	0.58	0.89
Planning ahead can help avoid most future problems	2.97	0.88	0.53	0.90
Changes in routine are interesting to me	2.63	0.85	0.46	0.90
By working hard, you can always achieve your goals	3.26	0.93	0.76	0.88
I really look forward to my work	2.97	0.91	0.72	0.89
If I'm working on a difficult task I know when to seek help	2.98	0.85	0.65	0.89
Trying your best at work really pays off in the end	3.27	0.92	0.78	0.88
I know I can overcome whatever difficulties I am faced with	3.15	0.88	0.76	0.88
Most days I enjoy the challenges that life put my way	2.97	0.88	0.75	0.88

Hardiness scale item (Cronbach's alpha = .90)	Mean	SD	Item-total correlation	Alpha if item deleted
When I make plans I am certain they can work	2.75	0.81	0.65	0.89
I don't like to make changes in my everyday schedule*	3.03	0.80	0.32	0.91

Note. \*Reverse-coded item.

### 3.2.3 Mastery

The Mastery scale demonstrated a similar level of internal consistency in the present study (Cronbach's alpha of .79, see Table 10) to that of a previous study of CF members (Thompson & Smith, 2002). Also suggesting a high level of internal consistency, all item-total correlations were above .20.

**Table 10. Properties of Mastery Scale**

Mastery scale item (Cronbach's alpha = .79)	Mean	SD	Item-total correlation	Alpha if item deleted
You have little control over the things that happen to you	2.70	0.94	0.51	0.77
There is really no way you can solve some of the problems you have	2.89	0.98	0.64	0.74
There is little you can do to change many of the important things in your life	2.99	0.94	0.58	0.76
You often feel helpless in dealing with problems of life	2.98	0.93	0.64	0.74
Sometimes you feel that you are being pushed around in life	2.81	1.04	0.53	0.77
What happens in the future mostly depends on you*	3.34	0.82	0.34	0.80
You can do just about anything you really set your mind to*	3.42	0.77	0.41	0.79

Note. \*Reverse-coded item.

### 3.2.4 Personal Need for Structure

The PNS scale also achieved a similar level of internal consistency in this CF recruit population to that of a previous study of CF members (Thompson & Smith, 2002), with a Cronbach's alpha of .78 and an acceptable range of item-total correlations (see Table 11).

**Table 11. Properties of Personal Need for Structure (PNS) Scale**

PNS scale item (Cronbach's alpha = .78)	Mean	SD	Item-total correlation	Alpha if item deleted
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PNS scale item (Cronbach's alpha = .78)	Mean	SD	Item-total correlation	Alpha if item deleted
It upsets me to go into a situation without knowing what I can expect from it*	2.89	1.00	0.45	0.76
I am bothered by things that disrupt my daily routine*	2.63	0.95	0.53	0.75
I enjoy having a clear and structured mode of life*	3.58	0.93	0.47	0.76
I like a place for everything and everything in its place*	3.56	0.96	0.27	0.78
I like being spontaneous	2.13	0.87	0.32	0.77
I find that a well ordered life with regular hours makes life boring	2.89	1.09	0.32	0.77
I dislike situations that are uncertain*	2.97	0.98	0.52	0.75
I dislike changing my plans at the last minute*	3.08	1.08	0.43	0.76
I dislike being with people who are unpredictable*	2.84	1.02	0.38	0.77
I find that a consistent routine enables me to enjoy life more*	3.20	0.96	0.51	0.75
I enjoy the exhilaration of being put in unpredictable situations	2.32	0.92	0.45	0.76
I become uncomfortable when the rules in a situation are not clear*	3.64	0.92	0.36	0.77

Note. \*Reverse-coded item.

### 3.2.5 Positive and Negative Affect Schedule

Rated on a 5-point agreement scale rather than on the original rating scale, items of the PA and NA scales yielded high internal consistencies. As shown in Table 12, Cronbach's alphas were .82 for the PA scale and .89 for the NA scale. The PA scale demonstrated a slightly lower Cronbach's alpha and lower item-total correlations compared to the NA scale. Item-total correlations suggested that one item ("Excited") contributed to a lower internal consistency of the PA scale. The item was nevertheless retained, given that it demonstrated an item-total correlation greater than .20.

