



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

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3 1 **Association of work-related stress with depression in a special police force. A cross-sectional**  
4 2 **study.**  
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8 5 **Garbarino Sergio<sup>1,2</sup>, Cuomo Giovanni<sup>2</sup>, Chiorri Carlo<sup>3</sup>, Magnavita Nicola<sup>4</sup>.**  
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38 35

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40 37 psychological tests, MN developed the statistical analyses and drafted the work, CG revised the  
41 38 work.  
42 39

43 40 Data sharing statement: Technical appendix, statistical code, and dataset available from the  
44 41 corresponding author at Dryad repository, who will provide a permanent, citable and open access  
45 42 home for the dataset.  
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3 44 **Abstract**  
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6 45 **Objectives.** Law and order enforcement may expose policemen to significant psychosocial risk  
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8 46 factors, so that some subjects may find themselves in conditions of distress. The aim of this work is  
9  
10 47 to study the relationship between job stress and the presence of symptoms of depression and to  
11  
12 48 assess the risk of mental disorders in policemen.  
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16 49 **Method:** 292 out of 294 components of the Genoa 'Mobile', a special police force engaged  
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18 50 exclusively in the enforcement of law and order, responded to our invitation to complete a  
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20 51 questionnaire for the assessment of work-related stress and depression.  
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24 52 **Results:** Policemen who experience a discrepancy between work effort and rewards showed a  
25  
26 53 marked increase in the risk of self-reported depression (OR 7.00 95% CI 4.76 to 10.30) when  
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28 54 compared with their counterparts who do not undergo "distress".  
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31  
32 55 **Conclusions:** The prevalence of depressive symptoms in the observed population of policemen was  
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34 56 low, but not negligible. It would be in the interests not only of the workers themselves, but also of  
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36 57 the general population to take steps to prevent distress and improve the mental well-being of the  
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38 58 police.  
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45 61 **Keywords:** effort-reward imbalance, depression, distress, job strain, mental health, over-  
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47 62 commitment, police, social support, work-related stress.  
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3 64 **Article summary**

4  
5 65 *'Article focus'*

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7 66 (up to three bullet points on the research questions or hypotheses addressed)

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9 67 Mental health in the special police forces is critical. The policemen are exposed to acute and  
10 68 chronic stress and may become depressed. The impairment of the police officer can be a serious  
11 69 threat to the safety of the public.

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18 71 *'Key messages'*

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20 72 (up to three bullet points showing the key messages or significance of the study)

21  
22 73 The prevalence of depression in the police special forces is lower than that of the general population  
23 74 and other groups of policemen. Even in special forces, the distress is associated with depression.

24  
25 75 The prevention of distress and the treatment of depressive disorders among policemen are necessary  
26 76 for the safety of the workers and the public.

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34 78 *'Strengths and limitations of this study'*

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36 79 This is a cross-sectional study, conducted on a small cohort. It was, however, obtained a very high  
37 80 participation in a group of policemen always in the front line, in the maintenance of public order.

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## 82 Introduction

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

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

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

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3 107 factors, the part of the brain that is responsible for/involved in neurophysiological response to  
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5 108 stress, i.e. the limbic system, makes no such distinction. Consequently, both a dramatic violent  
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7 109 event and a repeated and prolonged series of administrative events can cause an allostatic load, i.e. a  
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9 110 neurobiological maladaptive reaction characterized by behavioral, emotional and capacity changes  
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11 111 that goes under the name of “distress”. Distress, interacting with many different individual factors,  
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13 112 can induce the occurrence of mental illnesses such as anxiety, depression, burnout, conversion  
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15 113 disorder and other conditions classified in DSM IV.

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18 114 Psychological injury resulting from work experience can be a gradual and progressive process that  
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20 115 erodes well-being over time. This gradual evolution often leaves the worker unaware of the  
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22 116 problem, or unwilling to acknowledge its importance, at least until the severity of the disease makes  
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24 117 it clear to colleagues, family, or both. The prevailing culture in the police force does not encourage  
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26 118 recognition of emotional damage caused by work, as it is considered a sign of weakness <sup>6)</sup>.

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29 119 Consequently, people fail to seek professional help until the disease is so far advanced that it is  
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31 120 difficult to treat. It is for this reason that mental illness is the leading cause of retirement in the  
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33 121 police force <sup>7)</sup>.

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36 122 The two leading models that have been used to describe and explain individual perception of stress  
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38 123 factors are the Demand/Control/Support (DCS) model, developed by Karasek <sup>8)</sup>, and the  
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40 124 Effort/Reward Imbalance (ERI) model, developed by Siegrist <sup>9)</sup>. The DCS model assumes that the  
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42 125 primary sources of job stress stem from two basic characteristics of the job itself: “job demand” and  
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44 126 “job control”. The model predicts that job strain is not simply a function of job demand, but also  
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46 127 depends on the amount of control the worker has over the work. Job demand takes into  
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48 128 consideration the pace and intensity of work: work overload, degree of difficulty, available time,  
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50 129 time allotted to executing tasks and the existence of contradictory or conflicting orders. Job decision  
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52 130 latitude, or job control, depends upon the worker’s ability to control his own activities and skill  
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54 131 usage. Social support at work, a moderating factor of job strain, was subsequently included in the

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3 132 model. The ERI model puts emphasis more on the reward rather than the control structure of work,  
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5 133 suggesting that mental distress and its health correlates arise when a high degree of effort is not  
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7 134 adequately rewarded in the form of pay, esteem, status consistency or career opportunities. A  
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9 135 further assumption of this model involves individual differences in the perception of effort-reward  
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11 136 imbalance: people with a motivational pattern of excessive work-related commitment and high need  
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13 137 for approval (over-commitment) are at increased risk of strain <sup>9)</sup>. The Karasek model (DCS),  
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15 138 developed in the 1960s, appears to be more suitable for the physical aspects of occupational stress,  
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17 139 while Siegrist's model (ERI), designed for the tertiary society of the 1980s, is more sensitive to  
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19 140 stress arising from work relations and organizational factors <sup>10)</sup>.  
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23 141 'Distress' is an ill-defined term that refers to an unfavorable and unpleasant response to stress. Due  
24  
25 142 to such a vague definition, the prevalence of workers with distress ranges widely from 5% to 50%  
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27 143 in various studies <sup>11)</sup>. When distress reaches clinical relevance it is defined as "stress-related  
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29 144 disorder"; this term includes a variety of clinical conditions, including depression, which are  
30  
31 145 collectively labeled as "common mental disorders" (CMD). The prevalence of CMDs in the US  
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33 146 armed forces is 27% <sup>12)</sup> and there is a similar prevalence in the UK armed forces <sup>13)</sup>. Depression is  
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35 147 the most common diagnosis <sup>13)</sup>. In Europe it is estimated that the lifetime prevalence of mood  
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37 148 disorders is 14.0% and the one-year prevalence is 4.2% <sup>14)</sup>. Outside Europe, the prevalence of  
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39 149 severe distress with symptoms of depression or other mental problems is estimated to be at least  
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41 150 5%, but could be significantly higher <sup>15)</sup>. Distress and mental health problems caused by work are  
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43 151 very important for the performance of professional activity, especially in a very sensitive area such  
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45 152 as the police force, in which workers have weapons. The consequences of stress in police officers  
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47 153 can be particularly serious both on account of the increased risk of individual health problems, and  
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49 154 also the increased risk of impaired work performance that could jeopardize the safety and health of  
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53 155 the general population.  
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3 156 The relationship between mental health and the work environment is complex and multifaceted: an  
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5 157 unfavorable work environment is associated with higher prevalence of mental disorders, and  
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7 158 employees with mental problems are generally less adaptable to their work environment.  
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9 159 The diagnosis of work-related mental disorders is of particular importance for three reasons. At the  
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11 160 macro (national) level, epidemiological monitoring can identify trends and help to indicate  
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13 161 preventive strategies. In Italy, for example, it is compulsory for all employers to assess stress in the  
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15 162 workplace and to provide appropriate preventive measures if necessary. At intermediate (company)  
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17 163 level, the identification of one or more cases of work-related mental disorders can stimulate or  
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19 164 enhance preventive action. At the individual level, the occupational physician may give specific  
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21 165 instructions to encourage the return to work or improve the quality of working life.  
22  
23 166 Investigating stress in police officers is particularly difficult because the latter are afraid of being  
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25 167 identified as individuals who have been compromised by stress. They fear that this might then cause  
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27 168 them to be discriminated against in their careers, removed from active duties and relegated to office  
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29 169 work. On the other hand, a study by Summerfield <sup>7)</sup> found work stress to be the first cause of  
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31 170 sickness absence and reduction in operational duties, as well as the leading cause of ill health  
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33 171 retirement in policemen. A number of studies have previously evaluated occupational stress in  
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35 172 policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated  
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37 173 with cardiovascular risk in policewomen <sup>16)</sup>, musculoskeletal disorders in special police forces <sup>17)</sup>,  
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39 174 lower mental health level in correctional police officers <sup>18)</sup> and urban police officers <sup>19)</sup>. Previous  
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41 175 studies on police officers have demonstrated that the demand-control model is a significant  
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43 176 predictor of professional efficiency and exhaustion <sup>20)</sup>, and that there is a complex interplay between  
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45 177 job demands, emotional exhaustion and other social and individual factors <sup>21)</sup>. Subjects with greater  
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47 178 perceived work stress in the first year of police service have greater depression symptoms 12  
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49 179 months later <sup>22)</sup>.  
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3 180 The purpose of this study was to assess whether there is an association between a condition of  
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5 181 "distress" and the presence of self-reported symptoms of depression in a specialist or 'elite' unit of  
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7 182 the Italian police, the 'VI Reparto Mobile' of Genoa, a carefully selected group who is called to  
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9 183 maintain law and order in all the major events that happen in the country. The policemen in this  
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11 184 group work exclusively as First Responders; members are carefully selected among ordinary  
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13 185 officers and receive specific psychophysical and tactical training. Their routine work involves  
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15 186 ensuring order during sporting events, crowds and parades, natural and social emergencies, and also  
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17 187 they are often involved in public events in which there is a high risk of terrorist attacks and physical  
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19 188 fights. During a single riot, they are on duty for an average of 10 or more hours of work, have  
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21 189 physical fights for over an hour on average and often feel that they are in imminent danger of death.  
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23 190 They have a special and continuing education which aims to improve team spirit ("esprit de corp")  
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25 191 and increase the preparation to dramatic events. The decision to hold the 2009 G8 meeting in Italy  
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27 192 provided the opportunity for carrying out our present study. The police officers selected to ensure  
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29 193 law and order during this event were asked to undergo a thorough examination of their mental  
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31 194 health condition so that their conduct during the meeting could not be stigmatized.  
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## 197 **Method**

### 199 *Participants*

200 The Italian special police force unit 'VI Reparto Mobile' of Genoa is composed of 294 members.  
201 Two policemen refused to take part in the study and one was unable to complete all the tests in the  
202 battery described in the next section and was therefore excluded. The participation rate was 99%.  
203 Since only two officers were female, gender differences could not be assessed and were therefore  
204 excluded from the analyses. Hence the final group of participants comprised 289 officers (see Table

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3 205 1 below for descriptive statistics of the socio-demographic and work-related variables).  
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5 206 Occupational stress was measured using the validated Italian versions <sup>23)</sup> of two standardized  
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7 207 questionnaires: the DCS demand/control/support questionnaire, derived from the longer Job  
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9 208 Content Questionnaire <sup>8)</sup>, and the effort-reward imbalance questionnaire <sup>9)</sup>. The classic 17-item DCS  
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11 209 questionnaire consisted of 3 scales termed ‘psychological job demand’, ‘job control or decision  
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13 210 latitude’ and ‘workplace social support’. The ‘demand’ scale was the sum of 5 items (e.g. D1: “Do  
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15 211 you have to work very fast in your job?”) ( $\alpha = 0.71$ ), the ‘control’ scale was the sum of 6 items (e.g.  
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17 212 C1: “Do you have the opportunity to learn new things in your work?”) ( $\alpha = 0.65$ ), and the ‘support’  
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19 213 scale was the sum of 6 items (e.g. S1: “There is a calm and pleasant atmosphere where I work”) ( $\alpha$   
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21 214 = 0.84). Items were scored using a 4-point Likert scale in which the first two scales were graded  
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23 215 from 1=never to 4=often, while the third scale (support) was graded from 1=strong disagreement to  
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25 216 4=strong agreement. We followed the commonest method of obtaining a continuous variable,  
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27 217 termed “perceived job strain”, and divided demand by control (weighted by item numbers).  
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29 218 The 23-item ERI questionnaire contained two scales: ‘effort’, evaluated by 6 items (e.g. E1 “I have  
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31 219 constant time pressure due to a heavy workload”) ( $\alpha = 0.82$ ), and ‘reward’, evaluated by 11 items  
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33 220 (e.g. R1 “I receive the respect I deserve from my superior or equivalent person”) ( $\alpha = 0.89$ ). Both  
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35 221 were scored on a 5-point scale, where a value of 1 indicated no stressful experience and 5 indicated  
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37 222 a highly stressful experience. The weighted ratio between effort and reward was calculated to  
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39 223 quantify the degree of mismatch between effort and reward. Individuals who had a score greater than  
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41 224 one were considered to be stressed because they subjectively perceived a discrepancy between efforts and  
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43 225 results. The ERI questionnaire also included a third scale, ‘over-commitment’ which was evaluated  
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45 226 by 6 items on a 4-point Likert scale (e.g. O3 “When I get home, I can easily relax and ‘switch off’  
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47 227 work”) ( $\alpha = 0.79$ ). It measured the set of intrinsic personal factors regarding occupational  
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49 228 motivation and participation that enhance the effects of stress.  
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3 229 Depression was evaluated by the Beck Depression Inventory (BDI)<sup>24</sup>, as this questionnaire  
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5 230 performed better than other tests for depression screening<sup>25,26</sup>. The BDI consists of 21 groups of 4  
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7 231 alternative self-evaluation statements used to assess the presence and severity of the affective,  
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9 232 cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores  
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11 233 indicating more severe depression. If multiple responses are chosen under one item, the most  
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13 234 symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total  
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15 235 from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in  
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17 236 clinical practice for depression screening is 10<sup>27</sup>. The probability of suffering major depressive  
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19 237 disorder rapidly increases above this threshold; so, a higher score of 14<sup>25</sup> or 16<sup>26</sup> is often chosen  
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21 238 in order to reduce the prevalence of false positive in populations consisting of patients affected by  
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23 239 chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level  
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25 240 of 10, as the subjects tested were young, active and highly selected.

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27 241 The questionnaires were anonymous, and participants were identified by an alphanumeric code,  
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29 242 double-blind. All data was treated in accordance with the Ethical Principles of Psychologists Code  
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31 243 of Conduct (American Psychological Association 2002).  
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#### 36 37 245 *Control Variables*

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39 246 The control variables used in our study were: age (years), length of employment (years of service);  
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41 247 education level (8 or more years of schooling); rank (officer, or supervisor and technical staff);  
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43 248 origin (Northern or Southern Italy); housing (in barracks or home); marital status (single or  
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45 249 divorced/ married or cohabiting); presence of children (no/yes).  
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#### 50 51 251 *Statistical analyses*

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53 252 The first question we set out to answer was whether there is a relationship between the individual  
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55 253 level of work-related stress and mental health problems. In order to do this we used hierarchical  
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3 254 multiple linear regression model in which the variable “depression score” was posed as dependent  
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5 255 variable. In the first model we used the socio-demographic variables (age, length of employment,  
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7 256 rank, education level, origin, marital status, housing, having offspring) as independent variables. In  
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9 257 the second and third models, we separately added the stress-related variables from the Karasek  
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11 258 (demand, control, support) and the Siegrist models (effort, reward, over-commitment). In the final  
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13 259 model, we put together all the stress-related and the socio-demographic variables as predictors of  
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15 260 depression. The degree of association between variables is indicated by the regression coefficient  
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17 261 computed on the standardized variables ( $\beta$ ). The amount of variance of the depression score  
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19 262 accounted for by the predictors is indexed by the ( $R^2$ ).

22 263 The second question involved ascertaining what was the risk of suffering from depression for a  
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24 264 policeman in a state of distress. We used binary logistic regression, with the state of depression  
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26 265 (“caseness”) as defined above as the dependent variable. Separately, we used job strain (high  
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28 266 demand and low control), social isolation (“support” below the median), isostrain (job strain plus  
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30 267 social isolation), effort-reward imbalance (subjects with ERI value  $>1$ ), and over-involvement in  
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32 268 work (“over-commitment” above the median) as independent variables. The resulting values (“raw”  
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34 269 or unadjusted) were subsequently corrected by adding the socio-demographic variables to the  
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36 270 equation. We calculated odds ratios (OR) and their 95% confidence intervals (95%CI).

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40 271 PASW/SPSS software (version 20, IBM, Chicago, IL) was used for analyses.

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42 272 The study protocol was approved by the Ethics Committee of the Catholic University Rome School  
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44 273 of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and  
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46 274 the National Police Management Board.

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## 52 53 277 **Results**

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3 279 The characteristics of the study population are shown in Table 1. The average values of the  
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5 280 variables indicating stress in the workplace and those referring to mental disorders are listed in  
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7 281 Table 2. In this study, there were 21 (7.3%) likely cases of mild depression (BDI greater than or  
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9 282 equal to 10) among the policemen, while the most likely cases of moderate depression (BDI > 16)  
10  
11 283 were found among 7 subjects (2.4%).  
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13 284 Linear regression analysis (Table 3) enabled us to evaluate the level of depression that can be  
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15 285 predicted on the basis of socio-demographic and work-related stress data. The association between  
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17 286 socio-demographic variables and depression was weak and generally not significant, only the rank  
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19 287 level was inversely associated with depression. Taken together, the socio-demographic factors  
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21 288 described only a small fraction of the variability of psychological problems, i.e. less than 1%.  
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23 289 By adding demand, control and support, the percentage of variance expressed rose to about one-  
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25 290 tenth of the total variance ( $R^2=0.096$ ). Social support was negatively associated with depression ( $\beta=$   
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27 291  $-0.211$ ). Job control was negatively associated with the presence of depressive symptoms ( $\beta=$   
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29 292  $0.127$ ).  
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31 293 By substituting the DCS model variables with those of the ERI model (Model III of Table 3) among  
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33 294 the independent variables, the coefficient of determination improved significantly, thus expressing  
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35 295 about one-sixth of the total variance ( $R^2= 0,16$ ). Reward received for work was the most important  
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37 296 protective factor against depression ( $\beta = -0.303$ ). On the contrary, excessive involvement in work or  
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39 297 intrinsic effort (over-commitment) was significantly associated with depression in a positive way  
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41 298 ( $\beta= 0.121$ ).  
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43 299 The more complex model, in which all stress-related variables were included (Model IV of Table 3)  
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45 300 indicated that there was a negative linear association between the score for depression and rewards  
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47 301 ( $\beta= -0.226$ ).  
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49 302 By logistic regression (Table 4) we observed that for subjects in a state of "distress" according to  
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51 303 the DCS model ( i.e. those with a simultaneous high level of "demand" and low level of "control"),  
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3 304 the risk of being depressed almost doubled (OR 1.92; 95% CI 0.76-4.84), although the association  
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5 305 was not statistically significant since the ranges of variability of the estimates included the  
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7 306 assumption of equivalence. If we take into account the lack of social support, which was  
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9 307 significantly associated with depression (OR 3.47; 95%CI 1.16-10.38), the condition of iso-strain  
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11 308 was associated with a significantly increased risk of depression (OR 7.39; CI95% 2.46-22.23).  
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13  
14 309 The police officers who were in a state of "distress" according to the ERI model (i.e. weighted ratio  
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16 310 between effort and reward more than 1) also had a much higher risk of depression (OR 7.39 CI95%  
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18 311 2.46-22.23). Over-commitment was associated with the risk of depression (OR 3.85; CI95% 1.28-  
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20 312 11.54).  
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## 27 315 **Discussion**

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29 316 Our study, which to the best of our knowledge is the only conducted on a police unit of avant-garde,  
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31 317 indicated that higher levels of work stress are associated with depressive symptoms. Both the work-  
32  
33 318 related stress models we used were significantly associated with the presence of depressive  
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35 319 symptoms, even if the effort / reward / imbalance model seemed to be more efficient in predicting  
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37 320 mental ill-health than the demand / control / support model.  
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40 321 Seven per cent of policemen in our cohort reported depressive symptoms. The prevalence is lower  
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42 322 than that found by by Fox et al.<sup>28)</sup> in urban US policemen (9%), by Frühwald et al.<sup>29)</sup> in Lower  
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44 323 Austria (9%), by Arial et al.<sup>30)</sup> in a Swiss sample of police officers (11.9%), by Chen et al.<sup>31)</sup> in the  
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46 324 Taiwanese police (21.6%), and by Obidoa et al.<sup>32)</sup> among US corrections officers (31%), and it is  
47  
48 325 comparable with that found in other working populations<sup>12-15)</sup>. A nationwide study in the  
49  
50 326 Norwegian police service, indeed, showed that the younger policemen reported lower levels of  
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52 327 depressive symptoms than the corresponding general population<sup>33)</sup>. A recent comparison of police  
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54 328 and other employees found no indications that self-reported mental health disturbances are more  
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3 329 prevalent among police officers than among groups of employees that are not considered high-risk  
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5 330 groups <sup>34)</sup>. Our sample was composed by young and highly selected policemen, and this may  
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7 331 explain our findings.

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9 332 Depression represents a considerable cost for productivity both in terms of absenteeism and  
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11 333 presenteeism <sup>35)</sup>. But much more important is the fact that this condition increases the possibility of  
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13 334 errors and the risk to the health and safety of others.

14  
15 335 The results of our observations are in agreement with the literature. A recent meta-analysis of  
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17 336 studies on the association between stress and mental disorders indicates that psychosocial problems  
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19 337 in the workplace, reduced control, job strain, low social support, and the discrepancy between effort  
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21 338 and rewards predict the onset of depression <sup>36)</sup>. Another review of 14 longitudinal studies indicates  
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23 339 that lack of social support enhances depression <sup>37)</sup>. Even more recent studies go in the same  
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25 340 direction. The two effort-reward and demand-control-support models used together have greater  
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27 341 predictive power for depressive disorders than a single model <sup>38)</sup>.

