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Complete List of Authors:	Garbarino, Sergio; University of Genoa, Department of Neuroscience, Ophthalmology and Genetics Cuomo, Giovanni; Ministry of the Interior, 1. State Police Health Service Department Chiorri, Carlo; University of Genoa, Department of Educational Sciences, Psychology Unit, Magnavita, Nicola; Università Cattolica Sacro Cuore, Public Health
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Association of work-related stress with depression in a special police force. A cross-sectional study.

Garbarino Sergio[1,2], Cuomo Giovanni[2], Chiorri Carlo[3], Magnavita Nicola[4].

1. State Police Health Service Department, Ministry of the Interior, Rome, Italy
2. Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy
3. Department of Educational Sciences, Psychology Unit, University of Genoa, Genoa, Italy
4. Department of Public Health, Occupational Health Unit, Università Cattolica del Sacro Cuore, Largo Gemelli 8, 00168 Roma, Italy. e-mail: nicolamagnavita@gmail.com

Correspondence to: N. Magnavita. Tel. +39-347-3300367, Fax: +39-06-61909399, e-mail nicolamagnavita@gmail.com; nmagnavita@rm.unicatt.it

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Abstract

Objectives. Law and order enforcement may expose policemen to significant psychosocial risk factors, so that some subjects may find themselves in conditions of distress. The aim of this work is to study the relationship between job stress and the presence of symptoms of depression and to assess the risk of mental disorders in policemen.

Method: 292 out of 294 components of the Genoa 'Mobile', a special police force engaged exclusively in the enforcement of law and order, responded to our invitation to complete a questionnaire for the assessment of work-related stress and depression.

Results: Policemen who experience a discrepancy between work effort and rewards showed a marked increase in the risk of self-reported depression (OR 7.00 95% CI 4.76 to 10.30) when compared with their counterparts who do not undergo "distress ".

Conclusions: The prevalence of depressive symptoms in the observed population of policemen was low, but not negligible. It would be in the interests not only of the workers themselves, but also of the general population to take steps to prevent distress and improve the mental well-being of the police.

Keywords: effort-reward imbalance, depression, distress, job strain, mental health, over-commitment, police, social support, work-related stress.

Article summary

'Article focus'

(up to three bullet points on the research questions or hypotheses addressed)

Mental health in the special police forces is critical. The policemen are exposed to acute and chronic stress and may become depressed. The impairment of the police officer can be a serious threat to the safety of the public.

'Key messages'

(up to three bullet points showing the key messages or significance of the study)

The prevalence of depression in the police special forces is lower than that of the general population and other groups of policemen. Even in special forces, the distress is associated with depression. The prevention of distress and the treatment of depressive disorders among policemen are necessary for the safety of the workers and the public.

'Strengths and limitations of this study'

This is a cross-sectional study, conducted on a small cohort. It 'was, however, obtained a very high participation in a group of policemen always in the front line, in the maintenance of public order.

Introduction

The impairment of the mental health of workers is an increasingly frequent consequence of contemporary working conditions. Direct financial costs due to absenteeism, presenteeism, reduced productivity and compensation are being added to the intangible costs arising from the suffering of workers. Alongside the ethical reasons for action, there are important economic considerations that point to/indicate the need for preventing depression. Skilled workers with qualifications acquired through expensive training and long experience are the most important asset of any company, i.e. their human capital. The premature loss of these workers through psychological trauma or illness is an economic as well as a human drama.

Some workers, particularly those employed in first responder organizations such as the police force, are particularly vulnerable to psychosocial stress. It is known that violent trauma can acutely induce posttraumatic stress disorder (PTSD) in workers [1)]. Accidents of this type rarely occur and the likelihood that a police officer may be exposed to an event severe enough to cause PTSD tends to be low [2)]. Nevertheless, officers are frequently exposed to violent events that, even if not immediately perceived as detrimental, can still induce maladaptive reactions in individuals [3)]. In addition to these operational work-related challenges, policemen may be subject to organizational problems that are common within hierarchical, male-dominated paramilitary structures such as the fire-fighting, ambulance and paramedic services [4)]. Daily organizational stressors may be more challenging than operational experiences, as we have observed in a previous study in which the levels of perceived stress in a group of policemen was higher during routine jobs than during a high-risk public event [5)].

It is important to note that the pathophysiological reaction may be the same for completely different stimuli. Even if the "more recent" and advanced area of our brain (i.e. the medial-frontal cortex) is perfectly able to distinguish between the dramatic operational events and the chronic organizational

factors, the part of the brain that is responsible for/involved in neurophysiological response to stress, i.e. the limbic system, makes no such distinction. Consequently, both a dramatic violent event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e. a neurobiological maladaptive reaction characterized by behavioral, emotional and capacity changes that goes under the name of "distress". Distress, interacting with many different individual factors, can induce the occurrence of mental illnesses such as anxiety, depression, burnout, conversion disorder and other conditions classified in DSM IV.

Psychological injury resulting from work experience can be a gradual and progressive process that erodes well-being over time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at least until the severity of the disease makes it clear to colleagues, family, or both. The prevailing culture in the police force does not encourage recognition of emotional damage caused by work, as it is considered a sign of weakness [6].

Consequently, people fail to seek professional help until the disease is so far advanced that it is difficult to treat. It is for this reason that mental illness is the leading cause of retirement in the police force [7].

The two leading models that have been used to describe and explain individual perception of stress factors are the Demand/Control/Support (DCS) model, developed by Karasek [8], and the Effort/Reward Imbalance (ERI) model, developed by Siegrist [9]. 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. Social support at work, a moderating factor of job strain, was subsequently included in the

model. 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 [9]. 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 [10].

'Distress' is an ill-defined term that refers to an unfavorable and unpleasant response to stress. Due to such a vague definition, the prevalence of workers with distress ranges widely from 5% to 50% in various studies [11]. When distress reaches clinical relevance it is defined as "stress-related disorder"; this term includes a variety of clinical conditions, including depression, which are collectively labeled as "common mental disorders" (CMD). The prevalence of CMDs in the US armed forces is 27% [12] and there is a similar prevalence in the UK armed forces [13]. Depression is the most common diagnosis [13]. In Europe it is estimated that the lifetime prevalence of mood disorders is 14.0% and the one-year prevalence is 4.2% [14]. Outside Europe, the prevalence of severe distress with symptoms of depression or other mental problems is estimated to be at least 5%, but could be significantly higher [15]. Distress and mental health problems caused by work are very important for the performance of professional activity, especially in a very sensitive area such as the police force, in which workers have weapons. The consequences of stress in police officers can be particularly serious both on account of the increased risk of individual health problems, and also the increased risk of impaired work performance that could jeopardize the safety and health of the general population.

The relationship between mental health and the work environment is complex and multifaceted: an unfavorable work environment is associated with higher prevalence of mental disorders, and employees with mental problems are generally less adaptable to their work environment.

The diagnosis of work-related mental disorders is of particular importance for three reasons. At the macro (national) level, epidemiological monitoring can identify trends and help to indicate preventive strategies. In Italy, for example, it is compulsory for all employers to assess stress in the workplace and to provide appropriate preventive measures if necessary. At intermediate (company) level, the identification of one or more cases of work-related mental disorders can stimulate or enhance preventive action. At the individual level, the occupational physician may give specific instructions to encourage the return to work or improve the quality of working life.

Investigating stress in police officers is particularly difficult because the latter are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield 7) found work stress to be the first cause of sickness absence and reduction in operational duties, as well as the leading cause of ill health retirement in policemen. A number of studies have previously evaluated occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen [16)], musculoskeletal disorders in special police forces [17)], lower mental health level in correctional police officers [18)] and urban police officers [19)]. Previous studies on police officers have demonstrated that the demand-control model is a significant predictor of professional efficiency and exhaustion [20)], and that there is a complex interplay between job demands, emotional exhaustion and other social and individual factors [21)]. Subjects with greater perceived work stress in the first year of police service have greater depression symptoms 12 months later [22)].

The purpose of this study was to assess whether there is an association between a condition of "distress" and the presence of self-reported symptoms of depression in a specialist or 'elite' unit of the Italian police, the 'VI Reparto Mobile' of Genoa, a carefully selected group who is called to maintain law and order in all the major events that happen in the country. The policemen in this group work exclusively as First Responders; members are carefully selected among ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and also they are often involved in public events in which there is a high risk of terrorist attacks and physical fights. During a single riot, they are on duty for an average of 10 or more hours of work, have physical fights for over an hour on average and often feel that they are in imminent danger of death. They have a special and continuing education which aims to improve team spirit ("esprit de corp") and increase the preparation to dramatic events. 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.

Method

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 female, gender differences could not be assessed and 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).

Occupational stress was measured using the validated Italian versions [23] of two standardized questionnaires: the DCS demand/control/support questionnaire, derived from the longer Job Content Questionnaire [8], and the effort-reward imbalance questionnaire [9]. 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?") ($\alpha = 0.71$), the 'control' scale was the sum of 6 items (e.g. C1: "Do you have the opportunity to learn new things in your work?") ($\alpha = 0.65$), and the 'support' scale was the sum of 6 items (e.g. S1: "There is a calm and pleasant atmosphere where I work") ($\alpha = 0.84$). 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 two scales: 'effort', evaluated by 6 items (e.g. E1 "I have constant time pressure due to a heavy workload") ($\alpha = 0.82$), and 'reward', evaluated by 11 items (e.g. R1 "I receive the respect I deserve from my superior or equivalent person") ($\alpha = 0.89$). 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. Individuals who had a score greater than one were considered to be stressed because they subjectively perceived a discrepancy between efforts and results. 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") ($\alpha = 0.79$). It measured the set of intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress.

Depression was evaluated by the Beck Depression Inventory (BDI) [24], as this questionnaire performed better than other tests for depression screening [25,26]. The BDI consists of 21 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores indicating more severe depression. If multiple responses are chosen under one item, the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in clinical practice for depression screening is 10 [27]. The probability of suffering major depressive disorder rapidly increases above this threshold; so, a higher score of 14 [25] or 16 [26] is often chosen in order to reduce the prevalence of false positive in populations consisting of patients affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level of 10, as the subjects tested were young, active and highly selected.

The questionnaires were anonymous, and participants were identified by an alphanumeric code, double-blind. All data was treated in accordance with the Ethical Principles of Psychologists Code of Conduct (American Psychological Association 2002).

Control Variables

The control variables used 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); presence of children (no/yes).

Statistical analyses

The first question we set out to answer was whether there is a relationship between the individual level of work-related stress and mental health problems. In order to do this we used hierarchical

multiple linear regression model in which the variable "depression score" was posed as dependent variable. In the first model we used the socio-demographic variables (age, length of employment, rank, education level, origin, marital status, housing, having offspring) as independent variables. In the second and third models, we separately added the stress-related variables from the Karasek (demand, control, support) and the Siegrist models (effort, reward, over-commitment). In the final model, we put together all the stress-related and the socio-demographic variables as predictors of depression. The degree of association between variables is indicated by the regression coefficient computed on the standardized variables (β). The amount of variance of the depression score accounted for by the predictors is indexed by the (R^2).

The second question involved ascertaining what was the risk of suffering from depression for a policeman in a state of distress. We used binary logistic regression, with the state of depression ("caseness") as defined above as the dependent variable. Separately, we used job strain (high demand and low control), social isolation ("support" below the median), isostrain (job strain plus social isolation), effort-reward imbalance (subjects with ERI value >1), and over-involvement in work ("over-commitment" above the median) as independent variables. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the socio-demographic variables to the equation. We calculated odds ratios (OR) and their 95% confidence intervals (95%CI).

PASW/SPSS software (version 20, IBM, Chicago, IL) was used for analyses.

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

The characteristics of the study population are shown in Table 1. The average values of the variables indicating stress in the workplace and those referring to mental disorders are listed in Table 2. In this study, there were 21 (7.3%) likely cases of mild depression (BDI greater than or equal to 10) among the policemen, while the most likely cases of moderate depression (BDI> 16) were found among 7 subjects (2.4%).

Linear regression analysis (Table 3) enabled us to evaluate the level of depression that can be predicted on the basis of socio-demographic and work-related stress data. The association between socio-demographic variables and depression was weak and generally not significant, only the rank level was inversely associated with depression. Taken together, the socio-demographic factors described only a small fraction of the variability of psychological problems, i.e. less than 1%.

By adding demand, control and support, the percentage of variance expressed rose to about one-tenth of the total variance (R^2=0.096). Social support was negatively associated with depression (β= -0.211). Job control was negatively associated with the presence of depressive symptoms (β= -0.127).

By substituting the DCS model variables with those of the ERI model (Model III of Table 3) among the independent variables, the coefficient of determination improved significantly, thus expressing about one-sixth of the total variance (R^2= 0,16). Reward received for work was the most important protective factor against depression (β = -0.303). On the contrary, excessive involvement in work or intrinsic effort (over-commitment) was significantly associated with depression in a positive way (β= 0.121).

The more complex model, in which all stress-related variables were included (Model IV of Table 3) indicated that there was a negative linear association between the score for depression and rewards (β= -0.226).

By logistic regression (Table 4) we observed that for subjects in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"),

the risk of being depressed almost doubled (OR 1.92; 95% CI 0.76-4.84), although the association was not statistically significant since the ranges of variability of the estimates included the assumption of equivalence. If we take into account the lack of social support, which was significantly associated with depression (OR 3.47; 95%CI 1.16-10.38), the condition of iso-strain was associated with a significantly increased risk of depression (OR 7.39; CI95% 2.46-22.23). The police officers who were in a state of "distress" according to the ERI model (i.e. weighted ratio between effort and reward more than 1) also had a much higher risk of depression (OR 7.39 CI95% 2.46-22.23). Over-commitment was associated with the risk of depression (OR 3.85; CI95% 1.28-11.54).

Discussion

Our study, which to the best of our knowledge is the only conducted on a police unit of avant-garde, indicated that higher levels of work stress are associated with depressive symptoms. Both the work-related stress models we used were significantly associated with the presence of depressive symptoms, even if the effort / reward / imbalance model seemed to be more efficient in predicting mental ill-health than the demand / control / support model.

Seven per cent of policemen in our cohort reported depressive symptoms. The prevalence is lower than that found by by Fox et al. [28] in urban US policemen (9%), by Frühwald et al. [29] in Lower Austria (9%), by Arial et al. [30] in a Swiss sample of police officers (11.9%), by Chen et al. [31] in the Taiwanese police (21.6%), and by Obidoa et al. [32] among US corrections officers (31%), and it is comparable with that found in other working populations [12-15]. A nationwide study in the Norwegian police service, indeed, showed that the younger policemen reported lower levels of depressive symptoms than the corresponding general population [33]. A recent comparison of police and other employees found no indications that self-reported mental health disturbances are more

prevalent among police officers than among groups of employees that are not considered high-risk groups [34]. Our sample was composed by young and highly selected policemen, and this may explain our findings.

Depression represents a considerable cost for productivity both in terms of absenteeism and presenteeism [35]. But much more important is the fact that this condition increases the possibility of errors and the risk to the health and safety of others.

The results of our observations are in agreement with the literature. A recent meta-analysis of studies on the association between stress and mental disorders indicates that psychosocial problems in the workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [36]. Another review of 14 longitudinal studies indicates that lack of social support enhances depression [37]. Even more recent studies go in the same direction. The two effort-reward and demand-control-support models used together have greater predictive power for depressive disorders than a single model [38].

In this study, the ERI model proved particularly useful in interpreting the state of "distress" in policemen. Excessive over-commitment and lack of rewards significantly increased depression scores and the probability of disease. This result confirms the observations of Martins and Lopes [39] who argue that ERI and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and that of Kingdom and Smith [40] showing that ERI was the most important predictor of depression among police officers in the UK Coast Guard.

The DCS model captures some important aspects, such as the lack of full control over the organization of work and the lack of support from colleagues or superiors. The importance of lack of support from superior and organization in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [33], and by Arial et al. [30] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation of suffering which could result in disease.

The data emerging from our study should be interpreted with caution as subjectivity may have distorted the observations. The cross-sectional nature of the research does not allow us to infer the direction of the observed phenomena. 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, nor 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 depression 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 this study we found a modest prevalence of depression, lower than that found in other police corps. This does not mean that the problem in this Italian special unit is negligible. Workers with depressive symptoms should obtain timely and confidential assistance. Furthermore, the causes of excessive occupational stress must be promptly identified and removed or minimized.

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Table 1.
Characteristics of the observed population (N=289). Mean and standard deviation of stress and mental health variables.

SOCIO-DEMOGRAPHIC VARIABLES	
Age, years (mean, ± s.d.)	35.4 (± 7.5)
Length of service, years (mean, ± s.d.)	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)
STRESS VARIABLES	
Demand (mean, ± s.d.) (range 5-20)	13.4±2.02
Control (mean, ± s.d.) (range 6-24)	13.3±2.7
Support (mean, ± s.d.) (range 6-24)	18.6±2.9
Job Strain (D/C ratio) (mean, ± s.d.)	1.31±0.41
Effort (mean, ± s.d.) (range 6-30)	15.0±3.2
Reward (mean, ± s.d.) (range 11-55)	42.3±6.2
Over-commitment (mean, ± s.d.) (range 6-24)	6.9±1.9
ERI (mean, ± s.d.)	0.70±0.28
MENTAL HEALTH VARIABLES	
Depression (range 0-63)	3.3±4.2

Table 2. Standardized correlation coefficients (beta) for socio-demographic variables, stress measurements and depression score. Hierarchical linear regression; adjusted coefficient of determination (R^2) of each equation.
*=p<0,05; **=p<0,01; ***=p<0,001

	Depression			
Age	.020	.048	.150	.132
Length of employment	.239	.270	.179	.212
Rank	-.186	-.204*	-.136	-.148
Education	.028	.020	-.001	.000
Origin	-.070	-.091	-.052	-.063
Marital status	-.009	.026	.004	.011
Housing	-.124	-.108	-.105	-.099
Offspring	-.038	-.055	-.062	-.061
Demand		.102		-.016
Control		-.127*		-.068
Support		-.211***		-.095
Effort			.062	.086
Reward			-.303***	-.226**
Over-commitment			.121*	.114
R^2	0.009	0.096	0.159	0.161

Table 3. Relative risk (Odds ratios ,ORs , and 95% confidence intervals, CI 95%) of manifesting depression in association with state of distress (job strain, effort-reward imbalance, social isolation, elevated over-commitment). Logistic regression. Adjusted raw values for socio-demographic variables (age, length of employment, rank, education level, origin, marital status, housing, having offspring).

Distress type	**Depressive complaints**	
	Crude OR (95%CI)	Adjusted OR (95%CI)
Job strain (high demand, low control)	1.92 (0.76-4.84)	2.67 (0.93-7.69)
Social isolation (Low support)	3.01 (1.07-8.46)*	3.47 (1.16-10.38)*
Isostrain	2.62 (1.00-6.86)*	3.72 (1.26-10.95)*
Excessive discrepancy between effort and reward (ERI >1)	6.26 (2.36-16.59)***	7.39 (2.46-22.23)***
Excessive work commitment (High Over-commitment)	3.06 (1.11-8.46)*	3.85 (1.28-11.54)*

*=p<0,05; **=p<0,01; ***=p<0,001

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	8
Methods			
Study design	4	Present key elements of study design early in the paper	8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8-10
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8-10
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	*10*
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	11
		(*c*) Explain how missing data were addressed	8; 10-11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	11
		(*e*) Describe any sensitivity analyses	11
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Tab 1
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Tab 1
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	12-13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tab 2-3
		(*b*) Report category boundaries when continuous variables were categorized	12-13
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	2
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13-15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Association of work-related stress with depression symptoms in a special police force. A cross-sectional study.

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Association of work-related stress with depression symptoms in a special police force. A cross-sectional study.