**Table 12.** Properties of Positive and Negative Affect Schedule (PANAS) Subscales

PANAS subscale item	Mean	SD	Item-total correlation	Alpha if item deleted
Positive affect (Cronbach's alpha = .82)				

PANAS subscale item	Mean	SD	Item-total correlation	Alpha if item deleted
Attentive*	3.95	0.68	0.41	0.81
Active*	4.04	0.73	0.48	0.81
Inspired*	3.69	0.86	0.49	0.81
Determined*	4.31	0.67	0.63	0.80
Enthusiastic*	4.09	0.78	0.63	0.79
Proud*	4.32	0.75	0.60	0.80
Alert*	3.84	0.78	0.52	0.80
Strong*	4.01	0.74	0.59	0.80
Interested*	4.15	0.68	0.59	0.80
Excited*	3.44	1.12	0.29	0.84
Negative affect (Cronbach's alpha = .89)				
Jittery*	2.34	0.95	0.45	0.89
Afraid*	1.99	0.90	0.70	0.87
Ashamed*	1.79	0.88	0.65	0.88
Nervous*	2.62	1.03	0.61	0.88
Irritable*	2.38	0.97	0.56	0.88
Guilty*	1.81	0.90	0.63	0.88
Scared*	1.95	0.98	0.71	0.87
Hostile*	1.78	0.88	0.54	0.88
Distressed*	2.07	0.97	0.68	0.87
Upset*	2.01	0.95	0.70	0.87

### 3.2.6 Revised Life Orientation Test

The internal consistency of the 7-item version of the LOT-R examined in Thompson and Smith's (2002) study of CF members was computed. As shown in Table 13, this version of the scale yielded an adequate alpha of .71, although one item yielded a low item-total correlation ("I don't get upset easily"). However, respondents' ratings of this "filler" item were not initially intended to be included in the computation of total LOT-R scores (Scheier and Carver, 1985). Removal of this item not surprisingly resulted in an improved alpha of .74, as well as adequate item-total correlations.

**Table 13. Properties of Revised Life Orientation Test (LOT-R)**

LOT-R scale item	Mean	SD	Item-total correlation	Alpha if item deleted
LOT-R (Cronbach's alpha = .71)				
In uncertain times, I usually expect the best*	3.53	0.95	0.32	0.70
If something can go wrong, it will	3.33	1.02	0.45	0.67
I'm always optimistic about the future*	3.89	0.90	0.44	0.67
I hardly ever expect things to go my way	3.44	1.02	0.53	0.65
I don't get upset easily*	3.72	1.00	0.15	0.74
I rarely count on good things happening to me	3.55	1.03	0.59	0.63
Overall, I expect more good things to happen to me than bad*	3.92	0.92	0.51	0.66
Revised LOT-R (Cronbach's alpha = .74)				
In uncertain times, I usually expect the best*	3.53	0.96	0.31	0.75
If something can go wrong, it will	3.33	1.02	0.45	0.72
I'm always optimistic about the future*	3.89	0.90	0.43	0.72
I hardly ever expect things to go my way	3.44	1.02	0.55	0.68
I rarely count on good things happening to me	3.55	1.03	0.63	0.66
Overall, I expect more good things to happen to me than bad*	3.92	0.92	0.52	0.70

Note. \*Reverse-coded item.

### 3.2.7 Self-Esteem

Little is documented about the psychometric properties of the self-esteem scale other than its factor structure in the studies reviewed previously (Pearlin & Schooler, 1978). However, this scale demonstrated a Cronbach's alpha of .86 as well as an acceptable range of item-total correlations, suggesting that internal consistency holds in the CF recruit population (Table 14).

**Table 14. Properties of Self-Esteem Scale**

Self-Esteem scale item (Cronbach's alpha = .86)	Mean	SD	Item-total correlation	Alpha if item deleted
You feel that you have a number of good qualities*	3.57	0.58	0.63	0.84
You feel that you're a person of worth at least equal to others*	3.50	0.69	0.66	0.83

Self-Esteem scale item (Cronbach's alpha = .86)	Mean	SD	Item-total correlation	Alpha if item deleted
You are able to do things as well as most other people*	3.39	0.73	0.71	0.82
You take a positive attitude toward yourself*	3.27	0.80	0.74	0.82
On the whole you are satisfied with yourself*	3.25	0.78	0.70	0.82
All in all, you're inclined to feel you're a failure	3.43	0.84	0.48	0.87

Note. \*Reverse-coded item.

### 3.2.8 Toronto Alexithymia Scale

The TAS-20 emerged as the most problematic dispositional scale. Cronbach's alpha values exceeded the threshold for acceptability for two subscales (Difficulty Describing Feelings and Difficulty Identifying Feelings) (Table 15). However, the subscale assessing Externally-Oriented Thinking yielded an alpha of only .55. One reverse-scored item demonstrated an item-total correlation of less than .20 ("Looking for hidden meanings in movies or plays distracts from their enjoyment"). However, deletion of this item from the scale did not result in a greater Cronbach's alpha value.

