Resilience in relation to personality and intelligence

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Abstract

Resilience is a construct of increasing interest, but validated scales measuring resilience factors among adults are scarce. Here, a scale named the Resilience Scale for Adults (RSA) was crossvalidated and compared with measures of personality (Big Five/5PFs), cognitive abilities (Raven's Advanced Matrices, Vocabulary, Number series), and social intelligence (TSIS). All measures were given to 482 applicants for the military college.

Confirmatory factor analyses confirmed the fit of the five-factor model, measuring 'personal strength', 'social competence', 'structured style', 'family cohesion' and 'social resources'. Using Big Five to discriminate between well adjusted and more vulnerable personality profiles, all resilience factors were positively correlated with the well adjusted personality profile. RSA-personal strength was most associated with 5PFs-emotional stability, RSA-social competence with 5PFs-extroversion and 5PFs-agreeableness, as well as TSIS-social skills, RSA-structured style with 5PFs-conscientiousness. Unexpectedly but interestingly, measures of RSA-family cohesion and RSA-social resources were also related to personality. Furthermore, the RSA was unrelated to cognitive abilities.

This study supported the convergent and discriminative validity of the scale, and thus the inference that individuals scoring high on this scale are psychologically healthier, better adjusted, and thus more resilient.

Key words: resilience, validation, personality, cognitive abilities, social intelligence

Resilience in relation to personality and intelligence

For centuries, writers have been inspired by the extraordinary capacity some people show in combating adversity or misery. In psychology, however, the study of unexpected positive outcomes, today referred to as resilience (Garmezy, 1981; Egeland, Sroufe and Erickson, 1983; Rutter, 1985; Cowen and Work, 1988) has just started to capture interest. In fact, of all the published articles on resilience, about four-fifths have appeared during the last 10 years. A clear-cut taxonomy, as well as measurement instruments for studying the construct is, however, still lacking. Research on resilience processes has thus relied upon a diversity of measurement scales only partially related to resilience,

making it difficult to review and compare results. Hence, scales that measure the construct more directly are needed.

Operationalizing and measuring resilience is important for two reasons. In clinical psychology, it may provide evidence about which factors are most central for regaining and maintaining mental health for different patients. In predicting the ability to tolerate stress and negative affects, it may help in the selection of personnel who will manage tougher job demands. To meet the need for a valid resilience measure for the adult population, the authors constructed the Resilience Scale for Adults (RSA) (Hjemdal, Friborg, Martinussen and Rosenvinge, 2001). Using explorative factor analysis, the original 16 resilience factors

were reduced to five factors: 'personal competence', 'social competence', 'personal structure', 'family coherence', and 'social support'. The RSA has proven reliable and valid (Friborg, Hjemdal, Rosenvinge and Martinussen, 2003). Recently, it was extensively revised by rewriting all items from a Likert-type to a semantic differential-type response format to reduce problems with acquiescence bias (Friborg, Martinussen and Rosenvinge, 2004). This was of particular concern as all the items in the original scale were exclusively positively worded. However, the resilience scale has not yet been submitted to a confirmatory factor analysis, which represents a stronger test of the scale's factor structure. Therefore, the first aim of this study was to confirm the fit of the measurement model on a sample experiencing more stress, followed by investigations of model improvement. The second aim was to investigate whether subjects scoring high on the RSA are psychological healthier and more resourceful than subjects scoring low. This was done by studying the convergent and discriminative validity of the RSA against measures of personality, social intelligence, and cognitive abilities.

Resilience and personality
Personality assessment within the lexical tradition, with the Big Five model as the most prominent, is a widespread and validated method (McCrae and Costa, 1997). According to this model, individual differences in personality may be sufficiently described using five overall factors: neuroticism (also referred to as absence of 'emotional stability'), extroversion, openness, agreeableness and conscientiousness. Despite criticism (Block, 1995), it has received considerable empirical support across cultures (McCrae and Costa, 1997). Studies relating these personality factors to resilience (faster recovery and less symptomatology after trauma) have been repeatedly associated with a high score on emotional stability, extroversion, openness and conscientiousness (Riolli, Savicki and Cepani, 2002), as well as agreeableness (Davey, Eaker and Walters, 2003). In line with these findings, there is accumulating support for applying the Big Five measure to cluster individuals into well adjusted (resilient) and more vulnerable subgroups (Asendorpf, Borkenau, Ostendorf and Van Aken, 2001; Rammstedt, Riemann, Angleitner and Borkenau, 2004). All studies show evidence for the resilient personality profile being characterized by a high score on all the Big Five factors.

Of the five traits, emotional stability (absence of neuroticism) carries most interest for clinicians. It has been associated with a range of clinically relevant indicators. Individuals low on emotional stability generally report more negative affect, lower self-esteem, and in particular, more symptoms of depression and anxiety (McCrae, 1990). Furnham, Crump and Whelan (1997) validated the NEO inventory using subjective ratings that included resilience by trained assessors. They found a strong negative association between resilience and neuroticism (r = –0.71). As the factor RSA-personal competence was the most effective in discriminating between psychiatric outpatients and health controls (Friborg et al., 2003), this factor was expected to correlate more strongly with emotional stability than the other RSA-factors.