Sergio Garbarino [1,2], Giovanni Cuomo [2], Carlo Chiorri [3], Nicola Magnavita [4].

1. State Police Health Service Department, Ministry of the Interior, Rome, Italy
2. Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy
3. Department of Educational Sciences, Psychology Unit, University of Genoa, Genoa, Italy
4. Department of Public Health, Occupational Health Unit, Università Cattolica del Sacro Cuore, Largo Gemelli 8, 00168 Roma, Italy. e-mail: nicolamagnavita@gmail.com

Correspondence to: N. Magnavita. Tel. +39-347-3300367, Fax: +39-06-61909399, e-mail nicolamagnavita@gmail.com; nmagnavita@rm.unicatt.it

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Author's contribution: SG carried out medical examinations on workers, CC administered the psychological tests and revised statistics, NM carried out the statistical analyses and drafted the work, GC revised the work.

Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at Dryad repository, who will provide a permanent, citable and open access home for the dataset.

Abstract (max. 300 words

Objectives. Law and order enforcement may expose police officers to significant psychosocial risk factors, so that some of them may find themselves in conditions of distress. The aim of this work is to investigate the relationship between job stress and the presence of symptoms of depression and other psychological problems in police officers.

Method: 292 out of 294 components of the Genoa 'Mobile', a special police force engaged exclusively in the enforcement of law and order, responded to our invitation to complete a questionnaire for the assessment of work-related stress, using the demand-control-support (DCS) and the effort-reward-imbalance (ERI) models, and for a screening of mental disorders, including depression (Beck Depression Inventory, BDI), anxiety (State-Trate Anxiety Inventory-Trait, STAI-T), and burnout (Maslach Burnout Inventory, MBI).

Results: Psychological screening showed no case of possible anxiety or burnout, and 21 (7.3%) likely cases of mild depression (BDI ≥10). Lower reward significantly predicted higher depressive symptomatology, and officers that experienced a discrepancy between work effort and rewards showed a marked increase in the risk of self-reported depression (OR 7.00 95% CI 4.76 to 10.30) when compared with their counterparts who did not perceived themselves in a condition of distress.

Conclusions: The prevalence of depressive symptoms in the observed population of police officers was low, but not negligible. Given the delicate tasks that special police officers have to accomplish and that an impaired psychological functioning can increase the possibility of errors and the risk to the health and safety of others, the results of this study suggest to take steps to prevent distress and improve the mental well-being of the police.

Keywords: effort-reward imbalance, depression, distress, job strain, mental health, over-commitment, police, social support, work-related stress.

Article summary

'Article focus'

(up to three bullet points on the research questions or hypotheses addressed)

Mental health in the special police forces is a critical issue. Police officers are exposed to acute and chronic stress and may become depressed. The impairment of officers' psychological functioning can be a serious threat to the safety of the public.

'Key messages'

(up to three bullet points showing the key messages or significance of the study)

The prevalence of depression in the police special forces is lower than that of the general population and other groups of police officers. Although prevalence rates were low, a positive association between distress (or job stress) and depressive symptoms was found.. The prevention of distress and the treatment of depressive disorders among police officers are necessary for the safety of the workers and the public.

'Strengths and limitations of this study'

This is the first study to investigate the association of "job distress" with depressive symptomatology in a special force police unit and had a higher participation rate. It is a cross-sectional study, conducted on a relatively small cohort and with only self-report measures. .

Introduction

It is generally agreed that mental health disorders have a multifactorial etiology and in the last decades research has focused on the role of working conditions in determining people's mental health [Cherry et al. 2006, Melchior et al. 2007], also because the workers themselves often report that their work affect their health (X) Direct financial costs due to absenteeism, presenteeism, reduced productivity and compensation are being added to the intangible costs arising from the suffering of workers. Alongside the ethical reasons for action, there are also important economic considerations that indicate the need for preventing mental health conditions. Skilled workers with qualifications acquired through expensive training and long experience are the most important asset of any company, i.e., their human capital. The premature loss of these workers due to psychological problems or illness is an economic as well as a human drama.

In the modern society work is not just a way to earn money, but also a crucial element of the social status of an individual and a source of meaning in her/his life. This often leads to a very high level of commitment and identification with one's work and organization, and this is especially true for high level professionals, such as police officers operating in special force units employed in law enforcement and riot control. It is generally thought that this category of workers is particularly at risk for the exposure to violent traumas, and hence to posttraumatic stress disorder, since they are frequently exposed to violent events, but in fact traumatic accidents of this type rarely occur, whereas it tends to be overlooked the long term effect of such exposure, that, even if not immediately perceived as detrimental, can still induce maladaptive reactions [3)]. Although it has been shown that police officers are more resilient to stress than civilians [Yuan et al. 2011, Evans et al 2013, Galatzer-Levy et al. 2013, Garbarino et al. 2012], several cross-sectional studies have provided evidence that adverse work conditions are related to poor mental health outcomes (e.g., XX) In addition to these operational work-related challenges, police officers may be exposed to organizational problems that are common within hierarchical, male-dominated paramilitary

structures such as fire-fighting, ambulance and paramedic services [4), Violanti 2011]. Daily organizational stressors may be more challenging than operational experiences, as shown by a recent study that reported that levels of perceived stress in a group of police officers, somewhat ironically, were, higher during routine jobs than during a high-risk public event [5)].

Both a dramatic violent event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e., a neurobiological maladaptive reaction due to the adaptation to challenging evironments characterized by behavioral and emotional changes known as "distress" (Mc Ewen). Through the interaction with many different individual factors, distress can induce the occurrence of mental disorders such as anxiety, depression, burnout, conversion disorder and other conditions classified in DSM IV (Cooper). Psychological dysfunctioning resulting from job distress can be a gradual and progressive process that impairs well-being over time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at least until the severity of the symptoms makes it clear to colleagues, family, or both. The recognition of emotional problems due to work-related distress in the in the law enforcement context is rarely, if ever, encouraged, since it is considered a sign of weakness [6)]. Consequently, officers fail to seek professional help early enough to prevent diagnosis and gain a fast benefit from treatment.. It is for this reason that mental disorders are the leading cause of retirement in the police force [7)]

The two leading models that have been used to describe and explain individual perception of stress factors are the Demand/Control/Support (DCS) model, developed by Karasek [8)], and the Effort/Reward Imbalance (ERI) model, developed by Siegrist [9)]. The DCS model assumes that the primary sources of job stress, or "job strain", 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, refers to the worker's ability to control his own activities and skill usage. Social support at work, a moderating factor of job strain, was subsequently included in the model. According to this model, high psychological demands in combination with low decision latitude can contribute to the development of psychological problems, and the workers with high job strain and low social support at work are supposed to be the most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis).

The ERI model puts emphasis more on the reward rather than on 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, and, consequently, health problems [9)]. 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 [10)].

Unfortunately, in literature there is no unique definition of "distress", although there is some consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a vague definition, the prevalence of workers with distress in published studies can range from 5% to 50% [11,Marchand, van Rhenen]. When distress reaches clinical relevance it is defined as "stress-related disorder". This term includes a variety of clinical conditions, which are collectively labeled as "common mental disorders" (CMD) [Van der Klink & Van Dijk, 2003]. A systematic review of evidence on psychosocial factors at work and depression, however, showed a high degree of study heterogeneity (Bonde 2006), although other studies found moderate evidence for a relation between the psychological demands of the job and the development of depression, with relative risks of

approximately 2.0 (XX). The prevalence of CMDs in the US armed forces is 27% [12)] and there is a similar prevalence in the UK armed forces [13, Jones)]. Distress and mental health problems caused by work can affect performance of professional activity, especially in a delicate area such as law enforcement, in which workers have weapons. The mental health-related consequences of stress in police officers can thus be particularly serious not only for the increased risk of their individual health problems, and but also for the increased risk of impaired work performance that could jeopardize the safety and health of the general population. One of the most common diagnoses is depression [Iversen et al. 2009)], and as reported by Violanti (X), depression can be a contributing factor not only in early retirement, but also in police officer's suicides, murder-suicides, domestic violence, unnecessary violence and aggression while in service, over and above the role played by the police culture that might encourage aggressive and authoritarian attitudes.

The aim of this study was to investigate, apparently for the first time, the association of a condition of "distress" and the presence of self-reported symptoms of depression, alongside with other common work-related mental problems such as anxiety and burnout takes as a control, in a specialist or 'elite' unit of the Italian police, the 'VI Reparto Mobile' of Genoa, a carefully selected group who is called to maintain law and order in all the major events that take place in the country. The police officers in this group work exclusively as First Responders; are carefully selected among ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and also they are often involved in public events in which there is a high risk of terrorist attacks and physical fights. During a single riot, they are on duty for an average of 10 or more hours of work, have physical fights for over an hour on average and often feel that they are in imminent danger of death. They have a special and continuing education which aims to improve team spirit ("esprit de corp") and increase the preparation to dramatic events. 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.

Method

Participants

This study refers to the initial phase of a study started on the eve of the G8 meeting in 2009. The Italian special police force unit 'VI Reparto Mobile' of Genoa is composed of 294 members. Two officers 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 female, gender differences could not be assessed and they were therefore excluded from the analyses. Hence, the final group of participants comprised 289 officers (see Table 1 for descriptive statistics of the socio-demographic variables).

Insert Table 1 about here

Occupational stress was measured on three separate occasions: (i) in January 2009, when officers were engaged only in routine work; (ii) in April 2009, when they underwent specific training in preparation for the meeting, and (iii) in July 2009, shortly before the Genoa G8 summit meeting took place. Following the procedure already adopted in previous work [lavori su assenze, personalità], we averaged the three measurements into a single value, so as to have the level of stress that each officer had experienced during the period.

Occupational stress was assessed using the validated Italian versions [23)] of two standardized questionnaires: the Demand-Control-Support (DCS) questionnaire, derived from the longer Job Content Questionnaire [8)], and the Effort-Reward Imbalance (ERI) questionnaire [9)]. DCS is a 17.item self-report questionnaire that provides scores in three scales: *Psychological Job Demand*, (Demand, 5 items mapping quantitative aspects of work, such as time, requirement and speed to perform tasks, and conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping

use and development of abilities and autonomy to make decisions about the work process) and *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were . 71, .65 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job Strain) was computed by dividing the mean item score of Demand by the mean item score of the Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate excessive perceived job strain [XX]. ERI is a 23-item self-report questionnaire that assesses three dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11 items mapping the occupational rewards that are supposed to be received by the person) and *Overcommitment* (6 items mapping the intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity scale. In this study reliabilities of the scales were . 82, .89 and .79, respectively. Along with scale sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce stress [XX].

The mental health status was assessed after the third occasion using the following measures. Depression was evaluated by the Beck Depression Inventory (BDI) [24], as this questionnaire performed better than other tests for depression screening [25,26]. The BDI consists of 21 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores indicating more severe depression. If multiple responses are chosen under one item, the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in clinical practice for depression screening is 10 [27]. The probability of suffering major depressive

disorder rapidly increases above this threshold; so, a higher score of 14 [25] or 16 [26] is often chosen in order to reduce the prevalence of false positive in populations consisting of patients affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level of 10, as the subjects tested were young, active and highly selected.

Anxiety was evaluated by the State-Trate Anxiety Inventory−Trait (STAI-T; Spielberger et al. 1983; Italian version in Sanavio et al. 1997) The STAI-T is a 20-item self-report measure of anxiety proneness requiring participants to rate their frequency of anxiety symptoms on a 4-point Likert-type scale. Nine items are reverse scored. In this study the reliability of the scale was .74. Maslach Burnout Inventory (MBI; Maslach and Jackson 1981; Italian version in Sirigatti and Stefanile 1993) MBI is a 22-item self-report measure of professional burnout. It provides scores on three facets of burnout: Professional Exhaustion (9 items mapping feelings of being emotionally overextended and exhausted by one's work, Depersonalization (5 items mapping an unfeeling and impersonal response towards the recipients of one's care) and Personal Accomplishment (8 items mapping feelings of competence and successful achievement in one's work with people). Participants are asked to rate the frequency of experiencing feelings related to each subscale using a 7-point, Likert-type scale. In this study reliabilities of the scales were .86, .60 and .80, respectively. All participants were tested anonymously and confidentially during their routine psychophysical assessment. Anonymity was achieved by identifying participants with an alphanumeric code, double-blind. 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 and the whole procedure followed the Ethical Principles of Psychologists Code of Conduct (American Psychological Association 2002).

Control Variables

The control variables used in our study were: age (years), length of employment (years of service); education level (lower vs equal/higher than high school); rank (officer vs supervisor/technical staff);

origin (Northern or Southern Italy); housing (in barracks or home); marital status (single/divorced vs married/cohabiting); presence of children (no/yes).

Statistical analyses

The first research question we addressed was whether there was a relationship between the individual level of work-related stress and mental health problems. In order to do this we used hierarchical multiple linear regression models in which the variable the BDI score was specified as criterion. In Model 1 we specified as predictos only the control variables. In Model 2 and 3 scale scores from the DCS and from the ERI questionnaires, respectively, were entered in the regression model. In Model 4 control variables and DCS and ERI scores were specified as predictors.. The degree of association between variables is indexed by the regression coefficient computed on the standardized variables (β). The amount of variance of the depression score accounted for by the predictors (and the goodness of fit of the regression model) was indexed by the adjusted R^2. Since age and length of employment were highly correlated (r = .91), only the latter was used as a predictor. In order to minimize the potentially confounding effects of multicollinearity, we partialized the effects through principal component analysis.

We then tested the risk of suffering from depression for an officer in a state of distress. We used binary logistic regression, with caseness for depression (i.e., BDI score ≥ 10) as criterion and DCS-Job Strain, social isolation (DCS-Support score below the median), isostrain (job strain plus social isolation), Effort/Reward imbalance (E/R ratio >1), and Over-Involvement in work (ERI-Overcommittment score above the median) as predictors. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the socio-demographic variables to the equation. Odds ratios (OR) and their 95% confidence intervals (95%CI) were computed.

Results

Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not particularly high when compared with those of other groups of Italian workers [Magnavita PsyJ].

The average levels of depression, anxiety, emotional exhaustion and depersonalization scores were close to the lower limits of the respective scales, while those of personal accomplishment were high. Based on the Italian cut-off levels, there was no case of possible anxiety or burnout. However, there were 21 (7.3%) likely cases of mild depression (BDI ≥ 10) and 7 (2.4%) likely cases of moderate depression (BDI ≥ 16).

Hierarchical multiple linear regression allowed us to test the extent to which the level of depressive symptomatology that can be predicted on the basis of socio-demographic and work-related stress data (Table 2).

Insert Table 2 about herre

The association between of depression with only socio-demographic variables (Model 1) was weak (Adjusted R^2 = .01) and generally not significant, except a positive association with length of employment, which was significant also in all next models.When DCS scores were entered into the model (Model 2), a significant increase in Adjusted R^2 (.10) was observed, and DCS-Control and DCS-Support were significantly and negatively associated with BDI scores. When DCS scores where replaced by ERI scores (Model 3), the Adjusted R^2 significantly increased (.16) and the negative regression coefficient of ERI-Reward was the only significant effect, along with the one of length of employment. Model 4, that included all control and occupational stress variables, did not show an Adjusted R^2 significantly higher than Model 3, and the only significant predictors were length of employment and ERI-Reward score.

The results of the logistic regression are shown in Table 3.

Insert Table 3 about here

For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"), the risk of being depressed approximately doubled, but not significantly, whereas the other categorical predictors were all statistically significant.

Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher risk of depression than the others.

The results of regression analyses performed using anxiety and MBI scores as criteria are shown in Tables 4a-d.

Insert Tables 4a-d about here

Anxiety was significantly associated with living in barracks, with lower scores in DCS-Support and ERI-Reward and with higher scores in ERI-Effort. MBI Professional Exhaustion scores were higher in older officers and in agents and were significantly predicted by higher ERI-Over-commitment scores. MBI Depersonalization scores were higher in older officers and in officers without children, and were significantly predicted by lower ERI-Reward scores. MBI Personal Accomplishment scores were lower in barracked officers and in officers without children, and were significantly predicted by higher DCS-Control scores.

Discussion

This study investigated the association of a condition of "job distress" with the presence of self-reported symptoms of depression, alongside with other common work-related mental problems such as anxiety and burnout, in a special force police unit. Results from multiple regression analyses showed that lower ERI-Effort scores predicted higher BDI scores, whereas results from logistic regression analyses revealed that a higher effort/reward imbalance was associated with an approximately sevenfold increase in risk of depression. These results suggest that, consistently with previous studies, also in special force police officers the lower the reward opportunities, or the higher the imbalance between the the effort spent to meet the demanding aspects of the work environment and the reward (money, esteem and career opportunities, job security included), the higher the depressive symptomatology. Studies based on the demand /control model indicate that job strain is associated with depression (Bonde). A recent meta-analysis of studies on the association between stress and mental disorders indicates that psychosocial problems in the

workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [36]. Another review of 14 longitudinal studies indicates that lack of social support enhances depression [37]. The association we found between low reward and symptoms is in agreement with that suggested by neurobiological studies on depression (Eshel and Roiser). However, we could not replicate the finding that using both the DCS and the ERI model provides greater predictive power for depressive disorders than models including only one of them [38]. In this study, only the ERI model proved to be useful in predicting depression scores of officers. Lack of rewards and excessive over-commitment significantly increased depression scores and the probability of disease, respectively. This result replicates the observations of Martins and Lopes [39] who argued that effort, reward and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and those of Kingdom and Smith [40], that showed that ERI was the most important predictor of depression among police officers in the UK Coast Guard and, more generally, with a large body of literature on the relationship between reward processing and depressive symptoms (Eshel & Roiser (2010)). To a lesser extent, the DCS model captured some important aspects, such as the lack of control over the organization of work and the lack of support from colleagues or superiors. The importance of lack of support from superior and organization in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [33], and by Arial et al. [30] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation of suffering which could result in disease. Although not the main focus of this study, the ERI model also showed a good ability to predict anxiety and two of the three core dimensions of burnout (i.e. emotional exhaustion and depersonalization), consistently with previous studies (XX), whereas DCS-Control score was significantly associated with personal accomplishment. Some background variables also showed a significant association with measures of mental health. Higher length of employment (which overlaps age) was associated with higher depressive symptomatology, anxiety, professional exhaustion and depersonalization, being

barracked was associated with higher anxiety and lower personal accomplishment, being an operative agent was associated with higher professional exhaustion, having children was associated with lower depersonalization. These results are in line with previous studies on armed forces officers (XX)

Sadly, investigating stress in police officers is particularly difficult because the latter are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield 7) found work stress to be the first cause of sickness absence and reduction in operational duties, as well as the leading cause of ill health retirement in police officers. A number of studies have previously evaluated occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen 16), musculoskeletal disorders in special police forces 17), lower mental health level in correctional 18) and urban police officers 19). The demand-control model proved to be a valid theoretical framework to explain professional efficiency and exhaustion 20) and the complex interplay between job demands, emotional exhaustion and other social and individual factors 21). Officers with greater perceived work stress in the first year of police service showed more severe depression symptoms 12 months later 22).

It might be argued that only seven per cent of officers in our cohort reported a level of depressive symptomatology higher than the risk threshold.. In fact, such prevalence is lower than that found by by Fox et al. [28] in urban US police officer (9%), by Frühwald et al. [29] in Lower Austria (9%), by Arial et al. [30] in a Swiss officers (11.9%), by Chen et al. [31] in Taiwanese officers (21.6%), and by Obidoa et al. [32] among US corrections officers (31%), and it is comparable with that found in other working populations [12-15]. Moreover, a nationwide study in the Norwegian police service showed that the younger police officers reported lower levels of depressive symptoms than the corresponding general population [33]. A recent comparison of police and other

employees found no indications that self-reported mental health disturbances are more prevalent among police officers than among groups of employees that are not considered high-risk groups [34]. Since our sample was composed by young and highly selected police officers, which also shown an emotional stability higher than the general population (XX) this result is not surprising. However, this does not mean that the problem of depression in this special unit is negligible, and it cannot be ignored that, beyond individual's health related risk factors, depression represents a considerable cost for productivity both in terms of absenteeism and presenteeism [35] and, more importantly given that the delicate tasks the officers of this study have to accomplish, it increases the possibility of errors and the risk to the health and safety of others. Hence, officers with depressive symptoms should obtain timely and confidential assistance and the causes of excessive occupational stress must be promptly identified and removed or minimized.