**Table 15.** Properties of Toronto Alexithymia Scale (TAS) Subscales

TAS subscale	Mean	SD	Item-total correlation	Alpha if item deleted
Difficulty describing feelings (Cronbach's alpha = .78)				
It is difficult for me to find the right words for my feelings*	2.61	1.24	0.65	0.71
I am able to describe my feelings easily	2.69	1.21	0.46	0.77
I find it hard to describe how I feel about people*	2.52	1.18	0.59	0.73
People tell me to describe my feelings more*	2.44	1.21	0.54	0.75
It is difficult for me to reveal my innermost feelings, even to close friends*	2.64	1.35	0.55	0.74
Difficulty identifying feelings (Cronbach's alpha = .87)				
I am often confused about what emotion I am feeling*	2.27	1.13	0.65	0.84
I have physical sensations that even doctors don't understand*	1.52	0.90	0.52	0.86
When I am upset, I don't know if I am sad, frightened, or angry*	2.24	1.13	0.65	0.84
I am often puzzled by sensations in my body*	1.88	1.03	0.61	0.85

TAS subscale	Mean	SD	Item-total correlation	Alpha if item deleted
I have feelings that I can't quite identify*	2.19	1.16	0.70	0.84
I don't know what's going on inside me*	1.92	1.06	0.73	0.83
I often don't know why I am angry*	1.84	1.03	0.59	0.85
Externally-oriented thinking (Cronbach's alpha = .55)				
I prefer to analyze problems rather than to just describe them	2.37	0.98	0.21	0.53
I prefer to just let things happen rather than to understand why they turn out that way*	2.51	1.12	0.23	0.53
Being in touch with emotions is essential	2.13	1.01	0.41	0.47
I prefer talking to people about their daily activities rather than their feelings*	2.99	1.20	0.31	0.50
I prefer to watch "light" entertainment shows rather than psychological dramas*	2.95	1.22	0.22	0.53
I feel close to someone, even in moments of silence	2.22	1.07	0.20	0.54
I find examination of my feelings useful in solving personal problems	2.46	1.04	0.37	0.48
Looking for hidden meanings in movies or plays distracts from their enjoyment*	2.56	1.21	0.18	0.55

Note. \*Reverse-coded item.

### 3.3 Social Environmental Indices

Compared to psychological condition scales and dispositional indices, more problems arose with social environmental indices. In some cases, little information was available on related scoring methodologies (i.e., items assessing childhood neglect and items assessing exposure to violence drawn from the U.S. Army's RAP [Hyams et al., 2002]). Internal consistency of these items was nevertheless examined, based on the assumption that total scores might be computed and used as indices for respective sets of items.

#### 3.3.1 Adverse Childhood Experiences (ACE) Items

In accordance with scoring specifications of previous studies (Cabrera et al., 2007; Gahm et al., 2007), internal consistency of the six rescaled items on childhood adversity was examined. In contrast to previous observations (Gahm et al., 2007), the Childhood Adversity scale yielded a KR-20 of only .59 in the present study. In particular, the item-total correlation associated with the item on childhood sexual assault was below the acceptable threshold. However, removal of this item did not sufficiently improve the level of internal consistency.

Despite the lack of information available on the use of the remaining two items on childhood neglect in a scale, internal consistency of these two items was explored, and was found to be adequate (Cronbach's alpha of .76) (Table 16). Given the nature of these items, it is worth pointing out that higher scores on this scale would in actuality indicate that respondents experienced *less* rather than more neglect during childhood.

**Table 16. Properties of Adverse Childhood Experiences Items**

Adverse Childhood Experiences subscale items	% Yes	% No	Item-total correlation	KR-20 if item deleted
Childhood adversity (KR-20 = .59)				
How often did a parent or adult living in your home swear at you, insult you, or put you down	58	42	0.43	0.50
How often did a parent or other adult living in your home push, grab, shove, slap, or throw something at you	40	60	0.46	0.48
How often did a parent or other adult living in your home push, grab, shove, slap, or throw something at each other	23	77	0.47	0.49
How often did an adult ever touch you sexually or try to make you touch them sexually	4	96	0.12	0.61
Did you live with someone who was depressed or mentally ill	12	88	0.20	0.60
Did you live with someone who was a problem drinker or alcoholic	16	84	0.27	0.57
Childhood neglect (Cronbach's alpha = .76)				
	Mean	SD	Item-total correlation	Alpha if item deleted
There was someone to take care of you and protect you	4.47	0.92	0.61	--
You felt loved	4.41	0.92	0.61	--

### 3.3.2 Exposure to Violence Scale

Seven items on exposure to violence, also drawn from the RAP (Hyams et al., 2001), were subjected to an analysis of internal consistency to determine the appropriateness of including them in a composite index of Exposure to Violence (on which higher scores would reflect greater exposure to violence). A KR-20 of .58 was observed, suggesting that the items were not reliably measuring a single underlying construct (Table 17). Reminiscent of analyses carried out on the Childhood Adversity scale, one item pertaining to the previous experience

of a rape demonstrated a low item-total correlation. Removal of this item did not sufficiently improve the level of internal consistency of this scale.

