Psychophysiological Correlates of Organizational Change and Threat of Unemployment Among Police Inspectors

GIORGIO GROSSI[1]
TÖRES THEORELL[2]
MART JÜRISOO[3]
SVEN SETTERLIND[4]
[1]*Department of Biological Psychology, University of Stockholm*
Department of Public Health Sciences, Karolinska Institute
[2]*National Institute for Psychosocial Factors and Health, Stockholm, Sweden*
[3]*Jürisoo Consulting AB, Stockholm, Sweden*
[4]*Department of Pedagogy, University of Gothenburg, Sweden*

Abstract—The study examined psychosocial work-conditions and physiological reactions among thirty-six police inspectors (median age 45 years, 81% males) who participated in a reorganization. At this time, subjects were threatened by unemployment and had to re-apply for their positions in a new police district. Data were collected during the reorganization and at three years follow-up, by means of questionnaires (Stress Profile) and blood samples. The blood samples were used to determine serum levels of gamma-glutamyltransferase (GGT), glucose, lipids, prolactin, testosterone and cortisol. The results show a positive association between *worry about employment* and symptoms of *burnout* during the reorganization. Mean scores for the Stress Profile sub-scales *worry about employment* ($p<.01$) and *work-load* ($p<.05$) decreased between measurements, but an impairment in *relationships with management* was noticed ($p<.05$). No significant changes were observed in terms of self-rated health complaints. Significant decreases in total cholesterol ($p<.0001$), LDL-cholesterol ($p<.0001$), LDL/HDL-ratio ($p<.01$), prolactin ($p<.0001$), as well as increases in testosterone ($p<.01$) and cortisol ($p<.001$) were observed for the whole sample. Glucose decreased with marginal significance (<.07). Controlling for age and gender, multivariate regression analyses showed that subjects who reported deteriorations in *satisfaction with work* manifested the most modest decreases in prolactin ($p<.05$). Also, the decrease in glucose was larger for subjects who experienced impairments in *satisfaction with work* ($p<.05$), *information* ($p<.05$), *task-oriented leadership,* ($p<.05$), and *respect and dignity* ($p<.05$). Subjects who perceived deteriorations in the *ethical and moral standards of* the organization increased their cortisol level to a lower degree than their counterparts ($p<.05$). Favorable changes in employment status and psychosocial work environment seem to be related to improved physiological functioning.

WORK SITUATIONS CHARACTERIZED BY high demands and low degree of control are known to elicit a state of distressful psychophysiological arousal that may lead to negative health consequences. In order to cope with such situations, the organism responds with enhanced activity within the locus coeruleus-sympathetic-adreno-medullary axis (SAM) that in-

Address for correspondence: Dr. Giorgio Grossi: Department of Biological Psychology, University of Stockholm, Frescati Hagväg 14, 10691 Stockholm, Sweden.

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creases immune, cardiovascular, and metabolic activity. Increased NK-cell count and cytotoxicity, increased heart rate and blood pressure, increased levels of low density cholesterol, triglycerides, and free fatty acids together with increased levels of blood glucose are among the physiologic concomitants of these stressful situations (Lundberg and Frankenhaeuser, 1980; Frankenhaeuser, 1980, 1981, 1986; Stoney et al., 1988; Karasek and Theorell, 1990; Chrousos et al., 1992; Theorell and Karasek, 1996). A large part of these physiological changes are facilitated by increased levels of circulating catecholamines (Frankenhaeuser, 1980, 1986). Negative stress reactions may also be elicited by forced passivity, e.g., lack of control and low demands (Lundberg and Frankenhaeuser, 1980; Karasek and Theorell 1990). Such situations, which may be described as passive, have primarily been associated with increased hypothalamic-pituitary-adrenocortical (HPA) activity. The secretion of the glucocorticoid cortisol is the culminating event in the hormonal cascade which is initiated by the hypothalamic release of corticotrophin releasing factor (CRF) to the pituitary, which in turn responds by releasing ACTH into the bloodstream. ACTH stimulates the zona fasciculata of the adrenal cortex to release cortisol, which acts to suppress immune and enhance metabolic defence reactions. In the long-term, elevated cortisol levels may contribute to hypertension, hyperlipidaemia, lowered immuno-surveillance, and neuronal death (Yehuda et al., 1991; Uno et al., 1994; Whitworth et al., 1995; Cohen et al., 1995; Cacioppo, 1996). HPA-activity may be suppressed by increased levels of the pituitary hormone prolactin (Drago et al., 1986), which is believed to mirror a passive coping style in humans as well as animals (Drago et al., 1989; Theorell, 1992). Testosterone levels decrease in response to psychosocial stress, such as low decision latitude at work (Theorell et al., 1990). Psychosocial interventions aimed at increased control in the work setting have been associated to increases in testosterone (Theorell et al., 1995) and decreases in prolactin (Lökk et al., 1991; Lökk and Arnetz, 1997; Arnetz and Wiholm, 1997).