The results reported in this study should be interpreted with caution, as all the measures were self-reported questionnaires, and thus reporting bias and subjectivity may have distorted the observations. Depressed persons could be more likely to report psychosocial stress at work, even if objectively their work environment is not at risk *per se*. The cross-sectional nature of the research does not allow us to infer the direction of the observed phenomena, and thus separate cause from effect. Specifically, we could not address the issue of whether the observed reduction in experience of reward is an epiphenomenon of the presence of depressive symptoms. Finally, because our sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not be generalizable to police officers in general, with different occupational exposure, nor 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 of depression with work stress in terms of both DCS and ERI models in special force police officers. Such population has a high 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.

Limitations notwithstanding, the present findings indicate that some aspects of psychosocial environment at work, such as the imbalance between effort and reward, are associated with depressive symptoms, anxiety and burnout in special force police officers. Although we could not establish a casual relationships and these results need to be replicated in longitudinal studies, they suggest that the dimensions of effort, reward and overcommitment can be useful in monitoring special force police officers' psychological functioning.

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Table 1. Socio-demographical characteristics, occupational stress scores and mental health scores of the participants in this study (n=289)

Variable	*Statistics*
Socio-demographical variables	
Age, years (*M*±*DS*)	35.4±7.5
Length of service, years (*M*±*DS*)	14.0±7.9
Rank, superintendent or technical staff, frequency (%)	140 (48.4)
Education level, high school or higher, frequency (%)	217 (75.1)
Origin, Northern Italy, frequency (%)	145 (50.2)
Living in barracks, frequency (%)	162 (56.1)
Married or cohabiting, frequency (%)	108 (37.4)
Presence of children, frequency (%)	106 (36.7)
Occupational stress variables	
DCS-Demand (*M*±*DS*) (range 5-20)	13.4±2.02
DCS-Control (*M*±*DS*) (range 6-24)	13.3±2.7
DCS-Support (*M*±*DS*) (range 6-24)	18.6±2.9
DCS-Job Strain (Demand/Control ratio) (*M*±*DS*)	1.31±0.41
ERI-Effort (*M*±*DS*) (range 6-30)	15.0±3.2
ERI-Reward (*M*±*DS*) (range 11-55)	42.3±6.2
ERI-Over-commitment (*M*±*DS*) (range 6-24)	6.9±1.9
ERI-Weighted Effort/Reward ratio(*M*±*DS*)	0.70±0.28
Mental health variables	
BDI (range 0-63)	3.3±4.2
STAI-T (range 20-50)	27.5±4.3
MBI-Emotional Exhaustion (range 9-36)	17.4±7.9
MBI-Depersonalization (range 5-35)	9.3±4.5
MBI-Personal Accomplishment (range 8-56)	42.7±9.8

Note: DCS: Demand-Control-Support Questionnaire[16,33]; ERI: Effort-Reward Imbalance Questionnaire[17,33]; BDI: Beck Depression Inventory[36]; STAI-T: State-Trait Anxiety Inventory-Trait[40,41]; MBI: Maslach Burnout Inventory[42,43]

Table 2. Standardized regression coefficients (βs) for control socio-demographic variables and occupational stress variables as predictors of Beck Depression Inventory depression scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control variables				
Length of employment (years)	.12*	.16**	.16**	.18**
Rank	-.06	-.05	-.01	.00
Education	.07	.09	.08	.09
Origin	-.03	-.06	-.04	-.05
Marital status	-.02	.02	.01	.02
Barracked	-.10	-.07	-.06	-.05
Children	-.03	-.02	-.02	-.01
Occupational stress variables				
DCS-Demand		.10		-.02
DCS-Control		-.13*		-.07
DCS-Support		-.21**		-.10
ERI-Effort			.06	.09
ERI-Reward			-.30***	-.22**
ERI-Over-commitment			.12	.11
Adjusted R^2	.01	.10***	.16***	.16***

Note: Rank: Agent ('agente' or 'agente scelto')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; n = 289; * = p < .05; ** = p < .01; *** = p < .001;

Table 3. Odds ratios (ORs) for the association between risk of major depression (Beck Depression Inventory score ≥ 10) and occupational stress indicators, unadjusted and adjusted^

Occupational stress variable	*Prevalence–cases n (%)*	*Unadjusted OR (95%CI)*	*Adjusted OR (95%CI)*
DCS-Job strain (weighted Demand/Control ratio > 1)	73 (25.3)	1.92 (0.76-4.84)	2.67 (0.93-7.69)
Social isolation (DCS-Support score below the median)	154 (53.3)	3.01 (1.07-8.46)*	3.47 (1.16-10.38)*
Isostrain (Job strain+Social isolation)	50 (17.3)	2.62 (1.00-6.86)*	3.72 (1.26-10.95)*
ERI-Effort/Reward imbalance (Effort/Reward ratio >1)	32 (11.1)	6.26 (2.36-16.59)***	7.39 (2.46-22.23)***
ERI- Over-Involvement in work (Overcommittment score above the median)	37 (12.8)	3.06 (1.11-8.46)*	3.85 (1.28-11.54)*

Note: $n = 289$; ^: adjustments were made for age, length of employment, rank, education level, origin, being married or cohabiting, living in barracks, having children); * = $p < .05$; ** = $p < .01$; *** = $p < .001$;

Table 4a. Standardized correlation coefficients (beta) for socio-demographic variables, stress measurements and State-Trait Anxiety Inventory-Trait scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control variables				
Length of employment (years)	.08	.11	.11*	.12*
Rank	.06	.06	.11	.11
Education	.03	.04	.03	.04
Origin	-.07	-.10	-.08	-.09
Marital status	.02	.05	.05	.05
Barracked	.13*	.14*	.16**	.16**
Children	-.06	-.05	-.04	-.04
Occupational stress variables				
DCS-Demand		.01		-.11
DCS-Control		-.07		-.02
DCS-Support		-.25***		-.16*
ERI-Effort			.12	.17*
ERI-Reward			-.25**	-.18*
ERI-Over-commitment			.01	.00
Adjusted R^2	.01	.08***	.11***	.13***

Note: Rank: Agent ('agente' or 'agente scelto')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; n = 289; * = p < .05; ** = p < .01; *** = p < .001;

Table 4b. Standardized regression coefficients (βs) for control socio-demographic variables and occupational stress variables as predictors of Maslach Burnout Inventory professional exhaustion scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control variables				
Length of employment (years)	.13*	.16**	.18**	.19**
Rank	-.20**	-.19**	-.14**	-.13*
Education	.06	.06	.04	.04
Origin	-.02	-.04	-.03	-.04
Marital status	-.05	-.02	-.02	-.02
Barracked	-.05	-.03	-.01	.00
Children	-.09	-.09	-.08	-.08
Occupational stress variables				
DCS-Demand		.16**		.02
DCS-Control		-.10		-.06
DCS-Support		-.13*		-.02
ERI-Effort			.14*	.14
ERI-Reward			-.18**	-.14
ERI-Over-commitment			.23***	.23***
Adjusted R^2	.05**	.12***	.23***	.23***

Note: Rank: Agent ('agente' or 'agente scelto')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; n = 289; * = p < .05; ** = p < .01; *** = p < .001;

Table 4c. Standardized regression coefficients (βs) for control socio-demographic variables and occupational stress variables as predictors of Maslach Burnout Inventory depersonalization score.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control variables				
Length of employment (years)	.08	.11	.12*	.13*
Rank	-.08	-.07	-.03	-.02
Education	.00	.02	.02	.03
Origin	-.02	-.04	-.03	-.03
Marital status	-.09	-.06	-.06	-.06
Barracked	-.05	-.03	-.01	-.01
Children	-.18**	-.17**	-.16**	-.16**
Occupational stress variables				
DCS-Demand		.05		-.08
DCS-Control		-.11		-.04
DCS-Support		-.23***		-.10
ERI-Effort			.05	.08
ERI-Reward			-.34***	-.29***
ERI-Over-commitment			.08	.08
Adjusted R^2	.03*	.11***	.19***	.19***

Note: Rank: Agent ('agente' or 'agente scelto')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; n = 289; * = p < .05; ** = p < .01; *** = p < .001;

Table 4d. Standardized regression coefficients (βs) for control socio-demographic variables and occupational stress variables as predictors of Maslach Burnout Inventory personal accomplishment score.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Control variables				
Length of employment (years)	.06	.01	.04	.00
Rank	.01	-.02	-.01	-.04
Education	.01	-.03	.01	-.03
Origin	.09	.10	.10	.10
Marital status	.11	.08	.09	.08
Barracked	-.09	-.14*	-.11	-.15*
Children	.05	.01	.04	.01
Occupational stress variables				
DCS-Demand		.00		.06
DCS-Control		.24***		.22**
DCS-Support		.05		.00
ERI-Effort			-.02	-.06
ERI-Reward			.15*	.08
ERI-Over-commitment			-.08	-.09
Adjusted R^2	.01	.06**	.04*	.07

Note: Rank: Agent ('agente' or 'agente scelto')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; n = 289; * = p < .05; ** = p < .01; *** = p < .001;

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	8
Methods			
Study design	4	Present key elements of study design early in the paper	8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8-10
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8-10
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	*10*
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	11
		(*c*) Explain how missing data were addressed	8; 10-11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	11
		(*e*) Describe any sensitivity analyses	11
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Tab 1
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Tab 1
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	12-13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tab 2-3
		(*b*) Report category boundaries when continuous variables were categorized	12-13
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	2
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13-15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Association of work-related stress with depression symptoms in a special police force. A cross-sectional study.

Sergio Garbarino [1,2], Giovanni Cuomo [2], Carlo Chiorri [3], Nicola Magnavita [4].

1. State Police Health Service Department, Ministry of the Interior, Rome, Italy
2. Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy
3. Department of Educational Sciences, Psychology Unit, University of Genoa, Genoa, Italy
4. Department of Public Health, Occupational Health Unit, Università Cattolica del Sacro Cuore, Largo Gemelli 8, 00168 Roma, Italy. e-mail: nicolamagnavita@gmail.com

Correspondence to: N. Magnavita. Tel. +39-347-3300367, Fax: +39-06-61909399, e-mail nicolamagnavita@gmail.com; nmagnavita@rm.unicatt.it

Type of contribution: Original

Running title: Stress and depression in police

Word count: 4475 words

Abstract, word count: ~~178~~

Tables: 3

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Figures: 0

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Competing interest: none declared. A complete declaration on competing interest will be signed by all authors before the publication of the paper.

Author's contribution: ~~GS~~ SG carried out medical examinations on workers, CC administered the psychological tests ~~carried out the statistical analyses and drafted the work~~and revised statistics, ~~MN~~NM ~~developed~~ carried out the statistical analyses and drafted the work, ~~CG~~ GC revised the work.

Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at Dryad repository, who will provide a permanent, citable and open access home for the dataset.

Abstract (max. 300 words

Objectives. Law and order enforcement may expose police officersmen to significant psychosocial risk factors, so that some subjects of them may find themselves in conditions of distress. The aim of this work is to study investigate the relationship between job stress and the presence of symptoms of bad mental healthdepression and other psychological problems depression and to assess the risk of mental disorders in police officersemen.

Method: 292 out of 294 components of the Genoa ‘'Mobile'', a special police force engaged exclusively in the enforcement of law and order, responded to our invitation to complete a questionnaire for the assessment of work-related stress, using the demand-control-support (DCS) and the effort-reward-imbalance (ERI) models, and for a screening of mental disorders, including depression (Beck Depression Inventory, BDI), anxiety (State-Trate Anxiety Inventory-Trait, STAI-T), and burnout (Maslach Burnout Inventory, MBI). One response was incomplete. Since only two officers were female, gender differences could not be assessed and were therefore excluded from the analyses. Hence the final group of participants comprised 289 officers.

Results: Psychological screening showed no case of possible anxiety or burnout, and 21 (7.3%) likely cases of mild depression (BDI ≥10) among the policemen. Lower reward significantly predicted higher depressive symptomatology, and Policemen They whoofficers that experienced a discrepancy between work effort and rewards showed a marked increase in the risk of self-reported depression (OR 7.00 95% CI 4.76 to 10.30) when compared with their counterparts who dido not undergo “distress “perceived themselves in a condition of distress.

Conclusions: The prevalence of depressive symptoms in the observed population of police officersmen was low, but not negligible. Given the delicate tasks that special police officers have to accomplish and that an impaired psychological functioning can increase the possibility of errors and the risk to the health and safety of others, the results of this study suggest It would be in the

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~~interests not only of the workers themselves, but also of the general population~~ to take steps to prevent distress and improve the mental well-being of the police.

Keywords: effort-reward imbalance, depression, distress, job strain, mental health, over-commitment, police, social support, work-related stress.

Article summary

~~"~~*Article focus*~~"~~

(up to three bullet points on the research questions or hypotheses addressed)

Mental health in the special police forces is a critical issue. ~~The policemen~~Police officers are exposed to acute and chronic stress and may become depressed. The impairment of ~~the police officer~~officers' psychological functioning can be a serious threat to the safety of the public.

~~"~~*Key messages*~~"~~

(up to three bullet points showing the key messages or significance of the study)

The prevalence of depression in the police special forces is lower than that of the general population and other groups of police officers~~men~~. Although prevalence rates were low, a positive association between distress (or job stress) and depressive symptoms was found.~~Even in special forces, the distress is associated with depression~~. The prevention of distress and the treatment of depressive disorders among police officers~~men~~ are necessary for the safety of the workers and the public.

~~"~~*Strengths and limitations of this study*~~"~~

This is the first study to investigate the association of "job distress" with depressive symptomatology in a special force police unit and had a higher participation rate. ~~This~~ It is a cross-sectional study, conducted on a relatively small cohort and with only self-report measures.~~ It is the first study in Italy and one of the few in the world on first responder policemen, and had a high participation. It 'was, however, obtained a very high participation in a group of policemen always in the front line, in the maintenance of public order~~.

Introduction

~~Referee's opinions: [*The flow and writing style of the first paragraphs could be improved. Also, this section contains several instances of uneven writing/ awkward formulations] [Since not all police officers are male, a more gender-neutral wording would be appropriate throughout the document.]~~

It is generally agreed that mental health disorders have a multifactorial etiology and in the last decades research has focused on the role of working conditions in determining people's mental health~~The impairment of the mental health of workers is an increasingly frequent consequence of contemporary working conditions~~ [Cherry et al. 2006, Melchior et al. 2007], also because the workers themselves often report that their work affect their health (X). Direct financial costs due to absenteeism, presenteeism, reduced productivity and compensation are being added to the intangible costs arising from the suffering of workers. Alongside the ethical reasons for action, there are also important economic considerations that ~~point to/indicate~~indicate the need for preventing mental health conditions~~depression~~. Skilled workers with qualifications acquired through expensive training and long experience are the most important asset of any company, i.e., their human capital. The premature loss of these workers ~~through~~ due to psychological ~~trauma~~ problems or illness is an economic as well as a human drama.

In the modern society work is not just a way to earn money, but also a crucial element of the social status of an individual and a source of meaning in her/his life. This often leads to a very high level of commitment and identification with one's work and organization, and this is especially true for high level professionals, such as police officers operating in special force units employed in law enforcement and riot control. It is generally thought that this category of workers is particularly at risk for the exposure to violent traumas, and hence to posttraumatic stress disorder, since they are frequently exposed to violent events, but in fact traumatic accidents of this type rarely occur, whereas it tends to be overlooked the long term effect of such exposure, that, even if not immediately perceived as detrimental, can still induce maladaptive reactions [3]. Although it has

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Comment [DiSA1]: Paoli P, Merllié D. European Foundation for the Improvement of Living and Working Conditions—Third European survey on working conditions. Luxemburg: Offce for Offcial Publica tions of the European Communities; 2000.

been shown that police officers are more resilient to stress than civilians [Yuan et al. 2011, Evans et al 2013, Galatzer-Levy et al. 2013, Garbarino et al. 2012], several cross-sectional studies have provided evidence that adverse work conditions are related to poor mental health outcomes (e.g., XX) ~~Some workers, particularly those employed in first responder organizations such as the police force, are particularly vulnerable~~ exposed ~~to psychosocial stress~~ factors. ~~It is known that violent trauma can acutely induce posttraumatic stress disorder (PTSD) in workers [1]. Accidents of this type rarely occur, as policemen are probably more resilient to stress than civilians [Yuan et al. 2011, Evans et al 2013, Galatzer-Levy et al. 2013, Garbarino et al. 2012], and the likelihood that a police officer may be exposed to an event severe enough to cause PTSD tends to be low [2]. Nevertheless, officers are frequently exposed to violent events that, even if not immediately perceived as detrimental, can still induce maladaptive reactions in individuals [3].~~ In addition to these operational work-related challenges, police officers~~men~~ may be ~~subject~~ exposed to organizational problems that are common within hierarchical, male-dominated paramilitary structures such as ~~the~~ fire-fighting, ambulance and paramedic services [4], Violanti 2011. Daily organizational stressors may be more challenging than operational experiences, as ~~we have observed in a~~shown by a ~~previous~~ recent study ~~in which the~~that reported that levels of perceived stress in a group of police officers, somewhat ironically, ~~men~~ were, ~~as~~ higher during routine jobs than during a high-risk public event [5].

~~It is important to note that the pathophysiological reaction may be the same for completely different stimuli. Even if the "more recent" and advanced area of our brain (i.e. the medial frontal cortex) is perfectly able to distinguish between the dramatic operational events and the chronic organizational factors, the part of the brain that is responsible for/involved in neurophysiological response to stress, i.e. the limbic system, makes no such distinction. Consequently,~~ Bboth a dramatic violent event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e., a neurobiological maladaptive reaction due to the adaptation to challenging evironments characterized by behavioral and~~,~~ emotional ~~and capacity~~ changes ~~that goes under the~~

Comment [DiSA2]: Se mettiamo "police officers" evitiamo la questione del genere

Comment [DiSA3]: Sanne B, Mykletun A, Dahl A, Moen B, Tell G. Testing the job Demand-Control-Support model with anxiety and depression as outcomes: The Hordaland Health Study. Occup Med (Lond). 2005;55:463–73.

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name ofknown as “"distress”" (Mc Ewen). Through the Distress, interactioning with many different individual factors, distress can induce the occurrence of mental disordersillnesses such as anxiety, depression, burnout, conversion disorder and other conditions classified in DSM IV (Cooper).

Psychological injury dysfunctioning resulting from work experiencejob distress can be a gradual and progressive process that erodes impairs well-being over time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at least until the severity of the symptomsdisease makes it clear to colleagues, family, or both. The recognition of emotional problems due to work-related distress in the prevailing culture in the the police forcelaw enforcement context is rarely, if ever, does not encouraged, since recognition of emotional damage caused by work, as it is considered a sign of weakness [6]. Consequently, officerspeople fail to seek professional help early enough to prevent until the disease is so far advanced that it isdiagnosis and gain a fast benefit from treatment, difficult to treat. It is for this reason that mental illness disorders areis the leading cause of retirement in the police force [7].

