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RESEARCH ARTICLE

# Posttraumatic Stress Disorder among Danish Soldiers 2.5 Years after Military Deployment in Afghanistan: The Role of Personality Traits as Predisposing Risk Factors

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Understanding the development of posttraumatic stress disorder (PTSD) implicates research regarding factors besides the preceding traumatic event. This study investigated the influence of predisposing personality traits on development of PTSD in a group of Danish Soldiers deployed to Afghanistan ( $N = 445$ ). Using a prospective design data was collected using questionnaires including the NEO Five Factor Inventory and the Posttraumatic Stress Disorder Checklist. The results showed a PTSD-prevalence of 9.2% in the total sample 2.5 years after homecoming. Using Kruskal-Wallis, Mann-Whitney U, and Spearman's rho significant relationships were identified between pre-existing personality traits of neuroticism and agreeableness with development of PTSD symptoms 2.5 years after homecoming, however, a number of additional cofounders were identified.

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**Keywords:** PTSD; risk factors; personality traits; resilience; soldiers

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A traumatic experience of a certain severity is a preceding causality for the development of posttraumatic stress disorder (PTSD; American Psychiatric Association, 2000). However, empirical data rejects that the trauma experience can be regarded as the only leading etiological factor in the development of PTSD as a certain degree of individualization seems to influence the development of the disorder as well (Johnson & Thompson 2008; McFarlane, 1988a; McFarlane, 1988b; McFarlane & Papay, 1992). This is emphasized by epidemiological surveys, which show that 74% of women and 81% of men in the general population will experience at least one traumatic experience over the lifespan, which can potentially result in the development of PTSD. However only a minority of people develop PTSD. In fact, there is a lifetime prevalence of PTSD of 7% among the general European population (Bomyea, Risborough, & Lang, 2012). This fact together with various empirical findings (e.g., Brewin, Andrews, & Valentine, 2000; Ozer, Best, Lipsey, & Weiss, 2003) indicates that some people may be more vulnerable than others to the development of PTSD.

Clarification of factors playing a key role in the development of PTSD may contribute to further knowledge regarding the complex interaction of different variables

in the etiology of the disorder. Previous studies have identified pre-, per-, and post-trauma variables as being of great importance in addition to the traumatic event itself including past history of trauma and psychological problems, childhood adversities including violence in the home, gender, age, educational level, social support and so on (e.g., Berntsen et al., 2012; Brewin et al., 2000; Iversen et al., 2008; Ozer et al., 2003; Riddle, Sanders, Jones, & Webb, 2007). Personality traits have also been found to play an essential role regarding individual differences in the development of PTSD (e.g., Fauerbach, Lawrence, Schmidt, Munster, & Costa, 2000; Schnurr, Lunney, & Sengupta, 2004). Personality traits are traditionally conceptualized as dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings and actions across developmental periods and contexts (Costa & McCrae, 2003). One of the most popular and globally used structural personality models is the five-factor model of personality (Costa & McCrae, 1992). This model consists of five personality dimensions: neuroticism, extraversion, agreeableness, conscientiousness, and openness to experience. Research suggests that the traits described in the 'Big Five' are genetically based (Bouchard & McGue, 2003; Ožura, Ihan, & Musek, 2012).

A high score within the personality dimension of neuroticism in particular has been identified as playing a role in the development of PTSD (e.g., Fauerbach et al., 2000; Hyer et al., 1994; Ribbi, Vollrath, Sennhauser, Gnehm, & Landolt, 2007; Rubin, Berntsen, & Bohni, 2008; Talbert, Braswell, Albrecht, Hyer, & Boudewyns, 1993). The personality traits of neuroticism indicate a tendency to

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react with strong emotions to adverse events. For those who are extremely vulnerable, which in the case of neuroticism equals a high score within the trait, a smaller amount of stress or trauma is needed for mental disturbances to appear.