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29 342 In this study, the ERI model proved particularly useful in interpreting the state of "distress" in  
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31 343 policemen. Excessive over-commitment and lack of rewards significantly increased depression  
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33 344 scores and the probability of disease. This result confirms the observations of Martins and Lopes <sup>39)</sup>  
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35 345 who argue that ERI and over-commitment are associated with the presence of common mental  
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37 346 disorders among military personnel in peacetime, and that of Kingdom and Smith <sup>40)</sup> showing that  
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39 347 ERI was the most important predictor of depression among police officers in the UK Coast Guard.  
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41 348 The DCS model captures some important aspects, such as the lack of full control over the  
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43 349 organization of work and the lack of support from colleagues or superiors. The importance of lack  
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45 350 of support from superior and organization in the occurrence of depression has already been reported  
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47 351 by Berg et al. in the Norwegian police <sup>33)</sup>, and by Arial et al. <sup>30)</sup> in a sample of Swiss police. Overall,  
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49 352 both models appear to be useful for diagnosing a situation of suffering which could result in  
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51 353 disease.

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3 354 The data emerging from our study should be interpreted with caution as subjectivity may have  
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5 355 distorted the observations. The cross-sectional nature of the research does not allow us to infer the  
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7 356 direction of the observed phenomena. Finally, because our sample corresponds to a specific police  
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9 357 unit, and it is a rather small cohort, our results may not be generalizable to police officers in  
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11 358 general, with different occupational exposure, nor to special forces in countries with different ethnic  
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13 359 or cultural characteristics. However, our study also has several important strengths. To our  
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15 360 knowledge, this is the first study to investigate associations linked to depression and work stress in  
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17 361 terms of both DCS and ERI. The population had a very consistent exposure to homogenous  
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19 362 occupational risks, while many studies include persons who perform very different tasks. The  
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21 363 participation rate was very high (99%). Finally, since the measurements used in this study have  
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23 364 been validated in several other studies, our results are more comparable with other research  
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25 365 findings.

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29 366 In this study we found a modest prevalence of depression, lower than that found in other police  
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31 367 corps. This does not mean that the problem in this Italian special unit is negligible. Workers with  
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33 368 depressive symptoms should obtain timely and confidential assistance. Furthermore, the causes of  
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35 369 excessive occupational stress must be promptly identified and removed or minimized.

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3 371 **References**  
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1 Table 1.  
 2 Characteristics of the observed population (N=289). Mean and standard deviation of stress and  
 3 mental health variables.  
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SOCIO-DEMOGRAPHIC VARIABLES	
Age, years (mean, $\pm$ s.d.)	35.4 ( $\pm$ 7.5)
Length of service, years (mean, $\pm$ s.d.)	14.0 ( $\pm$ 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, $\pm$ s.d.) (range 5-20)	13.4 $\pm$ 2.02
Control (mean, $\pm$ s.d.) (range 6-24)	13.3 $\pm$ 2.7
Support (mean, $\pm$ s.d.) (range 6-24)	18.6 $\pm$ 2.9
Job Strain (D/C ratio) (mean, $\pm$ s.d.)	1.31 $\pm$ 0.41
Effort (mean, $\pm$ s.d.) (range 6-30)	15.0 $\pm$ 3.2
Reward (mean, $\pm$ s.d.) (range 11-55)	42.3 $\pm$ 6.2
Over-commitment (mean, $\pm$ s.d.) (range 6-24)	6.9 $\pm$ 1.9
ERI (mean, $\pm$ s.d.)	0.70 $\pm$ 0.28
MENTAL HEALTH VARIABLES	
Depression (range 0-63)	3.3 $\pm$ 4.2

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

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4 15 Table 3. Relative risk (Odds ratios ,ORs , and 95% confidence intervals, CI 95%) of manifesting depression in  
5 16 association with state of distress (job strain, effort-reward imbalance, social isolation, elevated over-  
6 17 commitment). Logistic regression. Adjusted raw values for socio-demographic variables (age, length of  
7 18 employment, rank, education level, origin, marital status, housing, having offspring).  
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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)*

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34 23 \*=p<0,05; \*\*=p<0,01; \*\*\*=p<0,001  
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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
<b>Introduction</b>			
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
<b>Methods</b>			
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
<b>Results</b>			

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
<b>Discussion</b>			
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
<b>Other information</b>			
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](http://www.strobe-statement.org).



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

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Secondary Subject Heading:	Medical management, Public health, Mental health
Keywords:	OCCUPATIONAL & INDUSTRIAL MEDICINE, Depression & mood disorders < PSYCHIATRY, PUBLIC HEALTH

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3 1 **Association of work-related stress with depression symptoms in a special police force. A cross-**  
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5 2 **sectional study.**

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30 37 psychological tests and revised statistics, NM carried out the statistical analyses and drafted the  
31 38 work, GC revised the work.  
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40 40 Data sharing statement: Technical appendix, statistical code, and dataset available from the  
41 41 corresponding author at Dryad repository, who will provide a permanent, citable and open access  
42 42 home for the dataset.  
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3 44 **Abstract (max. 300 words)**  
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5 45 **Objectives.** Law and order enforcement may expose police officers to significant psychosocial risk  
6  
7 46 factors, so that some of them may find themselves in conditions of distress. The aim of this work is  
8  
9 47 to investigate the relationship between job stress and the presence of symptoms of depression and  
10  
11 48 other psychological problems in police officers.

12  
13 49 **Method:** 292 out of 294 components of the Genoa 'Mobile', a special police force engaged  
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15 50 exclusively in the enforcement of law and order, responded to our invitation to complete a  
16  
17 51 questionnaire for the assessment of work-related stress, using the demand-control-support (DCS)  
18  
19 52 and the effort-reward-imbalance (ERI) models, and for a screening of mental disorders, including  
20  
21 53 depression (Beck Depression Inventory, BDI), anxiety (State-Trait Anxiety Inventory-Trait, STAI-  
22  
23 54 T), and burnout (Maslach Burnout Inventory, MBI).

24  
25 55 **Results:** Psychological screening showed no case of possible anxiety or burnout, and 21 (7.3%)  
26  
27 56 likely cases of mild depression (BDI  $\geq 10$ ). Lower reward significantly predicted higher depressive  
28  
29 57 symptomatology, and officers that experienced a discrepancy between work effort and rewards  
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31 58 showed a marked increase in the risk of self-reported depression (OR 7.00 95% CI 4.76 to 10.30)  
32  
33 59 when compared with their counterparts who did not perceived themselves in a condition of distress.

34  
35 60 **Conclusions:** The prevalence of depressive symptoms in the observed population of police officers  
36  
37 61 was low, but not negligible. Given the delicate tasks that special police officers have to accomplish  
38  
39 62 and that an impaired psychological functioning can increase the possibility of errors and the risk to  
40  
41 63 the health and safety of others, the results of this study suggest to take steps to prevent distress and  
42  
43 64 improve the mental well-being of the police.

44  
45 65 **Keywords:** effort-reward imbalance, depression, distress, job strain, mental health, over-  
46  
47 66 commitment, police, social support, work-related stress.

48  
49 67 **Article summary**

50  
51 68 *'Article focus'*  
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3 69 (up to three bullet points on the research questions or hypotheses addressed)  
4

5 70 Mental health in the special police forces is a critical issue. Police officers are exposed to acute and  
6  
7 71 chronic stress and may become depressed. The impairment of officers' psychological functioning  
8  
9 72 can be a serious threat to the safety of the public.  
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13  
14 74 *'Key messages'*  
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16 75 (up to three bullet points showing the key messages or significance of the study)  
17

18 76 The prevalence of depression in the police special forces is lower than that of the general population  
19  
20 77 and other groups of police officers. Although prevalence rates were low, a positive association  
21  
22 78 between distress (or job stress) and depressive symptoms was found.. The prevention of distress and  
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24 79 the treatment of depressive disorders among police officers are necessary for the safety of the  
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26 80 workers and the public.  
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32 82 *'Strengths and limitations of this study'*  
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34 83 This is the first study to investigate the association of "job distress" with depressive  
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36 84 symptomatology in a special force police unit and had a higher participation rate. It is a cross-  
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38 85 sectional study, conducted on a relatively small cohort and with only self-report measures. .  
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## 87 Introduction

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

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



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3 112 structures such as fire-fighting, ambulance and paramedic services <sup>4)</sup>, Violanti 2011. Daily organizational  
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5 113 stressors may be more challenging than operational experiences, as shown by a recent study that  
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7 114 reported that levels of perceived stress in a group of police officers, somewhat ironically, were,  
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9 115 higher during routine jobs than during a high-risk public event <sup>5)</sup>.

11 116 Both a dramatic violent event and a repeated and prolonged series of administrative events  
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13 117 can cause an allostatic load, i.e., a neurobiological maladaptive reaction due to the adaptation to  
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15 118 challenging environments characterized by behavioral and emotional changes known as "distress"  
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17 119 (Mc Ewen). Through the interaction with many different individual factors, distress can induce the  
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19 120 occurrence of mental disorders such as anxiety, depression, burnout, conversion disorder and other  
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21 121 conditions classified in DSM IV (Cooper). Psychological dysfunctioning resulting from job distress  
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23 122 can be a gradual and progressive process that impairs well-being over time. This gradual evolution  
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25 123 often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at  
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27 124 least until the severity of the symptoms makes it clear to colleagues, family, or both. The  
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29 125 recognition of emotional problems due to work-related distress in the in the law enforcement  
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31 126 context is rarely, if ever, encouraged, since it is considered a sign of weakness <sup>6)</sup>. Consequently,  
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33 127 officers fail to seek professional help early enough to prevent diagnosis and gain a fast benefit from  
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35 128 treatment.. It is for this reason that mental disorders are the leading cause of retirement in the police  
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37 129 force <sup>7)</sup>

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39 130 The two leading models that have been used to describe and explain individual perception of  
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41 131 stress factors are the Demand/Control/Support (DCS) model, developed by Karasek <sup>8)</sup>, and the  
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43 132 Effort/Reward Imbalance (ERI) model, developed by Siegrist <sup>9)</sup>. The DCS model assumes that the  
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45 133 primary sources of job stress, or "job strain", stem from two basic characteristics of the job itself:  
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47 134 "job demand" and "job control". The model predicts that job strain is not simply a function of job  
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49 135 demand, but also depends on the amount of control the worker has over the work. Job demand takes  
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51 136 into consideration the pace and intensity of work: work overload, degree of difficulty, available  
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3 137 time, time allotted to executing tasks and the existence of contradictory or conflicting orders. Job  
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5 138 decision latitude, or job control, refers to the worker's ability to control his own activities and skill  
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7 139 usage. Social support at work, a moderating factor of job strain, was subsequently included in the  
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9 140 model. According to this model, high psychological demands in combination with low decision  
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11 141 latitude can contribute to the development of psychological problems, and the workers with high  
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13 142 job strain and low social support at work are supposed to be the most vulnerable to negative health  
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15 143 effects (the so-called "isolated strain", or "isostrain", hypothesis).

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18 144 The ERI model puts emphasis more on the reward rather than on the control structure of  
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20 145 work, suggesting that mental distress and its health correlates arise when a high degree of effort is  
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22 146 not adequately rewarded in the form of pay, esteem, status consistency or career opportunities. A  
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24 147 further assumption of this model involves individual differences in the perception of effort-reward  
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26 148 imbalance: people with a motivational pattern of excessive work-related commitment and high need  
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28 149 for approval (over-commitment) are at increased risk of strain, and, consequently, health problems  
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30 150 <sup>9)</sup>. The Karasek model (DCS), developed in the 1960s, appears to be more suitable for the physical  
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32 151 aspects of occupational stress, while Siegrist's model (ERI), designed for the tertiary society of the  
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34 152 1980s, is more sensitive to stress arising from work relations and organizational factors <sup>10)</sup>.

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37 153 Unfortunately, in literature there is no unique definition of "distress", although there is some  
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39 154 consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a  
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41 155 vague definition, the prevalence of workers with distress in published studies can range from 5% to  
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43 156 50% <sup>11, Marchand, van Rhenen</sup>. When distress reaches clinical relevance it is defined as "stress-related  
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45 157 disorder". This term includes a variety of clinical conditions, which are collectively labeled as  
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47 158 "common mental disorders" (CMD) [Van der Klink & Van Dijk, 2003]. A systematic review of  
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49 159 evidence on psychosocial factors at work and depression, however, showed a high degree of study  
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51 160 heterogeneity (Bonde 2006), although other studies found moderate evidence for a relation between  
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53 161 the psychological demands of the job and the development of depression, with relative risks of  
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3 162 approximately 2.0 (XX). The prevalence of CMDs in the US armed forces is 27%<sup>12)</sup> and there is a  
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5 163 similar prevalence in the UK armed forces<sup>13, Jones)</sup>. Distress and mental health problems caused by  
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7 164 work can affect performance of professional activity, especially in a delicate area such as law  
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9 165 enforcement, in which workers have weapons. The mental health-related consequences of stress in  
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11 166 police officers can thus be particularly serious not only for the increased risk of their individual  
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13 167 health problems, and but also for the increased risk of impaired work performance that could  
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15 168 jeopardize the safety and health of the general population. One of the most common diagnoses is  
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17 169 depression<sup>Iversen et al. 2009)</sup>, and as reported by Violanti (X), depression can be a contributing factor  
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19 170 not only in early retirement, but also in police officer's suicides, murder-suicides, domestic  
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21 171 violence, unnecessary violence and aggression while in service, over and above the role played by  
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23 172 the police culture that might encourage aggressive and authoritarian attitudes.  
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29 174 The aim of this study was to investigate, apparently for the first time, the association of a  
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31 175 condition of "distress" and the presence of self-reported symptoms of depression, alongside with  
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33 176 other common work-related mental problems such as anxiety and burnout takes as a control, in a  
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35 177 specialist or 'elite' unit of the Italian police, the 'VI Reparto Mobile' of Genoa, a carefully selected  
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37 178 group who is called to maintain law and order in all the major events that take place in the country.  
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39 179 The police officers in this group work exclusively as First Responders; are carefully selected among  
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41 180 ordinary officers and receive specific psychophysical and tactical training. Their routine work  
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43 181 involves ensuring order during sporting events, crowds and parades, natural and social emergencies,  
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45 182 and also they are often involved in public events in which there is a high risk of terrorist attacks and  
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47 183 physical fights. During a single riot, they are on duty for an average of 10 or more hours of work,  
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49 184 have physical fights for over an hour on average and often feel that they are in imminent danger of  
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51 185 death. They have a special and continuing education which aims to improve team spirit ("esprit de  
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53 186 corp") and increase the preparation to dramatic events. The decision to hold the 2009 G8 meeting in  
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3 187 Italy provided the opportunity for carrying out our present study. The police officers selected to  
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5 188 ensure law and order during this event were asked to undergo a thorough examination of their  
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7 189 mental health condition so that their conduct during the meeting could not be stigmatized.  
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9  
10 **Method**

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12 *Participants*

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14 192 This study refers to the initial phase of a study started on the eve of the G8 meeting in 2009. The  
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16 193 Italian special police force unit 'VI Reparto Mobile' of Genoa is composed of 294 members. Two  
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18 194 officers refused to take part in the study and one was unable to complete all the tests in the battery  
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20 195 described in the next section and was therefore excluded. The participation rate was 99%. Since  
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22 196 only two officers were female, gender differences could not be assessed and they were therefore  
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24 197 excluded from the analyses. Hence, the final group of participants comprised 289 officers (see  
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26 198 Table 1 for descriptive statistics of the socio-demographic variables).  
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30 Insert Table 1 about here  
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32 200 Occupational stress was measured on three separate occasions: (i) in January 2009, when officers  
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34 201 were engaged only in routine work; (ii) in April 2009, when they underwent specific training in  
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36 202 preparation for the meeting, and (iii) in July 2009, shortly before the Genoa G8 summit meeting  
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38 203 took place. Following the procedure already adopted in previous work [lavori su assenze,  
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40 204 personalità], we averaged the three measurements into a single value, so as to have the level of  
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42 205 stress that each officer had experienced during the period.  
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44 206 Occupational stress was assessed using the validated Italian versions <sup>23)</sup> of two standardized  
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46 207 questionnaires: the Demand-Control-Support (DCS) questionnaire, derived from the longer Job  
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48 208 Content Questionnaire <sup>8)</sup>, and the Effort-Reward Imbalance (ERI) questionnaire <sup>9)</sup>. DCS is a 17.item  
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50 209 self-report questionnaire that provides scores in three scales: *Psychological Job Demand*, (Demand,  
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52 210 5 items mapping quantitative aspects of work, such as time, requirement and speed to perform tasks,  
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54 211 and conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping  
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3 212 use and development of abilities and autonomy to make decisions about the work process) and  
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5 213 *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and  
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7 214 superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or  
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9 215 agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were .71, .65  
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11 216 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job  
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13 217 Strain) was computed by dividing the mean item score of Demand by the mean item score of the  
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15 218 Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate  
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17 219 excessive perceived job strain [XX]. ERI is a 23-item self-report questionnaire that assesses three  
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19 220 dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11  
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21 221 items mapping the occupational rewards that are supposed to be received by the person) and  
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23 222 *Overcommitment* (6 items mapping the intrinsic personal factors regarding occupational motivation  
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25 223 and participation that enhance the effects of stress). Participants are asked to rate each item on a 5-  
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27 224 point intensity scale. In this study reliabilities of the scales were .82, .89 and .79, respectively.  
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29 225 Along with scale sum scores, the weighted ratio between effort and reward (E/R Ratio) was  
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31 226 computed to quantify the degree of mismatch between effort and reward. Values >1 reflect an  
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33 227 imbalance that can induce stress [XX].

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38 228 The mental health status was assessed after the third occasion using the following measures.  
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40 229 Depression was evaluated by the Beck Depression Inventory (BDI)<sup>24)</sup>, as this questionnaire  
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42 230 performed better than other tests for depression screening<sup>25,26)</sup>. The BDI consists of 21 groups of 4  
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44 231 alternative self-evaluation statements used to assess the presence and severity of the affective,  
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46 232 cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores  
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48 233 indicating more severe depression. If multiple responses are chosen under one item, the most  
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50 234 symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total  
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52 235 from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in  
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54 236 clinical practice for depression screening is 10<sup>27)</sup>. The probability of suffering major depressive

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3 237 disorder rapidly increases above this threshold; so, a higher score of 14<sup>25)</sup> or 16<sup>26)</sup> is often chosen  
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5 238 in order to reduce the prevalence of false positive in populations consisting of patients affected by  
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7 239 chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level  
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10 240 of 10, as the subjects tested were young, active and highly selected.

11 241 Anxiety was evaluated by the State-Trait Anxiety Inventory–Trait (STAI-T; Spielberger et  
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14 242 al. 1983; Italian version in Sanavio et al. 1997) The STAI-T is a 20-item self-report measure of  
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16 243 anxiety proneness requiring participants to rate their frequency of anxiety symptoms on a 4-point  
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18 244 Likert-type scale. Nine items are reverse scored. In this study the reliability of the scale was .74.  
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20 245 Maslach Burnout Inventory (MBI; Maslach and Jackson 1981; Italian version in Sirigatti and  
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22 246 Stefanile 1993) MBI is a 22-item self-report measure of professional burnout. It provides scores on  
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24 247 three facets of burnout: Professional Exhaustion (9 items mapping feelings of being emotionally  
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26 248 overextended and exhausted by one's work, Depersonalization (5 items mapping an unfeeling and  
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28 249 impersonal response towards the recipients of one's care) and Personal Accomplishment (8 items  
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30 250 mapping feelings of competence and successful achievement in one's work with people).  
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32 251 Participants are asked to rate the frequency of experiencing feelings related to each subscale using a  
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34 252 7-point, Likert-type scale. In this study reliabilities of the scales were .86, .60 and .80, respectively.  
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36 253 All participants were tested anonymously and confidentially during their routine psychophysical  
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38 254 assessment. Anonymity was achieved by identifying participants with an alphanumeric code,  
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40 255 double-blind. The study protocol was approved by the Ethics Committee of the Catholic University  
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42 256 Rome School of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating  
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44 257 the study, and the National Police Management Board and the whole procedure followed the Ethical  
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46 258 Principles of Psychologists Code of Conduct (American Psychological Association 2002).  
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51 259 *Control Variables*

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54 260 The control variables used in our study were: age (years), length of employment (years of service);  
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56 261 education level (lower vs equal/higher than high school); rank (officer vs supervisor/technical staff);  
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3 262 origin (Northern or Southern Italy); housing (in barracks or home); marital status (single/divorced  
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5 263 vs married/cohabiting); presence of children (no/yes).  
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7 264 *Statistical analyses*  
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9 265 The first research question we addressed was whether there was a relationship between the  
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11 266 individual level of work-related stress and mental health problems. In order to do this we used  
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13 267 hierarchical multiple linear regression models in which the variable the BDI score was specified as  
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15 268 criterion. In Model 1 we specified as predictors only the control variables. In Model 2 and 3 scale  
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17 269 scores from the DCS and from the ERI questionnaires, respectively, were entered in the regression  
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19 270 model. In Model 4 control variables and DCS and ERI scores were specified as predictors.. The  
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21 271 degree of association between variables is indexed by the regression coefficient computed on the  
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23 272 standardized variables ( $\beta$ ). The amount of variance of the depression score accounted for by the  
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25 273 predictors (and the goodness of fit of the regression model) was indexed by the adjusted  $R^2$ . Since  
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27 274 age and length of employment were highly correlated ( $r = .91$ ), only the latter was used as a  
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29 275 predictor. In order to minimize the potentially confounding effects of multicollinearity, we  
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31 276 partialized the effects through principal component analysis.  
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36 277 We then tested the risk of suffering from depression for an officer in a state of distress. We  
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38 278 used binary logistic regression, with caseness for depression (i.e., BDI score  $\geq 10$ ) as criterion and  
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40 279 DCS-Job Strain, social isolation (DCS-Support score below the median), isostrain (job strain plus  
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42 280 social isolation), Effort/Reward imbalance (E/R ratio  $>1$ ), and Over-Involvement in work (ERI-  
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44 281 Overcommitment score above the median) as predictors. The resulting values ("raw" or  
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46 282 unadjusted) were subsequently corrected by adding the socio-demographic variables to the  
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48 283 equation. Odds ratios (OR) and their 95% confidence intervals (95%CI) were computed.  
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51 284 **Results**  
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53 285 Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not  
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55 286 particularly high when compared with those of other groups of Italian workers [Magnavita PsyJ].  
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3 287 The average levels of depression, anxiety, emotional exhaustion and depersonalization scores were  
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5 288 close to the lower limits of the respective scales, while those of personal accomplishment were  
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7 289 high. Based on the Italian cut-off levels, there was no case of possible anxiety or burnout. However,  
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10 290 there were 21 (7.3%) likely cases of mild depression ( $BDI \geq 10$ ) and 7 (2.4%) likely cases of  
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12 291 moderate depression ( $BDI \geq 16$ ).

