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Personality traits of the Five-Factor Model are associated with work-related stress in special force police officers

S. Garbarino · C. Chiorri · N. Magnavita

Abstract

Purpose The police work is particularly stressful. The aim of this work was to clarify whether the personality factors are associated with perceived stress levels or reactivity to environmental stressors in a special body of police. *Methods* The police officers in charge of guaranteeing public order at the L'Aquila G8 meeting were subjected to a control of their levels of work-related stress in anticipation of the event. Personality was assessed by the Italian version of the Five-Factor Model questionnaire, while stress was measured three times (during routine work in January 2009, preparation and imminence of the event, in April and July 2009, respectively) with the demand/control/support model of Karasek and the effort/reward imbalance model of Siegrist. A total of 289 of 294 officers took part in the survey. *Results* Some personality traits of the Five-Factor Model were associated with stress levels and stress reactivity. Neuroticism (low emotional stability) showed the strongest associations with job strain (demand/control ratio) ($\beta = 0.115$, $p < 0.05$) and effort/reward imbalance ($\beta = 0.270$, $p < 0.001$) and was associated with most of the stress variables. High agreeableness was associated with low effort/reward imbalance ($\beta = -0.157$, $p < 0.01$). *Conclusions* Personality factors may mitigate or increase the strain induced by environmental stressors.

Keywords Big Five personality factors · Work-related stress · Demand · Control · Job strain · Effort/reward imbalance

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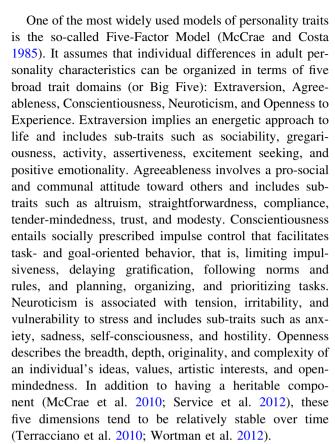e-mail: nicolamagnavita@gmail.com

Introduction

Police work is considered to be particularly stressful. The consequences of stress in police officers can be particularly serious both on account of the increased risk of health problems such as post-traumatic stress disorder (Austin-Ketch et al. 2012; Shucard et al. 2012; Pietrzak et al. 2012; Inslicht et al. 2011), depressive disorders (Lawson et al. 2012; Hartley et al. 2012; Kamble and Phalke 2011; Marchand and Durand 2011; Wang et al. 2010; Violanti et al. 2008), and coronary heart disease (Zimmerman 2012; Wright et al. 2011; Ramey et al. 2011) associated with acute and long-term work stress, and also due to an increased risk of impairment of work performance that could jeopardize the safety and health of the general population (Arial et al. 2010; Berg et al. 2005; Fox et al. 2012). Preventive programs, with complementary training in psychological and technical methods to reduce anxiety and enhance performance when facing a series of critical incidents, have been specifically developed for police forces (Arnetz et al. 2013; Levenson et al. 2010; Dowling et al. 2006).

Several studies have examined the causes of stress in police officers (Collins and Gibbs 2003; Juniper et al. 2010;

Leino et al. 2011; Komarovskaya et al. 2011, Violanti 2011; Lucas et al. 2012). Stressors include risk factors common to other jobs such as long working hours, shift work, commuting, repetitiveness, monotony, lack of support from superiors, lack of decision-making power, and also other factors typically associated with the specific tasks of a professional police officer such as those resulting from violence or the use of weapons. The two leading models thought to provide the best means of adequately evaluating this complex set of risk factors are the demand/control/support (DCS) model, developed by Karasek (1979), and the effort/reward imbalance (ERI) model, developed by Siegrist (1996). The DCS model assumes that the primary sources of job stress stem from two basic characteristics of the job itself: 'job demand' and 'job control'. The model predicts that job strain is not simply a function of job demand, but also depends on the amount of control the worker has over the work. Job demand takes into consideration the pace and intensity of work: work overload, degree of difficulty, available time, time allotted to executing tasks, and the existence of contradictory or conflicting orders. Job decision latitude, or job control, depends upon the worker's ability to control his own activities and skill usage (Karasek 2008). Social support at work, a moderating factor of job strain, was subsequently included in the model (Johnson et al. 1989). The ERI model puts emphasis more on the reward rather than the control structure of work, suggesting that mental distress and its health correlates arise when a high degree of effort is not adequately rewarded in the form of pay, esteem, status consistency, or career opportunities. A further assumption of this model involves individual differences in the perception of effort/reward imbalance: People with a motivational pattern of excessive work-related commitment and high need for approval (over-commitment) are at increased risk of strain (van Vegchel et al. 2005; Siegrist 2008). The Karasek model (DCS), developed in the 1960s, appears to be more suitable for the physical aspects of occupational stress, while Siegrist's model (ERI), designed for the tertiary society of the 1980s, is more sensitive to stress arising from work relations and organizational factors (Calnan et al. 2004).