The relation between personality traits and PTSD is not restricted to having a one-way effect of personality traits on the development of PTSD. A diagnostic category (F62) of enduring personality change after a catastrophic experience is included in the International Classification of Diseases 10 (World Health Organisation, 1993). This fact complicates research in the influence of personality traits on the development of PTSD since baseline data obtained before the traumatic event is essential to be able to differentiate the personality profile from the influence of the traumatic event. However, because of the unexpected nature of traumatic events most studies have no measurements of preexisting factors, including personality traits, before the traumatic event making it difficult to establish a baseline (Bensimon, 2012). As a result, this complicates the research for determining the influence of individualization in the development of PTSD.

The methodological problems caused by the unexpected nature of trauma and the subsequent problems associated with lacking accurate baseline data can be moderated in prospective studies by including people who work in certain types of high-risk occupations. Soldiers deployed for service in war zones belong to one of the occupational groups that contrast with other victims of trauma, as they are expected to be exposed to stressful situations involving actual and threatened death with the possibility of suffering serious injury. Stressful situations like these put deployed soldiers at high risk of developing PTSD according to the diagnostic criteria (DSM 5, American Psychiatric Association, 2013).

A recent study (named the USPER study) of 746 Danish soldiers introduced a unique opportunity to study the pre-, per-, and post-traumatic factors interacting in the development of PTSD due to six measurement waves of PTSD symptoms together with other measures of health and risk factors before, during and after deployment to Afghanistan (Andersen, Karstoft, Bertelsen, & Madsen, 2014; Berntsen et al., 2012; Danish Defence, 2013). This particular number of waves of measurement is unique and rare in the literature of the last 30 years of PTSD research. Accessing these data, the present study statistically analyzes the hypothesis based on previous research, that pre-existing personality traits are significant in the development of PTSD. Other risk factors are also included in the analysis.

## Method

### *Analysis sample and study design*

746 Danish soldiers belonging to one of the Danish Contingents of the International Security Assistance Force (ISAF) deployed to Afghanistan volunteered to answer questionnaires regarding symptoms of PTSD together with other measures of health and risk factors on six waves of measurement before, during, and after deployment to Afghanistan. All respondents had been deployed

to Afghanistan for a six month period including three weeks leave midway through the deployment (Andersen et al., 2014; Berntsen et al., 2012; Danish Defence, 2013).

The present analysis included the group of soldiers ( $n = 445$  including 5% females) from the data set ( $N = 746$ ), who answered both the NEO Five Factor Inventory (NEO FFI) and the Posttraumatic Disorder Checklist Civilian Version (PCL-C) 5–6 weeks prior to deployment to Afghanistan and then answered the PCL-C again 2.5 years after homecoming. To include combat exposure and other mission related stressors in the analysis the measurement wave 1–3 weeks after homecoming was included in order to measure the impact of these factors. In summary, there were three waves of measurement in total that were included in the analysis: 5–6 weeks before deployment, 1–3 weeks after homecoming, and 2.5 years after homecoming.

The participants answered the questionnaires during group sessions at different military camps in Denmark at all three waves of measurement, and those who could not attend the sessions in any of the military camps responded via email. The response rate from baseline measurement before deployment to the measurement at homecoming was reduced by 6.4% and by 12.5% at the measurement 2.5 years after homecoming ( $N = 746$ ). An overall analysis of the response rates found no significant differences between the soldiers that answered the questionnaires before deployment, at homecoming and 2.5 years after homecoming (Danish Defence, 2013). All respondents during the last data collection were given a gift certificate worth 500 DKR for their participation, since the majority of them were in civil jobs or undergoing civil education and therefore were using their free time to participate. The survey was performed according to the ethical principles of the Declaration of Helsinki (World Medical Association, 2000).

### *Questionnaire*

The questionnaire included the following scales: Posttraumatic Stress Disorder Checklist, Civilian Version, seventeen items (PCL-C; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), NEO Five Factor Inventory, sixty items (NEO FFI; Costa & McCrae, 2004), Combat Exposure Scale, seven items (CES; Keane et al., 1989), Traumatic Life Event Questionnaire, twenty-three items (TLEQ; Kubany et al., 2000), Beck Depression Inventory II, twenty-one items (BDI II; Beck, Steer, & Brown, 1996), The Multidimensional Perceived Social Support Scale, twelve items (MPSSS; Blumenthal et al., 1987). The items were rated on Likert scales according to the test manuals.