14 292 Hierarchical multiple linear regression allowed us to test the extent to which the level of  
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16 293 depressive symptomatology that can be predicted on the basis of socio-demographic and work-  
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18 294 related stress data (Table 2).

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21 295 Insert Table 2 about here

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23 296 The association between of depression with only socio-demographic variables (Model 1) was weak  
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25 297 ( $Adjusted R^2 = .01$ ) and generally not significant, except a positive association with length of  
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27 298 employment, which was significant also in all next models. When DCS scores were entered into the  
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29 299 model (Model 2), a significant increase in  $Adjusted R^2$  (.10) was observed, and DCS-Control and  
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31 300 DCS-Support were significantly and negatively associated with BDI scores. When DCS scores  
32  
33 301 where replaced by ERI scores (Model 3), the  $Adjusted R^2$  significantly increased (.16) and the  
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35 302 negative regression coefficient of ERI-Reward was the only significant effect, along with the one of  
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37 303 length of employment. Model 4, that included all control and occupational stress variables, did not  
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39 304 show an  $Adjusted R^2$  significantly higher than Model 3, and the only significant predictors were  
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41 305 length of employment and ERI-Reward score.

45 306 The results of the logistic regression are shown in Table 3.

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48 307 Insert Table 3 about here

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50 308 For officers in a state of "distress" according to the DCS model ( i.e. those with a simultaneous high  
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52 309 level of "demand" and low level of "control"), the risk of being depressed approximately doubled,  
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54 310 but not significantly, whereas the other categorical predictors were all statistically significant.



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3 311 Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher  
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5 312 risk of depression than the others.  
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7 313 The results of regression analyses performed using anxiety and MBI scores as criteria are  
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9 314 shown in Tables 4a-d.  
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11 315 Insert Tables 4a-d about here

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14 316 Anxiety was significantly associated with living in barracks, with lower scores in DCS-Support and  
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16 317 ERI-Reward and with higher scores in ERI-Effort. MBI Professional Exhaustion scores were higher  
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18 318 in older officers and in agents and were significantly predicted by higher ERI-Over-commitment  
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20 319 scores. MBI Depersonalization scores were higher in older officers and in officers without children,  
21  
22 320 and were significantly predicted by lower ERI-Reward scores. MBI Personal Accomplishment  
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24 321 scores were lower in barracked officers and in officers without children, and were significantly  
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26 322 predicted by higher DCS-Control scores.  
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### 29 323 **Discussion**

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31 324 This study investigated the association of a condition of "job distress" with the presence of self-  
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33 325 reported symptoms of depression, alongside with other common work-related mental problems such  
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35 326 as anxiety and burnout, in a special force police unit. Results from multiple regression analyses  
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37 327 showed that lower ERI-Effort scores predicted higher BDI scores, whereas results from logistic  
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39 328 regression analyses revealed that a higher effort/reward imbalance was associated with an  
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41 329 approximately sevenfold increase in risk of depression. These results suggest that, consistently with  
42  
43 330 previous studies, also in special force police officers the lower the reward opportunities, or the  
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45 331 higher the imbalance between the the effort spent to meet the demanding aspects of the work  
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47 332 environment and the reward (money, esteem and career opportunities, job security included), the  
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49 333 higher the depressive symptomatology. Studies based on the demand /control model indicate that  
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51 334 job strain is associated with depression (Bonde). A recent meta-analysis of studies on the  
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53 335 association between stress and mental disorders indicates that psychosocial problems in the  
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3 336 workplace, reduced control, job strain, low social support, and the discrepancy between effort and  
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5 337 rewards predict the onset of depression <sup>36)</sup>. Another review of 14 longitudinal studies indicates that  
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7 338 lack of social support enhances depression <sup>37)</sup>. The association we found between low reward and  
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10 339 symptoms is in agreement with that suggested by neurobiological studies on depression (Eshel and  
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12 340 Roiser). However, we could not replicate the finding that using both the DCS and the ERI model  
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14 341 provides greater predictive power for depressive disorders than models including only one of them  
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16 342 <sup>38)</sup>. In this study, only the ERI model proved to be useful in predicting depression scores of officers.  
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18 343 Lack of rewards and excessive over-commitment significantly increased depression scores and the  
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20 344 probability of disease, respectively. This result replicates the observations of Martins and Lopes <sup>39)</sup>  
21  
22 345 who argued that effort, reward and over-commitment are associated with the presence of common  
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24 346 mental disorders among military personnel in peacetime, and those of Kingdom and Smith <sup>40)</sup>, that  
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27 347 showed that ERI was the most important predictor of depression among police officers in the UK  
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29 348 Coast Guard and, more generally, with a large body of literature on the relationship between reward  
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31 349 processing and depressive symptoms (Eshel & Roiser (2010)). To a lesser extent, the DCS model  
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33 350 captured some important aspects, such as the lack of control over the organization of work and the  
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35 351 lack of support from colleagues or superiors. The importance of lack of support from superior and  
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37 352 organization in the occurrence of depression has already been reported by Berg et al. in the  
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40 353 Norwegian police <sup>33)</sup>, and by Arial et al. <sup>30)</sup> in a sample of Swiss police. Overall, both models appear  
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42 354 to be useful for diagnosing a situation of suffering which could result in disease. Although not the  
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44 355 main focus of this study, the ERI model also showed a good ability to predict anxiety and two of the  
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46 356 three core dimensions of burnout (i.e. emotional exhaustion and depersonalization), consistently  
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48 357 with previous studies (XX), whereas DCS-Control score was significantly associated with personal  
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50 358 accomplishment. Some background variables also showed a significant association with measures  
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52 359 of mental health. Higher length of employment (which overlaps age) was associated with higher  
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54 360 depressive symptomatology, anxiety, professional exhaustion and depersonalization, being  
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3 361 barracked was associated with higher anxiety and lower personal accomplishment, being an  
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5 362 operative agent was associated with higher professional exhaustion, having children was associated  
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7 363 with lower depersonalization. These results are in line with previous studies on armed forces  
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9 364 officers (XX)  
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11 365 Sadly, investigating stress in police officers is particularly difficult because the latter are afraid of  
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13 366 being identified as individuals who have been compromised by stress. They fear that this might then  
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15 367 cause them to be discriminated against in their careers, removed from active duties and relegated to  
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17 368 office work. On the other hand, a study by Summerfield <sup>7)</sup> found work stress to be the first cause of  
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19 369 sickness absence and reduction in operational duties, as well as the leading cause of ill health  
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21 370 retirement in police officers. A number of studies have previously evaluated occupational stress in  
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23 371 policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated  
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25 372 with cardiovascular risk in policewomen <sup>16)</sup>, musculoskeletal disorders in special police forces <sup>17)</sup>,  
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27 373 lower mental health level in correctional <sup>18)</sup> and urban police officers <sup>19)</sup>. The demand-control  
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29 374 model proved to be a valid theoretical framework to explain professional efficiency and exhaustion  
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31 375 <sup>20)</sup> and the complex interplay between job demands, emotional exhaustion and other social and  
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33 376 individual factors <sup>21)</sup>. Officers with greater perceived work stress in the first year of police service  
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35 377 showed more severe depression symptoms 12 months later <sup>22)</sup>.

378         It might be argued that only seven per cent of officers in our cohort reported a level of  
379 depressive symptomatology higher than the risk threshold.. In fact, such prevalence is lower than  
380 that found by by Fox et al. <sup>28)</sup> in urban US police officer (9%), by Frühwald et al. <sup>29)</sup> in Lower  
381 Austria (9%), by Arial et al. <sup>30)</sup> in a Swiss officers (11.9%), by Chen et al. <sup>31)</sup> in Taiwanese officers  
382 (21.6%), and by Obidoa et al. <sup>32)</sup> among US corrections officers (31%), and it is comparable with  
383 that found in other working populations <sup>12-15)</sup>. Moreover, a nationwide study in the Norwegian  
384 police service showed that the younger police officers reported lower levels of depressive  
385 symptoms than the corresponding general population <sup>33)</sup>. A recent comparison of police and other

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3 386 employees found no indications that self-reported mental health disturbances are more prevalent  
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5 387 among police officers than among groups of employees that are not considered high-risk groups<sup>34</sup>.  
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7 388 Since our sample was composed by young and highly selected police officers, which also shown an  
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9 389 emotional stability higher than the general population (XX) this result is not surprising. However,  
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11 390 this does not mean that the problem of depression in this special unit is negligible, and it cannot be  
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13 391 ignored that, beyond individual's health related risk factors, depression represents a considerable  
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15 392 cost for productivity both in terms of absenteeism and presenteeism<sup>35</sup>) and, more importantly given  
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17 393 that the delicate tasks the officers of this study have to accomplish, it increases the possibility of  
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19 394 errors and the risk to the health and safety of others. Hence, officers with depressive symptoms  
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21 395 should obtain timely and confidential assistance and the causes of excessive occupational stress  
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23 396 must be promptly identified and removed or minimized.

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27 397 The results reported in this study should be interpreted with caution, as all the measures  
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29 398 were self-reported questionnaires, and thus reporting bias and subjectivity may have distorted the  
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31 399 observations. Depressed persons could be more likely to report psychosocial stress at work, even if  
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33 400 objectively their work environment is not at risk *per se*. The cross-sectional nature of the research  
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35 401 does not allow us to infer the direction of the observed phenomena, and thus separate cause from  
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37 402 effect. Specifically, we could not address the issue of whether the observed reduction in experience  
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39 403 of reward is an epiphenomenon of the presence of depressive symptoms. Finally, because our  
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41 404 sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not  
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43 405 be generalizable to police officers in general, with different occupational exposure, nor to special  
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45 406 forces in countries with different ethnic or cultural characteristics. However, our study also has  
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47 407 several important strengths. To our knowledge, this is the first study to investigate associations of  
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49 408 depression with work stress in terms of both DCS and ERI models in special force police officers.  
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51 409 Such population has a high exposure to homogenous occupational risks, while many studies include  
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53 410 persons who perform very different tasks. The participation rate was very high (99%). Finally, since  
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3 411 the measurements used in this study have been validated in several other studies, our results are  
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5 412 more comparable with other research findings.  
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7 413 Limitations notwithstanding, the present findings indicate that some aspects of psychosocial  
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9 414 environment at work, such as the imbalance between effort and reward, are associated with  
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11 415 depressive symptoms, anxiety and burnout in special force police officers. Although we could not  
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13 416 establish a casual relationships and these results need to be replicated in longitudinal studies, they  
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15 417 suggest that the dimensions of effort, reward and overcommitment can be useful in monitoring  
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17 418 special force police officers' psychological functioning.  
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1 Table 1. Socio-demographical characteristics, occupational stress scores and mental health scores of  
 2 the participants in this study ( $n=289$ )

<i>Variable</i>	<i>Statistics</i>
Socio-demographical variables	
Age, years ( $M\pm DS$ )	35.4 $\pm$ 7.5
Length of service, years ( $M\pm DS$ )	14.0 $\pm$ 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 ( $M\pm DS$ ) (range 5-20)	13.4 $\pm$ 2.02
DCS-Control ( $M\pm DS$ ) (range 6-24)	13.3 $\pm$ 2.7
DCS-Support ( $M\pm DS$ ) (range 6-24)	18.6 $\pm$ 2.9
DCS-Job Strain (Demand/Control ratio) ( $M\pm DS$ )	1.31 $\pm$ 0.41
ERI-Effort ( $M\pm DS$ ) (range 6-30)	15.0 $\pm$ 3.2
ERI-Reward ( $M\pm DS$ ) (range 11-55)	42.3 $\pm$ 6.2
ERI-Over-commitment ( $M\pm DS$ ) (range 6-24)	6.9 $\pm$ 1.9
ERI-Weighted Effort/Reward ratio( $M\pm DS$ )	0.70 $\pm$ 0.28
Mental health variables	
BDI (range 0-63)	3.3 $\pm$ 4.2
STAI-T (range 20-50)	27.5 $\pm$ 4.3
MBI-Emotional Exhaustion (range 9-36)	17.4 $\pm$ 7.9
MBI-Depersonalization (range 5-35)	9.3 $\pm$ 4.5
MBI-Personal Accomplishment (range 8-56)	42.7 $\pm$ 9.8

3 Note: DCS: Demand-Control-Support Questionnaire<sup>16,33</sup>; ERI: Effort-Reward Imbalance  
 4 Questionnaire<sup>17,33</sup>; BDI: Beck Depression Inventory<sup>36</sup>; STAI-T: State-Trait Anxiety Inventory-  
 5 Trait<sup>40,41</sup>; MBI: Maslach Burnout Inventory<sup>42,43</sup>

7 Table 2. Standardized regression coefficients ( $\beta$ s) for control socio-demographic variables and  
 8 occupational stress variables as predictors of Beck Depression Inventory depression scores.

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
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***

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

15 Table 3. Odds ratios (ORs) for the association between risk of major depression (Beck Depression  
 16 Inventory score  $\geq 10$ ) and occupational stress indicators, unadjusted and adjusted<sup>^</sup>

<i>Occupational stress variable</i>	<i>Prevalence-cases n (%)</i>	<i>Unadjusted OR (95%CI)</i>	<i>Adjusted OR (95%CI)</i>
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 (Overcommitment score above the median)	37 (12.8)	3.06 (1.11-8.46)*	3.85 (1.28-11.54)*

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

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2  
3 1 Table 4a. Standardized correlation coefficients (beta) for socio-demographic variables, stress  
4 2 measurements and State-Trait Anxiety Inventory-Trait scores.

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
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***

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



9 Table 4b. Standardized regression coefficients ( $\beta$ s) for control socio-demographic variables and  
 10 occupational stress variables as predictors of Maslach Burnout Inventory professional exhaustion  
 11 scores.

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
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***

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

17 Table 4c. Standardized regression coefficients ( $\beta$ s) for control socio-demographic variables and  
 18 occupational stress variables as predictors of Maslach Burnout Inventory depersonalization score.

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
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***

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

24 Table 4d. Standardized regression coefficients ( $\beta$ s) for control socio-demographic variables and  
 25 occupational stress variables as predictors of Maslach Burnout Inventory personal accomplishment  
 26 score.

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>
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

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

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
<b>Introduction</b>			
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
<b>Methods</b>			
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
<b>Results</b>			

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
<b>Discussion</b>			
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
<b>Other information</b>			
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](http://www.strobe-statement.org).

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7 1 **Association of work-related stress with depression symptoms in a special police force. A cross-**  
8 **sectional study.**

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15 8 **Sergio Garbarino <sup>1,2</sup>, Giovanni Cuomo <sup>2</sup>, Carlo Chiorri <sup>3</sup>; Nicola Magnavita <sup>4</sup>.**

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54 **Type of contribution: Original**

55 **Running title: Stress and depression in police**

56 Word count: [4475 words](#)

57 Abstract, word count: [178](#)

58 Tables: 3

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7 28 | Figures: 0  
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11 30 | Funding: This research received no specific grant from any funding agency in the public,  
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13 31 | commercial or not-for-profit sectors.  
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16 33 | Competing interest: none declared. A complete declaration on competing interest will be signed by  
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18 34 | all authors before the publication of the paper.  
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20 35  
21 36 | Author's contribution: GS-SG carried out medical examinations on workers, CC administered the  
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25 38 | MNNM ~~developed~~ carried out the statistical analyses and drafted the work, CG-GC revised the  
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31 41 | Data sharing statement: Technical appendix, statistical code, and dataset available from the  
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**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 ~~officersmen~~.

**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-Trait 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 who~~ ~~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 ~~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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9 70 | prevent distress and improve the mental well-being of the police.  
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15 73 | **Keywords:** effort-reward imbalance, depression, distress, job strain, mental health, over-  
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17 74 | commitment, police, social support, work-related stress.  
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7 76 **Article summary**

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15 80 exposed to acute and chronic stress and may become depressed. The impairment of ~~the police~~  
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17 81 ~~officer~~ officers' psychological functioning can be a serious threat to the safety of the public.

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20 83 *"Key messages"*

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22 84 (up to three bullet points showing the key messages or significance of the study)

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24 85 The prevalence of depression in the police special forces is lower than that of the general population  
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26 86 and other groups of police ~~officersmen~~. Although prevalence rates were low, a positive association  
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28 87 between distress (or job stress) and depressive symptoms was found. ~~Even in special forces, the~~  
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30 88 distress is associated with depression. The prevention of distress and the treatment of depressive  
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32 89 disorders among police ~~officersmen~~ are necessary for the safety of the workers and the public.

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35 91 *"Strengths and limitations of this study"*

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37 92 This is the first study to investigate the association of "job distress" with depressive  
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39 93 symptomatology in a special force police unit and had a higher participation rate. ~~This-It~~ is a cross-  
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41 94 sectional study, conducted on a relatively small cohort and with only self-report measures. ~~It is the~~  
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43 95 first study in Italy and one of the few in the world on first responder policemen, and had a high  
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45 96 participation. ~~It 'was, however, obtained a very high participation in a group of policemen always in~~  
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47 97 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.]~~

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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.

Comment [DiSA1]: Paoli P, Merlié D. European Foundation for the Improvement of Living and Working Conditions—Third European survey on working conditions. Luxemburg: Office for Official Publications of the European Communities; 2000.

~~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<sup>3</sup>. Although it has~~

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7 124 ~~been shown that police officers are more resilient to stress than civilians [Yuan et al. 2011, Evans et~~  
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9 125 ~~al 2013, Galatzer-Levy et al. 2013, Garbarino et al. 2012], several cross-sectional studies have~~  
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11 126 ~~provided evidence that adverse work conditions are related to poor mental health outcomes (e.g.,~~  
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13 127 ~~XX). Some workers, particularly those employed in first responder organizations such as the police~~  
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15 128 ~~force, are particularly vulnerable exposed to psychosocial stress factors. It is known that violent~~  
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17 129 ~~trauma can acutely induce posttraumatic stress disorder (PTSD) in workers<sup>1)</sup>. Accidents of this type~~  
18  
19 130 ~~rarely occur, as policemen are probably more resilient to stress than civilians [Yuan et al. 2011,~~  
20  
21 131 ~~Evans et al 2013, Galatzer-Levy et al. 2013, Garbarino et al. 2012], and the likelihood that a police~~  
22  
23 132 ~~officer may be exposed to an event severe enough to cause PTSD tends to be low<sup>2)</sup>. Nevertheless,~~  
24  
25 133 ~~officers are frequently exposed to violent events that, even if not immediately perceived as~~  
26  
27 134 ~~detrimental, can still induce maladaptive reactions in individuals<sup>3)</sup>. In addition to these operational~~  
28  
29 135 ~~work-related challenges, police officersmen may be subject exposed to organizational problems that~~  
30  
31 136 ~~are common within hierarchical, male-dominated paramilitary structures such as the fire-fighting,~~  
32  
33 137 ~~ambulance and paramedic services<sup>4)</sup> Violanti 2011. Daily organizational stressors may be more~~  
34  
35 138 ~~challenging than operational experiences, as we have observed in a shown by a previous recent~~  
36  
37 139 ~~study in which the that reported that levels of perceived stress in a group of police officers,~~  
38  
39 140 ~~somewhat ironically, men were as higher during routine jobs than during a high-risk public event<sup>5)</sup>.~~

40  
41 141 ~~It is important to note that the pathophysiological reaction may be the same for completely~~  
42  
43 142 ~~different stimuli. Even if the “more recent” and advanced area of our brain (i.e. the medial frontal~~  
44  
45 143 ~~eorx) is perfectly able to distinguish between the dramatic operational events and the chronic~~  
46  
47 144 ~~organizational factors, the part of the brain that is responsible for/involved in neurophysiological~~  
48  
49 145 ~~response to stress, i.e. the limbic system, makes no such distinction. Consequently, Bboth a~~  
50  
51 146 ~~dramatic violent event and a repeated and prolonged series of administrative events can cause an~~  
52  
53 147 ~~allostatic load, i.e., a neurobiological maladaptive reaction due to the adaptation to challenging~~  
54  
55 148 ~~environments 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.

**Comment [DiSA4]:** Se mettiamo "police officers" evitiamo la questione del genere

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6  
7 149 ~~name of known as "distress" (Mc Ewen). Through the Distress,~~ interacting with many different  
8  
9 150 individual factors, distress can induce the occurrence of mental ~~disorders~~ illnesses such as anxiety,  
10  
11 151 depression, burnout, conversion disorder and other conditions classified in DSM IV (Cooper).

12  
13 152 Psychological ~~injury~~ dysfunctioning resulting from ~~work experience~~ job distress can be a  
14  
15 153 gradual and progressive process that ~~erodes~~ impairs well-being over time. This gradual evolution  
16  
17 154 often leaves the worker unaware of the problem, or unwilling to acknowledge its importance, at  
18  
19 155 least until the severity of the ~~symptoms~~ disease makes it clear to colleagues, family, or both. The  
20  
21 156 ~~recognition of emotional problems due to work-related distress in the prevailing culture in the the~~  
22  
23 157 ~~police force~~ law enforcement context is rarely, if ever, ~~does not~~ encouraged, ~~since recognition of~~  
24  
25 158 ~~emotional damage caused by work, as~~ it is considered a sign of weakness <sup>6</sup>. Consequently,  
26  
27 159 ~~officers~~ people fail to seek professional help early enough to prevent ~~until the disease is so far~~  
28  
29 160 ~~advanced that it is~~ diagnosis and gain a fast benefit from treatment, ~~difficult to treat~~. It is for this  
30  
31 161 reason that mental ~~illness disorders are~~ the leading cause of retirement in the police force <sup>7</sup>.