Work stress has often been studied through the conceptual framework of environmental load, where occupational conditions at work are held responsible for stress. Less attention has been given to individual differences in work stress, although it has been recognized that the clinical consequences of stress are the result of interplay between stress factors and individual characteristics (Lazarus and Folkman 1984) and that some people are more vulnerable to stress than others (Marmar et al. 2006). Personality could be an individual characteristic that influences vulnerability or resilience to job stress.

One of the most widely used models of personality traits is the so-called Five-Factor Model (McCrae and Costa 1985). It assumes that individual differences in adult personality characteristics can be organized in terms of five broad trait domains (or Big Five): Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. Extraversion implies an energetic approach to life and includes sub-traits such as sociability, gregariousness, activity, assertiveness, excitement seeking, and positive emotionality. Agreeableness involves a pro-social and communal attitude toward others and includes sub-traits such as altruism, straightforwardness, compliance, tender-mindedness, trust, and modesty. Conscientiousness entails socially prescribed impulse control that facilitates task- and goal-oriented behavior, that is, limiting impulsiveness, delaying gratification, following norms and rules, and planning, organizing, and prioritizing tasks. Neuroticism is associated with tension, irritability, and vulnerability to stress and includes sub-traits such as anxiety, sadness, self-consciousness, and hostility. Openness describes the breadth, depth, originality, and complexity of an individual's ideas, values, artistic interests, and open-mindedness. In addition to having a heritable component (McCrae et al. 2010; Service et al. 2012), these five dimensions tend to be relatively stable over time (Terracciano et al. 2010; Wortman et al. 2012).

Previous studies have found associations between the Five-Factor personality traits and various aspects of work. Personality traits proved to be associated with shift-work complaints (Natvik et al. 2011), job satisfaction (Roberts et al. 2003; Judge et al. 2002; Grant and Langan-Fox 2007; Levy and Lounsbury 2011), and burnout (Alarcon et al. 2009). Peculiar personality profiles in police might be associated with mental health, stress, and trauma resistance (Du Preez et al. 2011; Galatzer-Levy et al. 2011; Orr et al. 2012). The association of certain personality traits with post-traumatic stress disorder is still controversial (Jonassaint et al. 2009; Yuan et al. 2011).

A number of studies have previously evaluated occupational stress in police using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in female police workers (Yoo and Franke 2011), musculoskeletal disorders in special police forces (von dem Knesebeck et al. 2005), and lower mental health level in correctional police officers (Bourbonnais et al. 2007) and urban police officers (Janzen et al. 2007). Previous studies in police officers have demonstrated that the demand/control model is a significant predictor of professional efficacy and exhaustion (Taris et al. 2010) and that there is a complex interplay between job demands, emotional exhaustion, and other social and individual factors (Hall et al. 2010).

The decision to hold the 2009 G8 meeting in Italy provided the opportunity for carrying out our present study.

The police officers selected to ensure law and order during this event were asked to undergo a thorough examination of their mental health condition so that their conduct during the meeting could not be stigmatized. In this study, we examined the association of personality traits, as indicated in the Five-Factor Model, with DCS and ERI levels and with reactivity to job changes in the Italian 'V Reparto Mobile' of Genoa. This special state police force flying squad deals exclusively with law enforcement and riot control at political demonstrations, big-crowd sports events, unexpected events (e.g., natural disasters), and in all situations where public safety may be at risk.

Our understanding of the individual factors underlying the perception of stress could be enhanced by examining the Five-Factor Model's association with the DCS and ERI model. On the basis of previous literature on personality traits, we hypothesized that in police officers, higher scores on the neuroticism scale might be associated with higher work stress, whereas higher scores on agreeableness might be associated with lower work stress. We also hypothesized that personality traits are associated with changes in individual perceived stress levels due to changes of environmental/occupational pressure. To our knowledge, this is the first study to investigate the association between personality traits and perceived stress in police officers using the DCS and ERI models simultaneously.