**Table 17. Properties of Exposure to Violence Scale**

Exposure to Violence scale item (KR-20 = .59)	% Yes	% No	Item-total correlation	KR-20 if item deleted
You were in an accident where you could have been killed but were not badly hurt	40	60	0.34	0.54
You were in an accident where you were injured and had to spend at least one night in the hospital	12	88	0.20	0.58
You saw a close family member being badly injured or killed	19	81	0.28	0.56
You saw a stranger being badly injured or killed	27	73	0.41	0.50
You were seriously attacked, beaten up, or assaulted	13	87	0.37	0.53
You were threatened with a knife, gun, club, or other weapon	23	77	0.42	0.50
You were raped (someone forced you to have sex when you did not want them to)	3	97	0.07	0.60

### 3.3.3 Negative Life Events Scale

By contrast to the Childhood Adversity and Exposure to Violence scales, the 50-item Negative Life Events scale demonstrated adequate internal consistency (KR-20 of .77). Several items yielded an item-total correlation below .20, although removing these items did not further improve internal consistency (Table 18). Items with low item-total correlations tended to be those that were least frequently reported.

**Table 18. Properties of Negative Life Events Scale**

Negative Life Events scale item (KR-20 = .77)	% Yes	% No	Item-total correlation	KR-20 if item deleted
Failed a course	24	76	0.25	0.77
Expected to work more	23	77	0.23	0.77
Downgraded or demoted at work	1	99	0.06	0.77
Was fired or laid off	11	89	0.32	0.76
Had problems finding a good job	20	80	0.23	0.77
Had trouble with boss or coworkers	9	91	0.26	0.77
Had sudden, serious problems with vision or hearing	1	99	0.14	0.77
Had significant weight gain	3	97	0.18	0.77
Had problems sleeping	15	85	0.22	0.77
Had surgery	7	93	0.18	0.77
Became pregnant (women only)	1	99	0.06	0.77
Had miscarriage (women only)	< 1	100	0.05	0.77
Had abortion (women only)	< 1	100	0.07	0.77
Girlfriend/wife became pregnant (men only)	4	96	0.13	0.77
Girlfriend/wife had miscarriage (men only)	1	99	0.13	0.77
Girlfriend/wife had abortion (men only)	1	99	0.16	0.77
Had serious illness or injury	2	98	0.23	0.77
Had frequent colds, influenza	5	95	0.16	0.77
Had a psychiatric or emotional problem	2	98	0.19	0.77
Was concerned that your partner may have had a sexually transmitted disease	3	97	0.15	0.77
Was victim of auto accident, fire, flood, vandalism	13	87	0.27	0.77
Had your home robbed or car stolen	6	94	0.24	0.77
Was robbed, threatened, or physically assaulted	7	93	0.33	0.77
Was raped	1	99	0.13	0.77
Was found guilty of a traffic violation (except a parking ticket)	13	88	0.19	0.77

Negative Life Events scale item (KR-20 = .77)	% Yes	% No	Item-total correlation	KR-20 if item deleted
Was arrested by police	5	95	0.25	0.77
Was convicted of a criminal offence	2	98	0.15	0.77
Had major unexpected expense (e.g., car, housing)	13	88	0.26	0.77
Decreased income	18	82	0.23	0.77
Had problems with debts (e.g., credit cards, loans, mortgage)	12	88	0.24	0.77
Had more arguments with your partner/spouse/boyfriend or girlfriend	11	89	0.29	0.77
Had sexual difficulties	2	98	0.16	0.77
Learned that your boyfriend/girlfriend/spouse/partner had been unfaithful	7	94	0.34	0.76
Had an affair	7	94	0.31	0.77
Had a breakup of serious relationship	16	85	0.34	0.76
Boyfriend/girlfriend/spouse/partner had emotional or psychiatric problem, drank heavily or arrested	3	98	0.23	0.77
Partner was raped/physically attacked or threatened	2	98	0.24	0.77
Close friend moved to another city or area	22	78	0.28	0.77
Parents divorced or separated	10	90	0.28	0.77
Close family member entered a nursing home	3	97	0.12	0.77
A parent died	4	97	0.14	0.77
Another close family member died	13	87	0.16	0.77
A friend died	11	89	0.31	0.77
Family member or friend developed a serious illness or was seriously injured	13	88	0.26	0.77
Family member or close friend was drinking heavily, suicidal or in prison	7	94	0.27	0.77
Had a quarrel with a relative, friend, neighbour or roommate	14	86	0.36	0.76
A pet died	13	88	0.26	0.77
Family member or friend was raped	2	98	0.31	0.77
A family member or friend was robbed	4	96	0.31	0.77

Negative Life Events scale item (KR-20 = .77)	% Yes	% No	Item-total correlation	KR-20 if item deleted
Had a "falling out" with a close personal friend	12	88	0.33	0.76

### 3.3.4 Social Support Survey

Finally, analyses of internal consistency were performed on the overall MOS SSS functional social support index, as well as MOS SSS subscales. Consistent with previous work (Sherbourne & Stewart, 1991), the functional social support index yielded a high Cronbach's alpha of .97 (Table 19). Coefficients of the MOS SSS subscales were .89 for Affectionate Support, .95 for Emotional/Informational Support, .91 for Positive Social Interaction, and .87 for Tangible Support (Table 20). Item-total correlations were high for all respective scale items, further suggesting that the functional social support index and the MOS SSS subscales have good internal consistency.