The two leading models that have been used to describe and explain individual perception of stress factors are the Demand/Control/Support (DCS) model, developed by Karasek [8], and the Effort/Reward Imbalance (ERI) model, developed by Siegrist [9]. The DCS model assumes that the primary sources of job stress, or "job strain", 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 uponrefers to the worker's ability to control his own activities and skill usage. Social support at work, a moderating factor of job strain, was subsequently included in the model. According to this model, high psychological demands in combination with low decision latitude can contribute to the development of psychological

Comment [DiSA5]: Attenzione che l'anno di questa reference non è 2006 ma 1998.

problems, and the workers with high job strain and low social support at work are supposed to be the most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis).

-The ERI model puts emphasis more on the reward rather than on 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, and, consequently, health problems [9]. 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 [10].

Unfortunately, in literature there is no unique definition of -"dDistress-" ~~is an ill-defined~~, although there is some consensus in ~~term~~ considering it as~~that refers to~~ an unfavorable and unpleasant response to stress. Due to such a vague definition, the prevalence of workers with distress in published studies ~~with distress~~ can range ~~ranges widely~~ from 5% to 50% ~~in various studies~~ [11],Marchand, van Rhenen. When distress reaches clinical relevance it is defined as -"stress-related disorder-", ~~;~~ T~~t~~his term includes a variety of clinical conditions~~, including depression,~~ , which are collectively labeled as -"common mental disorders-" (CMD) [Van der Klink & Van Dijk, 2003]. ~~The prevalence of CMDs in the US armed forces is 27% [12] and there is a similar prevalence in the UK armed forces [13, Jones]. Depression is the most common diagnosis [13]Iversen 2004)~~. A systematic review of evidence on psychosocial factors at work and depression, however, showed a high degree of study heterogeneity (Bonde 2006), although other studies found moderate evidence for a relation between the psychological demands of the job and the development of depression, with relative risks of approximately 2.0 (XX). The prevalence of CMDs in the US armed forces is 27% [12] and

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Comment [DiSA6]: •Bo Netterstrøm, Nicole Conrad, Per Bech, Per Fink,Ole Olsen,Reiner Rugulies, and Stephen Stansfeld
The Relation between Work-related Psychosocial Factors and the Development of Depression
Epidemiol Rev (2008) 30(1): 118-132 first published online June 27, 2008doi:10.1093/epirev/mxn004

there is a similar prevalence in the UK armed forces [13, Jones)]. Distress and mental health problems caused by work can affect performance of professional activity, especially in a delicate area such as law enforcement, in which workers have weapons. The mental health-related consequences of stress in police officers can thus be particularly serious not only for the increased risk of their individual health problems, and but also for the increased risk of impaired work performance that could jeopardize the safety and health of the general population. One of the most common diagnoses is depression [Iversen et al. 2009)], and as reported by Violanti (X), depression can be a contributing factor not only in early retirement, but also in police officer's suicides, murder-suicides, domestic violence, unnecessary violence and aggression while in service, over and above the role played by the police culture that might encourage aggressive and authoritarian attitudes.

~~In Europe it is estimated that the lifetime prevalence of mood disorders is 14.0% and the one year prevalence is 4.2% [14)]. Outside Europe, the prevalence of severe distress with symptoms of depression or other mental problems is estimated to be at least 5%, but could be significantly higher Hilton, Fan, Huang [15)]. A systematic review of evidence on psychosocial factors at work and depression, however, showed a high degree of study heterogeneity (Bonde 2006). Distress and mental health problems caused by work are very important for the performance of professional activity, especially in a very sensitive area such as the police force, in which workers have weapons. The consequences of stress in police officers can be particularly serious both on account of the increased risk of individual health problems, and also the increased risk of impaired work performance that could jeopardize the safety and health of the general population.~~

~~The relationship between mental health and the work environment is complex and multifaceted: an unfavorable work environment is associated with higher prevalence of mental disorders, and employees with mental problems are generally less adaptable to their work environment.~~

Comment [DiSA7]: Violanti, J. M. (2007). Police Suicide: Epidemic in Blue, 2nd ed., Springfield, IL: Charles C Thomas Publisher

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~~The diagnosis of work-related mental disorders is of particular importance for three reasons. At the macro (national) level, epidemiological monitoring can identify trends and help to indicate preventive strategies. In Italy, for example, it is compulsory for all employers to assess stress in the workplace and to provide appropriate preventive measures if necessary. At intermediate (company) level, the identification of one or more cases of work-related mental disorders can stimulate or enhance preventive action. At the individual level, the occupational physician may give specific instructions to encourage the return to work or improve the quality of working life.~~

~~Sadly, iInvestigating stress in police officers is particularly difficult because the latter are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield 7) found work stress to be the first cause of sickness absence and reduction in operational duties, as well as the leading cause of ill health retirement in police officersmen. A number of studies have previously evaluated occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen 16), musculoskeletal disorders in special police forces 17), lower mental health level in correctional police officers 18) and urban police officers 19). The demand-control model proved to be a valid theoretical framework to explain Previous studies on police officers have demonstrated that the demand-control model is a significant predictor of professional efficiency and exhaustion 20), and that there is athe complex interplay between job demands, emotional exhaustion and other social and individual factors 21). Subjects Officers with greater perceived work stress in the first year of police service have showed greater more severe depression symptoms 12 months later 22).~~

The ~~purpose~~ aim of this study was to ~~assess whether there is an~~investigate, apparently for the first time, the association ~~between~~ of a condition of "distress" and the presence of self-reported symptoms of depression, alongside with other common work-related mental problems such as

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anxiety and burnout takes as a control, ~~, or other common mental disorders,~~ in a specialist or "elite" unit of the Italian police, the "VI Reparto Mobile" of Genoa, a carefully selected group who is called to maintain law and order in all the major events that ~~happen~~ take place in the country. The police officers~~men~~ in this group work exclusively as First Responders; ~~members~~ are carefully selected among ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and also they are often involved in public events in which there is a high risk of terrorist attacks and physical fights. During a single riot, they are on duty for an average of 10 or more hours of work, have physical fights for over an hour on average and often feel that they are in imminent danger of death. They have a special and continuing education which aims to improve team spirit ("esprit de corp") and increase the preparation to dramatic events. 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.

Method

Participants

This study refers to the initial phase of a study started on the eve of the G8 meeting in 2009. The Italian special police force unit "VI Reparto Mobile" of Genoa is composed of 294 members. Two ~~policemen~~ officers 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 female, gender differences could not be assessed and they 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).

Insert Table 1 about here

~~-~~Occupational stress was measured on three separate occasions: (i) in January 2009, when ~~the~~ ~~police~~officers were engaged only in routine work; (ii) ~~-~~ in April 2009, when they ~~were subjected to~~underwent specific training in preparation for the meeting, and (iii) in July 2009, shortly before the Genoa G8 summit meeting took place. Following the procedure already adopted in previous work [lavori su assenze, personalità], we ~~have integrated~~averaged ~~all~~the three measurements into a single value, so as to have the level of stress that each officer had~~s received~~experienced during the period.

Occupational stress was ~~measured~~assessed ~~using~~ using the validated Italian versions [23] of two standardized questionnaires: the ~~DCS -~~ D~~d~~emand ~~-/~~C~~e~~ontrol ~~-/~~S~~s~~upport (DCS) questionnaire, derived from the longer Job Content Questionnaire [8], and the E~~e~~ffort-R~~r~~eward I~~i~~mbalance (ERI) questionnaire [9]. DCS is a 17.item self-report questionnaire that provides scores in three scales: ~~*The classic 17-item DCS questionnaire consisted of 3 scales termed 'P~~*p*~~sychological* *J~~j~~ob D~~d~~emand~~'~~*, (Demand, 5 items mapping quantitative aspects of work, such as time, requirement and speed to perform tasks, and conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping use and development of abilities and autonomy to make decisions about the work process) and *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were . 71, .65 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job Strain) was computed by dividing the mean item score of Demand by the mean item score of the Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate excessive perceived job strain [XX]. ERI is a 23-item self-report questionnaire that

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Comment [DiSA9]: Courvoisier DS, Perneger TV. Validation of alternative formulations of job strain. J Occup Health 2010;52:5-13.

assesses three dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11 items mapping the occupational rewards that are supposed to be received by the person) and *Overcommitment* (6 items mapping the intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity scale. In this study reliabilities of the scales were . 82, .89 and .79, respectively. Along with scale sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce stress [XX].

~~'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?") (α = 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?") (α = 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") (α = 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 two scales: 'effort', evaluated by 6 items (e.g. E1 "I have constant time pressure due to a heavy workload") (α = 0.82), and 'reward', evaluated by 11 items (e.g. R1 "I receive the respect I deserve from my superior or equivalent person") (α = 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. Individuals who had a score greater than one were considered to be stressed because they subjectively perceived a discrepancy between efforts and results. The ERI questionnaire also included a third scale, 'over-commitment' which was evaluated~~

Comment [DiSA10]: uniper B, White N, Bellamy P. A new approach to evaluating the well-being of police. Occup Med (Lond) 2010;60:560-565.

~~by 6 items on a 4-point Likert scale (e.g. O3 "When I get home, I can easily relax and 'switch off' work") (α = 0.79). It measured the set of intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress.~~

The mental health status was assessed ~~at baseline~~after the third occasion using ~~three measures: depression, anxiety and burnout~~ the following measures.

Depression was evaluated by the Beck Depression Inventory (BDI) [24], as this questionnaire performed better than other tests for depression screening [25,26]. The BDI consists of 21 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores indicating more severe depression. If multiple responses are chosen under one item, the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in clinical practice for depression screening is 10 [27]. The probability of suffering major depressive disorder rapidly increases above this threshold; so, a higher score of 14 [25] or 16 [26] is often chosen in order to reduce the prevalence of false positive in populations consisting of patients affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level of 10, as the subjects tested were young, active and highly selected.

Anxiety was evaluated by the State-Trate Anxiety Inventory–Trait (STAI-T; Spielberger et al. 1983; Italian version in Sanavio et al. 1997) The STAI-T is a 20-item self-report measure of anxiety proneness requiring participants to rate their frequency of anxiety symptoms on a 4-point Likert-type ~~frequency~~ scale ~~ranging from 1 (almost never) to 4 (almost always)~~. Nine items are reverse scored. In this study ~~internal consistency~~the reliability of the scale was .74.

Maslach Burnout Inventory (MBI; Maslach and Jackson 1981; Italian version in Sirigatti and Stefanile 1993) MBI is a 22-item self-report measure of professional burnout. It provides scores

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on three facets of burnout: ~~Emotional~~Professional Exhaustion (~~EE; 9 items mapping), which assesses~~ feelings of being emotionally overextended and exhausted by one~~'~~'s work.~~;~~ Depersonalization (~~DP; 5 items), which assesss mappinges~~ an unfeeling and impersonal response towards the recipients of one~~'~~'s care) and ~~;~~ Personal Accomplishment (~~PA; 8 items), which evaluates~~mapping ~~-~~feelings of competence and successful achievement in one~~'~~'s work with people).~~;~~ Participants are asked to rate the frequency of experiencing feelings related to each subscale using a 7-point, Likert-type scale ~~(1 = Never; 7 = Every Day)~~. In this study reliabilities of the scales were ~~internal consistencies were EE0~~.86, ~~, DP0~~.60 and ~~and PA0~~.80, respectively.~~;~~ ~~The questionnaires were anonymous~~All participants were tested anonymously and confidentially during their routine psychophysical assessment. Anonymity was achieved~~,~~ ~~and participants~~by identifying ~~were identified by~~participants with an alphanumeric code, double-blind. 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 and ~~All data was treated in accordance~~the whole procedure followed the ~~with the~~ Ethical Principles of Psychologists Code of Conduct (American Psychological Association 2002).

Control Variables

The control variables used in our study were: age (years), length of employment (years of service); education level (~~8 or more years of schooling~~lower vs equal/higher than high school); rank (officer vs~~,~~ ~~or~~ supervisor~~/ and~~ technical staff); origin (Northern or Southern Italy); housing (in barracks or home); marital status (single~~/ or d~~di~~i~~vorced~~/ married~~ vs married~~/or~~ cohabiting); presence of children (no/yes).

Statistical analyses

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The first research question we ~~set out to answer~~addressed was whether there was~~is~~ a relationship between the individual level of work-related stress and mental health problems. In order to do this we used hierarchical multiple linear regression models in which the variable "the BDI score~~depression score"~~ was ~~posed~~ specified as ~~dependent variable~~criterion. In Model 1 ~~the first model~~ we ~~used~~ specified as predictos only the ~~socio-demographic~~control variables ~~(age, length of employment, rank, education level, origin, marital status, housing, having offspring) as independent variables~~. In Model 2 and 3 ~~the second and third models, we separately added the stress related variables~~scale scores from the ~~the Karasek (demand, control, support)~~DCS and from the ~~the Siegrist~~ERI ~~models (effort, reward, over-commitment)~~questionnaires, respectively, were entered in the regression model. ~~In the final model~~In Model 4, control variables and DCS and ERI scores were specified as predictors. ~~we put together all the stress related and the socio-demographic variables as predictors of depression~~. The degree of association between variables is ~~indicated~~ indexed by the regression coefficient computed on the standardized variables (β). The amount of variance of the depression score accounted for by the predictors (and the goodness of fit of the regression model) was~~is~~ indexed by the adjusted ~~r~~R^2~~)~~. Since age and length of employment were highly correlated (r = .91), only the latter was used as a predictor. In order to minimize the potentially confounding effects of multicollinearity, we partialized the effects through principal component analysis.

~~The second question involved ascertaining~~We then tested ~~what was~~ the risk of suffering from depression for an ~~policeman~~ officer in a state of distress. We used binary logistic regression, with caseness for ~~the state of~~ depression (i.e., BDI score ≥ 10~~("caseness")~~ ~~as defined above as the dependent variable. Separately,~~as criterion ~~we~~ and DCS-Job Strain~~used job strain (high demand and low control)~~, ~~s~~social isolation (~~"support"~~DCS-Support score below the median), isostrain (job strain plus social isolation), Effort/Reward imbalance (~~effort reward imbalance (subjects with~~E/R ratio ~~ERI value >~~1~~))~~, and O~~o~~ver-I~~i~~nvolvement in work (ERI-~~"over-commitment"~~Overcommittment score

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above the median) as ~~independent variables~~predictors. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the socio-demographic variables to the equation. ~~We calculated~~ Oodds ratios (OR) and their 95% confidence intervals (95%CI) were computed.~~.~~ ~~PASW/SPSS software (version 20, IBM, Chicago, IL) was used for analyses.~~

~~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

~~The characteristics of the study population are shown in Table 1. The average values of the variables indicating stress in the workplace and those referring to mental disorders are listed in Table 2~~Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not particularly high when compared with those of other groups of Italian workers [Magnavita PsyJ]. The average levels of depression, anxiety, emotional exhaustion and depersonalization scores were close to the lower limits of the respective scales, while those of personal accomplishment were high. Based on the Italian cut-off levels, there was no case of possible anxiety or burnout. ~~In this study~~However, there were 21 (7.3%) likely cases of mild depression (BDI ≥~~greater than or equal to~~ 10)~~ among the policemen~~ and 7 (2.4%)~~, while the most~~ likely cases of moderate depression (BDI ≥~~>~~ 16)~~. were found among 7 subjects (2.4%).~~

Hierarchical multiple linear regression ~~Linear regression analysis (Table 3)~~ allowed~~enabled~~ us to ~~evaluate~~ test the extent to which the level of depressive symptomatology~~ion~~ that can be predicted on the basis of socio-demographic and work-related stress data (Table 2).

Insert Table 2 about herre

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The association between of depression with only socio-demographic variables (Model 1) ~~and depression~~ was weak (Adjusted R^2 = .01) and ~~and~~ generally not significant, ~~only the rank level was inversely associated with depression~~except a positive association with length of employment, which was significant~~.~~ also in all next models.~~Taken together, the socio-demographic factors described only a small fraction of the variability of psychological problems, i.e. less than 1%~~When DCS scores were entered into the model (Model 2), a significant increase in Adjusted R^2 (.10) was observed, and DCS-Control and DCS-Support were significantly and negatively associated with BDI scores. When DCS scores where replaced by ERI scores (Model 3), the Adjusted R^2 significantly increased (.16) and the negative regression coefficient of ERI-Reward was the only significant effect, along with the one of length of employment. Model 4, that included all control and occupational stress variables, did not show an Adjusted R^2 significantly higher than Model 3, and the only significant predictors were length of employment and ERI-Reward score.

The results of the logistic regression are shown in Table 3.

Insert Table 3 about here~~.~~

For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"), the risk of being depressed approximately doubled, but not significantly, whereas the other categorical predictors were all statistically significant. Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher risk of depression than the others.

The results of regression analyses performed using anxiety and MBI scores as criteria are shown in Tables 4a-d.

Insert Tables 4a-d about here

Anxiety was significantly associated with living in barracks, with lower scores in DCS-Support and ERI-Reward and with higher scores in ERI-Effort. MBI Professional Exhaustion scores were higher in older officers and in agents and were significantly predicted by higher ERI-Over-commitment

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scores. MBI Depersonalization scores were higher in older officers and in officers without children, and were significantly predicted by lower ERI-Reward scores. MBI Personal Accomplishment scores were lower in barracked officers and in officers without children, and were significantly predicted by higher DCS-Control scores.