Methods

Participants

The Italian special police force unit 'VI Reparto Mobile' of Genoa is composed of 294 members. Two policemen refused to take part in the study, and one was unable to complete all the tests in the battery described in the next section and was therefore excluded. The participation rate was 99 %. Since only two officers were females, gender differences could not be assessed and the females were therefore excluded from the analyses. Hence the final group of participants comprised 289 officers (see Table 1 below for descriptive statistics of the socio-demographic and work-related variables).

Personality traits were assessed in January 2009. Perceived stress was measured on three separate occasions: in January 2009, when the police were engaged only in routine work, in April 2009, when they began to prepare the meeting, and in July 2009, shortly before the Genoa G8 summit meeting took place. The individual's perceptions of their overall working conditions, as measured by DCS and ERI scales, were expected to be unchanged or, eventually, increased in the proximity of the major event. The results of this study, that paradoxically showed stress levels to be

Table 1 Characteristics of the observed population ($N = 289$)

Socio-demographic variables	
Age, years (mean, ±SD)	35.4 (±7.5)
Length of service, years (mean, ±SD)	14.0 (±7.9)
Rank, superintendent or technical staff [N (%)]	140 (48.4)
Education level, high school or degree [N (%)]	217 (75.1)
Origin, Northern Italy [N (%)]	145 (50.2)
Living in barracks [N (%)]	162 (56.1)
Married or cohabiting [N (%)]	108 (37.4)
Presence of offspring [N (%)]	106 (36.7)
Personality traits	(mean + SD)
Extraversion/energy (mean, ±SD)	52.9 ± 8.3
Agreeableness/friendliness (mean, ±SD)	55.3 ± 10.5
Conscientiousness (mean, ±SD)	52.6 ± 8.6
Emotional stability/low neuroticism (mean, ± SD)	62.0 ± 8.2
Openness (mean, ± SD)	51.2 ± 9.1
Stress variables (range)	(mean ± SD)
Demand (5–20)	13.4 ± 2.02
Control (6–24)	13.3 ± 2.7
Support (6–24)	18.6 ± 2.9
Job strain (D/C weighted ratio)	1.31 ± 0.41
Effort (6–30)	15.0 ± 3.2
Reward (11–55)	42.3 ± 6.2
Overcommitment (6–24)	6.9 ± 1.9
ERI	0.70 ± 0.28
Change in stress levels (time A–time C)	(mean ± SD)
Demand	1.6 ± 2.2
Control	−2.6 ± 2.7
Support	−1.3 ± 2.0
Job strain	0.40 ± 0.36
Effort	5.6 ± 3.1
Reward	−7.9 ± 5.5
Overcommitment	0.51 ± 0.87
ERI	0.37 ± 0.20

lower shortly before the major event than they were during routine activities, have already been published (Garbarino et al. 2011). These studies show that in special groups of police constantly employed in the field, the unpredictability of routine tasks leads to a higher perceived stress than that corresponding to a single, very dangerous, but well-prepared event. The latter study revealed that the level of work stress for each officer slightly varied according to whether he was performing routine tasks, following specific training or coping with a major event. Since the work of a special police force requires over a period of time not only the performance of routine tasks but also active training and coping with major events, the level of stress of each individual officer may be evaluated approximately as the average stress level perceived in each of these conditions.
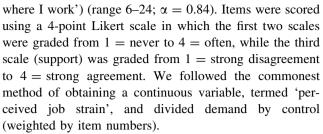
Furthermore, the change in stress levels while performing all the aforementioned activities can be considered a measurement of individual reactivity to environmental stress. For the purposes of this study, individual stress measurements obtained during routine work at time A (January 2009), during training at time B (April 2009), and shortly before the G8 meeting at time C (July 2009) were integrated into a single value expressing the mean stress level. A measure of stress reactivity, that is, the change in stress levels caused by changes in working conditions, was calculated by subtracting the level of each stress variable at time C from the value registered at time A.

Assessment of the five-factor personality traits

Personality traits were assessed at baseline (January 2009) by means of the Big Five Questionnaire (BFQ, Caprara et al. 1993a, b), an Italian measurement of the Big Five. In the BFQ, the Big Five are labeled Energy (E, Extraversion), Friendliness (F, Agreeableness), Conscientiousness (C), Emotional Stability (S, the opposite of Neuroticism), and Openness (O). Each scale contains 24 items half of which are negatively worded to control for possible acquiescence effects. Participants are asked to rate the degree to which each item adequately describes them on a 5-point Likert-type scale ranging from complete disagreement (1 = absolutely false for me) to complete agreement (5 = very true for me). Total raw scores, ranging for each variable from 24 to 120, were converted before analyses into standardized T scores using the Italian norms published in Caprara et al. (1993a). Scale reliabilities, measured as internal consistencies (Cronbach's α) in this study, were $E = 0.69$, $F = 0.80$, $C = 0.82$, $S = 0.88$, and $O = 0.77$.