**Table 19. Properties of Social Support Survey (SSS) Overall Functional Social Support Index**

SSS item (Cronbach's alpha = .97)	Mean	SD	Item-total correlation	Alpha if item deleted
Someone to help you if you were confined to bed	3.88	1.29	0.63	0.97
Someone you can count on to listen to you when you need to talk	4.33	1.01	0.77	0.96
Someone to give you advice about a crisis	4.20	1.06	0.77	0.97
Someone to take you to the doctor if you needed it	4.20	1.13	0.70	0.97
Someone who shows you love and affection	4.41	1.00	0.77	0.97
Someone to have a good time with	4.48	0.84	0.74	0.97
Someone to give you information in order to help you understand a situation	4.13	0.98	0.80	0.96
Someone to confide in or talk to about your problems	4.32	1.03	0.84	0.96
Some who hugs you	4.06	1.29	0.75	0.97
Someone to get together with for relaxation	4.31	0.97	0.79	0.96
Someone to prepare your meals if you were unable to do it yourself	4.17	1.13	0.72	0.97
Someone whose advice you really want	4.11	1.08	0.80	0.96
Someone to do things with to help get your mind off things	4.25	0.97	0.79	0.96
Someone to help with daily chores if you were sick	4.05	1.18	0.76	0.97
Someone to share your most private worries and fears with	4.05	1.27	0.81	0.96

SSS item (Cronbach's alpha = .97)	Mean	SD	Item-total correlation	Alpha if item deleted
Someone to turn to for suggestions about how to deal with a personal problem	4.15	1.13	0.85	0.96
Someone to do something enjoyable with	4.42	0.88	0.79	0.97
Someone who understands your problems	4.14	1.09	0.83	0.96
Someone to love and make you feel wanted	4.24	1.17	0.75	0.97

**Table 20. Properties of Social Support Survey (SSS) Subscales**

SSS subscale	Mean	SD	Item-total correlation	Alpha if item deleted
Affectionate support (Cronbach's alpha = .91)				
Someone who shows you love and affection	4.46	0.85	0.81	0.88
Someone who hugs you	4.29	0.98	0.80	0.89
Someone to love and make you feel wanted	4.39	0.90	0.85	0.84
Emotional/informational support (Cronbach's alpha = .95)				
Someone you can count on to listen to you when you need to talk	4.31	1.03	0.78	0.95
Someone to give you advice about a crisis	4.17	1.07	0.79	0.95
Someone to give you information in order to help you understand a situation	4.12	0.98	0.80	0.95
Someone to confide in or talk to about your problems	4.31	1.03	0.88	0.94
Someone whose advice you really want	4.09	1.08	0.80	0.95
Someone to share your most private worries and fears with	4.02	1.29	0.81	0.95
Someone to turn to for suggestions about how to deal with a personal problem	4.14	1.13	0.89	0.94
Someone who understands your problems	4.12	1.09	0.84	0.94
Positive social interaction (Cronbach's alpha = .89)				
Someone to have a good time with	4.39	1.00	0.80	0.85
Someone to get together with for relaxation	4.02	1.30	0.80	0.85
Someone to do something enjoyable with	4.22	1.18	0.80	0.84
Tangible support (Cronbach's alpha = .87)				

SSS subscale	Mean	SD	Item-total correlation	Alpha if item deleted
Someone to help you if you were confined to bed	3.85	1.31	0.70	0.85
Someone to take you to the doctor if you needed it	4.17	1.16	0.71	0.85
Someone to prepare your meals if you were unable to do it yourself	4.15	1.14	0.76	0.83
Someone to help with daily chores if you were sick	4.03	1.19	0.75	0.83

## 4. Discussion and Recommendations

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In summary, a brief review of the literature reveals that computation and scoring methodologies of the scales/subscales found in the RHQ are generally clear and well-established. Furthermore, most measures have demonstrated adequate internal consistency in either civilian samples, military samples, or both. Noted exceptions include the ACE and Exposure to Violence items taken from the RAP. More specifically, little is documented about the psychometric properties of items measuring previous childhood neglect and exposure to violence other than their test-retest reliability (Young et al., 2004).