The NEO FFI covers the five main personality traits in the test which include: neuroticism, extraversion, agreeableness, conscientiousness, and openness. All five personality traits were tested with the development of PTSD symptoms 2.5 years after homecoming measured by PCL-C.

In addition to the scales the following single item measures were used:

Before deployment: Age in years, Educational status (with or without lower secondary school leaving examination), Terms of employment (short term or permanent

	Before deployment (December 2008 – January 2009)	At homecoming (August 2009)	2.5 years after homecoming (March 2012 – October 2012)
Soldiers with PCL-C score 17–29	393 (88.3%)	403 (90.6%)	330 (74.2%)
Soldiers with PCL-C score 30–43	39 (8.8%)	34 (7.6%)	74 (16.6%)
Soldiers with PCL-C score >44	13 (2.9%)	8 (1.8%)	41 (9.2%)

*Note.* Soldiers with PCL-C score 17–29 are characterized by none or few PTSD symptoms, soldiers with PCL-C score 30–43 are characterized by some PTSD symptoms and soldiers with PCL-C score > 44 are characterized by intense PTSD symptoms corresponding to a PTSD diagnosis (Blanchard et al., 1996).

**Table 1:** PCL-C scores among the soldiers measured before deployment, at homecoming and 2.5 years after homecoming ( $n = 445$ ).

employment), Years employed in the Danish Defence, Deployed to international duty before ISAF 7 (yes/no), Combat soldier-status (yes/no), Physical punishment during childhood (five options from 'never' to 'more than five times'), Witnessing violence during childhood (five options from 'never' to 'more than five times'), Nonconsensual sexual relations during childhood (five options from 'never' to 'more than five times'), Received help from psychologist/psychiatrist before deployment (yes/no).

1–3 weeks after homecoming: Hurt or injured during deployment (yes/no), Subjective appraisal of exposure to injury during deployment (five options from 'very low' to 'very high' probability), Subjective appraisal of general risk during deployment (five options from 'low' to 'high' risk), Number of experienced situations with emotional strain during deployment ('never' to 'often'), Subjective appraisal of life danger for oneself or others during deployment (yes/no), Killed one or more enemies (five options from 'never' to '51 or more'), Never to feel attached to another person (five options ranging from 'totally disagree' to 'absolutely agree'), Feeling lonely (five options ranging from 'not at all' to 'very much').

2.5 years after homecoming: Deployment since ISAF 7 (yes/no).

## Results

The demographic analysis showed an average age in the group of soldiers ( $n = 445$ ) of 27 years with a dispersion of age from 18 to 57 years old. 71% of the group had a higher educational status than the secondary school leaving examination. 29.5% had been deployed to international military missions before the present deployment.

### *Development of PTSD symptoms in the group before and after deployment*

The development of PTSD symptoms in the total group of soldiers through the three measurement points before and after deployment to Afghanistan were tested using the Friedman test with pairwise Wilcoxon signed-rank tests.

The Friedman test is a non-parametric alternative to the multi-page analysis of variance (repeated measures ANOVA) used in the parametric data (Field, 2009), and the

Wilcoxon signed-rank test is a non-parametric alternative to the paired  $t$ -test (Field, 2009).