One defining feature of those with high resilience is the positive social orientation they show towards other people (Werner, 2001). They have good social skills, thrive in social contexts and generally make a positive impression of themselves. In Big Five terminology, they are more extroverted. However, not all sub-facets of extroversion are equally related to resilience. Whereas the extroversion-trait 'sociability' fits well with the conception of resilience as a positive social orientation (Werner, 2001), the extroversion trait 'competitiveness' is rather expected to keep others at a distance. Still, 'competitiveness' is not regarded as negative either, as high levels of drive and energy are found to increase coping capacity (Cederblad, Dahlin, Hagnell and Hansson, 1995). Furthermore, if the social style of the individual is to be experienced as positively by others, it should be authentic, empathic and warm (Werner, 2001). A high score on agreeableness, in measuring facets like empathy, closeness, trust and cooperation, may indicate such positive qualities. In summary, RSA-social competence is expected to correlate strongest with extroversion. Furthermore, in measuring positive social traits, RSA-social competence is expected to correlate stronger with 'sociability' than with 'competitiveness', and to correlate equally strongly with agreeableness and extroversion.

The third and final personality trait that is expected to covary with resilience is conscientiousness. Individuals high on this trait do not act on impulse, but prefer thorough planning. They generally stick to routines/habits, prefer order and structure and work systematically (McCrae and Costa, 1997). Werner and Smith (1992) found that resilient individuals were

more achievement oriented, pursued more education and almost all held full-time jobs in their adult life. Their adult career success, despite social adversities, was related to their strong ability to plan and organize, which Clausen (1993) denoted 'planfulness'. In the study by Furnham et al. (1997), conscientiousness, especially deliberation, self-discipline and achievement striving, was significantly associated with subjective ratings of resilience. The Big Five factor conscientiousness was thus expected to correlate stronger with RSA-structured style than any of the other RSA-factors.

A final purpose of validating the RSA against a Big Five inventory was to investigate the degree of variance that is shared with personality (redundancy). As the resilience-scores are hypothesized to positively covary with measures of personality, some redundancy is certainly expected. However, it should not be too high either. According to Cohen (1988), a correlation or factor loading of 0.80 describes as very strong effect, leaving only 36% of the variance unexplained. Consequently, the more the redundancy surpasses these levels, the less the RSA-factors may contribute uniquely beyond existing measures of personality. Among the five resilience factors, the two external factors, 'family cohesion' and 'social resources', were expected to share less variance than the other RSA-factors with personality.

Resilience and social intelligence
The role of interpersonal skills in the treatment of psychiatric disorders was early recognized by Sullivan (1938). Research on processes leading to resilience, also points to social skills, or the social positive orientation, as one of the most protective against maladaptation (Murphy and Moriarty, 1976; Werner, 2001). Social intelligence may be regarded as an overall construct for understanding how successfully people manage social relationships. However, the many facets of social intelligence are not equally important for resilience. In a study by Luthar (1991), 'social expressiveness' turned out as most protective among seven other social factors (Riggio, 1986). Recently, Silvera, Martinussen and Dahl (2001) operationalized social intelligence into a scale (TSIS) containing three distinct components: social information processing, social awareness and social skills. The first two factors are related to cognitive aspects of understanding and interpreting ambiguous social information. The last

factor, social skills, is vastly different and relates to positive beliefs about one's social performing abilities. As social skills or expressiveness (Luthar, 1991) have been most important for the resilient outcome, the factor RSA-social competence was expected to correlate stronger with TSIS-social skills than the other TSIS-factors.

Resilience and cognitive abilities
Higher intelligence implies better analytical, creative, and practical problem-solving abilities (Sternberg, 1998). To some extent, this finding should apply for life problems too. Intelligent people are more knowledgeable, expected to have better self-help skills (Ross, 1972) and to cope more actively when faced with stress (Cederblad et al., 1995). Indeed, several longitudinal studies have launched evidence for childhood intelligence being protective against later maladjustment (Radke-Yarrow and Sherman, 1990; Egeland, Carlson and Sroufe, 1993; Luthar, D'Avanzo and Hites, 2003). For example, Werner (1993) found that children's scholastic competence at age 10 was positively linked with more sources of support as a teenager and a greater sense of self-efficacy at age 18. However, the relation was not strong, as Werner (1993) emphasized by stating that resilient children were not unusually gifted, but rather were adept at using whatever skills they had available. Contradictive results are, however, present. Although Luthar (1991) found that intelligence was the best predictor of scholastic competence, it turned out as a vulnerability factor for internal affective symptomatology when levels of stress increased, thereby seriously challenging the notion of intelligence as being exclusively protective. Methodological issues are also present, as the many studies linking resilience and intelligence have used different operationalizations of resilience, both as a process and an outcome variable. Moreover, most studies have been conducted on individuals with stressful backgrounds, while the present study used subjects from the normal population in a stressful testing situation. However, taking the majority of results into consideration, the relation between the RSA and intelligence is expected to be positive but not strong.

Method

Subjects
Participants were 482 applicants to a military college:

47 women and 403 men, both M = 24.0 years of age (SD = 2.2 and 3.0, respectively). Gender was not reported for 32 cases. Most of them had finished the officer training programme and served at least one year in the military. This group represented a convenience sample for studying the validity of the scale for subjects expected to experience increased work stress and stress related to the testing situation.

Procedure

The participants were given the instrument materials during the selection programme. They completed them in a group setting, and returned them to an assistant when finished.

Instruments

The Resilience Scale for Adults (RSA)
The current 37-item version of the instrument used a five-point semantic differential scale format in which each item had a positive and a negative attribute at each end of the scale continuum. The positive attributes were keyed to the right for half of the items to reduce acquiescence biases. Three items were added to the first factor, 'Personal competence', to allow for remodelling of this factor as unpublished data (Friborg, 2004) had indicated that a two-factor model might describe the data better.