Of greater importance, the vast majority of psychological scales of the RHQ demonstrated good internal consistency when applied to CF recruits. Table 21 presents an overview of internal consistency coefficients for all scales and subscales, as observed in previous studies of either civilians or military personnel and in the current study. As shown in the Table, scales demonstrating low to modest internal consistency in CF recruits were the exception. These included some subscales of the PCL-C and TAS-20, as well as the PHQ-15, the Childhood Adversity scale and the Exposure to Violence scale. Findings pertaining to each of these scales are discussed below along with implications for future research.

**Table 21.** Summary of Cronbach's Coefficients Yielded by RHQ Psychological Scales in the Current and in Previous Studies

Scale/subscale	Civilian population	Other military population	CF population	CF recruits
PHQ-9	.86-.89 (Kroenke et al., 2001)	.89 (Smith et al., 2007)		.80
PHQ OAD scale		.75 (Smith et al., 2007)		.74
PHQ panic disorder scale		.76 (Smith et al., 2007)		.78
PHQ-15	.79-.80 (Interian et al, 2006, Kroenke et al., 2002)	.76 (Smith et al., 2007)		.68
<b>PCL-C</b>				
Total PCL-C	.94 (Blanchard et al., 1996; Ruggiero et al., 2003)	.94 (Smith et al., 2007)		.89
Criterion B	.85-.94 (Blanchard et al., 1996; Ruggiero et al., 2003)			.77
Criterion C	.82-.85 (Blanchard et al., 1996; Ruggiero et al., 2003)			.74
Criterion D	.84-.87 (Blanchard et al., 1996; Ruggiero et al., 2003)			.64
<b>BFI</b>				
Agreeableness	.79 (John & Srivastava, 1999)		.77 (Thompson & Smith, 2002)	.72
Conscientiousness	.82 (John & Srivastava,		.79 (Thompson & Smith,	.81

Scale/subscale	Civilian population	Other military population	CF population	CF recruits
	1999)		2002)	
Extroversion	.88 (John & Srivastava, 1999)		.84 (Thompson & Smith, 2002)	.83
Neuroticism	.84 (John & Srivastava, 1999)		.79 (Thompson & Smith, 2002)	.80
Openness (revised)			.73 (Thompson & Smith, 2002)	.74
Hardiness scale			.77 (Thompson & Smith, 2002)	.90
Mastery scale			.78 (Thompson & Smith, 2002)	.79
PNS scale			.78 (Thompson & Smith, 2002)	.78
PANAS				
Negative affect	.84-.87 (Watson et al., 1988)			.89
Positive affect	.86-.90 (Watson et al., 1988)			.82
LOT-R	.78 (Scheier et al., 1994)		.81 (Thompson & Smith, 2002)	.74
Self-esteem scale				.86
TAS-20				
Difficulty describing feelings	.75 (Bagby et al., 1994)			.77

Scale/subscale	Civilian population	Other military population	CF population	CF recruits
Difficulty identifying feelings	.78-.81 (Bagby et al., 1994)			.87
Externally-oriented thinking	.64-.66 (Bagby et al., 1994)			.53
ACE items				
Childhood adversity scale		.74 (Gahm et al., 2007)		.59
Childhood neglect scale				.76
Exposure to Violence scale				.58
Negative Life Events scale				.77
SSS				
Overall functional social support index	.97 (Sherbourne & Stewart, 1991)			.97
Affectionate support	.91 (Sherbourne & Stewart, 1991)			.89
Emotional/informational support	.96 (Sherbourne & Stewart, 1991)			.95
Positive social interaction	.94 (Sherbourne & Stewart, 1991)			.91
Tangible support	.92 (Sherbourne & Stewart, 1991)			.87

## 4.1 PHQ Somatic Symptoms Scale

In contrast to previous studies (Interian et al., 2006; Kroenke et al., 2002; Smith et al., 2007), the PHQ-15 displayed marginal internal consistency in this sample of CF recruits. Two items yielded item-total correlations inferior to .20. However, removing these items from the scale did not result in a higher Cronbach's alpha value. Two important differences between the current sample of CF recruits and samples of previous validation studies of the PHQ-15 might account for these observations.

A first concern relates to the greater proportion of men in the CF recruit population relative to samples in previous studies (e.g., Kroenke et al., 2002). For instance, a large part of the validation for the PHQ-15 in civilian samples was carried out in female patients at Obstetrics-Gynecology clinics. Thus, certain items may have posed fewer problems in that context (i.e., "Menstrual cramps or other problems with your period"). Still, the PHQ-15 achieved an adequate level of internal consistency in a large U.S. military sample (Smith et al., 2007).