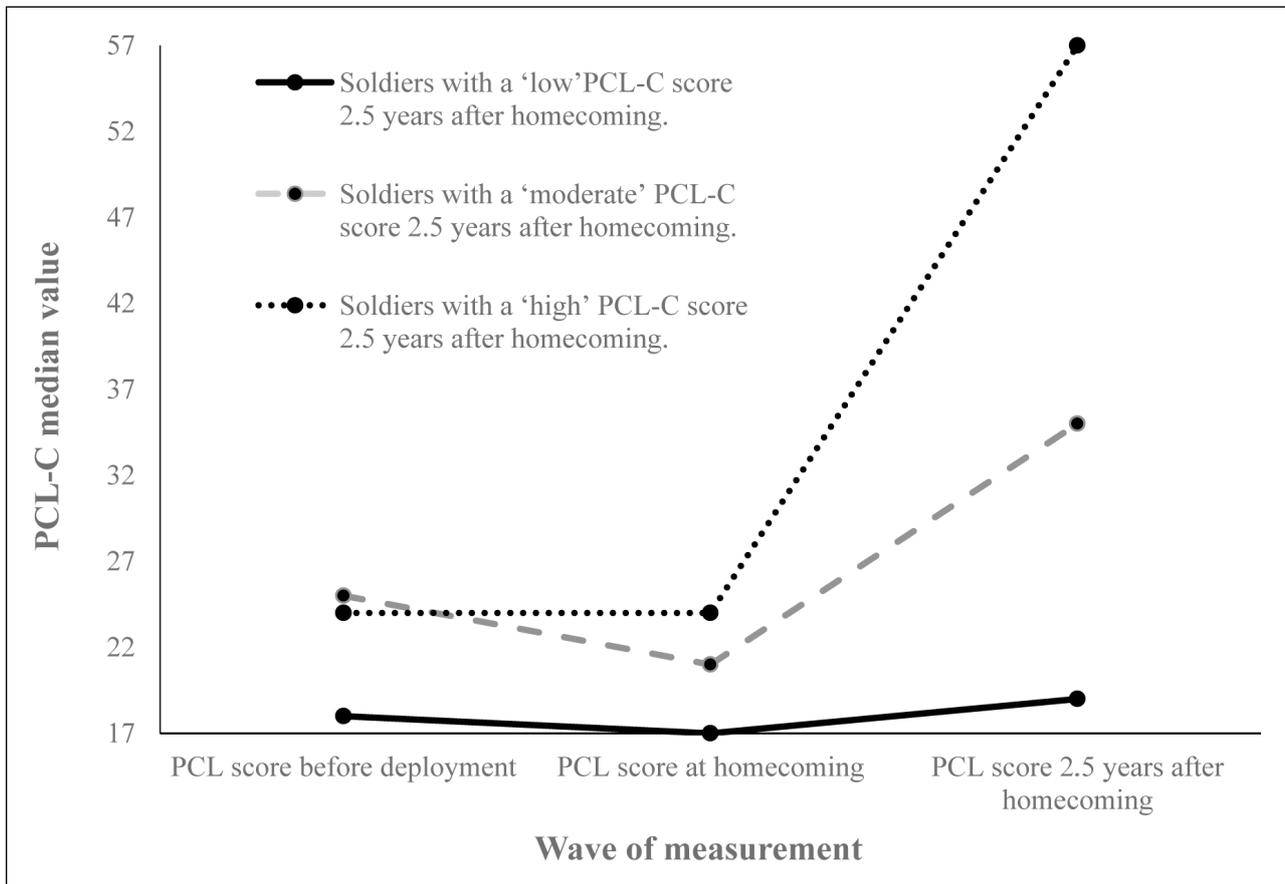
Since the risk of committing a Type I error increases with the number of individual comparison tests carried out in the Wilcoxon signed-rank test, a Bonferroni correction is utilized. This correction takes into account that the chance of finding significant results in cases of no significance increases with repeated measures. The Bonferroni correction is performed by dividing the determined critical  $p$ -value (.05) with the number of individual comparison tests. The Bonferroni correction conducted in the present study revealed that the cumulative Type I error was below .5.

The total group of soldiers was divided into three groups according to their score on the PCL-C scale: 'low' characterized by none or few PTSD symptoms (PCL-C score: 17–29), 'moderate' characterized by some PTSD symptoms (PCL-C score: 30–43) and 'high' characterized by intense PTSD symptoms corresponding to a PCL-C score above 44 which means this group was having symptoms equaling a diagnosis of PTSD (Blanchard et al., 1996).