Personality – the Big Five (5PFs)
The Norwegian military version of the 5PF (5PF mil 2.0) was developed by Engvik (1997) and applies a seven-point Likert scale. It was inspired by the NEO-PI model of Costa and McCrae (1995) and consists of 240 items. They are grouped into five second-ordered factors (the Big Five), each explaining the variance of six underlying primary factors. The first second-ordered factor, (I) extroversion, comprises the following primary factors: sociability, social impact, activity, leadership, competitiveness and social boldness. Factor II, agreeableness, consists of closeness, empathy, trust, cooperation, helpfulness and positive emotions. Factor III, conscientiousness, comprises punctuality, work ethic, order, systematic, ambitions and determination. Factor IV, emotional stability, is indicated by anxiety, anger, depression, self-consciousness, vulnerability and impulsiveness. Factor V, openness, is measured by fantasy, aesthetics, feelings, actions, ideas and values. Cronbach's alpha was high

for all major dimensions, ranging from 0.82 to 0.91 (Engvik, 1993).

The Tromsø Social Intelligence Scale (TSIS)
This instrument purports to measure three facets of social intelligence, one factor concerning social performance (social skills) and two factors concerning social perception (social awareness and social information processing). It contains 21 items, with each factor having seven items. Half of the items are reversed. Responses are scored along a seven-point Likert-scale from 1 ('describes me extremely poorly') to 7 ('describes me extremely well'). These semantic labels were attached to each endpoint. The three-factor structure, as well as the factors' internal consistency (α = 0.85, 0.72, 0.79, respectively) has proven adequate (Silvera et al., 2001)

Cognitive intelligence measures
Four measures indicating intelligence were included: (a) Raven Advanced Matrices (Raven, 1986) as a measure of non-verbal abstract and analytical intelligence; (b) Word Comprehension (from WAIS) as a measure of verbal intelligence – this being the subtest with the highest correlation with total WAIS-score (Engvik, Hjerkinn and Seim, 1978); (c) Number Series is a measure of mathematical reasoning, in which the task is to fill in the two last digits in series of numbers; and (d) Mathematics as a Measure of Mathematical Knowledge and Skills (Martinussen and Torjussen, 1997). These tests are regularly used for military selection purposes.

Data preparation
To improve data quality, participants were removed according to three criteria: if more than 10% of the data were missing (50 cases), a z-score +/– 3 standard deviations on the acquiescence/nay-saying index (17 cases), and cases scoring > 2 SD on the Big Five lie scale (three cases). In sum, 60 participants were omitted, yielding a final sample of 411 participants. Remaining missing data in the resilience variables were replaced with the mean composite score for each individual to each of the five factors the item belonged to.

Skewness and kurtosis
The RSA-items were heavily skewed, showing high kurtosis as well. Negative skew in z-values ranged from

–2.16 to –19.43 (M = –9.71, SD = 5.20), while for kurtosis the range was –2.58 to 30.37 (M = 7.35, SD = 8.43). Kurtosis was less pronounced, with 12 items being normally distributed. The covariance matrix was thus corrected for non-normality by computing the asymptotic covariance matrix in PRELIS 2, which was included as a weight matrix to adjust for non-normality in the poly-choric matrix. It was then possible to estimate all matrices using the Satorra-Bentler rescaled χ^2 statistics, which correct for biases in standard errors arising from significantly skewed data (Hu and Bentler, 1995; DiStefano, 2002).

Data analysis and model specifications
SPSS version 11 was used to perform standard descriptive, reliability and canonical correlational analyses, as well as exploratory factor analyses. Structural equations were solved using LISREL v8.53 (Jöreskog and Sörbom, 1996). Model fit was evaluated according to Hu and Bentler (1995, 1999), with a non-significant Satorra-Bentler χ^2, RMSEA < 0.06 and CFI/NNFI > 0.95 representing a good fit. However, as models are never an exact replica of reality, various degrees of misspecification are always present. Consequently, if the power of a test is strong enough (large sample and many indicators), even minor deviations between model and data will be significant (Hu and Bentler, 1995), thus rejecting perfectly acceptable models. The RMSEA-index, which indicates in what degree a model is a reasonable approximation to the observed data, is therefore used instead of absolute fit measures for the evaluation of the complete measurement model.

Bivariate normality
As the RSA measure used a five-point scale, the item indicators were considered as ordinal variables. Bivariate normality was however assumed for the latent variables. Testing this assumption using PRELIS (Jöreskog and Sörbom, 1988), by estimating the fit of all the poly-choric correlations, proved close fit (RMSEA < 0.05) for 811 of the 946 correlations and fair fit (0.05 – 0.081) for the remaining 135 correlations.

Reliability
Cronbach's method may underestimate internal consistency in case of violations of the tau-equivalence assumption (Raykov, 2001), or simply as a function of fewer items (Cronbach, 1990). As that would inflate the attenuation-corrected correlations used in this study, a structural equation modelling approach, according to Raykov (2001), was taken instead to provide more precise coefficient estimations.

Results

Crossvalidation of the factor model
The fit of the original 37-item version, specified as five correlated latent factors, was unsatisfactory in absolute terms (S-B χ^2 (619) = 1130.74, p < 0.001). Due to the strong power of this test, the RMSEA-index was inspected instead, revealing reasonably small degrees of misspecifications (RMSEA = 0.045), thus indicating a promising model.