32 162 The two leading models that have been used to describe and explain individual perception of  
33  
34 163 stress factors are the Demand/Control/Support (DCS) model, developed by Karasek <sup>8</sup>, and the  
35  
36 164 Effort/Reward Imbalance (ERI) model, developed by Siegrist <sup>9</sup>. The DCS model assumes that the  
37  
38 165 primary sources of job stress, or "job strain", stem from two basic characteristics of the job itself:  
39  
40 166 "job demand" and "job control". The model predicts that job strain is not simply a function of  
41  
42 167 job demand, but also depends on the amount of control the worker has over the work. Job demand  
43  
44 168 takes into consideration the pace and intensity of work: work overload, degree of difficulty,  
45  
46 169 available time, time allotted to executing tasks and the existence of contradictory or conflicting  
47  
48 170 orders. Job decision latitude, or job control, ~~depends upon~~ refers to the worker's ability to control  
49  
50 171 his own activities and skill usage. Social support at work, a moderating factor of job strain, was  
51  
52 172 subsequently included in the model. According to this model, high psychological demands in  
53  
54 173 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.

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7 174 problems, and the workers with high job strain and low social support at work are supposed to be  
8  
9 175 the most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain",  
10  
11 176 hypothesis).

12  
13 177 -The ERI model puts emphasis more on the reward rather than on the control structure of  
14  
15 178 work, suggesting that mental distress and its health correlates arise when a high degree of effort is  
16  
17 179 not adequately rewarded in the form of pay, esteem, status consistency or career opportunities. A  
18  
19 180 further assumption of this model involves individual differences in the perception of effort-reward  
20  
21 181 imbalance: people with a motivational pattern of excessive work-related commitment and high need  
22  
23 182 for approval (over-commitment) are at increased risk of strain, and, consequently, health problems  
24  
25 183 <sup>9)</sup>. The Karasek model (DCS), developed in the 1960s, appears to be more suitable for the physical  
26  
27 184 aspects of occupational stress, while Siegrist's model (ERI), designed for the tertiary society of the  
28  
29 185 1980s, is more sensitive to stress arising from work relations and organizational factors <sup>10)</sup>.

30 186 Unfortunately, in literature there is no unique definition of "distress" is an ill-defined,  
31  
32 187 although there is some consensus in term considering it as that refers to an unfavorable and  
33  
34 188 unpleasant response to stress. Due to such a vague definition, the prevalence of workers with  
35  
36 189 distress in published studies with distress can range ranges widely from 5% to 50% in various  
37  
38 190 studies<sup>11)</sup> Marchand, van Rhenen. When distress reaches clinical relevance it is defined as "stress-related  
39  
40 191 disorder"<sup>12)</sup>; This term includes a variety of clinical conditions, including depression, which are  
41  
42 192 collectively labeled as "common mental disorders" (CMD) [Van der Klink & Van Dijk, 2003].  
43  
44 193 The prevalence of CMDs in the US armed forces is 27%<sup>12)</sup> and there is a similar prevalence in the  
45  
46 194 UK armed forces<sup>13)</sup> Jones). Depression is the most common diagnosis<sup>13)</sup> Iversen 2004). A systematic  
47  
48 195 review of evidence on psychosocial factors at work and depression, however, showed a high degree  
49  
50 196 of study heterogeneity (Bonde 2006), although other studies found moderate evidence for a relation  
51  
52 197 between the psychological demands of the job and the development of depression, with relative  
53  
54 198 risks of approximately 2.0 (XX). The prevalence of CMDs in the US armed forces is 27%<sup>12)</sup> and

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Comment [DiSA6]: Bo Netterström, 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, 2008 doi:10.1093/epirev/mxn004

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7 199 there is a similar prevalence in the UK armed forces<sup>13, Jones</sup>. Distress and mental health problems  
8  
9 200 caused by work can affect performance of professional activity, especially in a delicate area such as  
10  
11 201 law enforcement, in which workers have weapons. The mental health-related consequences of stress  
12  
13 202 in police officers can thus be particularly serious not only for the increased risk of their individual  
14  
15 203 health problems, and but also for the increased risk of impaired work performance that could  
16  
17 204 jeopardize the safety and health of the general population. One of the most common diagnoses is  
18 205 depression<sup>Iversen et al. 2009</sup>, and as reported by Violanti (X), depression can be a contributing factor  
19  
20 206 not only in early retirement, but also in police officer's suicides, murder-suicides, domestic  
21  
22 207 violence, unnecessary violence and aggression while in service, over and above the role played by  
23  
24 208 the police culture that might encourage aggressive and authoritarian attitudes.

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

25  
26 209 ~~In Europe it is estimated that the lifetime prevalence of mood disorders is 14.0% and the~~  
27  
28 210 ~~one year prevalence is 4.2%.<sup>14)</sup> Outside Europe, the prevalence of severe distress with symptoms of~~  
29  
30 211 ~~depression or other mental problems is estimated to be at least 5%, but could be significantly higher~~  
31  
32 212 ~~Hilton, Fan, Huang<sup>15)</sup>. A systematic review of evidence on psychosocial factors at work and~~  
33  
34 213 ~~depression, however, showed a high degree of study heterogeneity (Bonde 2006). Distress and~~  
35  
36 214 ~~mental health problems caused by work are very important for the performance of professional~~  
37  
38 215 ~~activity, especially in a very sensitive area such as the police force, in which workers have weapons.~~  
39  
40 216 ~~The consequences of stress in police officers can be particularly serious both on account of the~~  
41  
42 217 ~~increased risk of individual health problems, and also the increased risk of impaired work~~  
43  
44 218 ~~performance that could jeopardize the safety and health of the general population.~~

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45 219 The relationship between mental health and the work environment is complex and  
46  
47 220 multifaceted: an unfavorable work environment is associated with higher prevalence of mental  
48  
49 221 disorders, and employees with mental problems are generally less adaptable to their work  
50  
51 222 environment.

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7 223 ~~The diagnosis of work related mental disorders is of particular importance for three reasons:~~  
8  
9 224 ~~At the macro (national) level, epidemiological monitoring can identify trends and help to indicate~~  
10  
11 225 ~~preventive strategies. In Italy, for example, it is compulsory for all employers to assess stress in the~~  
12  
13 226 ~~workplace and to provide appropriate preventive measures if necessary. At intermediate (company)~~  
14  
15 227 ~~level, the identification of one or more cases of work related mental disorders can stimulate or~~  
16  
17 228 ~~enhance preventive action. At the individual level, the occupational physician may give specific~~  
18  
19 229 ~~instructions to encourage the return to work or improve the quality of working life.~~

**Comment [DiSA8]:** Questo paragrafo qui è necessario? Forse possiamo spostarlo nella discussione

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20 230 ~~Sadly, investigating stress in police officers is particularly difficult because the latter are~~  
21  
22 231 ~~afraid of being identified as individuals who have been compromised by stress. They fear that this~~  
23  
24 232 ~~might then cause them to be discriminated against in their careers, removed from active duties and~~  
25  
26 233 ~~relegated to office work. On the other hand, a study by Summerfield<sup>7)</sup> found work stress to be the~~  
27  
28 234 ~~first cause of sickness absence and reduction in operational duties, as well as the leading cause of ill~~  
29  
30 235 ~~health retirement in police officersmen. A number of studies have previously evaluated~~  
31  
32 236 ~~occupational stress in policemen using the DCS and ERI models. Job strain and effort/reward~~  
33  
34 237 ~~imbalance were associated with cardiovascular risk in policewomen<sup>16)</sup>, musculoskeletal disorders~~  
35  
36 238 ~~in special police forces<sup>17)</sup>, lower mental health level in correctional police officers<sup>18)</sup> and urban~~  
37  
38 239 ~~police officers<sup>19)</sup>. The demand control model proved to be a valid theoretical framework to explain~~  
39  
40 240 ~~Previous studies on police officers have demonstrated that the demand control model is a~~  
41  
42 241 ~~significant predictor of professional efficiency and exhaustion<sup>20)</sup>, and that there is a complex~~  
43  
44 242 ~~interplay between job demands, emotional exhaustion and other social and individual factors<sup>21)</sup>.~~  
45  
46 243 ~~Subjects Officers with greater perceived work stress in the first year of police service have showed~~  
47  
48 244 ~~greater more severe depression symptoms 12 months later<sup>22)</sup>.~~

49 245 The ~~purpose aim~~ of this study was to ~~assess whether there is an investigate, apparently for~~  
50  
51 246 ~~the first time, the~~ association ~~between of~~ a condition of "distress" and the presence of self-reported  
52  
53 247 symptoms of depression, ~~alongside with other common work-related mental problems such as~~



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7 248 ~~anxiety and burnout takes as a control, or other common mental disorders,~~ in a specialist or "elite"  
8  
9 249 unit of the Italian police, the "VI Reparto Mobile" of Genoa, a carefully selected group who is  
10  
11 250 called to maintain law and order in all the major events that ~~happen take place~~ in the country. The  
12  
13 251 police ~~officersmen~~ in this group work exclusively as First Responders; ~~members~~ are carefully  
14  
15 252 selected among ordinary officers and receive specific psychophysical and tactical training. Their  
16  
17 253 routine work involves ensuring order during sporting events, crowds and parades, natural and social  
18  
19 254 emergencies, and also they are often involved in public events in which there is a high risk of  
20  
21 255 terrorist attacks and physical fights. During a single riot, they are on duty for an average of 10 or  
22  
23 256 more hours of work, have physical fights for over an hour on average and often feel that they are in  
24  
25 257 imminent danger of death. They have a special and continuing education which aims to improve  
26  
27 258 team spirit ("~~esprit de corp~~") and increase the preparation to dramatic events. The decision to hold  
28  
29 259 the 2009 G8 meeting in Italy provided the opportunity for carrying out our present study. The police  
30  
31 260 officers selected to ensure law and order during this event were asked to undergo a thorough  
32  
33 261 examination of their mental health condition so that their conduct during the meeting could not be  
34  
35 262 stigmatized.

## 39 265 **Method**

### 43 267 *Participants*

45 268 [This study refers to the initial phase of a study started on the eve of the G8 meeting in 2009.](#) The  
46  
47 269 Italian special police force unit "VI Reparto Mobile" of Genoa is composed of 294 members. Two  
48  
49 270 ~~policemen-officers~~ refused to take part in the study and one was unable to complete all the tests in  
50  
51 271 the battery described in the next section and was therefore excluded. The participation rate was  
52  
53 272 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

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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 [favori su assenze: personalita], we have integrated averaged all the three measurements into a single value, so as to have the level of stress that each officer had received experienced during the period.

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Occupational stress was ~~measured~~ assessed using the validated Italian versions<sup>23)</sup> of two standardized questionnaires: the ~~DCS Demand-Control-Support~~ (DCS) questionnaire, derived from the longer Job Content Questionnaire<sup>8)</sup>, and the ~~Effort-Reward Imbalance~~ (ERI) questionnaire<sup>9)</sup>. ~~DCS is a 17-item self-report questionnaire that provides scores in three scales: The~~

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~~classic 17-item DCS questionnaire consisted of 3 scales termed: Psychological Job Demand<sup>2</sup>, (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.

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7 298 assesses three dimensions: *Effort* (6 items mapping the demanding aspects of the work  
8  
9 299 environment), *Reward* (11 items mapping the occupational rewards that are supposed to be received  
10  
11 300 by the person) and *Overcommitment* (6 items mapping the intrinsic personal factors regarding  
12  
13 301 occupational motivation and participation that enhance the effects of stress). Participants are asked  
14  
15 302 to rate each item on a 5-point intensity scale. In this study reliabilities of the scales were .82, .89  
16  
17 303 and .79, respectively. Along with scale sum scores, the weighted ratio between effort and reward  
18  
19 304 (E/R Ratio) was computed to quantify the degree of mismatch between effort and reward. Values  
20  
21 305 >1 reflect an imbalance that can induce stress [XX].

**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.

22 306 'job control or decision latitude' and 'workplace social support'. The 'demand' scale was the sum  
23  
24 307 of 5 items (e.g. D1: "Do you have to work very fast in your job?") ( $\alpha = 0.71$ ), the 'control' scale  
25  
26 308 was the sum of 6 items (e.g. C1: "Do you have the opportunity to learn new things in your work?")  
27  
28 309 ( $\alpha = 0.65$ ), and the 'support' scale was the sum of 6 items (e.g. S1: "There is a calm and pleasant  
29  
30 310 atmosphere where I work") ( $\alpha = 0.84$ ). Items were scored using a 4 point Likert scale in which the  
31  
32 311 first two scales were graded from 1=never to 4=often, while the third scale (support) was graded  
33  
34 312 from 1=strong disagreement to 4=strong agreement. We followed the commonest method of  
35  
36 313 obtaining a continuous variable, termed "perceived job strain", and divided demand by control  
37  
38 314 (weighted by item numbers).

39 315 The 23-item ERI questionnaire contained two scales: 'effort', evaluated by 6 items (e.g. E1 "I have  
40  
41 316 constant time pressure due to a heavy workload") ( $\alpha = 0.82$ ), and 'reward', evaluated by 11 items  
42  
43 317 (e.g. R1 "I receive the respect I deserve from my superior or equivalent person") ( $\alpha = 0.89$ ). Both  
44  
45 318 were scored on a 5-point scale, where a value of 1 indicated no stressful experience and 5 indicated  
46  
47 319 a highly stressful experience. The weighted ratio between effort and reward was calculated to  
48  
49 320 quantify the degree of mismatch between effort and reward. Individuals who had a score greater than  
50  
51 321 one were considered to be stressed because they subjectively perceived a discrepancy between efforts and  
52  
53 322 results. The ERI questionnaire also included a third scale, 'over-commitment' which was evaluated

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7 323 by 6 items on a 4 point Likert scale (e.g. O3 “When I get home, I can easily relax and ‘switch off’  
8  
9 324 work”) ( $\alpha = 0.79$ ). It measured the set of intrinsic personal factors regarding occupational  
10  
11 325 motivation and participation that enhance the effects of stress.  
12  
13 326 The mental health status was assessed at baseline after the third occasion using three measures:  
14  
15 327 depression, anxiety and burnout the following measures.  
16  
17 328 Depression was evaluated by the Beck Depression Inventory (BDI) <sup>24</sup>, as this questionnaire  
18  
19 329 performed better than other tests for depression screening <sup>25,26</sup>. The BDI consists of 21 groups of 4  
20 330 alternative self-evaluation statements used to assess the presence and severity of the affective,  
21  
22 331 cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores  
23  
24 332 indicating more severe depression. If multiple responses are chosen under one item, the most  
25  
26 333 symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total  
27  
28 334 from 0 to 63. In this study internal consistency was 0.81. The cut-off score commonly used in  
29  
30 335 clinical practice for depression screening is 10 <sup>27</sup>. The probability of suffering major depressive  
31  
32 336 disorder rapidly increases above this threshold; so, a higher score of 14 <sup>25</sup> or 16 <sup>26</sup> is often chosen  
33  
34 337 in order to reduce the prevalence of false positive in populations consisting of patients affected by  
35  
36 338 chronic diseases with poor or severe prognosis. In this study, we adopted the classical cut-off level  
37 339 of 10, as the subjects tested were young, active and highly selected.

38  
39 340  
40  
41 341 Anxiety was evaluated by the State-Trait Anxiety Inventory–Trait (STAI-T; Spielberger et  
42  
43 342 al. 1983; Italian version in Sanavio et al. 1997) The STAI-T is a 20-item self-report measure of  
44  
45 343 anxiety proneness requiring participants to rate their frequency of anxiety symptoms on a 4-point  
46  
47 344 Likert-type frequency scale ranging from 1 (almost never) to 4 (almost always). Nine items are  
48  
49 345 reverse scored. In this study internal consistency the reliability of the scale was .74.

50  
51 346 Maslach Burnout Inventory (MBI; Maslach and Jackson 1981; Italian version in Sirigatti  
52 347 and Stefanile 1993) MBI is a 22-item self-report measure of professional burnout. It provides scores

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7 348 on three facets of burnout: Emotional Professional Exhaustion (EE; 9 items mapping), which

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8  
9 349 assesses feelings of being emotionally overextended and exhausted by one's work;

10  
11 350 Depersonalization (DP; 5 items), which assesses mappings an unfeeling and impersonal response

12  
13 351 towards the recipients of one's care) and Personal Accomplishment (PA; 8 items), which

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14  
15 352 evaluates mapping -feelings of competence and successful achievement in one's work with people);

16  
17 353 Participants are asked to rate the frequency of experiencing feelings related to each subscale using a

18  
19 354 7-point, Likert-type scale (1 = Never; 7 = Every Day). In this study reliabilities of the scales were

20  
21 355 internal consistencies were EE 0.86, DP 0.60 and PA 0.80, respectively.

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22  
23 356 The questionnaires were anonymous. All participants were tested anonymously and confidentially

24  
25 357 during their routine psychophysical assessment. Anonymity was achieved, and participants by

26  
27 358 identifying were identified by participants with an alphanumeric code, double-blind. The study

28  
29 359 protocol was approved by the Ethics Committee of the Catholic University Rome School of

30  
31 360 Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and the

32  
33 361 National Police Management Board and All data was treated in accordance the whole procedure

34  
35 362 followed the with the Ethical Principles of Psychologists Code of Conduct (American

36  
37 363 Psychological Association 2002).

### 38 39 365 *Control Variables*

40  
41 366 The control variables used in our study were: age (years), length of employment (years of service);

42  
43 367 education level (~~8 or more years of schooling~~ lower vs equal/higher than high school); rank (officer

44  
45 368 ~~vs; or~~ supervisor/~~and~~ technical staff); origin (Northern or Southern Italy); housing (in barracks or

46  
47 369 home); marital status (single/~~or~~ divorced/~~married~~ vs married/~~or~~ cohabiting); presence of children

48  
49 370 (no/yes).

### 50 51 371 *Statistical analyses*

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7 373 The first research question we ~~set out to answer~~addressed was whether there was a relationship  
8  
9 374 between the individual level of work-related stress and mental health problems. In order to do this  
10  
11 375 we used hierarchical multiple linear regression models in which the variable ~~“the BDI~~  
12  
13 376 ~~score depression score”~~ was ~~posed specified~~ as ~~dependent variable criterion~~. In Model 1 ~~the first~~  
14  
15 377 ~~model~~ we ~~used specified as predictors only~~ the ~~socio-demographic control~~ variables (~~age, length of~~  
16  
17 378 ~~employment, rank, education level, origin, marital status, housing, having offspring~~) as independent  
18  
19 379 ~~variables~~. In Model 2 and 3 ~~the second and third models, we separately added the stress related~~  
20 380 ~~variables scale scores~~ from ~~the the Karasek (demand, control, support) DCS~~ and ~~from the the~~  
21  
22 381 ~~Siegrist ERI models (effort, reward, over-commitment) questionnaires, respectively, were entered in~~  
23  
24 382 ~~the regression model. In the final model~~ In Model 4, control variables and DCS and ERI scores  
25  
26 383 ~~were specified as predictors, we put together all the stress related and the socio-demographic~~  
27  
28 384 ~~variables as predictors of depression~~. The degree of association between variables is ~~indicated~~  
29  
30 385 ~~indexed~~ by the regression coefficient computed on the standardized variables ( $\beta$ ). The amount of  
31  
32 386 variance of the depression score accounted for by the predictors (~~and the goodness of fit of the~~  
33  
34 387 ~~regression model~~) ~~was~~ indexed by the ~~adjusted ( $R^2$ )~~. ~~Since age and length of employment were~~  
35 388 ~~highly correlated ( $r = .91$ ), only the latter was used as a predictor. In order to minimize the~~  
36  
37 389 ~~potentially confounding effects of multicollinearity, we partialized the effects through principal~~  
38  
39 390 ~~component analysis~~.

40  
41 391 ~~The second question involved ascertaining~~ We then tested ~~what was~~ the risk of suffering  
42  
43 392 from depression for ~~an policeman-officer~~ in a state of distress. We used binary logistic regression,  
44  
45 393 with ~~caseness for the state of depression (i.e., BDI score  $\geq 10$  (“caseness”)) as defined above as the~~  
46  
47 394 ~~dependent variable. Separately, as criterion we and DCS-Job Strain used job strain (high demand and~~  
48  
49 395 ~~low control), social isolation (“support” DCS-Support score below the median), isostrain (job strain~~  
50  
51 396 ~~plus social isolation), Effort/Reward imbalance (effort-reward imbalance (subjects with E/R ratio~~  
52  
53 397 ~~ERI value  $> 1$ ), and Over-Involve in work (ERI-“over-commitment” Overcommitment score~~

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7 398 above the median) as ~~independent variables~~predictors. The resulting values ("raw" or unadjusted)  
8  
9 399 were subsequently corrected by adding the socio-demographic variables to the equation. ~~We~~  
10  
11 400 ~~calculated~~Odds ratios (OR) and their 95% confidence intervals (95%CI) ~~were computed~~.  
12  
13 401 ~~PASW/SPSS software (version 20, IBM, Chicago, IL) was used for analyses.~~

14  
15 402 ~~The study protocol was approved by the Ethics Committee of the Catholic University Rome School~~  
16  
17 403 ~~of Medicine, the Institute of Occupational Medicine, responsible for co-coordinating the study, and~~  
18  
19 404 ~~the National Police Management Board.~~

## 20 405 21 22 406 23 24 407 **Results**

25  
26 408  
27  
28 409 ~~The characteristics of the study population are shown in Table 1. The average values of the~~  
29  
30 410 ~~variables indicating stress in the workplace and those referring to mental disorders are listed in~~  
31  
32 411 ~~Table 2~~Mean scale scores are reported in Table 1. The mean levels of occupational stress scores  
33  
34 412 were not particularly high when compared with those of other groups of Italian workers [Magnavita  
35  
36 413 PsyJ]. The average levels of depression, anxiety, emotional exhaustion and depersonalization scores  
37  
38 414 were close to the lower limits of the respective scales, while those of personal accomplishment were  
39  
40 415 high. Based on the Italian cut-off levels, there was no case of possible anxiety or burnout. In this  
41  
42 416 study~~However~~, there were 21 (7.3%) likely cases of mild depression (BDI ~~≥~~greater than or equal to  
43  
44 417 10) among the policemen and 7 (2.4%); while the most likely cases of moderate depression (BDI ~~≥~~  
45  
46 418 16)~~were found among 7 subjects (2.4%).~~

47 419 ~~Hierarchical multiple linear regression~~ Linear regression analysis (Table 3)~~allowed~~enabled  
48  
49 420 us to ~~evaluate~~test the extent to which the level of depressive symptomatology ~~can~~ that can be  
50  
51 421 predicted on the basis of socio-demographic and work-related stress data (Table 2).