~~By adding demand, control and support, the percentage of variance expressed rose to about one-tenth of the total variance (R^2=0.096). Social support was negatively associated with depression (β= -0.211). Job control was negatively associated with the presence of depressive symptoms (β= -0.127).~~

~~By substituting the DCS model variables with those of the ERI model (Model III of Table 3) among the independent variables, the coefficient of determination improved significantly, thus expressing about one-sixth of the total variance (R^2= 0,16). Reward received for work was the most important protective factor against depression (β = -0.303). On the contrary, excessive involvement in work or intrinsic effort (over-commitment) was significantly associated with depression in a positive way (β= 0.121).~~

~~The more complex model, in which all stress related variables were included (Model IV of Table 3) indicated that there was a negative linear association between the score for depression and rewards (β= -0.226).~~

~~The correlations of stress with the other measures of mental health (anxiety, exhaustion, depersonalization, and personal accomplishment) were generally very weak (see the tables in the annex). Anxiety was weakly correlated inversely with support and reward and directly with effort. Exhaustion was significantly correlated with over-commitment. Depersonalization was inversely related to reward. The personal accomplishment was significantly associated with control. The socio-economic factors have often shown a greater predictive power on mental health than the stress variables. The coefficient of determination (R^2), however, was very low, even in more complex models.~~

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~~By logistic regression (Table 4) we observed that for subjects in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"), the risk of being depressed almost doubled (OR 1.92; 95% CI 0.76-4.84), although the association was not statistically significant since the ranges of variability of the estimates included the assumption of equivalence. If we take into account the lack of social support, which was significantly associated with depression (OR 3.47; 95%CI 1.16-10.38), the condition of iso-strain was associated with a significantly increased risk of depression (OR 7.39; CI95% 2.46-22.23). The police officers who were in a state of "distress" according to the ERI model (i.e. weighted ratio between effort and reward more than 1) also had a much higher risk of depression (OR 7.39 CI95% 2.46-22.23). Over-commitment was associated with the risk of depression (OR 3.85; CI95% 1.28-11.54).~~

Discussion

This study investigated the association of a condition of "job distress" with the presence of self-reported symptoms of depression, alongside with other common work-related mental problems such as anxiety and burnout, in a special force police unit. Results from multiple regression analyses showed that lower ERI-Effort scores predicted higher BDI scores, whereas results from logistic regression analyses revealed that a higher effort/reward imbalance was associated with an approximately sevenfold increase in risk of depression. These results suggest that, consistently with previous studies, also in special force police officers the lower the reward opportunities, or the higher the imbalance between the the effort spent to meet the demanding aspects of the work environment and the reward (money, esteem and career opportunities, job security included), the higher the depressive symptomatology. Studies based on the demand /control model indicate that job strain is associated with depression (Bonde). A recent meta-analysis of studies on the

association between stress and mental disorders indicates that psychosocial problems in the workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [36]. Another review of 14 longitudinal studies indicates that lack of social support enhances depression [37]. The association we found between low reward and symptoms is in agreement with that suggested by neurobiological studies on depression (Eshel and Roiser). However, we could not replicate the finding that using both the DCS and the ERI model provides greater predictive power for depressive disorders than models including only one of them [38]. In this study, only the ERI model proved to be useful in predicting depression scores of officers. Lack of rewards and excessive over-commitment significantly increased depression scores and the probability of disease, respectively. This result replicates the observations of Martins and Lopes [39] who argued that effort, reward and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and those of Kingdom and Smith [40], that showed that ERI was the most important predictor of depression among police officers in the UK Coast Guard and, more generally, with a large body of literature on the relationship between reward processing and depressive symptoms (Eshel & Roiser (2010)). To a lesser extent, the DCS model captured some important aspects, such as the lack of control over the organization of work and the lack of support from colleagues or superiors. The importance of lack of support from superior and organization in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [33], and by Arial et al. [30] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation of suffering which could result in disease. Although not the main focus of this study, the ERI model also showed a good ability to predict anxiety and two of the three core dimensions of burnout (i.e. emotional exhaustion and depersonalization), consistently with previous studies (XX), whereas DCS-Control score was significantly associated with personal accomplishment. Some background variables also showed a significant association with measures of mental health. Higher length of employment (which overlaps age) was associated with higher

Comment [DiSA12]: Griffin, J.M., Greiner, B.A., Stansfeld, S.A., & Marmot, M. (2007). The effect of self-reported and observed job conditions on depression and anxiety symptoms: a comparison of theoretical models. Journal of Occupational Health Psychology, 12, 334–349.
Bakker, A.B., Killmer, C.H., Siegrist, J., & Schaufeli, W.B. (2000). Effort–reward imbalance and burnout among nurses. *Journal of Advanced Nursing, 31*, 884-891.

depressive symptomatology, anxiety, professional exhaustion and depersonalization, being barracked was associated with higher anxiety and lower personal accomplishment, being an operative agent was associated with higher professional exhaustion, having children was associated with lower depersonalization. These results are in line with previous studies on armed forces officers (XX)

Sadly, investigating stress in police officers is particularly difficult because the latter are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield 7) found work stress to be the first cause of sickness absence and reduction in operational duties, as well as the leading cause of ill health retirement in police officers. A number of studies have previously evaluated occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen 16), musculoskeletal disorders in special police forces 17), lower mental health level in correctional 18) and urban police officers 19). The demand-control model proved to be a valid theoretical framework to explain professional efficiency and exhaustion 20) and the complex interplay between job demands, emotional exhaustion and other social and individual factors 21). Officers with greater perceived work stress in the first year of police service showed more severe depression symptoms 12 months later 22).

It might be argued that only seven per cent of officers in our cohort reported a level of depressive symptomatology higher than the risk threshold.. In fact, such prevalence is lower than that found by by Fox et al. [28] in urban US police officer (9%), by Frühwald et al. [29] in Lower Austria (9%), by Arial et al. [30] in a Swiss officers (11.9%), by Chen et al. [31] in Taiwanese officers (21.6%), and by Obidoa et al. [32] among US corrections officers (31%), and it is comparable with that found in other working populations [12-15]. Moreover, a nationwide study in the Norwegian police service showed that the younger police officers reported lower levels of depressive

Comment [DiSA13]: Arata, K. V. (1996). *Burnout in the Armed Forces: Communication, Satisfaction, and Commitment.* Department of the Army, Washington, DC.

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symptoms than the corresponding general population [33]. A recent comparison of police and other employees found no indications that self-reported mental health disturbances are more prevalent among police officers than among groups of employees that are not considered high-risk groups [34]. Since our sample was composed by young and highly selected police officers, which also shown an emotional stability higher than the general population (XX) this result is not surprising. However, this does not mean that the problem of depression in this special unit is negligible, and it cannot be ignored that, beyond individual's health related risk factors, depression represents a considerable cost for productivity both in terms of absenteeism and presenteeism [35] and, more importantly given that the delicate tasks the officers of this study have to accomplish, it increases the possibility of errors and the risk to the health and safety of others. Hence, officers with depressive symptoms should obtain timely and confidential assistance and the causes of excessive occupational stress must be promptly identified and removed or minimized.

The results reported in this study should be interpreted with caution, as all the measures were self-reported questionnaires, and thus reporting bias and subjectivity may have distorted the observations. Depressed persons could be more likely to report psychosocial stress at work, even if objectively their work environment is not at risk *per se*. The cross-sectional nature of the research does not allow us to infer the direction of the observed phenomena, and thus separate cause from effect. Specifically, we could not address the issue of whether the observed reduction in experience of reward is an epiphenomenon of the presence of depressive symptoms. Finally, because our sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not be generalizable to police officers in general, with different occupational exposure, nor 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 of depression with work stress in terms of both DCS and ERI models in special force police officers. Such population has a high exposure to homogenous occupational risks, while many studies include

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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.

Limitations notwithstanding, the present findings indicate that some aspects of psychosocial environment at work, such as the imbalance between effort and reward, are associated with depressive symptoms, anxiety and burnout in special force police officers. Although we could not establish a casual relationships and these results need to be replicated in longitudinal studies, they suggest that the dimensions of effort, reward and overcommitment can be useful in monitoring special force police officers' psychological functioning.

~~Our study, which to the best of our knowledge is the only conducted on a police unit of avant-garde, indicated that higher levels of work stress are associated with depressive symptoms. Both the work-related stress models we used were significantly associated with the presence of depressive symptoms, even if the effort / reward / imbalance model seemed to be more efficient in predicting mental ill-health than the demand / control / support model.~~

~~Seven per cent of policemen in our cohort reported depressive symptoms. The prevalence is lower than that found by by Fox et al.[28] in urban US policemen (9%), by Frühwald et al.[29] in Lower Austria (9%), by Arial et al.[30] in a Swiss sample of police officers (11.9%), by Chen et al.[31] in the Taiwanese police (21.6%), and by Obidoa et al.[32] among US corrections officers (31%), and it is comparable with that found in other working populations[12-15]. A nationwide study in the Norwegian police service, indeed, showed that the younger policemen reported lower levels of depressive symptoms than the corresponding general population[33]. A recent comparison of police and other employees found no indications that self-reported mental health disturbances are more prevalent among police officers than among groups of employees that are not considered high-risk groups[34]. Our sample was composed by young and highly selected policemen, and this may explain our findings.~~

Depression represents a considerable cost for productivity both in terms of absenteeism and presenteeism [35]. But much more important is the fact that this condition increases the possibility of errors and the risk to the health and safety of others.

The results of our observations are in agreement with the literature. Studies based on the demand / control model indicate that job strain is associated with depression (Bonde). A recent meta-analysis of studies on the association between stress and mental disorders indicates that psychosocial problems in the workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [36]. Another review of 14 longitudinal studies indicates that lack of social support enhances depression [37]. The association we found between low reward and symptoms is in agreement with that suggested by neurobiological studies on depression (Eshel and Roiser). Even more recent studies go in the same direction. The two effort-reward and demand-control-support models used together have greater predictive power for depressive disorders than a single model [38].

In this study, the ERI model proved particularly useful in interpreting the state of "distress" in policemen. Excessive over-commitment and lack of rewards significantly increased depression scores and the probability of disease. This result confirms the observations of Martins and Lopes [39] who argue that ERI and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and that of Kingdom and Smith [40] showing that ERI was the most important predictor of depression among police officers in the UK Coast Guard.

The DCS model captures some important aspects, such as the lack of full control over the organization of work and the lack of support from colleagues or superiors. The importance of lack of support from superior and organization in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [33], and by Arial et al. [30] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation of suffering which could result in disease.

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~~The data emerging from our study should be interpreted with caution as subjectivity may have distorted the observations. The cross-sectional nature of the research does not allow us to infer the direction of the observed phenomena. 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, nor 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 depression 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 this study we found a modest prevalence of depression, lower than that found in other police corps. This does not mean that the problem in this Italian special unit is negligible. Workers with depressive symptoms should obtain timely and confidential assistance. Furthermore, the causes of excessive occupational stress must be promptly identified and removed or minimized.~~

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Association of work-related stress with mental health problems in a special police force unit

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Association of work-related stress with mental health problems in a special police force unit

Sergio Garbarino [1,2], Giovanni Cuomo [2], Carlo Chiorri [3], Nicola Magnavita [4].

1. State Police Health Service Department, Ministry of the Interior, Rome, Italy
2. Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy
3. Department of Educational Sciences, Psychology Unit, University of Genoa, Genoa, Italy
4. Department of Public Health, Occupational Health Unit, Università Cattolica del Sacro Cuore, Largo Gemelli 8, 00168 Roma, Italy. e-mail: nicolamagnavita@gmail.com

Correspondence to: N. Magnavita. Tel. +39-347-3300367, Fax: +39-06-61909399, e-mail nicolamagnavita@gmail.com; nmagnavita@rm.unicatt.it

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Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at Dryad repository, who will provide a permanent, citable and open access home for the dataset.

Abstract

Objectives. Law and order enforcement tasks may expose special force police officers to significant psychosocial risk factors. The aim of this work is to investigate the relationship between job stress and the presence of mental health symptoms while controlling for socio-demographical, occupational and personality variables in special force police officers.

Method: At different time points, 292 out of 294 members of the 'VI Reparto Mobile', a special police force engaged exclusively in the enforcement of law and order, responded to our invitation to complete questionnaires for the assessment of personality traits, work-related stress (using the demand-control-support (DCS) and the effort-reward-imbalance (ERI) models), and mental health problems such as depression, anxiety and burnout.

Results: Regression analyses showed that lower levels of support and reward and higher levels of effort and overcomittment were associated with higher levels of mental health symptoms. Psychological screening revealed 21 (7.3%) likely cases of mild depression (BDI ≥10). Officers who had experienced a discrepancy between work effort and rewards showed a marked increase in the risk of depression (OR 7.89 95%CI 2.32-26.82) when compared with their counterparts who did not perceive themselves to be in a condition of distress.

Conclusions: The findings of this study suggest that self-reported work-related stress may play a role in the development of mental health problems in police officers. The prevalence of mental health symptoms in the cohort investigated here was low, but not negligible in the case of depression. Since special forces police officers have to perform sensitive tasks for which a healthy psychological functioning is needed, the results of this study suggest that steps should be taken to prevent distress and improve the mental well-being of these workers.

Keywords: effort-reward imbalance, depression, distress, job strain, mental health, over-commitment, police, social support, work-related stress.

Article summary

'Article focus'

Mental health in special police forces is a critical issue. Police officers are exposed to acute and chronic stress and may develop mental health problems. The impairment of police officers' psychological functioning can be a serious threat to the safety of the public.

'Key messages'

The prevalence of mental health problems in special force police officers is lower than that of the general population and other groups of police job distress (or job stress) measures and mental health symptoms was found. The prevention of distress and the treatment of mental health disorders among police officers are necessary for the safety of the workers themselves and the public.

'Strengths and limitations of this study'

This is the first study to investigate the association of job distress with mental health symptoms in a special force police unit. It has a high participation rate. The study has been conducted on a relatively small cohort, and with only self-report measures. .

Introduction

It is generally agreed that mental health disorders have a multifactorial etiology and, in the last few decades, research has focused on the role of working conditions in determining people's mental health [1, 2]. In fact, workers themselves often report that their work affects their health [3] and intangible costs arising from the suffering of workers are being added to direct financial costs due to absenteeism, presenteeism, reduced productivity and compensation. Police officers operating in special force units engaged in law enforcement and riot control are a category of workers that is considered particularly at risk for the development of mental health disturbances because of the possible exposure to violent events and traumas and hence to post-traumatic stress disorder, but in fact traumatic accidents rarely occur. However, the long term effect of the psychological stress due to the constant risk of being injured, wounded or even killed while on patrol and to the witnessing of violence and death tends to be overlooked. This may not be immediately perceived as detrimental, but it can still induce maladaptive reactions [3]. Although it has been shown that police officers are more resilient to stress than civilians [4-7], several studies have provided evidence that adverse work conditions are related to poor mental health outcomes (e.g., [8]) In addition to these operational work-related challenges, police officers may be exposed to organizational problems that are common within hierarchical, male-dominated paramilitary structures such as fire-fighting, ambulance and paramedic services [9-10]. Paradoxically, daily organizational stressors may be more challenging than operational experiences, as shown by a recent study in which reported levels of perceived stress in a group of police officers were higher during routine jobs than during a high-risk public event [11]. Both a dramatic violent event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e., a neurobiological maladaptive reaction due to being forced to adapt to challenging environments characterized by behavioral and emotional changes known as "distress" [12]. Through interaction with many different individual factors, distress can induce the occurrence of mental disorders such as anxiety, depression, burnout,

conversion disorder and other conditions classified in DSM IV [13]. Psychological dysfunction resulting from job distress can be a gradual and progressive process that impairs well-being over time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at least until the severity of the symptoms makes it clear to colleagues, family, or both. The recognition of emotional problems due to work-related distress is rarely, if ever, encouraged in the law enforcement sector, since it is considered a sign of weakness [14]. Consequently, police officers fail to seek professional help early enough to prevent diagnosis and quickly benefit from treatment. This is one of the main reasons for which mental disorders are the leading cause of retirement in the police force [15].

The two leading models that have been used to describe and explain individual perception of stress factors are the Demand/Control/Support (DCS) model, developed by Karasek [16], and the Effort/Reward Imbalance (ERI) model, developed by Siegrist [17]. The DCS model assumes that the primary sources of job stress, or "job strain", 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, refers to the worker's ability to control his own activities and skill usage. Social support at work, a moderating factor of job strain, was subsequently included in the model. According to this model, high psychological demands in conjunction with low decision latitude can contribute to the development of psychological problems, and workers with high job strain and low social support at work are thought to be the most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis [18].

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, and, consequently, health problems [17]. The DCS model, developed in the 1960s, appears to be more suitable for the physical aspects of occupational stress, while the ERI model, designed for the tertiary society of the 1980s, is more sensitive to stress arising from work relations and organizational factors [19].

Unfortunately, in literature there is no agreed definition of "distress", although there is some consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a vague definition, the prevalence of workers with distress in published studies can range from 5% to 50% [20-22]. When distress reaches clinical relevance it is defined as "stress-related disorder". This term includes a variety of clinical conditions, which are collectively labeled as "common mental disorders" (CMD) [23] and one of the most common diagnoses is depression [24]. However, a systematic review of evidence on psychosocial factors at work and depression revealed a high degree of study heterogeneity [25], although other studies found moderate evidence of a relationship between the psychological demands of a job and the development of depression, with relative risks of approximately 2.0 [26]. Distress and mental health problems caused by work can affect the performance of professional activity, especially in a sensitive area such as law enforcement. The consequences of stress on the mental health of police officers can thus be particularly serious not only for the increased risk of individual health problems, and but also on account of the increased risk of impaired work performance that could jeopardize the safety and health of the general population. For instance, as reported by Violanti [27], depression can be a contributing factor not only in early retirement, but also in police officer suicides, murder-suicides,

domestic violence, unnecessary violence and aggression while in service, that occurs over and above the role played by police culture that might encourage aggressive and authoritarian attitudes.

Sadly, investigating stress in police officers is particularly difficult because they are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield [15] found work stress to be the first cause of sickness absence and a reduction in operational duties, as well as the leading cause of ill health retirement in police officers. A number of studies have previously evaluated occupational stress in policemen using the ERI and DCS models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen [28], musculoskeletal disorders in special police forces [29], lower mental health level in correctional [30] and urban police officers [31] [58]. The DCS model proved to be a valid theoretical framework for explaining professional efficiency and exhaustion [32] and the complex interplay between job demands, emotional exhaustion and other social and individual factors[33]. Officers with greater perceived work stress in the first year of police service showed more severe depression symptoms 12 months later [34].

The aim of this study was to investigate the association of a condition of "distress" with the presence of self-reported symptoms of depression, anxiety and burnout, in a special force unit of the Italian police while controlling for socio-demographical and occupational variables and personality traits. Previous studies on this cohort have shown that younger officers, those who were single, had a shorter length of service, lived in barracks, had a lower rank and who were closer to their families had a higher short-term sickness absence risk [35] and that DCS control and support and ERI reward measures were negatively related to frequency of absence and short-term absence and that DCS demand and ERI effort measures were positively related to total lost days [36] Moreover, it has been reported that the majority of these officers described themselves as much more emotionally stable and slightly-to-moderately more extraverted, agreeable, conscientious and open

to experience than the general population and career soldiers [4] and that some personality traits (mainly emotional stability and agreeableness) were associated to perceived stress levels or reactivity to environmental stressors [37].

Method

Participants

Participants were the members of 'VI Reparto Mobile' of Genoa, a police special force unit called on to maintain law and order in all the major public events that take place in Italy. These officers work exclusively as First Responders; they are carefully selected from ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and they are also often involved in public events in which there is a high risk of terrorist attacks and physical clashes. During a single riot, they are on duty for an average of 10 or more hours of work, are engaged in physical clashes for over an hour on average, and often feel that they are in imminent danger of death. They have a special and on-going education which aims to improve team spirit ("esprit de corps") and increase their preparation for dramatic events. 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. The unit is composed of 294 members. Two officers 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 female, gender differences could not be assessed and were therefore excluded from the analyses. The final group of participants therefore comprised 289 officers (see Table 1 for descriptive statistics of the socio-demographic variables).

Insert Table 1 about here

Materials

Personality measure

Big Five Questionnaire (BFQ) [38, 39]. The BFQ is a self-report measure of the Big Five personality traits: Energy (E, Extraversion), Friendliness (F, Agreeableness), Conscientiousness (C), Emotional Stability (S, the opposite of Neuroticism), and Openness (O). Each scale contains 24 short phrases that eliminate some of the ambiguity that might arise when using single adjectives. 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 (*M*=50, *SD*=10) using the Italian norms published in Caprara et al. [38]. In this study reliabilities (Cronbach's alphas) of the scales were E=.69, F=.80, C=.82, S=.88, and O=.77.

Stress measures

Occupational stress was assessed using the validated Italian versions [40] of two standardized questionnaires: the *Demand-Control-Support* (DCS) questionnaire, derived from the longer *Job Content Questionnaire* [16], and the *Effort-Reward Imbalance* (ERI) questionnaire [17]. DCS is a 17-item self-report questionnaire that provides scores on three scales: *Psychological Job Demand*, (Demand, 5 items mapping quantitative aspects of work, such as time required to perform tasks, and conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping the use and development of skills and autonomy in making decisions about the work process) and *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were .71, .65 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job Strain) was computed by dividing the mean item score of Demand by the mean item score of the

Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate excessive perceived job strain [41]. ERI is a 23-item self-report questionnaire that assesses three dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11 items mapping the occupational rewards that the worker expects to receive), and *Overcommitment* (6 items mapping the intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity scale. In this study, reliabilities of the scales were . 82, .89 and .79, respectively. Along with scale sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce stress [42].

Mental health measures

Depression was evaluated by the *Beck Depression Inventory* (BDI) [43], as this questionnaire proved to be effective for depression screening [44, 45]. The BDI consists of 21 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores indicating more severe depression. If multiple responses are chosen under one item, the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total from 0 to 63. In this study, internal consistency was 0.81. The cut-off score commonly used in clinical practice for depression screening is 10 [46]. The probability of suffering major depressive disorder rapidly increases above this threshold, so a higher score of 14 [44] or 16 [45] is often chosen in order to reduce the prevalence of false positive in populations consisting of patients affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level of 10, as the subjects tested were young, active and highly selected.