Measurement of work stress

Occupational stress was measured using the validated Italian versions (Magnavita 2007) of two standardized questionnaires: the DCS demand/control/support questionnaire (Karasek et al. 2007, Fransson et al. 2012) derived from the longer Job Content Questionnaire (Karasek 1979), and the effort/reward imbalance questionnaire (Siegrist 1996, Siegrist et al. 2004). The classic 17-item DCS questionnaire consisted of 3 scales termed 'psychological job demand', 'job control or decision latitude', and 'workplace social support'. The 'demand' scale was the sum of 5 items (e.g., D1: 'Do you have to work very fast in your job?') (range 5–20; $\alpha = 0.71$), the 'control' scale was the sum of 6 items (e.g., C1: 'Do you have the opportunity to learn new things in your work?') (range 6–24; $\alpha = 0.65$), and the 'support' scale was the sum of 6 items (e.g., S1: 'There is a calm and pleasant atmosphere

where I work') (range 6–24; $\alpha = 0.84$). Items were scored using a 4-point Likert scale in which the first two scales were graded from 1 = never to 4 = often, while the third scale (support) was graded from 1 = strong disagreement to 4 = strong agreement. We followed the commonest method of obtaining a continuous variable, termed 'perceived job strain', and divided demand by control (weighted by item numbers).

The 23-item ERI questionnaire contained the scales: 'effort', evaluated by 6 items (e.g., E1 'I have constant time pressure due to a heavy workload') (range 6–30; $\alpha = 0.82$), and 'reward', evaluated by 11 items (e.g., R1 'I receive the respect I deserve from my superior or equivalent person') (range 11–55; $\alpha = 0.89$). Both were scored on a 5-point scale, where a value of 1 indicated no stressful experience and 5 indicated a highly stressful experience. The weighted ratio between effort and reward was calculated to quantify the degree of mismatch between effort and reward. The ERI questionnaire also included a third scale, 'over-commitment', which was evaluated by 6 items on a 4-point Likert scale (e.g., O3 'When I get home, I can easily relax and 'switch off' work') (range 6–24; $\alpha = 0.79$). It measured the set of intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress. Finally, before subsequent analyses, a logarithmic transformation was made of the stress variables to correct for skewness and kurtosis.

Confounders

The confounders in our study were age (years); length of employment (years of service); education level (8 or more years of schooling); rank (officer, or supervisor and technical staff); origin (Northern or Southern Italy); housing (in barracks or home); marital status (single or divorced/married or cohabiting); and presence of children (no/yes).

Statistical analyses

The associations between work stress and personality traits were examined by linear regression analyses. The dependent variables were stress variables (average level and change, in separate analyses). In the first step, each personality trait was introduced as predictor (Model A, crude). In the second step, age, length of employment, education, rank, origin, marital status, housing, and presence of offspring were added in the former model to form Model B (adjusted). The same analyses were repeated specifying the change in each stress-related variable in the period January–July 2009 as the dependent variable. In a final step (Model C), we included simultaneously all personality traits and confounders.