Model improvement
Knowing that the 37-item version crossvalidated well, the next step implied *post hoc* modelling within each resilience factor (now including all the 40 items), to remove poorly fitting items. Post-correctional fit indices for the separate factors, and the complete measurement model, are presented in Table 1. The factor names were revised slightly to reflect item content better.

The first factor, 'personal strength', had to be remodelled as a second-ordered factor accounting for two underlying primary factors, to improve model fit significantly. By removing three additional items due to correlated errors, the first factor now fitted the data very well (S-B χ^2 (34) = 46.92, p = 0.07; RMSEA = 0.030). Within the remaining four resilience factors, it was sufficient to remove one item within each factor to achieve a very strong fit (see Table 1). The degree of misspecification within each factor was now very small (RMSEA ranging from 0.013 to 0.042).

The complete measurement model
The correlated resilience model now comprised 33 items. Although statistics for absolute fit of this model was significant (S-B χ^2 (516) = 821.99, p < 0.001), the above modifications reduced the degree of model misspecification further (RMSEA = 0.037), indicating that this model will hold reasonably well in the population, although not exactly.

Descriptive statistics and reliability
The means, standard deviations and estimates of internal consistency for all the instruments are presented at the lower part of Table 2. The Cronbach's alphas of the

Table 1. Fit indices for each of the RSA-factors and the complete measurement model – estimation method: maximum likelihood (N = 411)

Dimensions	Personal strength[1]	Social competence	Structured style	Family cohesion	Social resources	All
No. items	10	6	4	6	7	33
S-B χ^2	46.92	15.38	2.28	10.54	14.92	750.94**
d.f.	34	9	2	9	14	484
ε_a	0.030	0.042	0.019	0.020	0.013	0.037
$\varepsilon_{a\,.90}$	0 – 0.050	0 – 0.076	0 – .102	0 – 0.061	0 – 0.050	0.031 – 0.042
NNFI [2]	0.950	0.963	0.984	0.978	0.951	0.894
CFI [2]	0.962	0.978	0.995	0.986	0.968	0.903
SRMR	0.051	0.038	0.019	0.031	0.044	0.112
R^2	0.42	0.42	0.45	0.54	0.48	0.49

Note. ** p < .01.

S-B χ^2 = Satorra-Bentler rescaled chi-square, d.f. = degrees of freedom, ε_a = root mean square error of approximation, $\varepsilon_{a\,.90}$ = 90% confidence interval, NNFI = non-normed fit index, CFI = comparative fit index, SRMR = standardized root mean residuals, R^2 = variance explained.

[1] Personal strength as a second-order factor explaining two underlying factors, 'perception of self' and 'perception of future'.
[2] Satorra-Bentler rescaling statistics do not correct NNFI and CFI for non-normality.

final 33-item version were lower (α = 0.67 – 0.79) than the original 37-item version (Friborg et al., 2003). However, using structural equations for estimating reliability proved the internal consistency to be adequate for all factors (α = 0.76 to 0.87) (Table 2).

The convergent and discriminative validity of the RSA
All zero-order correlations are presented in the lower triangular of Table 2. The attenuation-corrected correlations are presented in the upper triangular. Further analyses are based on these. As expected, all the RSA-factors were significantly inter-correlated (ranging from r = 0.31 to 0.57), except 'structured style', which was uncorrelated with 'social competence'. All the significant correlations between personality and resilience were positive (ranging from r = 0.17 to 0.83).

Emotional stability (absence of neuroticism) was the most interesting Big-Five factor for the prediction of stress-tolerance or absence of vulnerability. As expected, the two primary factors of RSA-Personal strength (PS), 'perception of self' and 'perception of future', correlated strongest with 5PFs-emotional stability, r = 0.79 and 0.57 respectively, while all the other RSA-factors correlated significantly less strongly (as indicated by Hotelling's T^2 tests) with 5PFs-emotional

stability (range 0.29 to 0.41). Unexpectedly, RSA-perception of future turned out equally strongly associated with 5PFs-conscientiousness (r = 0.63). The primary factor 'perception of self' was thus most related to emotional stability (absence of neuroticism).

RSA-social competence was expected to be strongest correlated with 5PFs-extroversion and 5PFs-agreeableness. This hypothesis was confirmed (r = 0.69), as the other correlations with Big Five were significantly lower, ranging from 0.30 (conscientiousness) to 0.42 (openness), thus indicating that RSA-social competence may be a good measure of an authentic and positive social style in addition to social style skills. Running correlational analyses between 'social competence' and the six sub-factors of extroversion further confirmed the expectation that 'social competence' was significantly stronger related to a positive social orientation (5PFs-sociability) (r = 0.60) than with a competitive social orientation (5PFs-competitiveness) (r = 0.20). Although it was not hypothesized, RSA-social resources correlated highly with agreeableness (r = 0.66), indicating that a supportive and reinforcing social network goes along with an empathic, trusting and authentic personality.