Anxiety was assessed with the *State-Trait Anxiety Inventory−Trait* (STAI-T) [47] Italian version [48]. The STAI-T is a 20-item self-report measure of anxiety proneness requiring participants to

rate their frequency of anxiety symptoms on a 4-point Likert-type scale. Nine items are reverse scored. According to [48], the cut-off score used in clinical practice for anxiety screening is 40. In this study the reliability of the scale was .74.

The *Maslach Burnout Inventory* (MBI) [49] Italian version [50] is a 22-item self-report measure of professional burnout. It provides scores on three facets of burnout: Professional Exhaustion (PE, 9 items mapping feelings of being emotionally overextended and exhausted by one's work), Depersonalization (DP, 5 items mapping an unfeeling and impersonal response towards the recipients of one's care) and Personal Accomplishment (PA, 8 items mapping feelings of competence and successful achievement in one's work with people). Participants are asked to rate the frequency of experiencing feelings related to each subscale using a 7-point, Likert-type scale. According to Violante et al. [51], a burnout condition can be defined by scores higher than 23 on PE, higher than 8 on DP and lower than 30 on PA. In this study reliabilities of the scales were PE=.86, DP=.60 and PA=.80, respectively.

Control Variables

The control variables used in our study were: age (years), length of employment (years of service); education level (lower vs. equal/higher than high school); rank (officer vs. supervisor/technical staff); origin (Northern or Southern Italy); housing (in barracks or home); marital status (single/divorced vs. married/cohabiting); presence of children (no/yes).

Procedure

Personality traits were assessed in January 2009. Perceived stress was measured on three separate occasions: (1) in January 2009, when officers were engaged only in routine work; (2) in April 2009, when they underwent specific training in preparation for the meeting, and (3) in July 2009, shortly before the Genoa G8 summit meeting took place. Following the procedure already adopted in previous work [36, 37], we averaged the three measurements into a single value, to obtain the level

of stress that each officer had experienced during that period. Mental health was assessed in September 2009.

Ethics

All participants were tested anonymously and confidentially during their routine psychophysical assessment. Anonymity was achieved by identifying participants with an alphanumeric code, double-blind. The study protocol was approved by the Ethics Committee of the Università Cattolica del Sacro Cuore, Faculty of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and the National Police Management Board and the whole procedure followed the Ethical Principles of Psychologists Code of Conduct (American Psychological Association 2002).

Statistical analyses

The first research question we addressed was whether there was a relationship between the individual level of work-related stress and mental health problems after controlling for socio-demographical and personality variables. In order to do this we used hierarchical multiple linear regression models in which BDI, STAI and MBI scores were specified as criteria. In Model 1, only the control variables were specified as predictors. In Model 2, the BFQ personality scores were entered in the regression model. In Model 3 and 4, scale scores from the DCS and from the ERI questionnaires, respectively, were added as further predictors. In Model 5, control variables, BFQ personality scores and DCS and ERI scores were specified as predictors. The degree of association between variables was indexed by the regression coefficient computed on the standardized variables (β). The amount of variance of the depression score accounted for by the predictors (and the goodness of fit of the regression model) was indexed by the adjusted R^2. Since age and length of employment were highly correlated (r = .91), only the latter was used as a predictor. In order to minimize the potentially confounding effects of multicollinearity, we partialized the effects through principal component analysis.

We then tested the risk of suffering from depression, anxiety and burnout for a police officer in a state of distress. We used binary logistic regression, and caseness for each construct was defined as a BDI score ≥ 10 for depression, a STAI score > 40 for anxiety, MBI-PE > 23 and MBI-DP > 8 and MBI-PA < 30 for burnout. DCS-Job Strain, social isolation (DCS-Support score below the median), isostrain (job strain plus social isolation, i.e. support below the median), Effort/Reward imbalance (E/R ratio >1), and Over-Involvement in work (ERI-Overcommittment score above the median) were used as predictors. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the socio-demographic variables to the equation. Odds ratios (OR) and their 95% confidence intervals (95%CI) were computed.

Results

Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not particularly high when compared with those of other groups of Italian workers [19]. The average levels of depression, anxiety, emotional exhaustion and depersonalization scores were close to the lower limits of the respective scales, while those of personal accomplishment were high. On the basis of the Italian cut-off levels, only one case of possible anxiety and three cases of possible burnout were observed. However, there were 21 (7.3%) likely cases of mild depression (BDI ≥ 10) and 7 (2.4%) likely cases of moderate depression (BDI ≥ 16). Given the negligible prevalence of possible anxiety or burnout, we applied the logistic analysis exclusively to depression.

Hierarchical multiple linear regression allowed us to test the extent to which the level of mental health symptomatology can be predicted on the basis of socio-demographic, occupational, personality and work-related stress data (Table 2).

Insert Table 2 about here

The association between depression and socio-demographic variables (Model 1) was weak (Adjusted R^2 = .01) and generally not significant, except for a positive association with length of employment. When personality traits were entered into the model (Model 2), a significant increase

in Adjusted R^2 was observed, due to the significant negative effect of emotional stability. A further significant increase in the proportion of variance of BDI score accounted for was observed also when DCS and ERI scores were entered (Model 3, 4 and 5). DCS-Control, DCS-Support and ERI-Reward showed a negative effect, whereas ERI-Effort and ERI-Reward showed a positive effect.

The results of the logistic regression are shown in Table 3.

Insert Table 3 about here

For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"), the risk of being depressed approximately doubled, but not significantly, whereas the other categorical predictors were all statistically significant. Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher risk of depression than the others.

The results of regression analyses performed using anxiety as criterion are reported in Table 4.

Insert Table 4 about here

Socio-demographical and occupational variables accounted for a negligible proportion of variance of the anxiety score (Model 1), with living in barracks being the only significant predictor. Entering personality traits as further predictors (Model 2) substantially improved the fit of the model, and lower extraversion, agreeableness and emotional stability were associated with higher anxiety levels. The inclusion of DCS and ERI scores as predictors (Models 3-5) further increased the Adjusted R^2.Results suggested that lower support, higher effort and lower rewards predicted higher anxiety.

Table 5 reports the results of the regression analyses carried on with MBI scores as criteria.

Insert Table 5 about here

MBI Professional Exhaustion scores were higher in agents (as opposed to supervisors/technical staff) (Model 1) and in officers with lower emotional stability (Model 2), and were associated with higher demand, higher effort, higher over-commitment and lower reward (Models 3-5). Depersonalization scores were lower in officers with children (Model 1), in more agreeable and emotionally stable officers (Model 2) and in officers with higher levels of control, support and reward and lower levels of effort and over-commitment (Models 3-5). Personal Accomplishment scores were not related to any socio-demographical and occupational variable (Model 1), but were positively predicted by all personality traits (Model 2). Control was the only stress-related variable to be significantly associated with this scale score.

Discussion

This study investigated the association between a condition of job distress and the presence of self-reported mental health symptom, in a special police force unit while controlling for socio-demographical, occupational and personality variables. Results from multiple regression analyses showed that socio-demographical and occupational variables accounted for a negligible proportion of variance of mental health problems, although, consistently with a previous study on the same cohort [35] higher length of employment, lower rank, being barracked and not having children were significant predictors of higher symptomatology. Emotional stability was a significant predictor for all the measures of mental health problems, which was expected given the large body of research that has shown that this trait is associated with several mental disorders and physical health problems, and that this is not an artifact of the overlapping of some symptoms with questionnaire items [52]. Lower levels of agreeableness (e.g., hostility) and extraversion were associated with higher anxiety and lower professional accomplishment, consistently with previous studies on the predictive power of these traits for psychological health and occupational outcomes [53]. However, the focus of this study was on the role of job stressors, and results showed that they can account for a further and substantial amount of variance of mental health measures. All ERI scales and all DCS

scales except demand were significant predictors of depressive symptoms, and results from logistic regression analyses revealed that a higher effort/reward imbalance was associated with an approximately sevenfold increase in risk of depression. These results suggest that, consistently with previous studies, also in the case of special force police officers, a lower autonomy in making decisions, poorer relationships between coworkers and superiors, lower reward opportunities (or higher imbalance between the effort spent to meet the demanding aspects of the work environment and the rewards), a more demanding work environment and a higher commitment can be associated with higher the depressive symptomatology. A recent meta-analysis of studies on the association between stress and mental disorders indicated that psychosocial problems in the workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [54]. Another review of 14 longitudinal studies reported that lack of social support enhanced depression [55]. The association we found between low reward and symptoms is in agreement with that suggested by neurobiological studies on depression [56].

Albeit to a lesser extent, the DCS and the ERI model showed a good ability to predict anxiety. Differently from other studies that found that all the three components of the DCS were significant predictors of anxiety [8], in this study only support, i.e., the quality of relationships between coworkers and superiors, was significant, suggesting that this dimension might be play a central role in the development of anxiety in special force police officers. Results for the ERI model were also only partially consistent with the literature which found little predictive power of ERI scales for anxiety [57], since in the cohort under study higher efforts needed to meet the demands of the working environment and lower occupational rewards were associated with higher anxiety.

As for burnout, all ERI scales proved to be useful in predicting professional exhaustion and depersonalization, since higher effort and over-commitment and lower reward were associated with higher scores, whereas they did not account for a substantial amount of variance or personal accomplishment. At least one DCS scale significantly predicted each burnout dimension (demand

predicted professional exhaustion, control and support predicted depersonalization, control predicted personal accomplishment).

Taken together, these results suggest that for special force police officers prediction models that include both the DCS and the ERI scores can provide a substantially greater predictive power for mental health symptoms than models that include only socio-demographical and occupational variables and personality traits. These results are consistent with some of previous studies (e.g., [58], on engineers) but not with others (e.g., [57] on civil servants), possibly suggesting that the effects of the dimensions of job distress on mental health might be the outcome of a complex interaction among the peculiar features of each occupation and the psychological characteristics of the workers, which necessarily self-select into occupations. In the very case of the officers assessed in this study, poor relationships between coworkers and superiors, higher efforts spent and lower rewards received are likely to elicit mental health problems, whereas the use and development of skills and autonomy in making decisions about the work process and the intrinsic personal factors regarding occupational motivation and participation may play a role for some specific problems. These findings replicate the observations of Martins and Lopes [59] who reported that effort, reward and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and those of Kingdom and Smith [60] who showed that ERI was the most important predictor of depression among police officers in the UK Coast Guard. More generally, our results are in agreement with a large body of literature on the relationship between reward processing and depressive symptoms [61]. The DCS model captured some important aspects, such as the lack of control over the organization of work and the lack of support from colleagues or superiors. The role of lack of support from superiors and on the part of the organization to which the worker belongs in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [62], and by Arial et al. [63] in a sample of Swiss police.

It might be argued that only seven per cent of police officers in our cohort reported a level of depressive symptomatology higher than the risk threshold. In fact, such prevalence is lower than that found by Fox et al. [64] in urban US police officers (9%), by Frühwald et al. [65] in Lower Austria (9%), by Arial et al. [63] in Swiss police officers (11.9%), by Chen et al. [58] in Taiwanese police officers (21.6%), and by Obidoa et al. [66] among US corrections officers (31%), and it is comparable with that found in other working populations [24, 67]. Moreover, a nationwide study in the Norwegian police service showed that the younger police officers reported lower levels of depressive symptoms than the corresponding general population [62]. A recent comparison of police and other employees found no indications that self-reported mental health disturbances are more prevalent among police officers than among groups of employees that are not considered to be high-risk groups [68]. Since our sample was composed of young and highly selected police officers, whose emotional stability was higher than the general population [4], this result is not surprising. However, this does not mean that the problem of depression in this special unit is negligible. It must not be overlooked that depression represents a considerable cost for productivity both in terms of absenteeism and presenteeism [69] and more importantly, given the highly sensitive tasks the officers of this study have to accomplish, it increases the possibility of errors and the risk to the health and safety of others. Police officers with depressive symptoms should therefore be given timely and confidential assistance [70] and the causes of excessive occupational stress should be promptly identified and removed or minimized.

The results reported in this study should be interpreted with caution. First, as all the measures were self-reported questionnaires, and reporting bias and subjectivity may therefore have distorted the observations. Depressed persons could be more likely to report psychosocial stress at work, even if objectively their work environment is not at risk *per se*. Second, the fact that job distress variables were measured before mental health symptoms supports prediction but not necessarily a causal hypothesis, since mental health symptoms could have been present even *before*

or *during* the assessment of job distress. Specifically, we could not address the issue of whether the observed reduction in experience of reward is an epiphenomenon of the presence of mental health symptoms. Finally, because our sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not be generalizable to police officers with different occupational exposure, nor 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 of mental health problems with work stress in terms of both DCS and ERI models in special force police officers while controlling for socio-demographical and occupational variables and personality traits. Such a population has a high exposure to homogenous occupational risks, while many studies include police officers engaged in investigative activities, control of the territory, administrative and office activities and many other 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.

Limitations notwithstanding, the present findings indicate that some aspects of psychosocial environment at work, such as the imbalance between effort and reward, are associated with depressive symptoms, anxiety and burnout in special force police officers. Although we could not establish a causal relationship and these results need to be replicated in longitudinal studies, they suggest that the dimensions of the DCS and ERI models can be useful in monitoring psychological functioning of special force police officers.

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Table 1. Socio-demographical and occupational characteristics, personality scores, occupational stress scores and mental health scores of the participants in this study (*n*=289)

Variable	*Statistics*
Socio-demographical variables	
Age, years (*M*±*DS*)	35.4±7.5
Length of service, years (*M*±*DS*)	14.0±7.9
Rank, superintendent or technical staff, frequency (%)	140 (48.4)
Education level, high school or higher, frequency (%)	217 (75.1)
Origin, Northern Italy, frequency (%)	145 (50.2)
Living in barracks, frequency (%)	162 (56.1)
Married or cohabiting, frequency (%)	108 (37.4)
Personality variables	
BFQ-Energy/Extraversion (*M*±*DS*)	52.9±8.3
BFQ-Friendliness/Agreeableness (*M*±*DS*)	55.3±10.5
BFQ-Conscientiousness (*M*±*DS*)	52.6±8.6
BFQ-Emotional Stability (*M*±*DS*)	62.0±8.2
BFQ-Openness (*M*±*DS*)	51.2±9.1
Occupational stress variables	
DCS-Demand (*M*±*DS*) (range 5-20)	13.4±2.02
DCS-Control (*M*±*DS*) (range 6-24)	13.3±2.7
DCS-Support (*M*±*DS*) (range 6-24)	18.6±2.9
DCS-Job Strain (Demand/Control ratio) (*M*±*DS*)	1.31±0.41
ERI-Effort (*M*±*DS*) (range 6-30)	15.0±3.2
ERI-Reward (*M*±*DS*) (range 11-55)	42.3±6.2
ERI-Over-commitment (*M*±*DS*) (range 6-24)	6.9±1.9
ERI-Weighted Effort/Reward ratio(*M*±*DS*)	0.70±0.28
Mental health variables	
BDI (*M*±*DS*) (range 0-63)	3.3±4.2
STAI-T (*M*±*DS*) (range 20-50)	27.5±4.3
MBI-Emotional Exhaustion (*M*±*DS*) (range 9-36)	17.4±7.9
MBI-Depersonalization (*M*±*DS*) (range 5-35)	9.3±4.5
MBI-Personal Accomplishment (*M*±*DS*) (range 8-56)	42.7±9.8

Note: M=mean; SD=standard deviation; BFQ: Big Five Questionnaire[38,39]; DCS: Demand-Control-Support Questionnaire[16,40]; ERI: Effort-Reward Imbalance Questionnaire[17,40]; BDI: Beck Depression Inventory[43,44]; STAI-T: State-Trait Anxiety Inventory-Trait[48,49]; MBI: Maslach Burnout Inventory[50,51]

Table 2. Standardized regression coefficients (βs) for control socio-demographic variables, personality and occupational stress variables as predictors of Beck Depression Inventory scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Control variables					
Length of employment (years)	.12*	.08	.10	.11	.14*
Rank	-.06	-.06	-.06	-.02	-.01
Education	.07	.08	.09	.08	.09
Origin	-.03	-.03	-.05	-.03	-.05
Marital status	-.02	-.01	.02	.00	.03
Barracked	-.10	-.12*	-.11	-.10	-.07
Children	-.03	-.03	-.02	-.02	-.01
Personality variables					
BFQ-Energy/Extraversion		-.07	-.07	-.07	-.06
BFQ-Friendliness/Agreeableness		-.08	-.08	-.08	-.09
BFQ-Conscientiousness		-.05	-.05	-.05	-.05
BFQ-Emotional Stability		-.23***	-.22***	-.22***	-.21***
BFQ-Openness		.00	.00	.00	.00
Occupational stress variables					
DCS-Demand			.08		.08
DCS-Control			-.10		-.13*
DCS-Support			-.17**		-.16**
ERI-Effort				.16**	.16**
ERI-Reward				-.21***	-.21***
ERI-Over-commitment				.16**	.16**
Adjusted R^2	.01	.06**	.09***	.14***	.18***

Note: Rank: Agent ('agent' or 'first class agent')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; BFQ: Big Five Questionnaire[38,39]; DCS: Demand-Control-Support Questionnaire[16,40]; ERI: Effort-Reward Imbalance Questionnaire[17,40]; BDI: Beck Depression Inventory[43,44]; STAI-T: State-Trait Anxiety Inventory-Trait[48,49]; MBI: Maslach Burnout Inventory[50,51]

$n = 289$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$;

Table 3. Odds ratios (ORs) for the association between risk of major depression (Beck Depression Inventory score ≥ 10) and occupational stress indicators, unadjusted and adjusted^

Occupational stress variable	*Prevalence–cases n (%)*	*Unadjusted OR (95%CI)*	*Adjusted OR (95%CI)*
DCS-Job strain (weighted Demand/Control ratio > 1)	73 (25.3)	1.92 (0.76-4.84)	3.06 (0.97-9.66)
Social isolation (DCS-Support score below the median)	154 (53.3)	3.01 (1.07-8.46)*	2.80 (0.88-8.87)
Isostrain (Job strain+Social isolation)	50 (17.3)	2.62 (0.99-6.86)	3.47 (1.08-11.10)*
ERI-Effort/Reward imbalance (Effort/Reward ratio >1)	32 (11.1)	6.26 (2.36-16.59)***	7.89 (2.32-26.82)***
ERI- Over-Involvement in work (Overcommittment score above the median)	37 (12.8)	3.06 (1.11-8.46)*	3.27 (1.01-10.63)*

Note: $n = 289$; ^: adjustments were made for age, length of employment, rank, education level, origin, being married or cohabiting, living in barracks, having children, and personality scores; * = $p < .05$; ** = $p < .01$; *** = $p < .001$;

Table 4. Standardized correlation coefficients (beta) for control socio-demographic variables, personality and occupational stress variables as predictors of State-Trait Anxiety Inventory-Trait scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
Control variables					
Length of employment (years)	.08	.02	.03	.04	.06
Rank	.06	.06	.05	.10	.09
Education	.03	.01	.01	.01	.01
Origin	-.07	-.07	-.09	-.07	-.09
Marital status	.02	.03	.05	.04	.06
Barracked	.13*	.10	.10	.12*	.12*
Children	-.06	-.07	-.07	-.05	-.05
Personality variables					
BFQ-Energy/Extraversion		-.13*	-.13*	-.13*	-.13*
BFQ-Friendliness/Agreeableness		-.13*	-.13*	-.13*	-.13*
BFQ-Conscientiousness		-.04	-.04	-.05	-.05
BFQ-Emotional Stability		-.33***	-.33***	-.32***	-.32***
BFQ-Openness		-.09	-.09	-.10	-.10
Occupational stress variables					
DCS-Demand			.01		.01
DCS-Control			-.03		-.05
DCS-Support			-.19***		-.18***
ERI-Effort				.19***	.19***
ERI-Reward				-.15**	-.15**
ERI-Over-commitment				.05	.05
Adjusted R^2	.01	.15***	.18***	.20***	.23***

Note: Rank: Agent ('agent' or 'first class agent')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; BFQ: Big Five Questionnaire[38,39]; DCS: Demand-Control-Support Questionnaire[16,40]; ERI: Effort-Reward Imbalance Questionnaire[17,40]; BDI: Beck Depression Inventory[43,44]; STAI-T: State-Trait Anxiety Inventory-Trait[48,49]; MBI: Maslach Burnout Inventory[50,51]

$n = 289$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$;

Table 5. Standardized correlation coefficients (beta) for control socio-demographic variables, personality and occupational stress variables as predictors of MBI - Maslach Burnout Inventory professional exhaustion, depersonalization, and personal accomplishment scores.