Table 2 Results of the regression analyses predicting work stress

	Demand		Control		Support		Job strain		Effort		Reward		Over-comm		ERI	
	U	A	U	A	U	A	U	A	U	A	U	A	U	A	U	A
Energy/extraversion																
β	0.16**	0.15**	0.08	0.11	0.10	0.11	0.02	−0.01	0.11	0.09	−0.01	0.01	−0.05	−0.07	0.07	0.05
R^2	0.03	0.05	0.01	0.16	0.01	0.02	0.01	0.10	0.01	0.05	0.00	0.05	0.01	0.05	0.01	0.06
Friendliness/agreeableness																
β	0.01	0.02	0.14*	0.13*	0.16**	0.16**	−0.11	−0.09	−0.11	−0.08	0.24***	0.22***	−0.08	−0.07	−0.18**	−0.16**
R^2	0.00	0.03	0.02	0.17	0.02	0.04	0.09	0.11	0.01	0.07	0.06	0.10	0.01	0.05	0.03	0.08
Conscientiousness																
β	0.05	0.06	0.11	0.09	0.01	0.02	0.06	−0.04	−0.03	−0.01	0.04	0.02	−0.04	−0.03	−0.04	−0.01
R^2	0.01	0.03	0.01	0.16	0.00	0.01	0.01	0.10	0.01	0.07	0.01	0.05	0.01	0.04	0.01	0.06
Stability (low neuroticism)																
β	−0.06	−0.05	0.07	0.11*	0.16**	0.17**	−0.08	−0.11*	−0.21***	−0.22***	0.25***	0.28***	−0.18**	−0.19***	−0.25***	−0.27***
R^2	0.01	0.03	0.01	0.16	0.03	0.04	0.01	0.11	0.04	0.11	0.07	0.12	0.03	0.08	0.07	0.13
Openness																
β	0.01	0.02	0.09	0.12*	0.09	0.10	−0.07	−0.09	−0.04	−0.01	0.08	0.09	−0.14*	−0.12*	−0.06	−0.05
R^2	0.00	0.03	0.01	0.16	0.01	0.02	0.01	0.10	0.01	0.07	0.01	0.06	0.02	0.06	0.01	0.06

Linear regression coefficients (β) and determination coefficients (R^2)

U crude, unadjusted, A adjusted for age, length of employment, education, rank, marital status, housing, and presence of offspring

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Results of the regression analyses predicting changes in stress levels

Change of stress variables	Demand		Control		Support		Job strain		Effort		Reward		Over-comm		ERI	
	U	A	U	A	U	A	U	A	U	A	U	A	U	A	U	A
Energy/extraversion																
β	−0.01	−0.01	−0.04	−0.05	0.08	0.07	0.02	0.03	0.02	0.03	0.03	−0.04	0.05	−0.05	0.01	0.02
R^2	0.00	0.03	0.01	0.09	0.01	0.02	0.00	0.03	0.00	0.04	0.01	0.05	0.01	0.02	0.00	0.04
Friendliness/agreeableness																
β	0.02	0.03	−0.12*	−0.11	−0.05	−0.05	0.04	0.03	0.14*	0.12*	−0.19***	−0.17**	−0.10	−0.10	0.05	0.04
R^2	0.00	0.03	0.02	0.10	0.01	0.02	0.01	0.03	0.00	0.05	0.04	0.08	0.01	0.03	0.01	0.05
Conscientiousness																
β	−0.02	−0.01	−0.11	−0.10	−0.04	−0.05	0.03	0.02	0.09	0.07	−0.12*	−0.10	−0.02	0.01	0.07	0.07
R^2	0.00	0.03	0.02	0.10	0.01	0.02	0.01	0.03	0.01	0.05	0.02	0.06	0.00	0.02	0.01	0.05
Stability (low neuroticism)																
β	0.09	0.10	−0.05	−0.09	−0.14*	−0.13*	0.05	0.06	0.20***	0.19***	−0.23***	−0.23***	−0.05	−0.06	0.12*	0.11
R^2	0.01	0.04	0.01	0.10	0.02	0.04	0.01	0.03	0.04	0.08	0.05	0.11	0.01	0.02	0.02	0.06
Openness																
β	0.03	0.01	−0.02	−0.02	0.01	0.01	−0.02	−0.03	0.10	0.08	−0.13*	−0.11	−0.05	−0.04	0.04	0.01
R^2	0.00	0.03	0.01	0.09	0.00	0.02	0.00	0.03	0.01	0.05	0.02	0.06	0.01	0.04	0.01	0.04

Linear regression coefficients (β) and determination coefficients (R^2)

U crude, unadjusted, A adjusted for age, length of employment, education, rank, marital status, housing, and presence of offspring

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Results of the regression analyses predicting interference of socio-demographic variables and personality with work-related stress

	Demand	Control	Support	Job strain	Effort	Reward	Over-comm	ERI
Age	−.179	−.119	.080	.001	−.168	.194	−.267	−.201
Length of employment	.123	.378*	.046	−.196	.051	.021	.019	.011
Rank	−.042	−.091	−.081	.051	−.214*	.014	−.080	−.131
Education	.116	.094	−.037	−.036	.198*	−.013	.161*	.116
Origin	.013	−.025	−.087	.022	−.033	.034	−.007	−.037
Marital status	−.135	.007	.069	−.080	−.018	.005	−.012	−.011
Housing	.004	.134	−.003	−.121	−.027	.062	−.043	−.048
Offsprings	.110	.061	−.068	.008	.034	−.042	.106	.049
Energy	.190*	.043	.096	.069	.140*	−.055	−.032	.114
Friendliness	.018	.053	.098	−.037	.001	.158*	.103	−.078
Conscientiousness	.015	.014	−.101	.006	.000	−.076	.058	.041
Stability	−.094	.045	.131	−.079	−.264***	.242***	−.225**	−.283***
Openness	−.049	.045	−.026	−.070	.027	−.040	−.088	.036
R²	0.06	0.17	0.06	0.11	0.13	0.14	0.09	0.15