The number of PTSD symptoms (PCL-C) increased significantly among the soldiers ( $N = 445$ ) from 2.9% before deployment to 9.2% 2.5 years after homecoming (**Table 1**). Furthermore the number of soldiers with moderate PTSD symptoms (PCL-C) almost doubled from 8.8% before deployment to 16.6% 2.5 years after deployment.

This indicates an overall increase in PTSD symptoms in the total group of soldiers 2.5 years after deployment, even though the majority continue to have no or few PTSD symptoms.

Testing the development over the three waves of measurement (**Figure 1**) through the Friedman test with pairwise Wilcoxon signed-rank tests revealed that both the group with 'low' and 'moderate' PCL-C score 2.5 years after homecoming had experienced a symptom relief during the measurement at homecoming and then showed a significant increase in PTSD symptoms ( $p < .001$ ) 2.5 years later. The group with a 'high' PCL-C score 2.5 years after homecoming had a stable symptom level before and immediately after the deployment and then experienced a significant increase in PTSD symptoms 2.5 years after homecoming ( $p < .001$ ).



**Figure 1:** The development in PCL-C scores for the three groups of soldiers with a 'low', 'moderate' and 'high' PCL-C score 2.5 years after homecoming.

***The association between pre-existing personality traits measured before deployment and the development of PTSD symptoms 2.5 years after homecoming***

Using Kruskal Wallis and Mann-Whitney U tests, a correlation between pre-existing personality traits and the development of PTSD symptoms 2.5 years after homecoming in the group of soldiers was identified.

The Kruskal-Wallis test is a non-parametric alternative to the one-tailed analysis of variance (one-way ANOVA) and the Mann-Whitney U test is an alternative to non-parametric unpaired t-test (Field, 2009). A Bonferroni correction is also conducted with the Mann-Whitney U test.

The personality assessment inventory NEO FFI used in the questionnaire provides gender-specific norms. This implies that an identical raw score produces standardized scores, which differ notably depending on the gender of the respondent. Since a limited number of female soldiers participated in the survey ( $n = 22$ ), they were excluded from all the performed statistical tests due to the risk of finding inconclusive results. Furthermore the correlation between pre-existing personality traits and development of PTSD 2.5 years after homecoming was tested using Spearman's rho correlation coefficient.

The statistical analysis revealed an association between the pre-existing personality traits and the development of PTSD symptoms for male soldiers 2.5 years after homecoming. Two of the personality traits were significantly associated with the development of PTSD symptoms 2.5

N = 432

Spearman's rho correlation coefficient

p-value

Neuroticism	.290***	< .001
Extraversion	-.037	.449
Agreeableness	-.184**	< .001
Conscientiousness	-.117	.160
Openness to Experience	.059	.222

Note. \*\* $p < .01$ ; \*\*\* $p < .001$ .