Predictor	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*
			Professional Exhaustion		
Control variables					
Length of employment (years)	.13*	.09	.10	.12*	.14**
Rank	-.20***	-.20***	-.20***	-.14**	-.14*
Education	.06	.07	.07	.05	.06
Origin	-.02	-.02	-.04	-.02	-.03
Marital status	-.05	-.05	-.03	-.04	-.01
Barracked	-.05	-.08	-.07	-.04	-.03
Children	-.09	-.09	-.09	-.08	-.08
Personality variables					
BFQ-Energy/Extraversion		-.10	-.09	-.09	-.09
BFQ-Friendliness/Agreeableness		-.08	-.08	-.09	-.09
BFQ-Conscientiousness		-.04	-.04	-.04	-.04
BFQ-Emotional Stability		-.23***	-.22***	-.21***	-.21***
BFQ-Openness		.04	.03	.03	.03
Occupational stress variables					
DCS-Demand			.12*		.12*
DCS-Control			-.07		-.09
DCS-Support			-.09		-.08
ERI-Effort				.21***	.21***
ERI-Reward				-.16**	-.16**
ERI-Over-commitment				.27***	.27***
Adjusted R^2	.05**	.11***	.13***	.24***	.26***
			Depersonalization		
Control variables					
Length of employment (years)	.08	.03	.05	.06	.09
Rank	-.08	-.06	-.06	-.02	-.01
Education	.00	.00	.01	.00	.02
Origin	-.02	-.04	-.06	-.03	-.05
Marital status	-.09	-.06	-.04	-.05	-.03
Barracked	-.05	-.07	-.06	-.04	-.03
Children	-.18**	-.16**	-.16**	-.15**	-.14**
Personality variables					
BFQ-Energy/Extraversion		.08	.08	.08	.09
BFQ-Friendliness/Agreeableness		-.23***	-.24***	-.24***	-.24***
BFQ-Conscientiousness		-.02	-.02	-.02	-.03
BFQ-Emotional Stability		-.24***	-.24***	-.23***	-.23***
BFQ-Openness		-.02	-.02	-.02	-.02
Occupational stress variables					
DCS-Demand			.03		.03

DCS-Control			-.09		-.12*
DCS-Support			-.17**		-.17***
ERI-Effort				.16**	.16**
ERI-Reward				-.23***	-.24***
ERI-Over-commitment				.14**	.14**
Adjusted R^2	.03*	.14***	.17***	.23***	.26***
	Personal Accomplishment				
Control variables					
Length of employment (years)	.06	.09	.05	.08	.03
Rank	.01	-.02	-.05	-.05	-.08
Education	.01	.03	-.01	.04	.00
Origin	.09	.08	.09	.08	.09
Marital status	.11	.06	.04	.06	.03
Barracked	-.09	-.06	-.10	-.07	-.11*
Children	.05	.03	.01	.03	.00
Personality variables					
BFQ-Energy/Extraversion		.15**	.14**	.15**	.14**
BFQ-Friendliness/Agreeableness		.26***	.27***	.26***	.27***
BFQ-Conscientiousness		.23***	.24***	.23***	.24***
BFQ-Emotional Stability		.18***	.17**	.18**	.16**
BFQ-Openness		.17**	.16**	.17**	.16**
Occupational stress variables					
DCS-Demand			-.02		-.02
DCS-Control			.19***		.20***
DCS-Support			.03		.02
ERI-Effort				-.08	-.09
ERI-Reward				.06	.07
ERI-Over-commitment				-.09	-.10
Adjusted R^2	.01	.20***	.23***	.21***	.24***

Note: Rank: Agent ('agent' or 'first class agent')=0, Other=1; Education: High school or higher=0, Lower than high school=1; Origin: Northern Italy=0, Southern Italy=1; Marital Status: single or divorced=0, Married or cohabiting=1; Barracked: No=0, Yes=1; Children: No=0, Yes=1; BFQ: Big Five Questionnaire[38,39]; DCS: Demand-Control-Support Questionnaire[16,40]; ERI: Effort-Reward Imbalance Questionnaire[17,40]; BDI: Beck Depression Inventory[43,44]; STAI-T: State-Trait Anxiety Inventory-Trait[48,49]; MBI: Maslach Burnout Inventory[50,51]

$n = 289$; * = $p < .05$; ** = $p < .01$; *** = $p < .001$;

Association of work-related stress with ~~depression~~ mental health problems~~symptoms~~ in a special police force unit. ~~A cross-sectional study.~~

Sergio Garbarino [1,2], Giovanni Cuomo [2], Carlo Chiorri [3],. Nicola Magnavita [4].

1. State Police Health Service Department, Ministry of the Interior, Rome, Italy
2. Department of Neuroscience, Ophthalmology and Genetics, University of Genoa, Genoa, Italy
3. Department of Educational Sciences, Psychology Unit, University of Genoa, Genoa, Italy
4. Department of Public Health, Occupational Health Unit, Università Cattolica del Sacro Cuore, Largo Gemelli 8, 00168 Roma, Italy. e-mail: nicolamagnavita@gmail.com

Correspondence to: N. Magnavita. Tel. +39-347-3300367, Fax: +39-06-61909399, e-mail nicolamagnavita@gmail.com; nmagnavita@rm.unicatt.it

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Author's contribution: SG carried out medical examinations on workers, CC administered the psychological tests and revised statistics, NM carried out the statistical analyses and drafted the work, GC revised the work.

Data sharing statement: Technical appendix, statistical code, and dataset available from the corresponding author at Dryad repository, who will provide a permanent, citable and open access home for the dataset.

Abstract

Objectives. Law and order enforcement tasks may expose special force police officers to significant psychosocial risk factors~~, so that some of them may find themselves in conditions of distress, which, in turn, may increase the possibility of errors or inappropriate behavior and thus jeopardize the health and safety of others~~. The aim of this work is to investigate the relationship between job stress and the presence of ~~symptoms of depression~~mental health symptoms while controlling for socio-demographical, occupational and personality variables ~~and other psychological problems~~ in special force police officers.

Method: At different time points, 292 out of 294 members of the 'VI Reparto Mobile'~~Genoa 'Mobile'~~, a special police force engaged exclusively in the enforcement of law and order, responded to our invitation to complete ~~a questionnaire~~questionnaires for the assessment of personality traits, work-related stress~~,~~ (using the demand-control-support (DCS) and the effort-reward-imbalance (ERI) models), and ~~for a screening of~~ mental ~~disorders~~health problems such as ~~, including~~ depression ~~(Beck Depression Inventory, BDI), ~~, anxiety ~~(State Trait Anxiety Inventory Trait, STAI T),~~ and burnout ~~(Maslach Burnout Inventory, MBI).~~ .

Results: Regression analyses showed that lower levels of support and reward and higher levels of effort and overcomittment were associated with higher levels of mental health symptoms. Psychological screening revealed 21 (7.3%) likely cases of mild depression (BDI ≥10)~~, but no cases of possible anxiety or burnout. Lower reward significantly predicted higher depressive symptomatology, and police o~~Officers who had experienced a discrepancy between work effort and rewards showed a marked increase in the risk of depression (OR 7.~~00~~ 89 95% CI 2.32-26.82~~4.76-10.30~~) when compared with their counterparts who did not perceive themselves to be in a condition of distress.

Conclusions: The findings of this study suggest that self-reported work-related stress may play a role in the development of mental health problems in police officers. The prevalence of ~~depressive~~ mental health symptoms in the cohort ~~of police officers~~investigated here ~~we observed~~ was low, but not negligible in the case of depression. Since special forces police officers have to perform sensitive tasks for which a healthy psychological functioning is needed, the results of this study suggest that steps should be taken to prevent distress and improve the mental well-being of these workers.

Keywords: effort-reward imbalance, depression, distress, job strain, mental health, over-commitment, police, social support, work-related stress.

Article summary

'Article focus'

Mental health in special police forces is a critical issue. Police officers are exposed to acute and chronic stress and may ~~become depressed~~develop mental health problems. The impairment of police officers' psychological functioning can be a serious threat to the safety of the public.

'Key messages'

The prevalence of ~~depression~~ mental health problems in special force ~~special~~ police ~~forces~~ officers is lower than that of the general population and other groups of police ~~officers. Although prevalence rates were low, a positive association between distress~~job distress (or job stress) measures and ~~depressive~~ mental health symptoms was found. The prevention of distress and the treatment of ~~depressive~~ mental health disorders among police officers are necessary for the safety of the workers themselves and the public.

'Strengths and limitations of this study'

This is the first study to investigate the association of "job distress" with ~~depressive~~ mental health symptoms in a special force police unit. It has a high participation rate. ~~It is a cross-sectional study.~~The study has been conducted on a relatively small cohort, and with only self-report measures. .

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Introduction

It is generally agreed that mental health disorders have a multifactorial etiology and, in the last few decades, research has focused on the role of working conditions in determining people's mental health [1, 2]. In fact, workers themselves often report that their work affects their health [3] and ~~-~~ i~~I~~ntangible costs arising from the suffering of workers are being added to direct financial costs due to absenteeism, presenteeism, reduced productivity and compensation~~)~~. ~~Alongside the ethical reasons for action, there are also important economic considerations that indicate the need for preventing mental health conditions. Skilled workers with qualifications acquired through expensive training and long experience are the most important asset of any company, i.e., their human capital. The premature loss of these workers due to psychological problems or illness is an economic as well as a human drama.~~

~~In modern society, work is not just a way of earning money, it is also a crucial element in the social status of an individual and a source of meaning in his/her life, leading to a very high level of commitment and identification with the individual's work and organization he/she belongs to. This is especially true for high level professionals such as~~ Ppolice officers operating in special force units engaged in law enforcement and riot control are ~~. It is generally thought that this~~ a category of workers that is considered ~~is~~ particularly at risk for the development of mental health disturbances because of the possible exposure to violent events and traumas and hence to post-traumatic stress disorder, but in fact traumatic accidents ~~-~~rarely occur. ~~On the other hand,~~However, the long term effect of the psychological stress due to the constant risk of being injured, wounded or even killed while on patrol and to the witnessing of violence and death ~~such exposure~~ tends to be overlooked. T~~T~~his may not be immediately perceived as detrimental, but it can still induce maladaptive reactions [3].~~3)~~. Although it has been shown that police officers are more resilient to stress than

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civilians [4-7], several ~~cross-sectional~~ studies have provided evidence that adverse work conditions are related to poor mental health outcomes (e.g., [8]) In addition to these operational work-related challenges, police officers may be exposed to organizational problems that are common within hierarchical, male-dominated paramilitary structures such as fire-fighting, ambulance and paramedic services [9-10]. Paradoxi~~Iron~~ically, daily organizational stressors may be more challenging than operational experiences, as shown by a recent study in which reported levels of perceived stress in a group of police officers were higher during routine jobs than during a high-risk public event [11].

Both a dramatic violent event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e., a neurobiological maladaptive reaction due to being forced to adapt to challenging environments characterized by behavioral and emotional changes known as "distress" [12]. Through interaction with many different individual factors, distress can induce the occurrence of mental disorders such as anxiety, depression, burnout, conversion disorder and other conditions classified in DSM IV [13]. Psychological dysfunction resulting from job distress can be a gradual and progressive process that impairs well-being over time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at least until the severity of the symptoms makes it clear to colleagues, family, or both. The recognition of emotional problems due to work-related distress is rarely, if ever, encouraged in the law enforcement sector, since it is considered a sign of weakness [14]. Consequently, police officers fail to seek professional help early enough to prevent diagnosis and quickly benefit from treatment. This is one of the main reasons for which mental disorders are the leading cause of retirement in the police force [15].

The two leading models that have been used to describe and explain individual perception of stress factors are the Demand/Control/Support (DCS) model, developed by Karasek [16], and the Effort/Reward Imbalance (ERI) model, developed by Siegrist [17]. The DCS model assumes that

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the primary sources of job stress, or "job strain", 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, refers to the worker's ability to control his own activities and skill usage. Social support at work, a moderating factor of job strain, was subsequently included in the model. According to this model, high psychological demands in conjunction with low decision latitude can contribute to the development of psychological problems, and workers with high job strain and low social support at work are thought to be the most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis [Rugulies& Krause, Amick et al]).

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, and, consequently, health problems [17]. 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 [18].

Unfortunately, in literature there is no agreed definition of "distress", although there is some consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a vague definition, the prevalence of workers with distress in published studies can range from 5% to

50% [19-21]. When distress reaches clinical relevance it is defined as "stress-related disorder". This term includes a variety of clinical conditions, which are collectively labeled as "common mental disorders" (CMD) [22] and one of the most common diagnoses is depression [28].~~.~~ However, a systematic review of evidence on psychosocial factors at work and depression revealed a high degree of study heterogeneity [23], although other studies found moderate evidence of a relationship between the psychological demands of a job and the development of depression, with relative risks of approximately 2.0 [24]. ~~The prevalence of CMDs in the US armed forces is 27% [25], and a similar prevalence has been reported in the UK armed forces [26, 27].~~ Distress and mental health problems caused by work can affect the performance of professional activity, especially in a sensitive area such as law enforcement~~, in which workers have weapons~~. The consequences of stress on the mental health of police officers can thus be particularly serious not only for the increased risk of individual health problems, and but also on account of the increased risk of impaired work performance that could jeopardize the safety and health of the general population. For instance, ~~One of the most common diagnoses is depression [28] and, a~~as reported by Violanti [29], depression can be a contributing factor not only in early retirement, but also in police officer suicides, murder-suicides, domestic violence, unnecessary violence and aggression while in service, that occurs over and above the role played by police culture that might encourage aggressive and authoritarian attitudes.

Sadly, investigating stress in police officers is particularly difficult because they are afraid of being identified as individuals who have been compromised by stress. They fear that this might then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield [15] found work stress to be the first cause of sickness absence and a reduction in operational duties, as well as the leading cause of ill health retirement in police officers. A number of studies have previously evaluated occupational stress in policemen using the ~~DCS~~ERI and ~~ERI~~DCS models. Job strain and

effort/reward imbalance were associated with cardiovascular risk in policewomen [55], musculoskeletal disorders in special police forces [56], lower mental health level in correctional [57] and urban police officers [58]. The DCS model proved to be a valid theoretical framework for explaining professional efficiency and exhaustion [59] and the complex interplay between job demands, emotional exhaustion and other social and individual factors [60]. Officers with greater perceived work stress in the first year of police service showed more severe depression symptoms 12 months later [61].

The aim of this study was to investigate~~, apparently for the first time,~~ the association of a condition of "distress" with the presence of self-reported symptoms of depression, anxiety and burnout ~~and of other common work-related mental problems such as anxiety and burnout~~, in a special force unit of the Italian police while controlling for socio-demographical and occupational variables and personality traits. Previous studies on this cohort have shown that younger officers, those who were single, had a shorter length of service, lived in barracks, had a lower rank and who were closer to their families had a higher short-term sickness absence risk [30] ~~[Evaluation of Operational Stress in Riot and Crowd Control Police Units]~~ and that DCS control and support and ERI reward measures were negatively related to frequency of absence and short-term absence and that DCS demand and ERI effort measures were positively related to total lost days [31] ~~Is Absence Related to Work Stress?]~~. Moreover, it has been reported that the majority of these officers described themselves as much more emotionally stable and slightly-to-moderately more extraverted, agreeable, conscientious and open to experience than the general population and career soldiers [4] ~~Personality profiles of SF police officers~~] and that some personality traits (mainly emotional stability and agreeableness) were associated to perceived stress levels or reactivity to environmental stressors [32] ~~Personality traits of the Five-Factor Model are associated with work-related stress]~~.

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~~the 'VI Reparto Mobile' of Genoa - called on to maintain law and order in all the major public events that take place in Italy. The police officers in this group work exclusively as First Responders; they are carefully selected among from ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and they are also often involved in public events in which there is a high risk of terrorist attacks and physical clashes. During a single riot, they are on duty for an average of 10 or more hours of work, are engaged in physical clashes for over an hour on average, and often feel that they are in imminent danger of death. They have a special and on-going education which aims to improve team spirit ("esprit de corps") and increase their preparation for dramatic events. 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.~~

Method

Participants

Participants were the members of 'VI Reparto Mobile' of Genoa, a police special force unit called on to maintain law and order in all the major public events that take place in Italy. These officers work exclusively as First Responders; they are carefully selected from ordinary officers and receive specific psychophysical and tactical training. Their routine work involves ensuring order during sporting events, crowds and parades, natural and social emergencies, and they are also often involved in public events in which there is a high risk of terrorist attacks and physical clashes.

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During a single riot, they are on duty for an average of 10 or more hours of work, are engaged in physical clashes for over an hour on average, and often feel that they are in imminent danger of death. They have a special and on-going education which aims to improve team spirit ("esprit de corps") and increase their preparation for dramatic events. 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. ~~This study refers to the initial phase of a study that began on the eve of the G8 meeting in 2009~~ .~~-~~The ~~Italian special police force unit 'VI Reparto Mobile' of Genoa~~unit is composed of 294 members. Two officers 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 female, gender differences could not be assessed and were therefore excluded from the analyses. The final group of participants therefore comprised 289 officers (see Table 1 for descriptive statistics of the socio-demographic variables).

Insert Table 1 about here

~~Occupational stress was measured on three separate occasions: (i) in January 2009, when officers were engaged only in routine work; (ii) in April 2009, when they underwent specific training in preparation for the meeting, and (iii) in July 2009, shortly before the Genoa G8 summit meeting took place. Following the procedure already adopted in previous work [30-32], we averaged the three measurements into a single value, to obtain the level of stress that each officer had experienced during that period.~~

Materials~~.~~

Personality measure

Big Five Questionnaire (BFQ, Caprara et al.1993a, b). The BFQ is a self-report measure of the Big Five personality traits: Energy (E, Extraversion), Friendliness (F, Agreeableness), Conscientiousness (C), Emotional Stability (S, the opposite of Neuroticism), and Openness (O). Each scale contains 24 short phrases that eliminate some of the ambiguity that might arise when using single adjectives. 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 (*M*=50, *SD*=10) using the Italian norms published in Caprara et al. (1993a). In this study reliabilities (Cronbach's alphas) of the scales were E=.69, F=.80, C=.82, S=.88, and O=.77.

Stress measures~~ment~~

Occupational stress was assessed using the validated Italian versions [33] of two standardized questionnaires: the *Demand-Control-Support* (DCS) questionnaire, derived from the longer *Job Content Questionnaire* [16], and the *Effort-Reward Imbalance* (ERI) questionnaire [17]. DCS is a 17-item self-report questionnaire that provides scores on three scales: *Psychological Job Demand*, (Demand, 5 items mapping quantitative aspects of work, such as time required to perform tasks, and conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping the use and development of skills and autonomy in making decisions about the work process) and *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were .71, .65 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job Strain) was computed by dividing the mean item score of Demand by the mean item score of the Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate excessive perceived job strain [34]. ERI is a 23-item self-report questionnaire that assesses three

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dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11 items mapping the occupational rewards that the worker expects to receive), and *Overcommitment* (6 items mapping the intrinsic personal factors regarding occupational motivation and participation that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity scale. In this study, reliabilities of the scales were . 82, .89 and .79, respectively. Along with scale sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce stress [35].