52  
53 422 [Insert Table 2 about here](#)

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7 423 The association between of depression with only socio-demographic variables (Model 1) ~~and~~  
8  
9 424 ~~depression~~ was weak (Adjusted  $R^2 = .01$ ) and ~~and~~ generally not significant, ~~only the rank level was~~  
10  
11 425 ~~inversely associated with depression~~ except a positive association with length of employment, which  
12  
13 426 ~~was significant~~ also in all next models. ~~Taken together, the socio-demographic factors described~~  
14  
15 427 ~~only a small fraction of the variability of psychological problems, i.e. less than 1%~~ When DCS  
16  
17 428 scores were entered into the model (Model 2), a significant increase in Adjusted  $R^2$  (.10) was  
18  
19 429 ~~observed, and DCS-Control and DCS-Support were significantly and negatively associated with~~  
20  
21 430 ~~BDI scores. When DCS scores were replaced by ERI scores (Model 3), the Adjusted  $R^2$~~   
22  
23 431 ~~significantly increased (.16) and the negative regression coefficient of ERI-Reward was the only~~  
24  
25 432 ~~significant effect, along with the one of length of employment. Model 4, that included all control~~  
26  
27 433 ~~and occupational stress variables, did not show an Adjusted  $R^2$  significantly higher than Model 3,~~  
28  
29 434 ~~and the only significant predictors were length of employment and ERI-Reward score.~~

30 435 The results of the logistic regression are shown in Table 3.

31  
32 436 Insert Table 3 about here:

33  
34 437 For officers in a state of "distress" according to the DCS model ( i.e. those with a simultaneous high  
35  
36 438 level of "demand" and low level of "control"), the risk of being depressed approximately doubled,  
37  
38 439 but not significantly, whereas the other categorical predictors were all statistically significant.  
39  
40 440 Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher  
41  
42 441 risk of depression than the others.

43 442 The results of regression analyses performed using anxiety and MBI scores as criteria are  
44  
45 443 shown in Tables 4a-d.

46  
47 444 Insert Tables 4a-d about here

48  
49 445 Anxiety was significantly associated with living in barracks, with lower scores in DCS-Support and  
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51 446 ERI-Reward and with higher scores in ERI-Effort. MBI Professional Exhaustion scores were higher  
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53 447 in older officers and in agents and were significantly predicted by higher ERI-Over-commitment

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7 448 scores. MBI Depersonalization scores were higher in older officers and in officers without children,  
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9 449 and were significantly predicted by lower ERI-Reward scores. MBI Personal Accomplishment  
10  
11 450 scores were lower in barracked officers and in officers without children, and were significantly  
12  
13 451 predicted by higher DCS-Control scores.

14  
15 452 By adding demand, control and support, the percentage of variance expressed rose to about ← **Formatted: Indent: First line: 0.49"**  
16  
17 453 one-tenth of the total variance ( $R^2=0.096$ ). Social support was negatively associated with depression  
18 454 ( $\beta=-0.211$ ). Job control was negatively associated with the presence of depressive symptoms ( $\beta=-$   
19  
20 455 0.127).

21  
22 456 By substituting the DCS model variables with those of the ERI model (Model III of Table 3)  
23  
24 457 among the independent variables, the coefficient of determination improved significantly, thus  
25  
26 458 expressing about one-sixth of the total variance ( $R^2=0.16$ ). Reward received for work was the most  
27  
28 459 important protective factor against depression ( $\beta=-0.303$ ). On the contrary, excessive involvement  
29  
30 460 in work or intrinsic effort (over-commitment) was significantly associated with depression in a  
31  
32 461 positive way ( $\beta=0.121$ ).

33  
34 462 The more complex model, in which all stress-related variables were included (Model IV of  
35 463 Table 3) indicated that there was a negative linear association between the score for depression and  
36  
37 464 rewards ( $\beta=-0.226$ ).

38  
39 465 The correlations of stress with the other measures of mental health (anxiety, exhaustion,  
40  
41 466 depersonalization, and personal accomplishment) were generally very weak (see the tables in the  
42  
43 467 annex). Anxiety was weakly correlated inversely with support and reward and directly with effort.  
44  
45 468 Exhaustion was significantly correlated with over-commitment. Depersonalization was inversely  
46  
47 469 related to reward. The personal accomplishment was significantly associated with control. The  
48  
49 470 socio-economic factors have often shown a greater predictive power on mental health than the stress  
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51 471 variables. The coefficient of determination ( $R^2$ ), however, was very low, even in more complex  
52 472 models.

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7 473 By logistic regression (Table 4) we observed that for subjects in a state of "distress" according to  
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9 474 the DCS model (i.e. those with a simultaneous high level of "demand" and low level of "control"),  
10  
11 475 the risk of being depressed almost doubled (OR 1.92; 95% CI 0.76-4.84), although the association  
12  
13 476 was not statistically significant since the ranges of variability of the estimates included the  
14  
15 477 assumption of equivalence. If we take into account the lack of social support, which was  
16  
17 478 significantly associated with depression (OR 3.47; 95% CI 1.16-10.38), the condition of iso-strain  
18  
19 479 was associated with a significantly increased risk of depression (OR 7.39; CI 95% 2.46-22.23).  
20  
21 480 The police officers who were in a state of "distress" according to the ERI model (i.e. weighted ratio  
22  
23 481 between effort and reward more than 1) also had a much higher risk of depression (OR 7.39 CI 95%  
24  
25 482 2.46-22.23). Over commitment was associated with the risk of depression (OR 3.85; CI 95% 1.28-  
26  
27 483 11.54).

## Discussion

33  
34 487 This study investigated the association of a condition of "job distress" with the presence of self-  
35  
36 488 reported symptoms of depression, alongside with other common work-related mental problems such  
37  
38 489 as anxiety and burnout, in a special force police unit. Results from multiple regression analyses  
39  
40 490 showed that lower ERI-Effort scores predicted higher BDI scores, whereas results from logistic  
41  
42 491 regression analyses revealed that a higher effort/reward imbalance was associated with an  
43  
44 492 approximately sevenfold increase in risk of depression. These results suggest that, consistently with  
45  
46 493 previous studies, also in special force police officers the lower the reward opportunities, or the  
47  
48 494 higher the imbalance between the the effort spent to meet the demanding aspects of the work  
49  
50 495 environment and the reward (money, esteem and career opportunities, job security included), the  
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52 496 higher the depressive symptomatology. Studies based on the demand /control model indicate that  
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54 497 job strain is associated with depression (Bonde). A recent meta-analysis of studies on the

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7 498 association between stress and mental disorders indicates that psychosocial problems in the  
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9 499 workplace, reduced control, job strain, low social support, and the discrepancy between effort and  
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11 500 rewards predict the onset of depression<sup>36</sup>. Another review of 14 longitudinal studies indicates that  
12  
13 501 lack of social support enhances depression<sup>37</sup>. The association we found between low reward and  
14  
15 502 symptoms is in agreement with that suggested by neurobiological studies on depression (Eshel and  
16  
17 503 Roiser). However, we could not replicate the finding that using both the DCS and the ERI model  
18  
19 504 provides greater predictive power for depressive disorders than models including only one of them  
20  
21 505 .<sup>38</sup> In this study, only the ERI model proved to be useful in predicting depression scores of officers.  
22 506 Lack of rewards and excessive over-commitment significantly increased depression scores and the  
23  
24 507 probability of disease, respectively. This result replicates the observations of Martins and Lopes<sup>39</sup>  
25  
26 508 who argued that effort, reward and over-commitment are associated with the presence of common  
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28 509 mental disorders among military personnel in peacetime, and those of Kingdom and Smith<sup>40</sup>, that  
29  
30 510 showed that ERI was the most important predictor of depression among police officers in the UK  
31  
32 511 Coast Guard and, more generally, with a large body of literature on the relationship between reward  
33  
34 512 processing and depressive symptoms (Eshel & Roiser (2010)). To a lesser extent, the DCS model  
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36 513 captured some important aspects, such as the lack of control over the organization of work and the  
37  
38 514 lack of support from colleagues or superiors. The importance of lack of support from superior and  
39  
40 515 organization in the occurrence of depression has already been reported by Berg et al. in the  
41  
42 516 Norwegian police<sup>33</sup>, and by Arial et al.<sup>30</sup> in a sample of Swiss police. Overall, both models appear  
43  
44 517 to be useful for diagnosing a situation of suffering which could result in disease. Although not the  
45  
46 518 main focus of this study, the ERI model also showed a good ability to predict anxiety and two of the  
47  
48 519 three core dimensions of burnout (i.e. emotional exhaustion and depersonalization), consistently  
49  
50 520 with previous studies (XX), whereas DCS-Control score was significantly associated with personal  
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52 521 accomplishment. Some background variables also showed a significant association with measures  
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54 522 of mental health. Higher length of employment (which overlaps age) was associated with higher

22

**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.

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7 523 depressive symptomatology, anxiety, professional exhaustion and depersonalization, being  
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9 524 barracked was associated with higher anxiety and lower personal accomplishment, being an  
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11 525 operative agent was associated with higher professional exhaustion, having children was associated  
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13 526 with lower depersonalization. These results are in line with previous studies on armed forces  
14  
15 527 officers (XX)

16  
17 528 Sadly, investigating stress in police officers is particularly difficult because the latter are afraid of  
18  
19 529 being identified as individuals who have been compromised by stress. They fear that this might then  
20  
21 530 cause them to be discriminated against in their careers, removed from active duties and relegated to  
22  
23 531 office work. On the other hand, a study by Summerfield <sup>7</sup> found work stress to be the first cause of  
24  
25 532 sickness absence and reduction in operational duties, as well as the leading cause of ill health  
26  
27 533 retirement in police officers. A number of studies have previously evaluated occupational stress in  
28  
29 534 policemen using the DCS and ERI models. Job strain and effort/reward imbalance were associated  
30  
31 535 with cardiovascular risk in policewomen <sup>16</sup>, musculoskeletal disorders in special police forces <sup>17</sup>,  
32  
33 536 lower mental health level in correctional <sup>18</sup> and urban police officers <sup>19</sup>. The demand-control  
34  
35 537 model proved to be a valid theoretical framework to explain professional efficiency and exhaustion  
36  
37 538 <sup>20</sup> and the complex interplay between job demands, emotional exhaustion and other social and  
38  
39 539 individual factors <sup>21</sup>. Officers with greater perceived work stress in the first year of police service  
40  
41 540 showed more severe depression symptoms 12 months later <sup>22</sup>.

42  
43 541 It might be argued that only seven per cent of officers in our cohort reported a level of  
44  
45 542 depressive symptomatology higher than the risk threshold. In fact, such prevalence is lower than  
46  
47 543 that found by by Fox et al. <sup>28</sup> in urban US police officer (9%), by Frühwald et al. <sup>29</sup> in Lower  
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49 544 Austria (9%), by Arial et al. <sup>30</sup> in a Swiss officers (11.9%), by Chen et al. <sup>31</sup> in Taiwanese officers  
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51 545 (21.6%), and by Obidoa et al. <sup>32</sup> among US corrections officers (31%), and it is comparable with  
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53 546 that found in other working populations <sup>12-15</sup>. Moreover, a nationwide study in the Norwegian  
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55 547 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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7 548 symptoms than the corresponding general population<sup>33)</sup>. A recent comparison of police and other  
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9 549 employees found no indications that self-reported mental health disturbances are more prevalent  
10  
11 550 among police officers than among groups of employees that are not considered high-risk groups<sup>34)</sup>.  
12  
13 551 Since our sample was composed by young and highly selected police officers, which also shown an  
14  
15 552 emotional stability higher than the general population (XX) this result is not surprising. However,  
16  
17 553 this does not mean that the problem of depression in this special unit is negligible, and it cannot be  
18  
19 554 ignored that, beyond individual's health related risk factors, depression represents a considerable  
20  
21 555 cost for productivity both in terms of absenteeism and presenteeism<sup>35)</sup> and, more importantly given  
22  
23 556 that the delicate tasks the officers of this study have to accomplish, it increases the possibility of  
24  
25 557 errors and the risk to the health and safety of others. Hence, officers with depressive symptoms  
26  
27 558 should obtain timely and confidential assistance and the causes of excessive occupational stress  
28  
29 559 must be promptly identified and removed or minimized.

30 560 The results reported in this study should be interpreted with caution, as all the measures  
31  
32 561 were self-reported questionnaires, and thus reporting bias and subjectivity may have distorted the  
33  
34 562 observations. Depressed persons could be more likely to report psychosocial stress at work, even if  
35  
36 563 objectively their work environment is not at risk *per se*. The cross-sectional nature of the research  
37  
38 564 does not allow us to infer the direction of the observed phenomena, and thus separate cause from  
39  
40 565 effect. Specifically, we could not address the issue of whether the observed reduction in experience  
41  
42 566 of reward is an epiphenomenon of the presence of depressive symptoms. Finally, because our  
43  
44 567 sample corresponds to a specific police unit, and it is a relatively small cohort, our results may not  
45  
46 568 be generalizable to police officers in general, with different occupational exposure, nor to special  
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48 569 forces in countries with different ethnic or cultural characteristics. However, our study also has  
49  
50 570 several important strengths. To our knowledge, this is the first study to investigate associations of  
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52 571 depression with work stress in terms of both DCS and ERI models in special force police officers.  
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54 572 Such population has a high exposure to homogenous occupational risks, while many studies include

**Comment [DISA14]:** Garbarino et al.  
Personality Profiles of Special Force Police Officers

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7 573 persons who perform very different tasks. The participation rate was very high (99%). Finally, since  
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9 574 the measurements used in this study have been validated in several other studies, our results are  
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11 575 more comparable with other research findings.

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13 576 Limitations notwithstanding, the present findings indicate that some aspects of psychosocial  
14  
15 577 environment at work, such as the imbalance between effort and reward, are associated with  
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17 578 depressive symptoms, anxiety and burnout in special force police officers. Although we could not  
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19 579 establish a casual relationships and these results need to be replicated in longitudinal studies, they  
20  
21 580 suggest that the dimensions of effort, reward and overcommitment can be useful in monitoring  
22  
23 581 special force police officers' psychological functioning.

24 582 ~~Our study, which to the best of our knowledge is the only conducted on a police unit of avant-garde,~~  
25  
26 583 ~~indicated that higher levels of work stress are associated with depressive symptoms. Both the work-~~  
27  
28 584 ~~related stress models we used were significantly associated with the presence of depressive~~  
29  
30 585 ~~symptoms, even if the effort / reward / imbalance model seemed to be more efficient in predicting~~  
31  
32 586 ~~mental ill health than the demand / control / support model.~~

33  
34 587 ~~Seven per cent of policemen in our cohort reported depressive symptoms. The prevalence is lower~~  
35  
36 588 ~~than that found by by Fox et al.<sup>28)</sup> in urban US policemen (9%), by Frühwald et al.<sup>29)</sup> in Lower~~  
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38 589 ~~Austria (9%), by Arial et al.<sup>30)</sup> in a Swiss sample of police officers (11.9%), by Chen et al.<sup>31)</sup> in the~~  
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40 590 ~~Taiwanese police (21.6%), and by Obidoa et al.<sup>32)</sup> among US corrections officers (31%), and it is~~  
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42 591 ~~comparable with that found in other working populations<sup>12-15)</sup>. A nationwide study in the~~  
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44 592 ~~Norwegian police service, indeed, showed that the younger policemen reported lower levels of~~  
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46 593 ~~depressive symptoms than the corresponding general population<sup>33)</sup>. A recent comparison of police~~  
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48 594 ~~and other employees found no indications that self-reported mental health disturbances are more~~  
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50 595 ~~prevalent among police officers than among groups of employees that are not considered high risk~~  
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52 596 ~~groups<sup>34)</sup>. Our sample was composed by young and highly selected policemen, and this may~~  
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54 597 ~~explain our findings.~~

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7 598 Depression represents a considerable cost for productivity both in terms of absenteeism and  
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9 599 presenteeism<sup>35)</sup>. But much more important is the fact that this condition increases the possibility of  
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11 600 errors and the risk to the health and safety of others.  
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13 601 The results of our observations are in agreement with the literature. Studies based on the demand /  
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15 602 control model indicate that job strain is associated with depression (Bonde). A recent meta-analysis  
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17 603 of studies on the association between stress and mental disorders indicates that psychosocial  
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19 604 problems in the workplace, reduced control, job strain, low social support, and the discrepancy  
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21 605 between effort and rewards predict the onset of depression<sup>36)</sup>. Another review of 14 longitudinal  
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23 606 studies indicates that lack of social support enhances depression<sup>37)</sup>. The association we found  
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25 607 between low reward and symptoms is in agreement with that suggested by neurobiological studies  
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27 608 on depression (Eshel and Roiser). Even more recent studies go in the same direction. The two  
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29 609 effort-reward and demand-control support models used together have greater predictive power for  
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31 610 depressive disorders than a single model<sup>38)</sup>.  
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33 611 In this study, the ERI model proved particularly useful in interpreting the state of "distress" in  
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35 612 policemen. Excessive over-commitment and lack of rewards significantly increased depression  
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37 613 scores and the probability of disease. This result confirms the observations of Martins and Lopes<sup>39)</sup>  
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39 614 who argue that ERI and over-commitment are associated with the presence of common mental  
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41 615 disorders among military personnel in peacetime, and that of Kingdom and Smith<sup>40)</sup> showing that  
42  
43 616 ERI was the most important predictor of depression among police officers in the UK Coast Guard.  
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45 617 The DCS model captures some important aspects, such as the lack of full control over the  
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47 618 organization of work and the lack of support from colleagues or superiors. The importance of lack  
48  
49 619 of support from superior and organization in the occurrence of depression has already been reported  
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51 620 by Berg et al. in the Norwegian police<sup>33)</sup>, and by Arial et al.<sup>30)</sup> in a sample of Swiss police. Overall,  
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53 621 both models appear to be useful for diagnosing a situation of suffering which could result in  
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55 622 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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1 **Association of work-related stress with mental health problems in a special police force unit**

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4 **Sergio Garbarino**<sup>1,2</sup>, **Giovanni Cuomo**<sup>2</sup>, **Carlo Chiorri**<sup>3</sup>, **Nicola Magnavita**<sup>4</sup>.

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7 31 by all authors before the publication of the paper.  
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11 33 **Author's contribution:** SG carried out medical examinations on workers, CC administered the  
12  
13 34 psychological tests and revised statistics, NM carried out the statistical analyses and drafted the  
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15 35 work, GC revised the work.  
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20 37 **Data sharing statement:** Technical appendix, statistical code, and dataset available from the  
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22 38 corresponding author at Dryad repository, who will provide a permanent, citable and open access  
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3 41 **Abstract**  
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8 **Objectives.** Law and order enforcement tasks may expose special force police officers to significant  
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10 44 psychosocial risk factors. The aim of this work is to investigate the relationship between job stress  
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12 45 and the presence of mental health symptoms while controlling for socio-demographical,  
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14 46 occupational and personality variables in special force police officers.

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16 47 **Method:** At different time points, 292 out of 294 members of the 'VI Reparto Mobile', a special  
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18 48 police force engaged exclusively in the enforcement of law and order, responded to our invitation to  
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20 49 complete questionnaires for the assessment of personality traits, work-related stress (using the  
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22 50 demand-control-support (DCS) and the effort-reward-imbalance (ERI) models), and mental health  
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24 51 problems such as depression, anxiety and burnout.

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27 52 **Results:** Regression analyses showed that lower levels of support and reward and higher levels of  
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29 53 effort and overcommitment were associated with higher levels of mental health symptoms.  
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31 54 Psychological screening revealed 21 (7.3%) likely cases of mild depression (BDI  $\geq 10$ ). Officers  
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33 55 who had experienced a discrepancy between work effort and rewards showed a marked increase in  
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35 56 the risk of depression (OR 7.89 95%CI 2.32-26.82) when compared with their counterparts who did  
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37 57 not perceive themselves to be in a condition of distress.