Energy (*E*, Extraversion), Friendliness (*F*, Agreeableness), *C* Conscientiousness, Emotional Stability (*S*, the opposite of neuroticism), and *O* Openness

The study protocol was approved by the Ethics Committee of the Catholic University Rome School of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and the national police management board.

Results

Descriptive statistics of the study variables are presented in Table 1

The results for the linear regression analyses are reported in Tables 2, 3, and 4.

The results show an association between low emotional stability (high neuroticism) and both high ERI ($\beta = -0.27$, $p < 0.001$) and high job strain (D/C ratio) ($\beta = -0.11$, $p < 0.05$). High agreeableness is related to low ERI ($\beta = -0.16$, $p < 0.01$). The association between agreeableness and job strain followed the same trend ($\beta = -0.09$) but did not reach the statistical level of significance.

Further significant associations can be observed by examining the variables that make up the stress models. In the DCS model, extraversion is associated with high demands ($\beta = 0.15$, $p < 0.01$). Emotional stability (low neuroticism), openness, and agreeableness are associated with high job control ($\beta = 0.11$, 0.12, and 0.13, respectively; $p < 0.05$). Emotional stability and agreeableness are

related to social support at work ($\beta = 0.17$ and 0.16, $p < 0.01$). In the ERI model, stability or low neuroticism is negatively associated with effort ($\beta = -0.22$, $p < 0.001$) and over-commitment ($\beta = -0.19$, $p < 0.001$) and, positively, with reward ($\beta = 0.28$, $p < 0.001$); agreeableness is associated with high rewards ($\beta = 0.22$, $p < 0.001$). No associations were found between conscientiousness and perceived stress. Overall, the association between personality and stress was weak: Less than 10 % of variance of stress was predicted by personality traits. The inclusion in the model of socio-demographic variables increased its predictive value, generally lowering the observed associations (Table 2).

Table 3 illustrates the regression analyses for the five-personality traits and stress reactivity. Emotional stability (low neuroticism) is associated with change in ERI ($\beta = 0.12$, $p < 0.05$), but this association disappeared after the control variables were added. Emotional stability is associated with change in effort ($\beta = 0.19$, $p < 0.001$), reward ($\beta = -0.23$, $p < 0.001$), and social support ($\beta = -0.13$, $p < 0.05$), even after correction for confounders. Agreeableness is associated with change in effort ($\beta = 0.12$, $p < 0.05$) and reward ($\beta = -0.17$, $p < 0.001$). Conscientiousness and openness showed a weak association with change in reward, but the associations disappeared after adjustment for confounding variables. Also, in this case, the association between personality and changes in stress levels is very weak, rarely exceeding 10 % of variance (Table 3).

In the final model (Table 4), in which all the personality variables are inserted simultaneously, emotional stability (low neuroticism) correlated with all scales of the ERI

model (effort, reward, and over-commitment). Energy positively correlated with effort and friendliness increased the reward score, so the contribution of these variables is compensated, and only stability is significantly correlated with ERI ($\beta = -0.28$, $p < 0.001$). The combined correlation of personality variables with DCS model of stress is generally not significant. Personality factors account for between 6 and 17 % of the variance of stress.

Discussion

The aim of our study was to examine the association between personality measured by the Five-Factor Model and work stress measured by the most widely used models: DCS and ERI. A second objective of our work was to verify whether some personality trait was associated with the extent of change in the levels of stress perceived by each worker in the different exposure conditions. Our findings showed that some personality traits of the Five-Factor Model are associated with stress levels and stress reactivity. Neuroticism (low emotional stability) showed the strongest associations with job strain (D/C ratio) and ERI and was associated with most of the stress variables. Agreeableness was associated with low ERI, high social support, and high rewards. These personality traits are also associated with changing levels of stress that express individual responsiveness to changing environmental work conditions. All these associations, however, are very weak, and personality traits account for between 6 and 17 % of the variance in self-perceived stress, and less of 10 % of the reactivity to changing environmental conditions.