~~*Materials.*~~ *Mental health measure*~~*ement*~~

Mental health status was assessed after the third occasion using the following measures. Depression was evaluated by the *Beck Depression Inventory* (BDI) [36], as this questionnaire ~~performed better than other tests~~proved to be effective for depression screening [37, 38]. The BDI consists of 21 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the affective, cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores indicating more severe depression. If multiple responses are chosen under one item, the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total from 0 to 63. In this study, internal consistency was 0.81. The cut-off score commonly used in clinical practice for depression screening is 10 [39]. The probability of suffering major depressive disorder rapidly increases above this threshold, so a higher score of 14 [37] or 16 [38] is often chosen in order to reduce the prevalence of false positive in populations consisting of patients affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level of 10, as the subjects tested were young, active and highly selected.

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Anxiety was ~~evaluated~~ assessed ~~by~~ with the *State-Trait Anxiety Inventory–Trait* (STAI-T) [40] Italian version [41]. -The STAI-T is a 20-item self-report measure of anxiety proneness requiring participants to rate their frequency of anxiety symptoms on a 4-point Likert-type scale. Nine items are reverse scored. According to [41], the cut-off score used in clinical practice for anxiety screening is 40. In this study the reliability of the scale was .74.

The *Maslach Burnout Inventory* (MBI) [42] Italian version [43] is a 22-item self-report measure of professional burnout. It provides scores on three facets of burnout: Professional Exhaustion (PE, 9 items mapping feelings of being emotionally overextended and exhausted by one's work), Depersonalization (DP, 5 items mapping an unfeeling and impersonal response towards the recipients of one's care) and Personal Accomplishment (PA, 8 items mapping feelings of competence and successful achievement in one's work with people). Participants are asked to rate the frequency of experiencing feelings related to each subscale using a 7-point, Likert-type scale. According to Violante et al. ([XX], a burnout condition can be defined by scores higher than 23 on PE, higher than 8 on DP and lower than 30 on PA. In this study reliabilities of the scales were PE=.86, DP=.60 and PA=.80, respectively.

Control Variables

The control variables used in our study were: age (years), length of employment (years of service); education level (lower vs. equal/higher than high school); rank (officer vs. supervisor/technical staff); origin (Northern or Southern Italy); housing (in barracks or home); marital status (single/divorced vs. married/cohabiting); presence of children (no/yes).

Procedure

Personality traits were assessed in January 2009. Perceived stress was measured on three separate occasions: (1) in January 2009, when officers were engaged only in routine work; (2) in April 2009, when they underwent specific training in preparation for the meeting, and (3) in July

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2009, shortly before the Genoa G8 summit meeting took place. Following the procedure already adopted in previous work [30-32], we averaged the three measurements into a single value, to obtain the level of stress that each officer had experienced during that period. Mental health was assessed in September 2009.

Ethics

All participants were tested anonymously and confidentially during their routine psychophysical assessment. Anonymity was achieved by identifying participants with an alphanumeric code, double-blind. The study protocol was approved by the Ethics Committee of the Università Cattolica del Sacro Cuore, Faculty of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and the National Police Management Board and the whole procedure followed the Ethical Principles of Psychologists Code of Conduct (American Psychological Association 2002).

~~*Control Variables*~~

~~The control variables used in our study were: age (years), length of employment (years of service); education level (lower vs. equal/higher than high school); rank (officer vs. supervisor/technical staff); origin (Northern or Southern Italy); housing (in barracks or home); marital status (single/divorced vs. married/cohabiting); presence of children (no/yes).~~

Statistical analyses

The first research question we addressed was whether there was a relationship between the individual level of work-related stress and mental health problems after controlling for socio-dempographical and personality variables. In order to do this we used hierarchical multiple linear

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regression models in which BDI, STAI and MBI scores wereas specified as criteriaon. In Model 1, only the control variables were specified as predictors. In Model 2, the BFQ personality scores were entered in the regression model. In Model 32 and 43, scale scores from the DCS and from the ERI questionnaires, respectively, were ~~entered in the regression model~~added as further predictors. In Model 54, control variables, BFQ personality scores -and DCS and ERI scores were specified as predictors. The degree of association between variables was indexed by the regression coefficient computed on the standardized variables (β). The amount of variance of the depression score accounted for by the predictors (and the goodness of fit of the regression model) was indexed by the adjusted R^2. Since age and length of employment were highly correlated (r = .91), only the latter was used as a predictor. In order to minimize the potentially confounding effects of multicollinearity, we partialized the effects through principal component analysis. ~~Multiple linear regression analysis was also used to study the correlation between occupational stress variables and anxiety or burnout.~~

We then tested the risk of suffering from depression, anxiety and burnout for a police officer in a state of distress. We used binary logistic regression, and caseness for each construct was defined as a BDI score ≥ 10 for depression, a STAI score > 40 for anxiety, MBI-PE > 23 and MBI-DP > 8 and MBI-PA < 30 for burnout. ~~with caseness for depression (i.e., BDI score ≥ 10) as criterion and~~ DCS-Job Strain, social isolation (DCS-Support score below the median), isostrain (job strain plus social isolation, i.e. support below the median), Effort/Reward imbalance (E/R ratio >1), and Over-Involvement in work (ERI-Overcommittment score above the median) were used asas predictors. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the socio-demographic variables to the equation. Odds ratios (OR) and their 95% confidence intervals (95%CI) were computed.

Results

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Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not particularly high when compared with those of other groups of Italian workers [18]. The average levels of depression, anxiety, emotional exhaustion and depersonalization scores were close to the lower limits of the respective scales, while those of personal accomplishment were high. On the basis of the Italian cut-off levels, ~~no~~ only one case~~s~~ of possible anxiety ~~or~~ and three cases of possible burnout were observed. However, there were 21 (7.3%) likely cases of mild depression (BDI ≥ 10) and 7 (2.4%) likely cases of moderate depression (BDI ≥ 16). Given the negligible prevalence of possible anxiety or burnout, we applied the logistic analysis exclusively to depression.

Hierarchical multiple linear regression allowed us to test the extent to which the level of ~~depressive~~ mental health symptomatology can be predicted on the basis of socio-demographic, occupational, personality and work-related stress data (Table 2).

Insert Table 2 about here

The association between depression and socio-demographic variables (Model 1) was weak (Adjusted R^2 = .01) and generally not significant, except for a positive association with length of employment~~, which was also significant in all the following models~~. When personality traits were entered into the model (Model 2), a significant increase in Adjusted R^2 was observed, due to the significant negative effect of emotional stability. A further significant increase in the proportion of variance of BDI score accounted for was observed also when DCS and ERI scores were entered (Model 3, 4 and 5). DCS-Control, ~~DCS scores were entered into the model (Model 2), a significant increase in Adjusted R^2 (.10) was observed, and DCS-Control and~~ DCS-Support and ERI-Reward showed a negative effect, whereas ERI-Effort and ERI-Reward showed a positive effect~~were~~

~~significantly and negatively associated with BDI scores. When DCS scores were replaced by ERI scores (Model 3), the Adjusted R^2 significantly increased (.16) and the negative regression coefficient of ERI-Reward was the only significant effect, together with that of length of employment. In Model 4, which included all control and occupational stress variables, Adjusted R^2 was not significantly higher than Model 3, and the only significant predictors were length of employment and the ERI-Reward score.~~

The results of the logistic regression are shown in Table 3.

Insert Table 3 about here

For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"), the risk of being depressed approximately doubled, but not significantly, whereas the other categorical predictors were all statistically significant. Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher risk of depression than the others.

The results of regression analyses performed using anxiety ~~and MBI scores~~ as criteriona~~a~~ are reported in Table~~s~~ 4~~a-d that are added as supplementary files~~.

Insert Table 4 about here

Socio-demographical and occupational variables accounted for a negligible proportion of variance of the anxiety score (Model 1), with living in barracks being the only significant predictor. Entering personality traits as further predictors (Model 2) substantially improved the fit of the model, and lower extraversion, agreeableness and emotional stability were associated with higher anxiety levels. The inclusion of DCS and ERI scores as predictors (Models 3-5) further increased the Adjusted R^2. ~~and r~~Results suggested that lower support, higher effort and lower rewards predicted higher anxiety.

Table 5 reports the results of the regression analyses carried on with MBI scores as criteria.

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Insert Table 5 about here

~~Anxiety was significantly associated with living in barracks, with lower scores in DCS-Support and ERI-Reward and with higher scores in ERI-Effort.~~ MBI Professional Exhaustion scores were higher in ~~older police officers and in officers~~agents (as opposed to supervisors/technical staff) (Model 1) and in officers with lower emotional stability (Model 2), and were associated with higher demand, higher effort, higher over-commitment and lower reward (Models 3-5). Depersonalization scores were lower in officers with children (Model 1), in more agreeable and emotionally stable officers (Model 2) and in officers with higher levels of control, support and reward and ower levels of effort and over-commitment (Models 3-5). Personal Accomplishment scores were not related to any socio-demographical and occupational variable (Model 1), but were positively predicted by all personality traits (Model 2). Control was the only stress-related variable to be significantly associated with this scale.

~~were significantly predicted by higher ERI-Over-commitment scores. MBI-Depersonalization scores were higher in older officers and in officers without children, and were significantly predicted by lower ERI-Reward scores. MBI-Personal Accomplishment scores were lower in barracked officers and in officers without children, and were significantly predicted by higher DCS-Control scores.~~

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Discussion

This study investigated the association between a condition of "job distress" and the presence of self-reported mental health symptoms ~~of depression, in conjunction with other common work-related mental problems such as anxiety and burnout~~, in a special police force unit while controlling for socio-demographical, occupational and personality variables. Results from multiple regression analyses showed that socio-demographical and occupational variables accounted for a negligible proportion of variance of mental health problems, although, consistently with a previous study on the same cohort[30] ~~[Evaluation of Operational Stress in Riot and Crowd Control Police Units~~] higher length of employment, lower rank, being barracked and not having children were significant predictors of higher symptomatology. Emotional stability was a significant predictor for all the measures of mental health problems, which was expected given the large body of research that has shown that this trait is associated with several mental disorders and physical health problems, and that this is not an artifact of the overlapping of some symptoms with questionnaire items (for a review, see [Lahey]XX). Lower levels of agreeableness (e.g., hostility) and extraversion were associated with higher anxiety and lower professional accomplishment, consistently with previous studies on the predictive power of these traits for psychological health and occupational outcomes (for a review, see [Ozer]XX). However, the focus of this study was on the role of job stressors, and results showed that they can account for a further and substantial amount of variance of mental health measures. All ERI scales and all DCS scales except demand were significant predictors of depressive symptoms, and ~~lower ERI Effort scores predicted higher BDI scores, whereas~~ results from logistic regression analyses revealed that a higher effort/reward imbalance was associated with an approximately sevenfold increase in risk of depression. These results suggest that, consistently with previous studies, also in the case of special force police officers, ~~the~~ a lower autonomy in

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making decisions, poorer relationships between coworkers and superiors, ~~the~~ lower reward opportunities (, ~~or the~~ higher ~~the~~ imbalance between the effort spent to meet the demanding aspects of the work environment and the rewards ~~(money, esteem and career opportunities, job security included)~~, a more demanding work environment and a higher commitment can be associated with ~~the~~ higher the depressive symptomatology. ~~Studies based on the DCS model indicate that job strain is associated with depression [23].~~ A recent meta-analysis of studies on the association between stress and mental disorders indicated that psychosocial problems in the workplace, reduced control, job strain, low social support, and the discrepancy between effort and rewards predict the onset of depression [44]. Another review of 14 longitudinal studies reported that lack of social support enhanced depression [45]. The association we found between low reward and symptoms is in agreement with that suggested by neurobiological studies on depression [46]. ~~However, we could not replicate the finding that a joint use of the DCS and the ERI models provides greater predictive power for depressive disorders than models that include only one of them [47]. In this study, only the ERI model proved to be useful in predicting depression scores of police officers. Lack of rewards and excessive over-commitment significantly increased depression scores and the probability of disease, respectively. This result replicates the observations of Martins and Lopes [48] who argued that effort, reward and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and those of Kingdom and Smith [49] who showed that ERI was the most important predictor of depression among police officers in the UK Coast Guard. More generally, our results are in agreement with a large body of literature on the relationship between reward processing and depressive symptoms [46]. To a lesser extent, the DCS model captured some important aspects, such as the lack of control over the organization of work and the lack of support from colleagues or superiors. The role of lack of support from superiors and on the part of the organization to which the worker belongs in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [50], and by Arial et al.~~

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~~[51] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation of suffering which could result in disease.~~

~~Although not the main focus of this study, the~~ Albeit to a lesser extent, the DCS and the ERI model ~~also~~ showed a good ability to predict anxiety. Differently form other studies that found that all the three components of the DCS were significant predictors of anxiety [e.g., 8], in this study only support, i.e., the quality of relationships between coworkers and superiors, was significant, suggesting that this dimension might be play a central role in the development of anxiety in special force police officers. Results for the ERI model were also only partially consistent with the literature which found little predictive power of ERI scales for anxiety [e.g., 52], since in the cohort under study higher efforts needed to meet the demands of the working environment and lower occupational rewards were associated with higher anxiety.

As for burnout, all ERI scales proved to be useful in predicting professional exhaustion and depersonalization, since higher effort and over-commitment and lower reward were associated with higher scores, whereas they did not account for a substantial amount of variance or personal accomplishment. At least one DCS scale significantly predicted each burnout dimension (demand predicted professional exhaustion, control and support predicted depersonalization, control predicted personal accomplishment).

Taken together, these results suggest that for special force police officers prediction models that include both the DCS and the ERI scores can provide a substantially greater predictive power for mental health symptoms than models that include only socio-demographical and occupational variables and personality traits. These results are consistent with some of previous studies (e.g., [47], on engineers) but not with others (e.g., [52] on civil servants), possibly suggesting that the effects of the dimensions of job distress on mental health might be the outcome of a complex interaction among the peculiar features of each occupation and the psychological characteristics of the workers, which necessarily self-select into occupations. In the very case of the officers assessed

in this study, poor relationships between coworkers and superiors, higher efforts spent and lower rewards received are likely to elicit mental health problems, whereas the use and development of skills and autonomy in making decisions about the work process and the intrinsic personal factors regarding occupational motivation and participation may play a role for some specific problems. These findings replicate the observations of Martins and Lopes [48] who reported that effort, reward and over-commitment are associated with the presence of common mental disorders among military personnel in peacetime, and those of Kingdom and Smith [49] who showed that ERI was the most important predictor of depression among police officers in the UK Coast Guard. More generally, our results are in agreement with a large body of literature on the relationship between reward processing and depressive symptoms [46]. The DCS model captured some important aspects, such as the lack of control over the organization of work and the lack of support from colleagues or superiors. The role of lack of support from superiors and on the part of the organization to which the worker belongs in the occurrence of depression has already been reported by Berg et al. in the Norwegian police [50], and by Arial et al. [51] in a sample of Swiss police. ~~and two of the three core dimensions of burnout (i.e. emotional exhaustion and depersonalization), consistent with previous studies [52, 53], whereas the DCS-Control score was significantly associated with personal accomplishment. Some background variables also showed a significant association with measures of mental health. Higher length of employment (which overlaps age) was associated with higher depressive symptomatology, anxiety, professional exhaustion and depersonalization; being barracked was associated with higher anxiety and lower personal accomplishment; being an operational policeman was associated with higher professional exhaustion; having children was associated with lower depersonalization. These results are in line with previous studies on members of the armed forces [54].~~

~~Sadly, investigating stress in police officers is particularly difficult because they are afraid of being identified as individuals who have been compromised by stress. They fear that this might~~

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~~then cause them to be discriminated against in their careers, removed from active duties and relegated to office work. On the other hand, a study by Summerfield [15] found work stress to be the first cause of sickness absence and a reduction in operational duties, as well as the leading cause of ill health retirement in police officers. A number of studies have previously evaluated occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated with cardiovascular risk in policewomen [55], musculoskeletal disorders in special police forces [56], lower mental health level in correctional [57] and urban police officers [58]. The DCS model proved to be a valid theoretical framework for explaining professional efficiency and exhaustion [59] and the complex interplay between job demands, emotional exhaustion and other social and individual factors [60]. Officers with greater perceived work stress in the first year of police service showed more severe depression symptoms 12 months later [61].~~

It might be argued that only seven per cent of police officers in our cohort reported a level of depressive symptomatology higher than the risk threshold. In fact, such prevalence is lower than that found by Fox et al. [62] in urban US police officers (9%), by Frühwald et al. [63] in Lower Austria (9%), by Arial et al. [51] in Swiss police officers (11.9%), by Chen et al. [64] in Taiwanese police officers (21.6%), and by Obidoa et al. [65] among US corrections officers (31%), and it is comparable with that found in other working populations [25, 28]. Moreover, a nationwide study in the Norwegian police service showed that the younger police officers reported lower levels of depressive symptoms than the corresponding general population [50]. A recent comparison of police and other employees found no indications that self-reported mental health disturbances are more prevalent among police officers than among groups of employees that are not considered to be high-risk groups [66]. Since our sample was composed of young and highly selected police officers, whose emotional stability was higher than the general population [4], this result is not surprising. However, this does not mean that the problem of depression in this special unit is negligible~~, and, besides individual health related risk factors, I~~t must not be overlooked that depression represents a

considerable cost for productivity both in terms of absenteeism and presenteeism [67] and more importantly, given the highly sensitive tasks the officers of this study have to accomplish, it increases the possibility of errors and the risk to the health and safety of others. Police officers with depressive symptoms should therefore be given timely and confidential assistance (e.g., [~~XX~~Berking]) and the causes of excessive occupational stress should be promptly identified and removed or minimized.

The results reported in this study should be interpreted with caution. First, ~~-~~ as all the measures were self-reported questionnaires, and reporting bias and subjectivity may therefore have distorted the observations. Depressed persons could be more likely to report psychosocial stress at work, even if objectively their work environment is not at risk *per se*. Second, the fact that job distress variables were measured before mental health symptoms supports prediction but not necessarily a causal hypothesis, since mental health symptoms could have been present even *before* or *during* the assessment of job distress. ~~The cross-sectional nature of the research does not allow us to infer the direction of the observed phenomena, and thus separate cause from effect.~~ Specifically, we could not address the issue of whether the observed reduction in experience of reward is an epiphenomenon of the presence of ~~depressive~~ mental health symptoms. Finally, because our sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not be generalizable to police officers with different occupational exposure, nor 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 of ~~depression~~ mental health problems with work stress in terms of both DCS and ERI models in special force police officers while controlling for socio-demographical and occupational variables and personality traits. Such a population has a high exposure to homogenous occupational risks, while many studies include police officers engaged in investigative activities, control of the territory, administrative and office activities and many other ~~persons who perform~~ very different

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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.

Limitations notwithstanding, the present findings indicate that some aspects of psychosocial environment at work, such as the imbalance between effort and reward, are associated with depressive symptoms, anxiety and burnout in special force police officers. Although we could not establish a casual relationship and these results need to be replicated in longitudinal studies, they suggest that the dimensions of ~~effort, reward and over commitment~~ the DCS and ERI models can be useful in monitoring psychological functioning of special force police officers.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	8
Methods			
Study design	4	Present key elements of study design early in the paper	8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8-10
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8-10
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	*10*
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10-11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	11
		(*c*) Explain how missing data were addressed	8; 10-11
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	11
		(*e*) Describe any sensitivity analyses	11
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Tab 1
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Tab 1
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	12-13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tab 2-3
		(*b*) Report category boundaries when continuous variables were categorized	12-13
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	n/a
Discussion			
Key results	18	Summarise key results with reference to study objectives	2
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13-15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14-15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	1

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.