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40 58 **Conclusions:** The findings of this study suggest that self-reported work-related stress may play a  
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42 59 role in the development of mental health problems in police officers. The prevalence of mental  
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44 60 health symptoms in the cohort investigated here was low, but not negligible in the case of  
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46 61 depression. Since special forces police officers have to perform sensitive tasks for which a healthy  
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48 62 psychological functioning is needed, the results of this study suggest that steps should be taken to  
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50 63 prevent distress and improve the mental well-being of these workers.  
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3 65 **Keywords:** effort-reward imbalance, depression, distress, job strain, mental health, over-  
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5 66 commitment, police, social support, work-related stress.  
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10 68 **Article summary**

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12 69 *'Article focus'*

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14 70 Mental health in special police forces is a critical issue. Police officers are exposed to acute and  
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16 71 chronic stress and may develop mental health problems. The impairment of police officers'  
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18 72 psychological functioning can be a serious threat to the safety of the public.  
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23 74 *'Key messages'*

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25 75 The prevalence of mental health problems in special force police officers is lower than that of the  
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27 76 general population and other groups of police job distress (or job stress) measures and mental health  
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29 77 symptoms was found. The prevention of distress and the treatment of mental health disorders  
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31 78 among police officers are necessary for the safety of the workers themselves and the public.  
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36 80 *'Strengths and limitations of this study'*

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38 81 This is the first study to investigate the association of job distress with mental health symptoms in a  
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40 82 special force police unit. It has a high participation rate. The study has been conducted on a  
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42 83 relatively small cohort, and with only self-report measures. .  
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## 85 Introduction

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

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3 110 conversion disorder and other conditions classified in DSM IV [13]. Psychological dysfunction  
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5 111 resulting from job distress can be a gradual and progressive process that impairs well-being over  
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7 112 time. This gradual evolution often leaves the worker unaware of the problem, or unwilling to  
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9 113 acknowledge its importance, at least until the severity of the symptoms makes it clear to colleagues,  
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11 114 family, or both. The recognition of emotional problems due to work-related distress is rarely, if  
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13 115 ever, encouraged in the law enforcement sector, since it is considered a sign of weakness [14].  
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15 116 Consequently, police officers fail to seek professional help early enough to prevent diagnosis and  
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17 117 quickly benefit from treatment. This is one of the main reasons for which mental disorders are the  
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19 118 leading cause of retirement in the police force [15].  
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23 119 The two leading models that have been used to describe and explain individual perception of stress  
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25 120 factors are the Demand/Control/Support (DCS) model, developed by Karasek [16], and the  
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27 121 Effort/Reward Imbalance (ERI) model, developed by Siegrist [17]. The DCS model assumes that  
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29 122 the primary sources of job stress, or "job strain", stem from two basic characteristics of the job  
30  
31 123 itself: "job demand" and "job control". The model predicts that job strain is not simply a function of  
32  
33 124 job demand, but also depends on the amount of control the worker has over the work. Job demand  
34  
35 125 takes into consideration the pace and intensity of work: work overload, degree of difficulty,  
36  
37 126 available time, time allotted to executing tasks and the existence of contradictory or conflicting  
38  
39 127 orders. Job decision latitude, or job control, refers to the worker's ability to control his own  
40  
41 128 activities and skill usage. Social support at work, a moderating factor of job strain, was  
42  
43 129 subsequently included in the model. According to this model, high psychological demands in  
44  
45 130 conjunction with low decision latitude can contribute to the development of psychological  
46  
47 131 problems, and workers with high job strain and low social support at work are thought to be the  
48  
49 132 most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis  
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51 133 [18].  
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3 134 The ERI model puts emphasis more on the reward rather than the control structure of work,  
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5 135 suggesting that mental distress and its health correlates arise when a high degree of effort is not  
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7 136 adequately rewarded in the form of pay, esteem, status consistency or career opportunities. A  
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9  
10 137 further assumption of this model involves individual differences in the perception of effort-reward  
11  
12 138 imbalance: people with a motivational pattern of excessive work-related commitment and high need  
13  
14 139 for approval (over-commitment) are at increased risk of strain, and, consequently, health problems  
15  
16 140 [17]. The DCS model, developed in the 1960s, appears to be more suitable for the physical aspects  
17  
18 141 of occupational stress, while the ERI model, designed for the tertiary society of the 1980s, is more  
19  
20 142 sensitive to stress arising from work relations and organizational factors [19].  
21

22  
23 143 Unfortunately, in literature there is no agreed definition of "distress", although there is some  
24  
25 144 consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a  
26  
27 145 vague definition, the prevalence of workers with distress in published studies can range from 5% to  
28  
29 146 50% [20-22]. When distress reaches clinical relevance it is defined as "stress-related disorder". This  
30  
31 147 term includes a variety of clinical conditions, which are collectively labeled as "common mental  
32  
33 148 disorders" (CMD) [23] and one of the most common diagnoses is depression [24]. However, a  
34  
35 149 systematic review of evidence on psychosocial factors at work and depression revealed a high  
36  
37 150 degree of study heterogeneity [25], although other studies found moderate evidence of a  
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39 151 relationship between the psychological demands of a job and the development of depression, with  
40  
41 152 relative risks of approximately 2.0 [26]. Distress and mental health problems caused by work can  
42  
43 153 affect the performance of professional activity, especially in a sensitive area such as law  
44  
45 154 enforcement. The consequences of stress on the mental health of police officers can thus be  
46  
47 155 particularly serious not only for the increased risk of individual health problems, and but also on  
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49 156 account of the increased risk of impaired work performance that could jeopardize the safety and  
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51 157 health of the general population. For instance, as reported by Violanti [27], depression can be a  
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53 158 contributing factor not only in early retirement, but also in police officer suicides, murder-suicides,  
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3 159 domestic violence, unnecessary violence and aggression while in service, that occurs over and  
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5 160 above the role played by police culture that might encourage aggressive and authoritarian attitudes.  
6

7 161 Sadly, investigating stress in police officers is particularly difficult because they are afraid  
8  
9 162 of being identified as individuals who have been compromised by stress. They fear that this might  
10  
11 163 then cause them to be discriminated against in their careers, removed from active duties and  
12  
13 164 relegated to office work. On the other hand, a study by Summerfield [15] found work stress to be  
14  
15 165 the first cause of sickness absence and a reduction in operational duties, as well as the leading  
16  
17 166 cause of ill health retirement in police officers. A number of studies have previously evaluated  
18  
19 167 occupational stress in policemen using the ERI and DCS models. Job strain and effort/reward  
20  
21 168 imbalance were associated with cardiovascular risk in policewomen [28], musculoskeletal disorders  
22  
23 169 in special police forces [29], lower mental health level in correctional [30] and urban police officers  
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25 170 [31] [58]. The DCS model proved to be a valid theoretical framework for explaining professional  
26  
27 171 efficiency and exhaustion [32] and the complex interplay between job demands, emotional  
28  
29 172 exhaustion and other social and individual factors[33]. Officers with greater perceived work stress  
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31 173 in the first year of police service showed more severe depression symptoms 12 months later [34].  
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36 174 The aim of this study was to investigate the association of a condition of "distress" with the  
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38 175 presence of self-reported symptoms of depression, anxiety and burnout, in a special force unit of the  
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40 176 Italian police while controlling for socio-demographical and occupational variables and personality  
41  
42 177 traits. Previous studies on this cohort have shown that younger officers, those who were single, had  
43  
44 178 a shorter length of service, lived in barracks, had a lower rank and who were closer to their families  
45  
46 179 had a higher short-term sickness absence risk [35] and that DCS control and support and ERI  
47  
48 180 reward measures were negatively related to frequency of absence and short-term absence and that  
49  
50 181 DCS demand and ERI effort measures were positively related to total lost days [36] Moreover, it  
51  
52 182 has been reported that the majority of these officers described themselves as much more  
53  
54 183 emotionally stable and slightly-to-moderately more extraverted, agreeable, conscientious and open  
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3 184 to experience than the general population and career soldiers [4] and that some personality traits  
4  
5 185 (mainly emotional stability and agreeableness) were associated to perceived stress levels or  
6  
7 186 reactivity to environmental stressors [37].  
8

9  
10 187 **Method**

11  
12 188 *Participants*

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14 189 Participants were the members of 'VI Reparto Mobile' of Genoa, a police special force unit called  
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16 190 on to maintain law and order in all the major public events that take place in Italy. These officers  
17  
18 191 work exclusively as First Responders; they are carefully selected from ordinary officers and receive  
19  
20 192 specific psychophysical and tactical training. Their routine work involves ensuring order during  
21  
22 193 sporting events, crowds and parades, natural and social emergencies, and they are also often  
23  
24 194 involved in public events in which there is a high risk of terrorist attacks and physical clashes.  
25  
26 195 During a single riot, they are on duty for an average of 10 or more hours of work, are engaged in  
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28 196 physical clashes for over an hour on average, and often feel that they are in imminent danger of  
29  
30 197 death. They have a special and on-going education which aims to improve team spirit ("esprit de  
31  
32 198 corps") and increase their preparation for dramatic events. The decision to hold the 2009 G8  
33  
34 199 meeting in Italy provided the opportunity for carrying out our present study. The police officers  
35  
36 200 selected to ensure law and order during this event were asked to undergo a thorough examination of  
37  
38 201 their mental health condition so that their conduct during the meeting could not be stigmatized.  
39  
40 202 The unit is composed of 294 members. Two officers refused to take part in the study and one was  
41  
42 203 unable to complete all the tests in the battery described in the next section and was therefore  
43  
44 204 excluded. The participation rate was 99%. Since only two officers were female, gender differences  
45  
46 205 could not be assessed and were therefore excluded from the analyses. The final group of  
47  
48 206 participants therefore comprised 289 officers (see Table 1 for descriptive statistics of the socio-  
49  
50 207 demographic variables).  
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Insert Table 1 about here

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3 209 *Materials*

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5 210 *Personality measure*

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7 211 *Big Five Questionnaire* (BFQ) [38, 39]. The BFQ is a self-report measure of the Big Five  
8  
9 212 personality traits: Energy (E, Extraversion), Friendliness (F, Agreeableness), Conscientiousness (C),  
10 213 Emotional Stability (S, the opposite of Neuroticism), and Openness (O). Each scale contains 24  
11 214 short phrases that eliminate some of the ambiguity that might arise when using single adjectives.  
12 215 Participants are asked to rate the degree to which each item adequately describes them on a 5-point  
13 216 Likert-type scale ranging from complete disagreement (1=absolutely false for me) to complete  
14 217 agreement (5=very true for me). Total raw scores, ranging for each variable from 24 to 120, were  
15 218 converted before analyses into standardized *T* scores ( $M=50$ ,  $SD=10$ ) using the Italian norms  
16 219 published in Caprara et al. [38]. In this study reliabilities (Cronbach's alphas) of the scales were  
17 220  $E=.69$ ,  $F=.80$ ,  $C=.82$ ,  $S=.88$ , and  $O=.77$ .

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23 221 *Stress measures*

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25 222 Occupational stress was assessed using the validated Italian versions [40] of two standardized  
26 223 questionnaires: the *Demand-Control-Support* (DCS) questionnaire, derived from the longer *Job*  
27 224 *Content Questionnaire* [16], and the *Effort-Reward Imbalance* (ERI) questionnaire [17]. DCS is a  
28 225 17-item self-report questionnaire that provides scores on three scales: *Psychological Job Demand*,  
29 226 (Demand, 5 items mapping quantitative aspects of work, such as time required to perform tasks, and  
30 227 conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping the  
31 228 use and development of skills and autonomy in making decisions about the work process) and  
32 229 *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and  
33 230 superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or  
34 231 agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were .71, .65  
35 232 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job  
36 233 Strain) was computed by dividing the mean item score of Demand by the mean item score of the

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2  
3 234 Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate  
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5 235 excessive perceived job strain [41]. ERI is a 23-item self-report questionnaire that assesses three  
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7 236 dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11  
8  
9 237 items mapping the occupational rewards that the worker expects to receive), and *Overcommitment*  
10  
11 238 (6 items mapping the intrinsic personal factors regarding occupational motivation and participation  
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13 239 that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity  
14  
15 240 scale. In this study, reliabilities of the scales were .82, .89 and .79, respectively. Along with scale  
16  
17 241 sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the  
18  
19 242 degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce  
20  
21 243 stress [42].  
22

#### 23 244 *Mental health measures*

24  
25 245 Depression was evaluated by the *Beck Depression Inventory* (BDI) [43], as this questionnaire  
26  
27 246 proved to be effective for depression screening [44, 45]. The BDI consists of 21 groups of 4  
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29 247 alternative self-evaluation statements used to assess the presence and severity of the affective,  
30  
31 248 cognitive, motivational, psychomotor, and vegetative components of depression, with higher scores  
32  
33 249 indicating more severe depression. If multiple responses are chosen under one item, the most  
34  
35 250 symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and can total  
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37 251 from 0 to 63. In this study, internal consistency was 0.81. The cut-off score commonly used in  
38  
39 252 clinical practice for depression screening is 10 [46]. The probability of suffering major depressive  
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41 253 disorder rapidly increases above this threshold, so a higher score of 14 [44] or 16 [45] is often  
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43 254 chosen in order to reduce the prevalence of false positive in populations consisting of patients  
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45 255 affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical  
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47 256 cut-off level of 10, as the subjects tested were young, active and highly selected.  
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49 257 Anxiety was assessed with the *State-Trait Anxiety Inventory–Trait* (STAI-T) [47] Italian version  
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51 258 [48]. The STAI-T is a 20-item self-report measure of anxiety proneness requiring participants to  
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3 259 rate their frequency of anxiety symptoms on a 4-point Likert-type scale. Nine items are reverse  
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5 260 scored. According to [48], the cut-off score used in clinical practice for anxiety screening is 40. In  
6  
7 261 this study the reliability of the scale was .74.

8  
9 262 The *Maslach Burnout Inventory* (MBI) [49] Italian version [50] is a 22-item self-report measure of  
10  
11 263 professional burnout. It provides scores on three facets of burnout: Professional Exhaustion (PE, 9  
12  
13 264 items mapping feelings of being emotionally overextended and exhausted by one's work),  
14  
15 265 Depersonalization (DP, 5 items mapping an unfeeling and impersonal response towards the  
16  
17 266 recipients of one's care) and Personal Accomplishment (PA, 8 items mapping feelings of  
18  
19 267 competence and successful achievement in one's work with people). Participants are asked to rate  
20  
21 268 the frequency of experiencing feelings related to each subscale using a 7-point, Likert-type scale.  
22  
23 269 According to Violante et al. [51], a burnout condition can be defined by scores higher than 23 on  
24  
25 270 PE, higher than 8 on DP and lower than 30 on PA. In this study reliabilities of the scales were  
26  
27 271 PE=.86, DP=.60 and PA=.80, respectively.

### 272 *Control Variables*

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

### 277 *Procedure*

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

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3 283 of stress that each officer had experienced during that period. Mental health was assessed in  
4  
5 284 September 2009.

6  
7 285 *Ethics*

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9 286 All participants were tested anonymously and confidentially during their routine psychophysical  
10  
11 287 assessment. Anonymity was achieved by identifying participants with an alphanumeric code,  
12  
13 288 double-blind. The study protocol was approved by the Ethics Committee of the Università Cattolica  
14  
15 289 del Sacro Cuore, Faculty of Medicine, the Institute of Occupational Medicine, responsible for co-  
16  
17 290 coordinating the study, and the National Police Management Board and the whole procedure  
18  
19 291 followed the Ethical Principles of Psychologists Code of Conduct (American Psychological  
20  
21 292 Association 2002).

22  
23 293 *Statistical analyses*

24  
25 294 The first research question we addressed was whether there was a relationship between the  
26  
27 295 individual level of work-related stress and mental health problems after controlling for socio-  
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29 296 demographical and personality variables. In order to do this we used hierarchical multiple linear  
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31 297 regression models in which BDI, STAI and MBI scores were specified as criteria. In Model 1, only  
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33 298 the control variables were specified as predictors. In Model 2, the BFQ personality scores were  
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35 299 entered in the regression model. In Model 3 and 4, scale scores from the DCS and from the ERI  
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37 300 questionnaires, respectively, were added as further predictors. In Model 5, control variables, BFQ  
38  
39 301 personality scores and DCS and ERI scores were specified as predictors. The degree of association  
40  
41 302 between variables was indexed by the regression coefficient computed on the standardized variables  
42  
43 303 ( $\beta$ ). The amount of variance of the depression score accounted for by the predictors (and the  
44  
45 304 goodness of fit of the regression model) was indexed by the adjusted  $R^2$ . Since age and length of  
46  
47 305 employment were highly correlated ( $r = .91$ ), only the latter was used as a predictor. In order to  
48  
49 306 minimize the potentially confounding effects of multicollinearity, we partialized the effects through  
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51 307 principal component analysis.  
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3 308 We then tested the risk of suffering from depression, anxiety and burnout for a police officer  
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5 309 in a state of distress. We used binary logistic regression, and caseness for each construct was  
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7 310 defined as a BDI score  $\geq 10$  for depression, a STAI score  $> 40$  for anxiety, MBI-PE  $> 23$  and MBI-  
8  
9 311 DP  $> 8$  and MBI-PA  $< 30$  for burnout. DCS-Job Strain, social isolation (DCS-Support score below  
10  
11 312 the median), isostrain (job strain plus social isolation, i.e. support below the median), Effort/Reward  
12  
13 313 imbalance (E/R ratio  $> 1$ ), and Over-Involvement in work (ERI-Overcommitment score above the  
14  
15 314 median) were used as predictors. The resulting values ("raw" or unadjusted) were subsequently  
16  
17 315 corrected by adding the socio-demographic variables to the equation. Odds ratios (OR) and their  
18  
19 316 95% confidence intervals (95%CI) were computed.

## 22 317 **Results**

23  
24 318 Mean scale scores are reported in Table 1. The mean levels of occupational stress scores were not  
25  
26 319 particularly high when compared with those of other groups of Italian workers [19]. The average  
27  
28 320 levels of depression, anxiety, emotional exhaustion and depersonalization scores were close to the  
29  
30 321 lower limits of the respective scales, while those of personal accomplishment were high. On the  
31  
32 322 basis of the Italian cut-off levels, only one case of possible anxiety and three cases of possible  
33  
34 323 burnout were observed. However, there were 21 (7.3%) likely cases of mild depression (BDI  $\geq 10$ )  
35  
36 324 and 7 (2.4%) likely cases of moderate depression (BDI  $\geq 16$ ). Given the negligible prevalence of  
37  
38 325 possible anxiety or burnout, we applied the logistic analysis exclusively to depression.

39  
40 326 Hierarchical multiple linear regression allowed us to test the extent to which the level of  
41  
42 327 mental health symptomatology can be predicted on the basis of socio-demographic, occupational,  
43  
44 328 personality and work-related stress data (Table 2).

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45 329 Insert Table 2 about here

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46 330 The association between depression and socio-demographic variables (Model 1) was weak  
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48 331 (Adjusted  $R^2 = .01$ ) and generally not significant, except for a positive association with length of  
49  
50 332 employment. When personality traits were entered into the model (Model 2), a significant increase

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3 333 in Adjusted  $R^2$  was observed, due to the significant negative effect of emotional stability. A further  
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5 334 significant increase in the proportion of variance of BDI score accounted for was observed also  
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7 335 when DCS and ERI scores were entered (Model 3, 4 and 5). DCS-Control, DCS-Support and ERI-  
8  
9 336 Reward showed a negative effect, whereas ERI-Effort and ERI-Reward showed a positive effect.

10  
11 337 The results of the logistic regression are shown in Table 3.

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12  
13  
14 338 Insert Table 3 about here

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15  
16 339 For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high  
17  
18 340 level of "demand" and low level of "control"), the risk of being depressed approximately doubled,  
19  
20 341 but not significantly, whereas the other categorical predictors were all statistically significant.  
21  
22 342 Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher  
23  
24 343 risk of depression than the others.

25  
26  
27 344 The results of regression analyses performed using anxiety as criterion are reported in Table  
28  
29 345 4.

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30  
31  
32 346 Insert Table 4 about here

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33  
34 347 Socio-demographical and occupational variables accounted for a negligible proportion of variance  
35  
36 348 of the anxiety score (Model 1), with living in barracks being the only significant predictor. Entering  
37  
38 349 personality traits as further predictors (Model 2) substantially improved the fit of the model, and  
39  
40 350 lower extraversion, agreeableness and emotional stability were associated with higher anxiety  
41  
42 351 levels. The inclusion of DCS and ERI scores as predictors (Models 3-5) further increased the  
43  
44 352 Adjusted  $R^2$ . Results suggested that lower support, higher effort and lower rewards predicted higher  
45  
46 353 anxiety.

47  
48  
49 354 Table 5 reports the results of the regression analyses carried on with MBI scores as criteria.

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50  
51  
52 355 Insert Table 5 about here

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3 356 MBI Professional Exhaustion scores were higher in agents (as opposed to supervisors/technical  
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5 357 staff) (Model 1) and in officers with lower emotional stability (Model 2), and were associated with  
6  
7 358 higher demand, higher effort, higher over-commitment and lower reward (Models 3-5).

8  
9  
10 359 Depersonalization scores were lower in officers with children (Model 1), in more agreeable and  
11  
12 360 emotionally stable officers (Model 2) and in officers with higher levels of control, support and  
13  
14 361 reward and lower levels of effort and over-commitment (Models 3-5). Personal Accomplishment  
15  
16 362 scores were not related to any socio-demographical and occupational variable (Model 1), but were  
17  
18 363 positively predicted by all personality traits (Model 2). Control was the only stress-related variable  
19  
20 364 to be significantly associated with this scale score.

## 21 22 23 365 **Discussion**

24  
25 366 This study investigated the association between a condition of job distress and the presence of self-  
26  
27 367 reported mental health symptom, in a special police force unit while controlling for socio-  
28  
29 368 demographical, occupational and personality variables. Results from multiple regression analyses  
30  
31 369 showed that socio-demographical and occupational variables accounted for a negligible proportion  
32  
33 370 of variance of mental health problems, although, consistently with a previous study on the same  
34  
35 371 cohort [35] higher length of employment, lower rank, being barracked and not having children were  
36  
37 372 significant predictors of higher symptomatology. Emotional stability was a significant predictor for  
38  
39 373 all the measures of mental health problems, which was expected given the large body of research  
40  
41 374 that has shown that this trait is associated with several mental disorders and physical health  
42  
43 375 problems, and that this is not an artifact of the overlapping of some symptoms with questionnaire  
44  
45 376 items [52]. Lower levels of agreeableness (e.g., hostility) and extraversion were associated with  
46  
47 377 higher anxiety and lower professional accomplishment, consistently with previous studies on the  
48  
49 378 predictive power of these traits for psychological health and occupational outcomes [53]. However,  
50  
51 379 the focus of this study was on the role of job stressors, and results showed that they can account for  
52  
53 380 a further and substantial amount of variance of mental health measures. All ERI scales and all DCS  
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3 381 scales except demand were significant predictors of depressive symptoms, and results from logistic  
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5 382 regression analyses revealed that a higher effort/reward imbalance was associated with an  
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7 383 approximately sevenfold increase in risk of depression. These results suggest that, consistently with  
8  
9 384 previous studies, also in the case of special force police officers, a lower autonomy in making  
10  
11 385 decisions, poorer relationships between coworkers and superiors, lower reward opportunities (or  
12  
13 386 higher imbalance between the effort spent to meet the demanding aspects of the work environment  
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15  
16 387 and the rewards), a more demanding work environment and a higher commitment can be associated  
17  
18 388 with higher the depressive symptomatology. A recent meta-analysis of studies on the association  
19  
20 389 between stress and mental disorders indicated that psychosocial problems in the workplace, reduced  
21  
22 390 control, job strain, low social support, and the discrepancy between effort and rewards predict the  
23  
24 391 onset of depression [54]. Another review of 14 longitudinal studies reported that lack of social  
25  
26 392 support enhanced depression [55]. The association we found between low reward and symptoms is  
27  
28 393 in agreement with that suggested by neurobiological studies on depression [56].  
29  
30

31  
32 394 Albeit to a lesser extent, the DCS and the ERI model showed a good ability to predict  
33  
34 395 anxiety. Differently from other studies that found that all the three components of the DCS were  
35  
36 396 significant predictors of anxiety [8], in this study only support, i.e., the quality of relationships  
37  
38 397 between coworkers and superiors, was significant, suggesting that this dimension might be play a  
39  
40 398 central role in the development of anxiety in special force police officers. Results for the ERI model  
41  
42 399 were also only partially consistent with the literature which found little predictive power of ERI  
43  
44 400 scales for anxiety [57], since in the cohort under study higher efforts needed to meet the demands of  
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46 401 the working environment and lower occupational rewards were associated with higher anxiety.  
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49 402 As for burnout, all ERI scales proved to be useful in predicting professional exhaustion and  
50  
51 403 depersonalization, since higher effort and over-commitment and lower reward were associated with  
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53 404 higher scores, whereas they did not account for a substantial amount of variance or personal  
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55 405 accomplishment. At least one DCS scale significantly predicted each burnout dimension (demand  
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3 406 predicted professional exhaustion, control and support predicted depersonalization, control  
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5 407 predicted personal accomplishment).