A second, more likely contributing factor might entail differences in health status between CF recruits and samples in previous studies (e.g., Interian et al., 2006; Kroenke et al., 2002; Smith et al., 2007). Specifically, participants of studies carried out in civilians were approached in a primary care setting and were thus at greater risk of experiencing health problems when they completed the scale (Kroenke et al., 2002). Participants of one study carried out in a large military cohort had a wider age range and a history of deployment (Smith et al., 2007). Therefore, a higher number of health problems could also be expected in this sample compared to recruits.

Nevertheless, it should be emphasized that the Cronbach's coefficient yielded by the PHQ-15 fell only slightly below the criterion for adequate internal consistency. In its present form, this scale may still be of some value to assess somatic symptoms in the CF. Removing items with low item-total correlations would not only fail to improve internal consistency of the scale; doing so would also interfere with the use of established and validated cutoff scores to identify recruits with somatic symptoms of low-, medium-, and high-level severity (Kroenke et al., 2002). Moreover, because the PHQ-15 is a type of symptom checklist, establishing internal consistency of this tool is not as critical as it would be for measures assessing constructs of a more abstract or theoretical nature (e.g., dimensions of personality, cognitive styles, or belief sets). In light of these considerations, it would seem reasonable to retain the PHQ-15 in its present form in the RHQ.

## 4.2 Posttraumatic Stress Disorder Checklist–Civilian Version

While internal consistencies of the total PCL-C as well as symptom cluster B and C subscales were adequate, internal consistency of the PCL-C symptom cluster D subscale was limited. This finding could relate to the limited factorial validity of the PCL-C. More specifically, past studies have suggested that four rather than three factors underlie the PCL-C. The first two factors include items that reflect symptom clusters B and C. However, rather than falling onto a single factor, items that reflect symptom cluster D fall into two separate factors (arousal and numbing dimensions) (Schinka, Brown, Borenstein, & Mortimer, 2007).

Despite the poor internal consistency of the symptom cluster D subscale and potentially unstable factorial structure of the PCL-C, both the total score and symptom cluster approaches have reliably (although to varying degrees) identified cases of PTSD in previous studies. Moreover, the limited internal consistency of symptom cluster D subscale is not sufficient to detract from using the symptom cluster method of scoring, since this method of scoring does not require the computation of a composite score. Until the preferred scoring approach can be identified for use in the CF recruit population, it may be best to examine probable rates of PTSD using both approaches.

### **4.3 Toronto Alexithymia Scale**

The adequate internal consistency of the Difficulty Describing Feelings and Difficulty Identifying Feelings TAS-20 subscales, and poor internal consistency of the Externally-Oriented Thinking TAS-20 subscale is in line with past studies carried out in civilian populations (Taylor, Bagby, & Parker, 2003). Further analysis of the latter subscale revealed items with item-total correlations below .20, and removal of each of these items did not result in greater Cronbach's alpha values. It is also unlikely that this observation relates to a limited factorial validity the TAS-20, since its hypothesized three-factor structure (i.e., Difficulty Describing Feelings, Difficulty Identifying Feelings, and Externally-Oriented Thinking) has been replicated across a wide range of samples (Taylor et al., 2003). One possibility is that the construct of Externally-Oriented Thinking itself has limited validity. At face value, items of the scale seem to reflect multiple themes, including one's preference for analytical thought and one's level of comfort with emotional states. While these themes may be related, they may simply not represent a single construct. It may help to revisit the construct of Emotionally-Oriented Thinking and refine this subscale accordingly.

Notwithstanding the limited internal consistency of this subscale, the TAS-20 is considered to have the most promise as a measure of alexithymia (Taylor, Bagby, & Luminet, 2000). Until a more appropriate alternative can be identified, it will be necessary to acknowledge this limitation in the interpretation of analyses involving this subscale. It should also be noted that the rationale for including the TAS-20 in the RHQ was the hypothesized link between alexithymia and somatic symptoms. Previous research has found that physical symptoms are most frequently associated with Difficulty Describing Feelings and Difficulty Identifying Feelings (Taylor et al., 2000). Therefore, the Externally-Oriented Thinking subscale may not be essential for future studies involving RHQ data.

### **4.4 Adverse Childhood Experiences (ACE) Items**

Derived from the ACE items of the U.S. Army's RAP tool, the Childhood Adversity scale demonstrated low internal consistency according to the KR-20 coefficient. One item on childhood sexual abuse yielded a low item-total correlation. However, removing this item from the scale did not sufficiently increase KR-20.

By contrast, this scale was found to be reliable in a sample of U.S. Army recruits (Gahm et al., 2007). It is not clear why results differed in CF recruits. One possibility is that inaccurate reporting of adverse childhood events compromised the internal consistency of this scale. Indeed, results of a previous study examining the effects of confidentiality on reporting of childhood victimization in U.S. Navy recruits suggested that underreporting of

victimization is fairly common in surveys containing identifying information (Olson, Stander, & Merrill, 2004).