Conscientiousness was expected to be strongest related to RSA-structured style. This hypothesis was

Table 2. The means, standard deviations, skewness, reliability and the correlations between all measurement instruments (N = 411)

Measurements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Perception, self	**0.80**	0.56	0.46	0.36	0.50	0.32	0.22	0.46	0.53	0.51	0.43	0.49	0.79	0.30				
2. Percept., future	0.43	**0.75**	0.37	0.39	0.48	0.57	0.18	0.36	0.39	0.40	0.38	0.63	0.57	0.25				
3. Social comp.	0.37	0.29	**0.82**	0.31	0.53	0.10	0.29	0.88	0.35	0.68	0.69	0.30	0.41	0.42				
4. Fam. cohesion	0.30	0.31	0.26	**0.86**	0.54	0.33	0.12	0.23	0.30	0.17	0.33	0.33	0.32	0.09				
5. Soc. resources	0.41	0.38	0.44	0.46	**0.84**	0.38	0.24	0.44	0.39	0.36	0.66	0.42	0.39	0.33				
6. Structured style	0.25	0.43	0.08	0.27	0.30	**0.76**	0.15	0.07	0.23	0.22	0.20	0.83	0.29	-0.08				
7. Soc. info. proc.	0.18	0.14	0.24	0.10	0.20	0.12	**0.82**	0.31	0.29	0.35	0.33	0.16	0.28	0.34				
8. Soc. skills	0.39	0.29	0.75	0.20	0.38	0.06	0.26	**0.88**	0.41	0.71	0.58	0.29	0.55	0.39				
9. Soc. awareness	0.42	0.30	0.28	0.25	0.32	0.18	0.23	0.34	**0.79**	0.25	0.49	0.37	0.62	0.31				
10. Extroversion	0.43	0.33	0.58	0.15	0.31	0.18	0.30	0.63	0.21	**0.89**	0.40	0.42	0.56	0.42				
11. Agreeableness	0.36	0.31	0.59	0.29	0.57	0.16	0.28	0.51	0.41	0.40	**0.88**	0.44	0.47	0.56				
12. Conscient.	0.42	0.52	0.26	0.29	0.37	0.69	0.14	0.26	0.31	0.38	0.39	**0.91**	0.54	0.15				
13. Emo. stability	0.64	0.45	0.34	0.27	0.32	0.23	0.23	0.47	0.50	0.48	0.40	0.47	**0.82**	0.27				
14. Openness	0.26	0.21	0.36	0.08	0.29	-0.07	0.29	0.35	0.26	0.38	0.50	0.14	0.27	**0.91**				
15. Raven	0.05	-0.04	-0.15	-0.05	-0.10	-0.12	0.06	-0.09	0.08	-0.03	-0.14	-0.15	0.10	0.13	–			
16. Numbers	-0.01	0.01	-0.09	-0.05	-0.13	-0.09	0.08	-0.04	0.07	0.01	-0.15	-0.10	0.10	0.12	0.60	–		
17. Vocabulary	0.03	0.04	-0.13	-0.01	-0.06	-0.04	0.04	-0.09	0.11	-0.05	-0.08	-0.01	0.07	0.21	0.30	0.25	–	
18. Mathematics	-0.04	0.00	-0.16	0.00	-0.10	-0.03	0.11	-0.17	-0.05	-0.02	-0.19	-0.05	0.00	0.05	0.57	0.62	0.38	–
No. of items	6	4	6	6	7	4	7	7	7	30	30	30	30	30	36			
N	411	411	411	411	411	411	411	411	411	411	411	411	411	411	365	372	365	363
M	4.28	4.24	4.22	4.29	4.66	3.90	5.11	5.41	5.49	57.06	48.88	53.18	50.69	48.65	23.96	9.30	40.85	10.70
SD	0.44	0.56	0.53	0.58	0.35	0.62	0.74	0.90	0.71	7.94	9.60	7.97	7.92	9.26	4.80	3.98	11.71	4.67
Skew	-1.43	-6.48	-5.71	-11.27	-10.22	-2.58	-5.33	-3.61	-5.13	-3.01	-3.34	-3.53	-1.85	0.53				
SEM r	0.80	0.75	0.82	0.86	0.84	0.76	0.82	0.88	0.79									
Cronbach's alpha	0.70	0.66	0.76	0.78	0.69	0.69	0.77	0.82	0.69	0.89	0.88	0.91	0.82	0.91				

Note. Pearson correlations in the lower triangular. Reliability coefficients in the diagonal (SEM r coefficients only estimated for the RSA and the TSIS measures). Attenuation-corrected correlations in the upper triangular. Correlations above ≥ 0.16 are significant at p < 0.001.

strongly supported (r = 0.83) as the other RSA-factors had significantly lower correlations, ranging from 0.33 (family cohesion) to 0.63 (perception of future).

Correlating the RSA-factors with the TSIS-social intelligence scale indicated that RSA-personal strength, RSA-social competence and RSA-social support were more strongly related to social intelligence than RSA-family cohesion and RSA-structured style. Furthermore, and as expected, RSA-social competence correlated strongest with TSIS-social skills (r = 0.88) and significantly lower with 'social information processing' and 'social awareness', r = 0.29 and r = 0.35 respectively.

The correlational patterns between the resilience factors and intelligence factors (Raven's Advanced Matrices, mathematics, vocabulary and number series) were non-significant, except for 'social competence', which correlated slightly negatively with 'mathematics' (r = –0.16, p < 0.001).

Joint explorative factor analysis
Combining the resilience and personality factors in a joint explorative factor analysis, we investigated which personality factors accounted most for the resilience factors. A principal component analysis using varimax rotation was conducted, prespecifying six factors, five for the Big Five and one for the RSA. Despite several substantial side loadings, the Big Five model was reasonably reproduced (see Table 3). The model accounted for 57% of the variance.

All the resilience factors were accounted for by the three first principal components. The first component consisted mostly of facets related to agreeableness, 'sociability' and 'feelings', thus representing a factor indicating a positive social orientation towards other people. Two resilience factors loaded highly on this component, respectively RSA-social competence (0.69) and RSA-social resources (0.68). Unexpectedly, RSA-social competence had a much smaller side loading (0.38) on the fourth component (extroversion). Interestingly, 'social resources' also side loaded (0.30) on the third component (emotional stability).