The policemen with high emotional stability (low neuroticism) have a greater control over their work and suffer a significantly reduced mental and physical effort in the activities of law enforcement. They receive more support from colleagues and a greater amount of intangible rewards for their work, they also tend not to be personally involved in the situations they face, and this reduces the intrinsic stress and is at the same time a guarantee to preserve the coolness needed in dangerous situations.

Individuals with greater friendliness perceive a higher support from colleagues and superiors and greater rewards, and this moderates their work-related stress. The policemen with high energy/extraversion report a greater demand at work and a greater personal effort, suggesting that they probably personally take a larger amount of work than their colleagues.

Moving from a favorable to a more annoying working condition, that is, from the imminence of a great event to the routine law enforcement, policemen experience reduction of support and reward, and increased effort. We observed that emotional stability and friendliness moderate these unfavorable changes. Our study supports the hypothesis that the combination of emotional stability (low neuroticism) and friendliness improves the level of self-perceived stress and increases resistance to stressful changes of working tasks.

Our study on a group of officers from a special police force replicated the results of a recent study on the Finnish general population (Törnroos et al. 2012), suggesting that there is a direct relationship between neuroticism and low agreeableness and work stress.

However, in this study, the magnitude of the association between personality factors and stress was lower than that observed by Törnroos et al. (2012). Extraversion and conscientiousness, which were related to stress in the Finnish study, showed only a weak association with stress, or none at all. This difference was probably linked firstly to the smaller size of our sample that reduced the power of statistical tests, and also to the occupational specificity of the sample that was composed of a highly selected population engaged in the same type of work. Officers in special police forces are reported to describe themselves as much more emotionally stable and moderately more extraverted, agreeable, conscientious, and open to experiences than the general population and military forces (Garbarino et al. 2012; Detrick and Chibnall 2006). Self-selection to job and job homogeneity in special police forces are probably reducing variability and therefore may lessen the strength of the association between personality traits and work-related stress.

Low emotional stability (neuroticism) in our study was associated with higher effort and over-commitment (intrinsic stress) but also with lower reward, lower control, and lower support at work. This suggests that by putting in considerable effort without any increase in decisional power, neurotic individuals may extend their personal involvement and put themselves at stake without gaining any reward or social support. Consequently, they perceive higher work stress. This is in keeping with previous studies suggesting that neuroticism is associated with lower job satisfaction and a higher risk of burnout (Grant and Langan-Fox 2007; Alarcon et al. 2009; Hudek-Knezevic et al. 2011). In a 15-year prospective study of young Finns (Hintsanen et al. 2011), negative emotionality (a personality trait similar to neuroticism) was shown to be associated with future job strain and ERI. We also found that neuroticism was correlated with observed changes in effort, reward, and support levels. Studies show that personality traits influence stress responses due to the mediating role of appraisal, that is to say, personality influences what is, and what is not perceived as stressful (Code and Langan-Fox 2001). Neuroticism has been linked to maladaptive coping strategies employed by individuals facing a stressful situation (McCrae and Costa 1986; Penley and Tomaka 2002).

There is evidence that neuroticism also leads to worse performance due to individual appraisal of threats (Schneider et al. 2012). In the case of police officers, a worried and insecure officer may not only be vulnerable to stress but may also bring a negative appraisal to the workplace and consequently perceive the work environment as negative. This might then lead to an increase in perceived stress.

In a study on British nurses, openness and extraversion were associated with less perceived stress, while conscientiousness was associated with more perceived stress (Burgess et al. 2010). A follow-up study of young Finns showed that negative emotionality, a temperament trait conceptually close to neuroticism, predicts subsequent stress at work (Hintsanen et al. 2011). Only one recent study has focused on the association between personality traits and perceptions of work stress, showing that high neuroticism, low extraversion, and low agreeableness are associated with high stress measured using the effort/reward imbalance (ERI) model (Törnroos et al. 2012). Neuroticism (N) and Extraversion (E) proved to influence physiological reactivity to mental and emotional stress (Jonassaint et al. 2009). Other studies, by contrast, found no association between five-factor personality and post-traumatic stress disorder symptoms (Yuan et al. 2011).