#### **4.5 Exposure to Violence Scale**

Perhaps also for reasons stated above, the Exposure to Violence scale demonstrated low internal consistency. Item-total correlations similarly pointed to difficulties with one item on the past experience of a rape. Not surprisingly, previous evaluations of ACE and Exposure to Violence items have found items related to sexual abuse to be particularly problematic. Specifically, Young et al. (2004) observed a low level of agreement between responses to the question “How often did an adult ever touch you sexually or try to make you touch them sexually?” and the item, “You were raped.” The former was also among those questions that participants of the RAP most frequently skipped or chose not to answer.

Taken with observations made in the current study, these findings emphasize the need to exercise caution in using ACE and Exposure to Violence items to estimate the prevalence of previous adverse experiences in CF recruits. There may still be value in including such items in the RHQ, however. Indeed, findings of two studies pointed to adverse childhood experiences as a key predictor of psychopathology in previous research on military personnel (Chapin, 2004; Gahm et al., 2007).

In order to overcome problems with the internal consistency of the Childhood Adversity and Exposure to Violence scales, one option is to perform analyses on an item by item basis rather than on the entire scales. It might also be useful to carry out additional work to assess the dimensionality of these scales and determine whether subscales might better represent them.

## 5. Conclusion

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In conclusion, this report provides an overview of some psychometric properties of psychological scales of the RHQ in both civilian and military populations, and further documents their internal consistency in CF recruits. Evaluating the structural validity of the PCL-C and TAS-20 might prove to be a useful next step in preparation for future multivariate and prospective analyses of data of the RHQ. Nevertheless, the high internal consistencies demonstrated by most scales in the RHQ provide support for its use as a reliable and useful tool to assess various psychological conditions, as well as key dispositional and social environmental factors shaping health in the CF recruit population.

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The Recruit Health Questionnaire (RHQ) is a paper and pencil measure that was developed to gather general background information and assess current health status and practices among Canadian Forces (CF) recruits. This report documents the scoring methodology of psychological scales of the RHQ, presents a brief review of the literature on their psychometric properties in civilian and military populations, and further examines these properties in the CF recruit population. Psychometric analyses were performed on data from 1,120 CF recruits (68% non-commissioned member [NCM] and 32% Officer candidates) who completed the RHQ in their first week of Basic Training in 2003. The internal consistency of each scale was evaluated by examining Cronbach's alpha or Kuder-Richardson formula 20 coefficients, as well as item-total correlations. While all psychological scales included in the RHQ have been deemed psychometrically sound in previous research, a small number of these demonstrated marginal or low internal consistency when applied to the CF recruit population (e.g., subscales of the Posttraumatic Stress Disorder Checklist-Civilian Version and the 20-item Toronto Alexithymia scale, as well as the Patient Health Questionnaire 15-item somatic symptoms scale, the Childhood Adversity scale and the Exposure to Violence scale). Nevertheless, the vast majority of psychological scales demonstrated high internal consistency, indicating that the RHQ is a reliable tool to assess psychosocial aspects of health among CF recruits.

Le Questionnaire sur la santé des recrues (QSR) est un outil papier et crayon qui vise à recueillir des renseignements généraux sur les recrues des Forces canadiennes (FC) et à évaluer leur état de santé et leurs pratiques en matière de santé à l'heure actuelle. Le présent rapport expose la méthode de cotation des échelles psychologiques du QSR, résume brièvement les études publiées sur leurs propriétés psychométriques dans les populations civiles et militaires et jette un regard approfondi sur ces propriétés chez les recrues des FC. On a mené des analyses psychométriques des données portant sur 1 120 recrues des FC (68 % étaient des militaires de rang [MR] et 32 %, des candidats au grade d'officier) ayant rempli le QSR la première semaine de leur instruction de base en 2003. On a examiné la cohérence interne de chaque échelle en évaluant le coefficient alpha de Cronbach, le coefficient KR 20 (formule de Kuder Richardson) ainsi que les corrélations élément total. Bien que toutes les échelles psychologiques incorporées dans le QSR aient été jugées psychométriquement valides dans des recherches antérieures, un faible nombre d'entre elles ont présenté une cohérence interne marginale ou faible lorsqu'elles étaient appliquées à la population des recrues des FC (p. ex., sous échelles de la liste de vérification de l'état de stress post traumatique [ESPT] – population civile et de l'échelle d'alexithymie de Toronto à 20 points, échelle d'évaluation de la gravité des symptômes physiques PHQ 15, échelle d'adversité durant l'enfance, échelle d'exposition à la violence). Cependant, la vaste majorité des échelles psychologiques ont présenté une grande cohérence interne, ce qui porte à croire que le QSR est un outil fiable pour évaluer les aspects psychosociaux de la santé chez les recrues des FC.

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