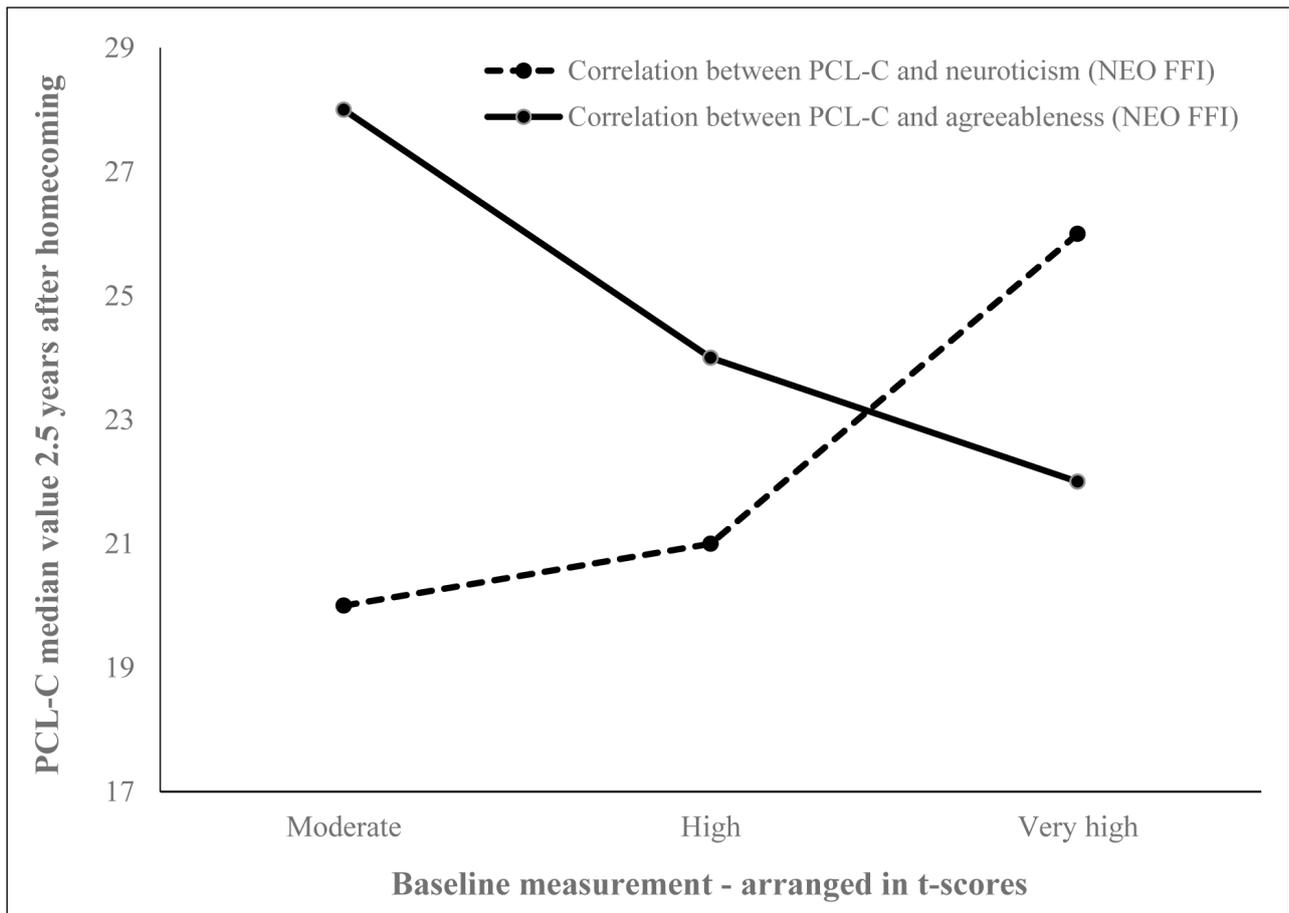
**Table 2:** Test for differences in PCL scores among male soldiers 2.5 years after homecoming between the five domains of the NEO FFI.

years after homecoming; namely neuroticism ( $p < .01$ ) and agreeableness ( $p < .01$ ; **Table 2**).

Neuroticism was positively correlated, and agreeableness was negatively correlated with the development of PTSD symptoms 2.5 years after homecoming (**Figure 2**).

***Other risk factors with possible influence on the development of PTSD symptoms 2.5 years after homecoming***

Finally, other risk factors identified in the existing research literature influencing the development of PTSD were tested using Spearman's rho correlation coefficient between the individual risk factors and the PCL-C scale



**Figure 2:** Correlation between PCL-C 2.5 years after homecoming and the personality traits of neuroticism and agreeableness measured before deployment (NEO FFI).

(ungrouped). Spearman's rho test is a non-parametric test used to identify correlation between two variables (Field, 2009).

Several other risk factors, which emerge in **Table 3** besides personality traits, were tested significant to the development of PTSD in the group of soldiers 2.5 years after homecoming. These findings suggest that the development of PTSD comprises a variety of different factors, which may interact with each other.