The second component was most distinct as it contained all the conscientiousness factors. It accounted for two resilience factors, with RSA-structured style loading most strongly (0.82), and RSA-perception of future loading moderately (0.47). Of these, 'perception of future' side loaded roughly equally on emotional stability (0.43).

RSA-perception of self loaded exclusively and highly (0.67) upon the third component, which contained mainly factors related to emotional stability. This finding was expected as items related to internal strength was assumed to be best accounted for by absence of neuroticism. Interestingly, RSA-family cohesion also loaded on this component (0.43), indicating that a coherent family life goes along with less neuroticism. However, this factor side loaded significantly (0.41) on the first component (agreeableness) as well, thus representing a factor also associated with a positive social orientation.

Shared variance between resilience and personality
To investigate total shared variance between resilience and personality, a canonical correlation analysis was run. The average of the squared crossloadings between the two sets indicated that the five personality canonical variates explained 37.8% of the variance in the six resilience scores. Conversely, the six resilience canonical variates explained 42.2% of the variance in the personality scores. They were thus approximately equal in explaining power, though resilience turned out as slightly stronger.

Discussion
The original correlated five-factor model (37 items) crossvalidated well by indicating a close fit to the population parameters. Having confirmed the factor structure, the model was further improved by *post hoc* modelling. The first resilience factor, 'personal strength' had to be remodelled as a second-ordered factor, containing two primary factors, to achieve a good fit. For the remaining four resilience factors, it was sufficient to remove the worst fitting item from each factor to achieve similar good fit. The final model, now containing 33 items, indicated even smaller discrepancies between the implied and estimated covariance matrix. Due to the smaller discrepancies, the tolerance for sample variations is greater, and it should thus generalize better to new samples.

The overall factor structure was thus similar to the original one (Hjemdal et al., 2001). However, the factor names were revised slightly to reflect item content better. The model comprises three resilience factors measuring various aspects of 'personal competence' (personal strength, social competence and structured style), one factor measuring degree of

Table 3. A principal component analysis including the six factors of the RSA and the 30 primary factors of the 5PFs measure, using varimax rotation (N = 411)

Primary factors	1	2	3	4	5	6
II-Closeness	**0.72**					
RSA-Soc. competence	**0.69**			0.38		
II-Positive emotions	**0.68**					
RSA-Soc. resources	**0.68**		0.30			
I-Sociability	**0.61**			0.39		
II-Cooperation	**0.58**					
V-Feelings	**0.56**				0.48	
II-Trust	**0.52**					0.41
RSA-Structured style		**0.82**				
III-Systematic		**0.81**				
III-Order		**0.74**				
III-Work moral		**0.68**				
III-Punctuality		**0.65**				
III-Determination		**0.49**	0.38	0.42		
RSA-Perception, future		**0.47**	0.43			
III-Ambition		**0.45**				
IV-Depression			**0.79**			
RSA-Perception, self			**0.67**			
IV-Anxiety			**0.67**			
IV-Selfconsciousness			**0.63**	0.33		
IV-Impulsiveness			**0.62**	0.31		
IV-Vulnerability			**0.58**	0.31		
RSA-Fam. cohesion	0.41		**0.43**	−0.31		
I-Social impact				**0.78**		
I-Leadership				**0.76**		
I-Social boldness			0.36	**0.64**		
I-Activity	0.37	0.35		**0.47**		
I-Competitiveness		0.32	0.32	**0.38**		
V-Actions		−0.32		**0.37**		
V-Aesthetics					**0.77**	
V-Ideas					**0.67**	
V-Fantasy					**0.63**	
II-Empathy	0.40				**0.47**	0.40
V-Values						**0.61**
II-Helpfulness	0.48					**0.53**
IV-Anger			0.33			**.52**
Variance explained %	12	12	12	10	6	5

Note. Total variance explained: 57%.
Factor loadings below < 0.30 are omitted.

'family cohesion' and a final factor measuring how the individuals view their own 'social resources'. The last two factors may be regarded as individual sources of support that may reinforce and strengthen the coping ability of the individual. The first factor, 'personal strength', now contains two primary factors measuring individuals' views of their own current strengths and abilities ('perception of self') and their beliefs about opportunities for realizing future plans and goals ('perception of future').

Convergent validity of the RSA-scale

Firstly, all the resilience factors were themselves highly correlated, implying that if individuals experienced strong personal strength or social competence, they most probably also experienced a coherent and stable family or good social resources. All the expected relations between the Big Five personality factors and the resilience factors were confirmed by showing positive correlations of moderate to strong association. The same finding was evident for the relation between resilience and social intelligence as well, all being positively related. Contrary to expectations, the relation between cognitive intelligence and resilience was slightly negative, but largely insignificant and negligible. As this hypothesis was less strong, as discussed in the introduction, they were partly regarded as an exploration of this relation. Consequently, these results were not exclusively disconfirmative, especially with reference to Werner (1993) who stated that resilient individuals were not necessarily intellectually strong but rather adept at effectively using whatever skills they had available to help them cope. This was also a finding of Vaillant and Davis (2000) who followed economically and educationally disadvantaged men from age 14 to age 65, finding that half of the low IQ men (<80) were equally successful in adult and late life as those with a high IQ (>115). They had similar incomes, equally educated children, and had developed even more mature defences and warmer object relations than the high-IQ group. The null correlation between the RSA and the intelligence measures thus confirms the problems with using IQ as direct a indicator of resilience. Taken as a whole, the results gave reasonably strong support for the convergent validity of the RSA measurement.