6  
7 408 Taken together, these results suggest that for special force police officers prediction models  
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9 409 that include both the DCS and the ERI scores can provide a substantially greater predictive power  
10  
11 410 for mental health symptoms than models that include only socio-demographical and occupational  
12  
13 411 variables and personality traits. These results are consistent with some of previous studies (e.g.,  
14  
15 412 [58], on engineers) but not with others (e.g., [57] on civil servants), possibly suggesting that the  
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17 413 effects of the dimensions of job distress on mental health might be the outcome of a complex  
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19 414 interaction among the peculiar features of each occupation and the psychological characteristics of  
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21 415 the workers, which necessarily self-select into occupations. In the very case of the officers assessed  
22  
23 416 in this study, poor relationships between coworkers and superiors, higher efforts spent and lower  
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25 417 rewards received are likely to elicit mental health problems, whereas the use and development of  
26  
27 418 skills and autonomy in making decisions about the work process and the intrinsic personal factors  
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29 419 regarding occupational motivation and participation may play a role for some specific problems.  
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31 420 These findings replicate the observations of Martins and Lopes [59] who reported that effort,  
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33 421 reward and over-commitment are associated with the presence of common mental disorders among  
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35 422 military personnel in peacetime, and those of Kingdom and Smith [60] who showed that ERI was  
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37 423 the most important predictor of depression among police officers in the UK Coast Guard. More  
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39 424 generally, our results are in agreement with a large body of literature on the relationship between  
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41 425 reward processing and depressive symptoms [61]. The DCS model captured some important  
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43 426 aspects, such as the lack of control over the organization of work and the lack of support from  
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45 427 colleagues or superiors. The role of lack of support from superiors and on the part of the  
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47 428 organization to which the worker belongs in the occurrence of depression has already been reported  
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49 429 by Berg et al. in the Norwegian police [62], and by Arial et al. [63] in a sample of Swiss police.  
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3 430 It might be argued that only seven per cent of police officers in our cohort reported a level of  
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5 431 depressive symptomatology higher than the risk threshold. In fact, such prevalence is lower than  
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7 432 that found by Fox et al. [64] in urban US police officers (9%), by Frühwald et al. [65] in Lower  
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9 433 Austria (9%), by Arial et al. [63] in Swiss police officers (11.9%), by Chen et al. [58] in Taiwanese  
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11 434 police officers (21.6%), and by Obidoa et al. [66] among US corrections officers (31%), and it is  
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13 435 comparable with that found in other working populations [24, 67]. Moreover, a nationwide study in  
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15 436 the Norwegian police service showed that the younger police officers reported lower levels of  
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17 437 depressive symptoms than the corresponding general population [62]. A recent comparison of  
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19 438 police and other employees found no indications that self-reported mental health disturbances are  
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21 439 more prevalent among police officers than among groups of employees that are not considered to be  
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23 440 high-risk groups [68]. Since our sample was composed of young and highly selected police officers,  
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25 441 whose emotional stability was higher than the general population [4], this result is not surprising.  
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27 442 However, this does not mean that the problem of depression in this special unit is negligible. It  
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29 443 must not be overlooked that depression represents a considerable cost for productivity both in terms  
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31 444 of absenteeism and presenteeism [69] and more importantly, given the highly sensitive tasks the  
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33 445 officers of this study have to accomplish, it increases the possibility of errors and the risk to the  
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35 446 health and safety of others. Police officers with depressive symptoms should therefore be given  
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37 447 timely and confidential assistance [70] and the causes of excessive occupational stress should be  
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39 448 promptly identified and removed or minimized.  
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45 449 The results reported in this study should be interpreted with caution. First, as all the  
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47 450 measures were self-reported questionnaires, and reporting bias and subjectivity may therefore have  
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49 451 distorted the observations. Depressed persons could be more likely to report psychosocial stress at  
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51 452 work, even if objectively their work environment is not at risk *per se*. Second, the fact that job  
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53 453 distress variables were measured before mental health symptoms supports prediction but not  
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55 454 necessarily a causal hypothesis, since mental health symptoms could have been present even *before*  
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3 455 or *during* the assessment of job distress. Specifically, we could not address the issue of whether the  
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5 456 observed reduction in experience of reward is an epiphenomenon of the presence of mental health  
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7 457 symptoms. Finally, because our sample corresponds to a specific police unit, and it is a relatively  
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9 458 small cohort, our results may not be generalizable to police officers with different occupational  
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11 459 exposure, nor to special forces in countries with different ethnic or cultural characteristics.  
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13 460 However, our study also has several important strengths. To our knowledge, this is the first study to  
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15 461 investigate associations of mental health problems with work stress in terms of both DCS and ERI  
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17 462 models in special force police officers while controlling for socio-demographical and occupational  
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19 463 variables and personality traits. Such a population has a high exposure to homogenous occupational  
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21 464 risks, while many studies include police officers engaged in investigative activities, control of the  
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23 465 territory, administrative and office activities and many other very different tasks. The participation  
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25 466 rate was very high (99%). Finally, since the measurements used in this study have been validated in  
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27 467 several other studies, our results are more comparable with other research findings.  
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32 468 Limitations notwithstanding, the present findings indicate that some aspects of psychosocial  
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34 469 environment at work, such as the imbalance between effort and reward, are associated with  
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36 470 depressive symptoms, anxiety and burnout in special force police officers. Although we could not  
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38 471 establish a causal relationship and these results need to be replicated in longitudinal studies, they  
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40 472 suggest that the dimensions of the DCS and ERI models can be useful in monitoring psychological  
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42 473 functioning of special force police officers.  
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3 1 Table 1. Socio-demographical and occupational characteristics, personality scores, occupational  
4 2 stress scores and mental health scores of the participants in this study (n=289)

<i>Variable</i>	<i>Statistics</i>
<i>Socio-demographical variables</i>	
Age, years ( <i>M±DS</i> )	35.4±7.5
Length of service, years ( <i>M±DS</i> )	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)
<i>Personality variables</i>	
BFQ-Energy/Extraversion ( <i>M±DS</i> )	52.9±8.3
BFQ-Friendliness/Agreeableness ( <i>M±DS</i> )	55.3±10.5
BFQ-Conscientiousness ( <i>M±DS</i> )	52.6±8.6
BFQ-Emotional Stability ( <i>M±DS</i> )	62.0±8.2
BFQ-Openness ( <i>M±DS</i> )	51.2±9.1
<i>Occupational stress variables</i>	
DCS-Demand ( <i>M±DS</i> ) (range 5-20)	13.4±2.02
DCS-Control ( <i>M±DS</i> ) (range 6-24)	13.3±2.7
DCS-Support ( <i>M±DS</i> ) (range 6-24)	18.6±2.9
DCS-Job Strain (Demand/Control ratio) ( <i>M±DS</i> )	1.31±0.41
ERI-Effort ( <i>M±DS</i> ) (range 6-30)	15.0±3.2
ERI-Reward ( <i>M±DS</i> ) (range 11-55)	42.3±6.2
ERI-Over-commitment ( <i>M±DS</i> ) (range 6-24)	6.9±1.9
ERI-Weighted Effort/Reward ratio( <i>M±DS</i> )	0.70±0.28
<i>Mental health variables</i>	
BDI ( <i>M±DS</i> ) (range 0-63)	3.3±4.2
STAI-T ( <i>M±DS</i> ) (range 20-50)	27.5±4.3
MBI-Emotional Exhaustion ( <i>M±DS</i> ) (range 9-36)	17.4±7.9
MBI-Depersonalization ( <i>M±DS</i> ) (range 5-35)	9.3±4.5
MBI-Personal Accomplishment ( <i>M±DS</i> ) (range 8-56)	42.7±9.8

3 Note: M=mean; SD=standard deviation; BFQ: Big Five Questionnaire<sup>38,39</sup>; DCS: Demand-Control-  
4 Support Questionnaire<sup>16,40</sup>; ERI: Effort-Reward Imbalance Questionnaire<sup>17,40</sup>; BDI: Beck  
5 Depression Inventory<sup>43,44</sup>; STAI-T: State-Trait Anxiety Inventory-Trait<sup>48,49</sup>; MBI: Maslach Burnout  
6 Inventory<sup>50,51</sup>  
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Table 2. Standardized regression coefficients ( $\beta$ s) 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
<i>Control variables</i>					
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
<i>Personality variables</i>					
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
<i>Occupational stress variables</i>					
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<sup>38,39</sup>; DCS: Demand-Control-Support Questionnaire<sup>16,40</sup>; ERI: Effort-Reward Imbalance Questionnaire<sup>17,40</sup>; BDI: Beck Depression Inventory<sup>43,44</sup>; STAI-T: State-Trait Anxiety Inventory-Trait<sup>48,49</sup>; MBI: Maslach Burnout Inventory<sup>50,51</sup>  
 $n = 289$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$ ;

19 Table 3. Odds ratios (ORs) for the association between risk of major depression (Beck Depression  
 20 Inventory score  $\geq 10$ ) and occupational stress indicators, unadjusted and adjusted<sup>^</sup>

<i>Occupational stress variable</i>	<i>Prevalence—cases n (%)</i>	<i>Unadjusted OR (95%CI)</i>	<i>Adjusted OR (95%CI)</i>
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 (Overcommitment score above the median)	37 (12.8)	3.06 (1.11-8.46)*	3.27 (1.01-10.63)*

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

24

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
<i>Control variables</i>					
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
<i>Personality variables</i>					
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
<i>Occupational stress variables</i>					
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 <sup>2</sup>	.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<sup>38,39</sup>; DCS: Demand-Control-Support Questionnaire<sup>16,40</sup>; ERI: Effort-Reward Imbalance Questionnaire<sup>17,40</sup>; BDI: Beck Depression Inventory<sup>43,44</sup>; STAI-T: State-Trait Anxiety Inventory-Trait<sup>48,49</sup>; MBI: Maslach Burnout Inventory<sup>50,51</sup>  
 $n = 289$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$ ;



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

<i>Predictor</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>
Professional Exhaustion					
<i>Control variables</i>					
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
<i>Personality variables</i>					
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
<i>Occupational stress variables</i>					
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					
<i>Control variables</i>					
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**
<i>Personality variables</i>					
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
<i>Occupational stress variables</i>					
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***

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### 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***
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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<sup>38,39</sup>; DCS: Demand-Control-Support Questionnaire<sup>16,40</sup>; ERI: Effort-Reward Imbalance Questionnaire<sup>17,40</sup>; BDI: Beck Depression Inventory<sup>43,44</sup>; STAI-T: State-Trait Anxiety Inventory-Trait<sup>48,49</sup>; MBI: Maslach Burnout Inventory<sup>50,51</sup>  
 $n = 289$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$ ;

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

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17 34  
18 35 **Author's contribution:** SG carried out medical examinations on workers, CC administered the  
19  
20 36 psychological tests and revised statistics, NM carried out the statistical analyses and drafted the  
21  
22 37 work, GC revised the work.  
23

24 38  
25 39 **Data sharing statement:** Technical appendix, statistical code, and dataset available from the  
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27 40 corresponding author at Dryad repository, who will provide a permanent, citable and open access  
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29 41 home for the dataset.  
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## 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 overcommitment were associated with higher levels of mental health symptoms.

Psychological screening revealed 21 (7.3%) likely cases of mild depression ( $BDI \geq 10$ ), ~~but no cases of possible anxiety or burnout.~~ ~~Lower reward significantly predicted higher depressive symptomatology, and police 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 2.32-26.824.76-10.30)~~ when compared with their counterparts who did not perceive themselves to be in a condition of distress.

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7 67 **Conclusions:** [The findings of this study suggest that self-reported work-related stress may play a](#)  
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9 68 [role in the development of mental health problems in police officers.](#) The prevalence of ~~depressive~~  
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11 69 [mental health](#) symptoms in the cohort ~~of police officers investigated here we observed~~ was low, but  
12  
13 70 not negligible [in the case of depression](#). Since special forces police officers have to perform  
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15 71 sensitive tasks for which a healthy psychological functioning is needed, the results of this study  
16  
17 72 suggest that steps should be taken to prevent distress and improve the mental well-being of these  
18  
19 73 workers.

20 74  
21  
22 75 **Keywords:** effort-reward imbalance, depression, distress, job strain, mental health, over-  
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24 76 commitment, police, social support, work-related stress.

#### 25 26 77 27 28 78 **Article summary**

##### 29 30 79 *'Article focus'*

31  
32 80 Mental health in special police forces is a critical issue. Police officers are exposed to acute and  
33  
34 81 chronic stress and may ~~become depressed~~ [develop mental health problems](#). The impairment of  
35  
36 82 police officers' psychological functioning can be a serious threat to the safety of the public.

##### 37 83 38 39 84 *'Key messages'*

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41 85 The prevalence of ~~depression~~ [mental health problems](#) in ~~special force~~ [special police forces](#) ~~officers~~  
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43 86 is lower than that of the general population and other groups of police ~~officers~~. ~~Although prevalence~~  
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45 87 ~~rates were low, a positive association between distress~~ [job distress](#) (or job stress) [measures](#) and  
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47 88 ~~depressive~~ [mental health](#) symptoms was found. The prevention of distress and the treatment of  
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49 89 ~~depressive~~ [mental health](#) disorders among police officers are necessary for the safety of the workers  
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51 90 themselves and the public.

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92 *'Strengths and limitations of this study'*

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

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7 123 | civilians [4-7], several ~~cross-sectional~~ studies have provided evidence that adverse work conditions  
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9 124 | are related to poor mental health outcomes (e.g., [8]). In addition to these operational work-related  
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11 125 | challenges, police officers may be exposed to organizational problems that are common within  
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13 126 | hierarchical, male-dominated paramilitary structures such as fire-fighting, ambulance and  
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15 127 | paramedic services [9-10]. ~~Paradoxically~~ Ironically, daily organizational stressors may be more  
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17 128 | challenging than operational experiences, as shown by a recent study in which reported levels of  
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19 129 | perceived stress in a group of police officers were higher during routine jobs than during a high-risk  
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21 130 | public event [11].

**Comment [SJD1]:** Inserirei la citazione del paper di Rademaker [66].

22 131 | Both a dramatic violent event and a repeated and prolonged series of administrative events can  
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24 132 | cause an allostatic load, i.e., a neurobiological maladaptive reaction due to being forced to adapt to  
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26 133 | challenging environments characterized by behavioral and emotional changes known as "distress"  
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28 134 | [12]. Through interaction with many different individual factors, distress can induce the occurrence  
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30 135 | of mental disorders such as anxiety, depression, burnout, conversion disorder and other conditions  
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32 136 | classified in DSM IV [13]. Psychological dysfunction resulting from job distress can be a gradual  
33  
34 137 | and progressive process that impairs well-being over time. This gradual evolution often leaves the  
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36 138 | worker unaware of the problem, or unwilling to acknowledge its importance, at least until the  
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38 139 | severity of the symptoms makes it clear to colleagues, family, or both. The recognition of emotional  
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40 140 | problems due to work-related distress is rarely, if ever, encouraged in the law enforcement sector,  
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42 141 | since it is considered a sign of weakness [14]. Consequently, police officers fail to seek professional  
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44 142 | help early enough to prevent diagnosis and quickly benefit from treatment. This is one of the main  
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46 143 | reasons for which mental disorders are the leading cause of retirement in the police force [15].

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49 145 | The two leading models that have been used to describe and explain individual perception of stress  
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51 146 | factors are the Demand/Control/Support (DCS) model, developed by Karasek [16], and the  
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53 147 | Effort/Reward Imbalance (ERI) model, developed by Siegrist [17]. The DCS model assumes that

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7 148 the primary sources of job stress, or "job strain", stem from two basic characteristics of the job  
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9 149 itself: "job demand" and "job control". The model predicts that job strain is not simply a function of  
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11 150 job demand, but also depends on the amount of control the worker has over the work. Job demand  
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13 151 takes into consideration the pace and intensity of work: work overload, degree of difficulty,  
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15 152 available time, time allotted to executing tasks and the existence of contradictory or conflicting  
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17 153 orders. Job decision latitude, or job control, refers to the worker's ability to control his own  
18 154 activities and skill usage. Social support at work, a moderating factor of job strain, was  
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20 155 subsequently included in the model. According to this model, high psychological demands in  
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22 156 conjunction with low decision latitude can contribute to the development of psychological  
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24 157 problems, and workers with high job strain and low social support at work are thought to be the  
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26 158 most vulnerable to negative health effects (the so-called "isolated strain", or "isostrain", hypothesis  
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28 159 [[Rugulies & Krause, Amick et al.](#)]).

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30 160 The ERI model puts emphasis more on the reward rather than the control structure of work,  
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32 161 suggesting that mental distress and its health correlates arise when a high degree of effort is not  
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34 162 adequately rewarded in the form of pay, esteem, status consistency or career opportunities. A  
35 163 further assumption of this model involves individual differences in the perception of effort-reward  
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37 164 imbalance: people with a motivational pattern of excessive work-related commitment and high need  
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39 165 for approval (over-commitment) are at increased risk of strain, and, consequently, health problems  
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41 166 [17]. The Karasek model (DCS), developed in the 1960s, appears to be more suitable for the  
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43 167 physical aspects of occupational stress, while Siegrist's model (ERI), designed for the tertiary  
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45 168 society of the 1980s, is more sensitive to stress arising from work relations and organizational  
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47 169 factors [18].

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49 170 Unfortunately, in literature there is no agreed definition of "distress", although there is some  
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51 171 consensus in considering it as an unfavorable and unpleasant response to stress. Due to such a  
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53 172 vague definition, the prevalence of workers with distress in published studies can range from 5% to

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7 173 50% [19-21]. When distress reaches clinical relevance it is defined as "stress-related disorder". This  
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9 174 term includes a variety of clinical conditions, which are collectively labeled as "common mental  
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11 175 disorders" (CMD) [22] and one of the most common diagnoses is depression [28]. However, a  
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13 176 systematic review of evidence on psychosocial factors at work and depression revealed a high  
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15 177 degree of study heterogeneity [23], although other studies found moderate evidence of a  
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17 178 relationship between the psychological demands of a job and the development of depression, with  
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19 179 relative risks of approximately 2.0 [24]. ~~The prevalence of CMDs in the US armed forces is 27%~~  
20 180 ~~[25], and a similar prevalence has been reported in the UK armed forces [26, 27].~~ Distress and  
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22 181 mental health problems caused by work can affect the performance of professional activity,  
23  
24 182 especially in a sensitive area such as law enforcement, ~~in which workers have weapons.~~ The  
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26 183 consequences of stress on the mental health of police officers can thus be particularly serious not  
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28 184 only for the increased risk of individual health problems, and but also on account of the increased  
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30 185 risk of impaired work performance that could jeopardize the safety and health of the general  
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32 186 population. For instance, One of the most common diagnoses is depression [28] and, as reported  
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34 187 by Violanti [29], depression can be a contributing factor not only in early retirement, but also in  
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36 188 police officer suicides, murder-suicides, domestic violence, unnecessary violence and aggression  
37 189 while in service, that occurs over and above the role played by police culture that might encourage  
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39 190 aggressive and authoritarian attitudes.

40  
41 191 Sadly, investigating stress in police officers is particularly difficult because they are afraid  
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43 192 of being identified as individuals who have been compromised by stress. They fear that this might  
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45 193 then cause them to be discriminated against in their careers, removed from active duties and  
46  
47 194 relegated to office work. On the other hand, a study by Summerfield [15] found work stress to be  
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49 195 the first cause of sickness absence and a reduction in operational duties, as well as the leading  
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51 196 cause of ill health retirement in police officers. A number of studies have previously evaluated  
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53 197 occupational stress in policemen using the DCSERI and ERIDCS models. Job strain and

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7 198 effort/reward imbalance were associated with cardiovascular risk in policewomen [55],  
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9 199 musculoskeletal disorders in special police forces [56], lower mental health level in correctional  
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11 200 [57] and urban police officers [58]. The DCS model proved to be a valid theoretical framework for  
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13 201 explaining professional efficiency and exhaustion [59] and the complex interplay between job  
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15 202 demands, emotional exhaustion and other social and individual factors [60]. Officers with greater  
16  
17 203 perceived work stress in the first year of police service showed more severe depression symptoms  
18  
19 204 12 months later [61].

20 205 The aim of this study was to investigate, ~~apparently for the first time,~~ the association of a  
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22 206 condition of "distress" with the presence of self-reported symptoms of depression, anxiety and  
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24 207 burnout and of other common work related mental problems such as anxiety and burnout, in a  
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26 208 special force unit of the Italian police while controlling for socio-demographical and occupational  
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28 209 variables and personality traits. Previous studies on this cohort have shown that younger officers,  
29  
30 210 those who were single, had a shorter length of service, lived in barracks, had a lower rank and who  
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32 211 were closer to their families had a higher short-term sickness absence risk [30]. ~~Evaluation of~~  
33  
34 212 ~~Operational Stress in Riot and Crowd Control Police Units]~~ and that DCS control and support and  
35  
36 213 ERI reward measures were negatively related to frequency of absence and short-term absence and  
37 214 that DCS demand and ERI effort measures were positively related to total lost days [31]. ~~Is Absence~~  
38  
39 215 ~~Related to Work Stress?].~~ Moreover, it has been reported that the majority of these officers  
40  
41 216 described themselves as much more emotionally stable and slightly-to-moderately more  
42  
43 217 extraverted, agreeable, conscientious and open to experience than the general population and career  
44  
45 218 soldiers [4]. ~~Personality profiles of SF police officers]~~ and that some personality traits (mainly  
46  
47 219 emotional stability and agreeableness) were associated to perceived stress levels or reactivity to  
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49 220 environmental stressors [32]. ~~Personality traits of the Five Factor Model are associated with work~~  
50  
51 221 related stress].