### Discussion

The results showed a PTSD-prevalence of 9.2% in the total sample ( $N = 432$ ) 2.5 years after homecoming. Cause analysis revealed that the increase in PTSD symptoms among the veterans from homecoming to 2.5 years after could not be fully explained by another deployment or other stressful life events after homecoming (also see Danish Defence, 2013).

Using Kruskal Wallis, Mann Whitney U, and Spearman's rho the statistical analyses identified significant relationships between the pre-existing personality traits of neuroticism and agreeableness with the development of PTSD-symptoms 2.5 years after homecoming. The findings indicate that a high score within the domain of neuroticism can comprise a predisposing risk factor to the development of symptoms of PTSD, and a high score within the domain of agreeableness can comprise a predisposing resilience factor. These findings are consistent with

previous work (e.g., Chung, Berger, Jones & Rudd, 2006; Fauerbach et al., 2000; Hyer et al., 1994; Ribi et al., 2007; Rubin, Berntsen, & Bohni, 2008; Talbert et al., 1993). However the statistical analysis also revealed that pre-existing personality traits cannot by themselves explain the development of symptoms of PTSD among veterans, since a number of cofounders were identified.

These findings indicate that human responses to psychological trauma are comprised by an interplay of many different factors besides the traumatic experience itself and personality traits constitute important pieces in the puzzle of understanding the development of PTSD. Predisposing risk or resilience factors refer to a measurable attribute of an individual that increases the likelihood of current or future outcomes (Layne, Warren, Watson, & Ahalev, 2007). Therefore, a personality trait that demonstrates a positive or negative association with PTSD in a sample of individuals who have experienced a traumatic event may qualify as a predisposing risk or resilience factor.

However, a variety of other risk factors besides personality traits, with correlation to the development of PTSD symptoms 2.5 years after homecoming, were identified in the statistical analysis emphasizing that PTSD is a disorder which develops in a complicated interaction between different risk factors. This corresponds with The diathesis-stress model of PTSD as introduced by McKeever and Huff (2003). The Diathesis-stress model addresses the complex interactions between risk factors and situational stressors

	<i>N</i>	Spearman's rho correlation coefficient	Spearman's rho <i>p</i> -value
Measurements before deployment			
Age in years	427	-.125**	.010
Educational status (with or without lower secondary school leaving examination)	424	-.157***	< .001
Terms of employment (short term or permanent employment)	424	-.099*	.042
Years employed in the Danish Defence	379	.081	.121
Previously deployed to international duty (yes/no)	423	.051	.089
Combat soldier-status (yes/no)	426	.115*	.017
Traumatic events ( <i>TLEQ</i> )	370	.248***	< .001
Physical punishment during childhood (5 options from 'never' to 'more than 5 times')	380	.156**	.002
Witnessing violence during childhood (5 options from 'never' to 'more than 5 times')	379	.189***	< .001
Nonconsensual sexual relations during childhood (5 options from 'never' to 'more than 5 times')	380	.048	.172
Social support ( <i>MPSSS</i> )	358	.079	.114
Depression score ( <i>BDI II</i> )	372	.068	.253
PTSD symptom score ( <i>PCL-C</i> )	423	.235***	< .001
Received help from psychologist/psychiatrist before deployment (yes/no)	378	.225***	< .001
Measurement at homecoming (including subjective assessment of mission-related stressors)			
Combat exposure ( <i>CES</i> )	320	.014	.441
Hurt or injured during deployment (yes/no)	339	.056	.783
Subjective appraisal of exposure to injury during deployment (five options from 'very low' to 'very high' probability)	338	.080	.144
Subjective appraisal of general risk during deployment (5 options from 'low' to 'high' risk)	336	.088	.109
Number of experienced situations with emotional strain during deployment ('never' to 'often')	338	.079	.114
Subjective appraisal of life danger for oneself or others during deployment (yes/no)	334	.379	.125
Killed one or more enemies (5 options from 'never' to '51 or more')	328	.176***	< .001
Social support ( <i>MPSSS</i> )	336	.076	.097
Never felt attached to another person (5 options ranging from 'totally disagree' to 'absolutely agree')	343	.155**	.004
Feeling lonely (5 options ranging from 'not at all' to 'very much')	344	.166**	.002
Measurements 2.5 years after homecoming			
Traumatic events after homecoming ( <i>TLEQ</i> )	423	.180***	< .001
Deployment since homecoming (yes/no).	423	.089	.118
Social support ( <i>MPSSS</i> )	424	.186***	< .001