Discriminate validity of the RSA-scale

Discriminative validity was equally well supported – the expected differences in the magnitude of the correlations between resilience and personality, and resilience and social intelligence were confirmed. First of all, emotional stability, as the most clinical meaningful factor, was strongest related to the resilience factor 'personal strength' and its primary factor 'perception of self'. Individuals scoring low on emotional stability (high neuroticism) generally report lower self-esteem (Engvik, 1993), and have a ruminative and negative style of thinking. They often experience periods of anxious and depressed feelings. The high correlation with 'perception of self' concurs with previous findings of this factor as the strongest in discriminating between patients and health controls (Friborg et al., 2003), thus supporting the interpretation of 'personal strength/perception of self' as the foremost resource indicator that may counteract psychological vulnerability. However, the other primary factor 'personal strength/perception of future' correlated equally strongly with conscientiousness and emotional stability, thus representing a blend of these factors. The orthogonally rotated factor solution, maximizing differences in factor loadings, and thus factor uniqueness, confirmed that 'perception of self' loaded uniquely upon emotional stability, while 'perception of future' loaded equally strongly with 'conscientiousness'. This finding is interesting as Clausen (1993) claimed that resilient individuals possess a certain kind of planfulness for their life that helped them realize future plans and goals. Werner (2001) also employed planfulness as an explanation for the adult successful adaptation despite social hardships (for example, acquiring an education and getting oneself a full-time job). A study that investigated this relation more directly (Nezlek, 2001) also supported the notion that psychological healthier individuals were more efficient than vulnerable individuals in realizing social and achievement related plans on a day-to-day basis as well.

RSA-social competence was expected to correlate strongest with 5PFs-extroversion and TSIS-social skills, and significantly weaker with the other personality and social intelligence factors. The results supported this discriminative interpretation. Furthermore, the interpretation of RSA-social competence as a measure of positive social qualities was also confirmed, as it correlated significantly stronger with the extroversion-trait 'sociability' than with 'competitiveness'. Consequently, a high score on RSA-social competence should imply social skills that are experienced positively by others as well. To shed light on that, it is well known that positive social skills (such as knowing how to start a conversation, how to make a good impression) may not necessarily imply a genuinely warm and empathic personality trait. However, taking a resilience perspective on social competence, it is the blend of these two qualities, being socially competent and able to share experiences in a trusting, empathic and cooperative way, that helps establish mutually supportive friendships

(Werner, 2001). The results supported the interpretation of RSA-social competence as a factor measuring such combined positive characteristics, as it correlated equally strongly with both extroversion and agreeableness.

The factor RSA-structured style correlated very strongly with 5PFs-conscientiousness, as expected. In the factor analysis it also turned out as the most sensitive factor (highest loading) for a unit change in conscientiousness. Of the five resilience factors, this factor was related to personality most strongly, and among the six facets of conscientiousness it was significantly more strongly related to the order and systematic factors than to ambitions and determination. The high factor loading, as well as the high correlations, do not leave much unexplained. The resilience factor may thus be redundant in explaining anything beyond personality/conscientiousness and measurement errors. However, as conscientiousness has related positively to recovery after trauma (Riolli et al., 2002), the same would be the case for this resilience factor.

The two external resilience factors, 'family cohesion' and 'social resources', which were expected to be less related to Big Five than the three previous factors, was only partly true as 'social resources' loaded equally strongly on agreeableness and 'social competence'. Nevertheless, this result is adequately interpretable and highly interesting, indicating that people who were trusting, cooperative, emphatic and warm, also had a wider social network which could provide them with support and reinforcement to help overcome psychosocial stressors. The interesting question then becomes whether it is these personality traits that enhance the social network of resources, or whether a wealth of social support in early life helps develop agreeable positive traits. Taken together, the factor 'social resources' seems to measure not only degrees of social support and resources, but also the quality of the support received. This is a promising finding, interesting for further studies.

What about the moderate-to-strong redundancy with personality?

A moderate-to-strong degree of redundancy between resilience and personality was evident from the canonical correlation analysis. Moreover, all the resilience factors loaded significantly upon the latent personality factors in the principal component analysis. It is thus incorrect to view the RSA-measure as independent of personality. Rather, the current results speak for the resilience factors as variants of personality factors not accounted for in the current Big Five model. A positive score on the Big Five factors has been associated with a well adjusted personality profile (Asendorpf et al., 2001; Rammstedt et al., 2004) and resilience (Riolli et al., 2002; Davey et al., 2003), so these associations were expected. The redundancy issue was thus not a qualitative question (either/or), but one of magnitude. As more than 60% of the variance was unshared, further studies are needed to clarify how much of this residual variance is unique for resilience, and how well it eventually may explain constructs like stress tolerance, adaptability, adjustment, absence of psychiatric symptoms (negative mood), and so forth, beyond personality (incremental validity). Due to the relatively large residual variance, the resilience factors are certainly expected to explain a significant portion of this residual variance beyond personality. If they add to the incremental predictive validity in prospective studies, they will have earned a place in mental health measurement.

Reduced reliability in the scores of the current version?