We found that high agreeableness was associated with lower ERI, higher reward, and higher social support. Agreeable individuals may experience less work stress because they gain adequate rewards and have high social support from co-workers and superiors. These findings are in line with previous studies indicating that high agreeableness is associated with higher job satisfaction and lower risk of burnout (Grant and Langan-Fox 2007; Alarcon et al. 2009), and also with lower levels of work-related stress (Törnroos et al. 2012). Positive affect has been associated with positive reappraisal (reframing) of stressful situations, goal-directed problem-focused coping, and infusion of meaning into the ordinary events of daily life in order to gain a psychological time-out from distress (Lecic-Tosevski et al. 2011). In our study, the policemen with high emotional stability and friendliness seem to be able to make a positive reappraisal of stressful situations, reporting a minor deterioration of self-perceived stress in the comparison of more-favorable to less-favorable working conditions.

Our study provides support for the idea that personality traits influence work-related stress. The relationship between personality and stress is undoubtedly complex and may act at different levels: (1) exposure, through the choice or avoidance of occupations that are associated with specific stressors, challenges, or benefits; (2) appraisal, way of interpreting a stressful situation and evaluating one's own abilities and capacities for proactive behavior so as to confront or avoid it; (3) intensity of response to a stressor; and (4) coping strategies employed by the individual facing a stressful situation (Lecic-Tosevski et al. 2011).

Some limitations should be taken into account when interpreting our results. Firstly, in our study, assessed personality traits and work stress by means of self-reports could lead to a response bias, that is, common method variance. Nevertheless, it has been argued that common method variance is not automatically a source of bias in research based on self-reports and that any eventual effect is often small (Spector 1987, 2006) and may actually diminish associations and not amplify them (Podsakoff et al. 2003, 2012). Methodological studies show that correlations with an explained variance of 10 % and above are not likely to be the result of negative affectivity bias (Arial and Wild 2011).

Secondly, this was a cross-sectional study, as we analyzed the association of personality traits with average level of occupational stress, and therefore, no conclusions about cause–effect relationships or temporal precedence can be made. This raises the question of the direction in which association occurs. However, since personality traits are considered stable (Rantanen et al. 2007), while stress is variable, it is more likely that the former affects the latter and not vice versa. In fact, a recent study of the Big Five traits and work stress demonstrated that the direction is unidirectional, that is, from personality to occupational experiences rather than the other way around (Sutin and Costa 2010). Moreover, longitudinal, population-based studies of temperament-based personality traits and work stress indicate that individual dispositions predict stress at work (Hintsanen et al. 2009, 2011). Furthermore, the observation period of 6 months enabled us to measure stress levels under different working conditions (routine work, training, and shortly before a major event) so as to make an approximate calculation of the change in stress levels occurring during the working life of a policeman. It was also possible to measure this variation in stress levels and determine whether it is influenced by personality factors.

The small size of our cohort undoubtedly reduced the statistical power of the study and did not allow studying the interactions between personality factors. Subsequent studies on larger cohorts are needed to clarify whether the high positive association of neuroticism with stress could be buffered with the negative association of high agreeableness.

Finally, because our sample corresponds to a specific police unit, and it is a rather small cohort, our results may not be generalizable to police officers in general, with different occupational exposure, or to special forces in countries with different ethnic or cultural characteristics.

However, our study also has several important strengths. To our knowledge, this is the first study to investigate

associations linked to personality as defined by the Five-Factor Model, a theoretically sound model covering the most important higher-order aspects of personality, and work stress in terms of both DCS and ERI. The population had a very consistent exposure to homogenous occupational risks, while many studies include persons who perform very different tasks. The participation rate was very high (99 %). Finally, since the measurements used in this study have been validated in several other studies, our results are more comparable with other research findings.

In literature, the study of personality factors showed little utility for predicting a successful career in the armed forces (Hartmann et al. 2003). We should emphasize that the weakness of the associations found in our study between personality traits and response to occupational stress factors does not justify the use of personality tests as a selection criterion for the police. It has also been observed, however, that recruits who manifested the greatest level of stress during training were reported to have a worse result in the future (Jackson et al. 2011). Our study shows that identification of the personality traits that affect stress response may be useful in developing the most appropriate training strategies for enhancing coping and moderating stress.

The Italian law requires all companies, including the police, to assess the risk of work-related stress through systematic collection of information, the so-called 'objective indicators of stress', that refer to factors of job content (i.e., workload and schedule), organizational context (i.e., role, autonomy, and interpersonal conflict), and possible sentinel events (i.e., absenteeism and turnover). This assessment is not based on evidence and has little chance of predicting the actual occurrence of stress-related diseases, because it does not take into account the personality profile of individual workers and their perceptions of stress. Our aim was to provide useful indications to help recognize these individual factors.

Conflict of interest The authors declare that they have no conflict of interest.

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