Note. \* $p \leq .5$ , \*\* $p \leq .01$ , \*\*\* $p \leq .001$ ; Sample sizes differ due to a varying number of soldiers responding on the different questionnaires. Furthermore as described in the method section, the response rate decreased considerably at homecoming.

**Table 3:** Test for other risk factors with correlation to the development of PTSD symptoms 2.5 years after homecoming (tests performed on the ungrouped PCL-C).

in the development of PTSD by implementing both ecological and biological diathesis together with the situational stressors. Personality traits in the diathesis-stress model are included in the biological category due to the definition as genetically based (Costa & McCrae, 2003). The diathesis-stress model for PTSD has the potential to help clarify who should be targeted for preventative interventions, what risk factors should be assessed, and the different treatment modalities that might best address the respective risk factors. Because the model highlights the importance of premorbid risk factors, markedly high-risk individuals might be more readily identifiable based on the degree to which these risk factors are in place.

Personal characteristics comprising personality traits may influence an individual's appraisal of potential stressors as well as their perceived coping ability and thereby either intensify, allay, or prevent severe stress reactions. This seems to be supported by the fact that the statistical analysis found subjective appraisal of risk and danger during deployment to be correlated with the development of PTSD as well. Interestingly the soldiers' self-reported ratings of experienced combat exposure during deployment did not have a significant correlation with the development of PTSD 2.5 years after homecoming.

The present study introduces unique information about predisposing risk and resilience factors due to the prospective design involving baseline measurements of personality traits and other essential factors. The longitudinal perspective with tracking of PTSD symptoms 2.5 years after homecoming also underlines the fact that it is important in the understanding of development of PTSD symptoms that they can appear a long time after the traumatic event (Berntsen et al., 2012).

The primary limitation of the present study is the use of non-parametric tests, which limits the possibility to control for contingent interactions among the included variables. The use of non-parametric statistical tests however counteracts the possible risk of introducing systematic statistical bias, when parametric tests are used on self-reported data as well as Likert scale items (Field, 2009). In sum, the statistical analysis performed in the present study provides a solid foundation for further research within the field of personality psychology and trauma psychology by suggesting the presence of a significant correlation between predisposing personality traits and the development of PTSD. At the same time the results emphasize that development of PTSD is comprised by a variety of interacting variables (Breslau et al., 2008; Koenen, Moffit, Poulton, Martin, & Caspi, 2007). However this does not dismiss a dose-response view of PTSD (e.g., Neuer et al., 2004) but suggests that the development of symptoms of PTSD are considered in a more complex life-span developmental perspective (Berntsen et al., 2012; Bremner, et al., 1993;)

## Conclusion

In recent decades there has been an ongoing investigation regarding the factors responsible for some people to develop PTSD while others exposed to similar threatening events do not. The present study, based on a prospective

design, found that predisposing personality traits, particularly the personality traits of neuroticism and agreeableness, could comprise key variables of predisposing risk and resilience factors in the development of PTSD. These findings do not reject a dose-response perspective of PTSD (e.g., Neuer et al., 2004) but imply the consideration of a more complex perspective including multiple personal attributes as well as the life experiences of an individual.

Knowledge of different risk and protective factors in the development of PTSD may help in uncovering etiological mechanisms and improving preventive strategies, identification and reduction of health risks among deployed soldiers and the trauma population in general. Further research into the role of personality traits in the development of PTSD could possibly comprise helpful screening tools for selection of personnel before deployment to a war zone or other high-risk professions.

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## Competing interests

The authors declare that they have no competing interests in publishing this article.

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