One consequence of transforming this scale into a semantic differential response format (Friborg et al., 2004) was a slight reduction in internal consistency in terms of Cronbach's alpha. However, Cronbach's method underestimates true reliability when the tau-equivalence assumption is violated (unequal item loadings) or when the number of items decreases. As both of these factors were present, a structural equation method was used to estimate the true and total variance components more directly. Using this method (Raykov, 2001), which is not negatively affected by differential item loadings and fewer items, showed that the internal consistency of all factors was adequate to high.

Sample limitations?

The applicants for the military academy used in this sample are not entirely representative of the Norwegian population: (a) they were younger than the general adult population; (b) the majority were men; and (c) heterogeneity in subject variance were reduced due increased homogeneity in personality, educational

and work preferential background. This may reduce the generalizability for the convergent and discriminative indices but it rather strengthens the validity of the factor structure. Having an *a priori* model represents a much stronger test of the factor structure, especially when the implied model fits well with data from a very different sample. The convergent and discriminate validity indices are, however, more sample specific. Still, they are expected to reproduce well on other samples due to the relatively strong associations found in this study, and would only represent a problem if they showed even stronger associations in other samples. Moreover, the results come from self-report inventories, with all the constraints that usually imply, such as social desirable responding. That may be of concern as the inventories were part of an intake procedure for the academy, thus increasing desirable responses. However, such problems would represent itself as extraneous and systematic variance showing up in the error term. As each factor explained roughly half of the variance in the items, which is normal, extraneous variables were not assumed to affect the results significantly. Finally, one prime advantage of utilizing this particular sample was the possibility to investigate the construct validity on subjects experiencing higher degrees of stress. Although it was reasonable to assume increased activation and stress related to the testing situation for acceptance at the military college, one obvious drawback was that explicit measures of stress were not included. This problem may be met by including measures of stress, or conducting experimental studies inducing stress to investigate how well the resilience factors moderate various levels of stress.

Utility of the scale

Measuring protective factors (Friborg et al., 2003) to predict positive adjustment, despite risks and stressors, is an important step in operationalizing scales measuring resilience more directly. That is advantageous in that it provides the possibility of reviewing and comparing results across studies. Measuring protective factors at different levels, both on an intrapersonal (personal/social competence) and an interpersonal level (family/social resources) is also helpful in revealing new insights into how different levels of protective factors interact with risk and stress factors. Increased evidence-based knowledge about what kind of resilience factors increase adjustment or coping capacity is relevant for the prediction and selection of stress-tolerant personnel, as is evidence-based knowledge about how they do so, and to what kind of problems/life events, as well as for what kinds of individuals. It may also guide practising therapists and researchers in designing and planning mental health prevention services.

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Appendix: the Resilience Scale for Adults, 33 items

Personal strength/Perception of self

When something unforeseen happens	I always find a solution	☐☐☐☐☐	I often feel bewildered
My personal problems	are unsolvable	☐☐☐☐☐	I know how to solve
My abilities	I strongly believe in	☐☐☐☐☐	I am uncertain about
My judgements and decisions	I often doubt	☐☐☐☐☐	I trust completely
In difficult periods I have a tendency to	view everything gloomy	☐☐☐☐☐	find something good that help me thrive
Events in my life that I cannot influence	I manage to come to terms with	☐☐☐☐☐	are a constant source of worry/concern

Personal strength/Perception of future

My plans for the future are	difficult to accomplish	☐☐☐☐☐	possible to accomplish
My future goals	I know how to accomplish	☐☐☐☐☐	I am unsure how to accomplish
I feel that my future looks	very promising	☐☐☐☐☐	uncertain
My goals for the future are	unclear	☐☐☐☐☐	well thought through

Structured style

I am at my best when I	have a clear goal to strive for	☐☐☐☐☐	can take one day at a time
When I start on new things/projects	I rarely plan ahead, just get on with it	☐☐☐☐☐	I prefer to have a thorough plan
I am good at	organizing my time	☐☐☐☐☐	wasting my time
Rules and regular routines	are abscent in my everyday life	☐☐☐☐☐	simplify my everyday life

Social competence

I enjoy being	together with other people	☐☐☐☐☐	by myself
To be flexible in social settings	is not important to me	☐☐☐☐☐	is really important to me
New friendships are something	I make easily	☐☐☐☐☐	I have difficulty making
Meeting new people is	difficult for me	☐☐☐☐☐	something I am good at
When I am with others	I easily laugh	☐☐☐☐☐	I seldom laugh
For me, thinking of good topics for conversation is	difficult	☐☐☐☐☐	easy

Family cohesion

My family's understanding of what is important in life is	quite different than mine	☐☐☐☐☐	very similar to mine
I feel	very happy with my family	☐☐☐☐☐	very unhappy with my family
My family is characterized by	disconnection	☐☐☐☐☐	healthy coherence
In difficult periods my family	keeps a positive outlook on the future	☐☐☐☐☐	Views the future as gloomy
Facing other people, our family acts	unsupportive of one another	☐☐☐☐☐	loyal towards one another
In my family we like to	do things on our own	☐☐☐☐☐	do things together

Social resources

I can discuss personal issues with	no one	☐☐☐☐☐	friends/family-members
Those who are good at encouraging me are	some close friends/family members	☐☐☐☐☐	nowhere
The bonds among my friends is	weak	☐☐☐☐☐	strong
When a family member experiences a crisis/emergency	I am informed right away	☐☐☐☐☐	it takes quite a while before I am told
I get support from	friends/family members	☐☐☐☐☐	No one
When needed, I have	no one who can help me	☐☐☐☐☐	always someone who can help me
My close friends/family members	appreciate my qualities	☐☐☐☐☐	dislike my qualities

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