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7 222 —the 'VI Reparto Mobile' of Genoa—called on to maintain law and order in all the major  
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9 223 public events that take place in Italy. The police officers in this group work exclusively as First  
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11 224 Responders; they are carefully selected among from ordinary officers and receive specific  
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13 225 psychophysical and tactical training. Their routine work involves ensuring order during sporting  
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15 226 events, crowds and parades, natural and social emergencies, and they are also often involved in  
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17 227 public events in which there is a high risk of terrorist attacks and physical clashes. During a single  
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19 228 riot, they are on duty for an average of 10 or more hours of work, are engaged in physical clashes  
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21 229 for over an hour on average, and often feel that they are in imminent danger of death. They have a  
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23 230 special and on-going education which aims to improve team spirit ("esprit de corps") and increase  
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25 231 their preparation for dramatic events. The decision to hold the 2009 G8 meeting in Italy provided  
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27 232 the opportunity for carrying out our present study. The police officers selected to ensure law and  
28  
29 233 order during this event were asked to undergo a thorough examination of their mental health  
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31 234 condition so that their conduct during the meeting could not be stigmatized.  
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33 235  
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## 35 237 Method

### 37 238 *Participants*

39 239 *Participants were the members of 'VI Reparto Mobile' of Genoa, a police special force unit called*  
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41 240 *on to maintain law and order in all the major public events that take place in Italy. These officers*  
42  
43 241 *work exclusively as First Responders; they are carefully selected from ordinary officers and receive*  
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45 242 *specific psychophysical and tactical training. Their routine work involves ensuring order during*  
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47 243 *sporting events, crowds and parades, natural and social emergencies, and they are also often*  
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49 244 *involved in public events in which there is a high risk of terrorist attacks and physical clashes.*  
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7 247 During a single riot, they are on duty for an average of 10 or more hours of work, are engaged in  
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9 248 physical clashes for over an hour on average, and often feel that they are in imminent danger of  
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11 249 death. They have a special and on-going education which aims to improve team spirit ("esprit de  
12  
13 250 corps") and increase their preparation for dramatic events. The decision to hold the 2009 G8  
14  
15 251 meeting in Italy provided the opportunity for carrying out our present study. The police officers  
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17 252 selected to ensure law and order during this event were asked to undergo a thorough examination of  
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19 253 their mental health condition so that their conduct during the meeting could not be stigmatized. This  
20  
21 254 study refers to the initial phase of a study that began on the eve of the G8 meeting in 2009  
22  
23 255 :-The Italian special police force unit 'VI Reparto Mobile' of Genoa unit is composed of 294  
24  
25 256 members. Two officers refused to take part in the study and one was unable to complete all the tests  
26  
27 257 in the battery described in the next section and was therefore excluded. The participation rate was  
28  
29 258 99%. Since only two officers were female, gender differences could not be assessed and were  
30  
31 259 therefore excluded from the analyses. The final group of participants therefore comprised 289  
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33 260 officers (see Table 1 for descriptive statistics of the socio-demographic variables).

---

34 261 Insert Table 1 about here

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35 262 Occupational stress was measured on three separate occasions: (i) in January 2009, when officers  
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37 263 were engaged only in routine work; (ii) in April 2009, when they underwent specific training in  
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39 264 preparation for the meeting, and (iii) in July 2009, shortly before the Genoa G8 summit meeting  
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41 265 took place. Following the procedure already adopted in previous work [30-32], we averaged the  
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43 266 three measurements into a single value, to obtain the level of stress that each officer had  
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45 267 experienced during that period.

#### 48 269 Materials:

##### 49 270 Personality measure

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7 271 Big Five Questionnaire (BFQ, Caprara et al.1993a, b). The BFQ is a self-report measure of the Big  
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9 272 Five personality traits: Energy (E, Extraversion), Friendliness (F, Agreeableness),  
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11 273 Conscientiousness (C), Emotional Stability (S, the opposite of Neuroticism), and Openness (O).  
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13 274 Each scale contains 24 short phrases that eliminate some of the ambiguity that might arise when  
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15 275 using single adjectives. Participants are asked to rate the degree to which each item adequately  
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17 276 describes them on a 5-point Likert-type scale ranging from complete disagreement (1=absolutely  
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19 277 false for me) to complete agreement (5=very true for me). Total raw scores, ranging for each  
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21 278 variable from 24 to 120, were converted before analyses into standardized *T* scores ( $M=50$ ,  $SD=10$ )  
22  
23 279 using the Italian norms published in Caprara et al. (1993a). In this study reliabilities (Cronbach's  
24  
25 280 alphas) of the scales were  $E=.69$ ,  $F=.80$ ,  $C=.82$ ,  $S=.88$ , and  $O=.77$ .

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### 26 281 Stress measurement

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28 282 Occupational stress was assessed using the validated Italian versions [33] of two standardized  
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30 283 questionnaires: the *Demand-Control-Support* (DCS) questionnaire, derived from the longer *Job*  
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32 284 *Content Questionnaire* [16], and the *Effort-Reward Imbalance* (ERI) questionnaire [17]. DCS is a  
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34 285 17-item self-report questionnaire that provides scores on three scales: *Psychological Job Demand*,  
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36 286 (Demand, 5 items mapping quantitative aspects of work, such as time required to perform tasks, and  
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38 287 conflict among different demands), *Job Control/Decision Latitude* (Control, 6 items mapping the  
39  
40 288 use and development of skills and autonomy in making decisions about the work process) and  
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42 289 *Workplace Social Support* (Support, 6 items mapping relationships between coworkers and  
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44 290 superiors). Participants are asked to rate each item on a 4-point frequency (Demand and Control) or  
45  
46 291 agreement (Support) scale. In this study reliabilities (Cronbach's alphas) of the scales were .71, .65  
47  
48 292 and .84, respectively. Along with scale sum scores, a further index, "perceived job strain" (DCS-Job  
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50 293 Strain) was computed by dividing the mean item score of Demand by the mean item score of the  
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52 294 Control scale. A ratio of 1 indicates a balance between demand and control; values >1 indicate  
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54 295 excessive perceived job strain [34]. ERI is a 23-item self-report questionnaire that assesses three

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7 296 dimensions: *Effort* (6 items mapping the demanding aspects of the work environment), *Reward* (11  
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9 297 items mapping the occupational rewards that the worker expects to receive), and *Overcommitment*  
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11 298 (6 items mapping the intrinsic personal factors regarding occupational motivation and participation  
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13 299 that enhance the effects of stress). Participants are asked to rate each item on a 5-point intensity  
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15 300 scale. In this study, reliabilities of the scales were .82, .89 and .79, respectively. Along with scale  
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17 301 sum scores, the weighted ratio between effort and reward (E/R Ratio) was computed to quantify the  
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19 302 degree of mismatch between effort and reward. Values >1 reflect an imbalance that can induce  
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21 303 stress [35].  
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#### 24 305 *Materials. Mental health measurement*

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26 306  
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28 307 Mental health status was assessed after the third occasion using the following measures. Depression  
29  
30 308 was evaluated by the *Beck Depression Inventory* (BDI) [36], as this questionnaire **performed better**  
31  
32 309 **than other tests proved to be effective** for depression screening [37, 38]. The BDI consists of 21  
33  
34 310 groups of 4 alternative self-evaluation statements used to assess the presence and severity of the  
35  
36 311 affective, cognitive, motivational, psychomotor, and vegetative components of depression, with  
37  
38 312 higher scores indicating more severe depression. If multiple responses are chosen under one item,  
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40 313 the most symptomatic item is scored. Statement choices are scored from 0 (absent) to 3 (severe) and  
41  
42 314 can total from 0 to 63. In this study, internal consistency was 0.81. The cut-off score commonly  
43  
44 315 used in clinical practice for depression screening is 10 [39]. The probability of suffering major  
45  
46 316 depressive disorder rapidly increases above this threshold, so a higher score of 14 [37] or 16 [38] is  
47  
48 317 often chosen in order to reduce the prevalence of false positive in populations consisting of patients  
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50 318 affected by chronic diseases with poor or severe prognosis. In this study, we adopted the classical  
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52 319 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.

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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.

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[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.

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### 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 \(no/yes\).](#)

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### 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 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-demographic and personality variables](#). In order to do this we used hierarchical multiple linear

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7 370 regression models in which BDI, [STAI and MBI](#) scores ~~were~~ specified as criteria~~on~~. In Model 1,  
8  
9 371 only the control variables were specified as predictors. [In Model 2, the BFQ personality scores were](#)  
10  
11 372 [entered in the regression model](#). In Model [32](#) and [43](#), scale scores from the DCS and from the ERI  
12  
13 373 questionnaires, respectively, were ~~entered in the regression model~~ [added as further predictors](#). In  
14  
15 374 Model [54](#), control variables, [BFQ personality scores](#) -and DCS and ERI scores were specified as  
16  
17 375 predictors. The degree of association between variables was indexed by the regression coefficient  
18  
19 376 computed on the standardized variables ( $\beta$ ). The amount of variance of the depression score  
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21 377 accounted for by the predictors (and the goodness of fit of the regression model) was indexed by the  
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23 378 adjusted  $R^2$ . Since age and length of employment were highly correlated ( $r = .91$ ), only the latter  
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25 379 was used as a predictor. In order to minimize the potentially confounding effects of  
26  
27 380 multicollinearity, we partialized the effects through principal component analysis. [Multiple linear](#)  
28  
29 381 [regression analysis was also used to study the correlation between occupational stress variables and](#)  
30  
31 382 [anxiety or burnout](#).

31  
32 383 We then tested the risk of suffering from depression, [anxiety and burnout](#) for a police officer  
33  
34 384 in a state of distress. We used binary logistic regression, [and caseness for each construct was](#)  
35  
36 385 [defined as a BDI score  \$\geq 10\$  for depression, a STAI score  \$> 40\$  for anxiety, MBI-PE  \$> 23\$  and MBI-](#)  
37  
38 386 [DP  \$> 8\$  and MBI-PA  \$< 30\$  for burnout, with caseness for depression \(i.e., BDI score  \$\geq 10\$ \) as](#)  
39  
40 387 ~~riterion and~~ DCS-Job Strain, social isolation (DCS-Support score below the median), isostrain (job  
41  
42 388 strain plus social isolation, i.e. support below the median), Effort/Reward imbalance (E/R ratio  $> 1$ ),  
43  
44 389 and Over-Involvement in work (ERI-Overcommitment score above the median) [were used as](#)  
45  
46 390 predictors. The resulting values ("raw" or unadjusted) were subsequently corrected by adding the  
47  
48 391 socio-demographic variables to the equation. Odds ratios (OR) and their 95% confidence intervals  
49  
50 392 (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 [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 cases~~ of possible anxiety ~~or and three cases of possible~~ burnout were observed. However, there were 21 (7.3%) likely cases of mild depression (BDI  $\geq$  10) and 7 (2.4%) likely cases of moderate depression (BDI  $\geq$  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~~

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7 420 significantly and negatively associated with BDI scores. When DCS scores were replaced by ERI  
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9 421 scores (Model 3), the Adjusted  $R^2$  significantly increased (.16) and the negative regression  
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11 422 coefficient of ERI Reward was the only significant effect, together with that of length of  
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13 423 employment. In Model 4, which included all control and occupational stress variables, Adjusted  $R^2$   
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15 424 was not significantly higher than Model 3, and the only significant predictors were length of  
16  
17 425 employment and the ERI Reward score.

18 426 The results of the logistic regression are shown in Table 3.

---

20 427 Insert Table 3 about here

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22 428 For officers in a state of "distress" according to the DCS model (i.e. those with a simultaneous high  
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24 429 level of "demand" and low level of "control"), the risk of being depressed approximately doubled,  
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26 430 but not significantly, whereas the other categorical predictors were all statistically significant.  
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28 431 Notably, officers with an ERI-Effort/Reward ratio higher than 1 had an approximately 7-fold higher  
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30 432 risk of depression than the others.

31  
32 433 The results of regression analyses performed using anxiety and MBI scores as criteria are  
33  
34 434 reported in Tables 4a-d that are added as supplementary files.

---

36 435 Insert Table 4 about here

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38 436 Socio-demographical and occupational variables accounted for a negligible proportion of variance  
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40 437 of the anxiety score (Model 1), with living in barracks being the only significant predictor. Entering  
41  
42 438 personality traits as further predictors (Model 2) substantially improved the fit of the model, and  
43  
44 439 lower extraversion, agreeableness and emotional stability were associated with higher anxiety  
45  
46 440 levels. The inclusion of DCS and ERI scores as predictors (Models 3-5) further increased the  
47  
48 441 Adjusted  $R^2$ . and  $F$  Results suggested that lower support, higher effort and lower rewards predicted  
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50 442 higher anxiety.

51 443 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](#)

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~~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 over 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.~~

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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7 487 ~~making decisions, poorer relationships between coworkers and superiors, the lower~~ reward  
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9 488 opportunities (~~or the higher the~~ imbalance between the effort spent to meet the demanding aspects  
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11 489 of the work environment and the rewards ~~(money, esteem and career opportunities, job security~~  
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13 490 ~~included), a more demanding work environment and a higher commitment can be associated with~~  
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15 491 ~~the higher the depressive symptomatology. Studies based on the DCS model indicate that job strain~~  
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17 492 ~~is associated with depression [23].~~ A recent meta-analysis of studies on the association between  
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19 493 stress and mental disorders indicated that psychosocial problems in the workplace, reduced control,  
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21 494 job strain, low social support, and the discrepancy between effort and rewards predict the onset of  
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23 495 depression [44]. Another review of 14 longitudinal studies reported that lack of social support  
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25 496 enhanced depression [45]. The association we found between low reward and symptoms is in  
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27 497 agreement with that suggested by neurobiological studies on depression [46]. ~~However, we could~~  
28  
29 498 ~~not replicate the finding that a joint use of the DCS and the ERI models provides greater predictive~~  
30  
31 499 ~~power for depressive disorders than models that include only one of them [47]. In this study, only~~  
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33 500 ~~the ERI model proved to be useful in predicting depression scores of police officers. Lack of~~  
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35 501 ~~rewards and excessive over commitment significantly increased depression scores and the~~  
36  
37 502 ~~probability of disease, respectively. This result replicates the observations of Martins and Lopes~~  
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39 503 ~~[48] who argued that effort, reward and over commitment are associated with the presence of~~  
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41 504 ~~common mental disorders among military personnel in peacetime, and those of Kingdom and Smith~~  
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43 505 ~~[49] who showed that ERI was the most important predictor of depression among police officers in~~  
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45 506 ~~the UK Coast Guard. More generally, our results are in agreement with a large body of literature on~~  
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47 507 ~~the relationship between reward processing and depressive symptoms [46]. To a lesser extent, the~~  
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49 508 ~~DCS model captured some important aspects, such as the lack of control over the organization of~~  
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51 509 ~~work and the lack of support from colleagues or superiors. The role of lack of support from~~  
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53 510 ~~superiors and on the part of the organization to which the worker belongs in the occurrence of~~  
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55 511 ~~depression has already been reported by Berg et al. in the Norwegian police [50], and by Arial et al.~~

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7 512 [51] in a sample of Swiss police. Overall, both models appear to be useful for diagnosing a situation  
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9 513 of suffering which could result in disease.

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11 514 Although not the main focus of this study, the Albeit to a lesser extent, the DCS and the ERI  
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13 515 model also showed a good ability to predict anxiety. Differently form other studies that found that  
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15 516 all the three components of the DCS were significant predictors of anxiety [e.g., 8], in this study  
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17 517 only support, i.e., the quality of relationships between coworkers and superiors, was significant,  
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19 518 suggesting that this dimension might be play a central role in the development of anxiety in special  
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21 519 force police officers. Results for the ERI model were also only partially consistent with the  
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23 520 literature which found little predictive power of ERI scales for anxiety [e.g., 52], since in the cohort  
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25 521 under study higher efforts needed to meet the demands of the working environment and lower  
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27 522 occupational rewards were associated with higher anxiety.

28 523 As for burnout, all ERI scales proved to be useful in predicting professional exhaustion and  
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30 524 depersonalization, since higher effort and over-commitment and lower reward were associated with  
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32 525 higher scores, whereas they did not account for a substantial amount of variance or personal  
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34 526 accomplishment. At least one DCS scale significantly predicted each burnout dimension (demand  
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36 527 predicted professional exhaustion, control and support predicted depersonalization, control  
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38 528 predicted personal accomplishment).

39 529 Taken together, these results suggest that for special force police officers prediction models  
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41 530 that include both the DCS and the ERI scores can provide a substantially greater predictive power  
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43 531 for mental health symptoms than models that include only socio-demographical and occupational  
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45 532 variables and personality traits. These results are consistent with some of previous studies (e.g.,  
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47 533 [47], on engineers) but not with others (e.g., [52] on civil servants), possibly suggesting that the  
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49 534 effects of the dimensions of job distress on mental health might be the outcome of a complex  
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51 535 interaction among the peculiar features of each occupation and the psychological characteristics of  
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53 536 the workers, which necessarily self-select into occupations. In the very case of the officers assessed

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7 537 [in this study, poor relationships between coworkers and superiors, higher efforts spent and lower](#)  
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9 538 [rewards received are likely to elicit mental health problems, whereas the use and development of](#)  
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11 539 [skills and autonomy in making decisions about the work process and the intrinsic personal factors](#)  
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13 540 [regarding occupational motivation and participation may play a role for some specific problems.](#)  
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15 541 [These findings replicate the observations of Martins and Lopes \[48\] who reported that effort,](#)  
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17 542 [reward and over-commitment are associated with the presence of common mental disorders among](#)  
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19 543 [military personnel in peacetime, and those of Kingdom and Smith \[49\] who showed that ERI was](#)  
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21 544 [the most important predictor of depression among police officers in the UK Coast Guard. More](#)  
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23 545 [generally, our results are in agreement with a large body of literature on the relationship between](#)  
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25 546 [reward processing and depressive symptoms \[46\]. The DCS model captured some important](#)  
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27 547 [aspects, such as the lack of control over the organization of work and the lack of support from](#)  
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29 548 [colleagues or superiors. The role of lack of support from superiors and on the part of the](#)  
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31 549 [organization to which the worker belongs in the occurrence of depression has already been reported](#)  
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33 550 [by Berg et al. in the Norwegian police \[50\], and by Arial et al. \[51\] in a sample of Swiss police,](#)  
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35 551 [and two of the three core dimensions of burnout \(i.e. emotional exhaustion and depersonalization\),](#)  
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37 552 [consistent with previous studies \[52, 53\], whereas the DCS Control score was significantly](#)  
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39 553 [associated with personal accomplishment. Some background variables also showed a significant](#)  
40  
41 554 [association with measures of mental health. Higher length of employment \(which overlaps age\) was](#)  
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43 555 [associated with higher depressive symptomatology, anxiety, professional exhaustion and](#)  
44  
45 556 [depersonalization; being barracked was associated with higher anxiety and lower personal](#)  
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47 557 [accomplishment; being an operational policeman was associated with higher professional](#)  
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49 558 [exhaustion; having children was associated with lower depersonalization. These results are in line](#)  
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51 559 [with previous studies on members of the armed forces \[54\].](#)

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53 561 [Sadly, investigating stress in police officers is particularly difficult because they are afraid](#)  
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51 560 [Sadly, investigating stress in police officers is particularly difficult because they are afraid](#)  
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53 561 [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, it~~ must not be overlooked that depression represents a

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7 587 considerable cost for productivity both in terms of absenteeism and presenteeism [67] and more  
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9 588 importantly, given the highly sensitive tasks the officers of this study have to accomplish, it  
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11 589 increases the possibility of errors and the risk to the health and safety of others. Police officers with  
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13 590 depressive symptoms should therefore be given timely and confidential assistance ([e.g.](#)  
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15 591 [\[XXBerking\]](#)) and the causes of excessive occupational stress should be promptly identified and  
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17 592 removed or minimized.

18 593 The results reported in this study should be interpreted with caution. [First,](#) as all the  
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20 594 measures were self-reported questionnaires, and reporting bias and subjectivity may therefore have  
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22 595 distorted the observations. Depressed persons could be more likely to report psychosocial stress at  
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24 596 work, even if objectively their work environment is not at risk *per se*. [Second, the fact that job](#)  
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26 597 [distress variables were measured before mental health symptoms supports prediction but not](#)  
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28 598 [necessarily a causal hypothesis, since mental health symptoms could have been present even \*before\*](#)  
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30 599 [or \*during\* the assessment of job distress.](#) ~~The cross-sectional nature of the research does not allow us~~  
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32 600 ~~to infer the direction of the observed phenomena, and thus separate cause from effect.~~ Specifically,  
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34 601 we could not address the issue of whether the observed reduction in experience of reward is an  
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36 602 epiphenomenon of the presence of ~~depressive-mental health~~ symptoms. Finally, because our sample  
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38 603 corresponds to a specific police unit, and it is a relatively small cohort, our results may not be  
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40 604 generalizable to police officers with different occupational exposure, nor to special forces in  
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42 605 countries with different ethnic or cultural characteristics. However, our study also has several  
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44 606 important strengths. To our knowledge, this is the first study to investigate associations of  
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46 607 ~~depression-mental health problems~~ with work stress in terms of both DCS and ERI models in  
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48 608 special force police officers [while controlling for socio-demographical and occupational variables](#)  
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50 609 [and personality traits](#). Such a population has a high exposure to homogenous occupational risks,  
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52 610 while many studies include [police officers engaged in investigative activities, control of the](#)  
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54 611 [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
<b>Introduction</b>			
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
<b>Methods</b>			
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
<b>Results</b>			

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
<b>Discussion</b>			
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
<b>Other information</b>			
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](http://www.strobe-statement.org).