Threat of unemployment is a situation marked by low control and has been related to psychophysiological stress reactions, e.g., elevated levels of serum cholesterol (Mattiasson et al., 1990) and elevated levels of cortisol (Brenner et al., 1988). In Sweden, reorganizations involving threat of unemployment have become increasingly common during the past decade and are experienced by many individuals. The psychophysiological reactions of subjects exposed to such stressors are however poorly documented. Therefore, this was the aim of the present study that was conducted among police inspectors exposed to a reorganization, threatened by unemployment, and forced to re-apply for their positions in a new organization. It was hypothesized that threat of unemployment would be positively associated with psychological and somatic complaints. It was further hypothesized that threat of unemployment would be positively related to serum levels of glucose, total cholesterol, LDL-cholesterol, LDL/HDL-ratio, triglycerides, cortisol, and prolactin, and inversely related to HDL-cholesterol. Since inadequate responses to psychosocial stress often implicate the use of palliative coping, e.g., increased alcohol consumption (Juel et al., 1994), threat of unemployment was also assumed to be mirrored by high levels of the enzyme gammaglutamyltransferase (GGT). Finally, it was hypothesized that improvements in the self-rated psychosocial work environment (i.e., increased decision latitude, more satisfactory relationships with collegues and management, decreased worry about unemployment) following organizational change, would be associated with improved self-rated health, decreased levels of glucose, total cholesterol, LDL-cholesterol, LDL/HDL-ratio, triglycerides, cortisol, prolactin, and GGT as well as increased levels of HDL-cholesterol.

Methods

Subjects

During 1994, a reorganization was conducted within two police districts in the Stockholm area. Following the reorganization, both districts were merged into one new district. In conjunction with the merging, thirty-six police inspectors where asked to resign and to re-apply for their positions in the new district. The median age within the sample was forty-five years (range 30–65 years), and twenty-nine subjects (81%) were males. Eight subjects (22%) had a college education, nineteen subjects (53%) had a high school education, while the remaining nine (25%) had a comprehensive school education. Most subjects (94%) had been employed at their respective police districts for eleven years or more. Twenty-eight subjects (78%) reported not having been on sick leave during the twelve months preceding the investigation. All subjects were rehired as inspectors in the new district.

Measures

Data were collected by means of the Stress Profile, a questionnaire that was developed over a period of five years and has been tested and standardized on approximately 3,000 men and women representing more than fifty Scandinavian companies (Larsson, 1990; Setterlind and Larsson, 1995). The reliability of the Stress Profile indices has been analyzed in four different ways (Test-Retest, Cronbach's Alpha, Spearman Brown Split-half, and Maximum Likelihood). Most reliability coefficients are above .80 (Larsson and Setterlind, 1995). This instrument contains 224 questions answered on a five-point Likert scale. Twenty items concern background variables and ten criteria, such as *satisfaction with work.* The remaining 204 items map a number of areas derived from current stress research, e.g., *external* and *internal stressors, coping styles,* and *stress reactions.* A detailed description of the Stress Profile is provided in Setterlind and Larsson (1995). For the purposes of the present study, results will be presented concerning changes in the item *satisfaction with work* and the field of psychosocial work environment (48 items), which deals with such areas as *leadership climate, relations with co-workers, work content, decision latitude,* etc. Also, results concerning *psychological, somatic* and *behavioural stress reactions* (31 items), and *burnout* (18 items) will be presented. Burnout implies physical, emotional, and cognitive exhaustion. People with high scores for burnout are indifferent and feel alienated from themselves and others. In the Stress Profile, *burnout* is measured with a selection of eighteen items from the field of *psychosocial work environment, inner stressors,* and *stress reactions.*

The items from *psychosocial work environment* which are used in the *burnout* index cover perceptions of decision latitude, committment, meaningfullness, and availability of resources at work. The *burnout* index also comprises items which measure the hard-driving, achievement oriented aspects of the type A-behavior pattern together with perceptions of control and purpose in life. Finally, *stress reactions* associated with *burnout* are sleep difficulties, helplessness, depressive symptoms, fatigue, lack of interest in others, and low mood. Lisspers and Setterlind (1998, in preparation) validated the *burnout* index of the Stress Profile in a cross-sectional investigation among 268 Swedes (age range 20–64 years; 68% females) in low and middle white-collar occupations. They found significant positive associations between this burnout index and the overall index for the Pines Burnout Mea-

sure (Pines et al., 1981) (r=.738, p <0.01), the emotional exhaustion sub-scale of the Maslach Burnout Inventory (Maslach and Jackson, 1981) (r=.737, p <0.01), and the Burnout questionnaire devised by Melamed, Kushnir and Shirom (1992) (r= .749, p <0.01).

Blood sampling

Blood samples were drawn between 8 and 10 a.m. from an antecubital vein in seated subjects who had fasted overnight. The samples were frozen and subsequently analyzed to determine serum levels of GGT, glucose, HDL-cholesterol, LDL-cholesterol, total-cholesterol, LDL/HDL-ratio, triglycerides, prolactin, testosterone, and cortisol. Immunoassay techniques were used for the assessement of the concentration of cortisol, testosterone, and prolactin. Kits were manufactured by Abbott (cortisol) and Lypochek (testosterone and prolactin). Intra-assay variation coefficients indicate the difference between duplicates of the same sample, measured simultaneously. Inter-assay variation coefficients measure differences between samples analyzed by the same method, on different occasions. The intra- and inter-assay variation coefficients, respectively, were 8 and 7% (cortisol), 25 and 19% (men testosterone), 3.8–4.6% and 3.5–3.4% (low—high prolactin levels) respectively. Enzymatic methods were used for the estimation of glucose, GGT, total cholesterol, HDL-cholesterol and triglycerides. Manufacturers were Bayer (glucose, total cholesterol, triglycerides), Clinicon (GGT) and Technicon Dextransulfat (HDL-cholesterol). The variation coefficients were estimated at 2–3% (glucose), 3–3% (cholesterol), and 5–7% (triglycerides), 4–3% (GGT), and 5% (HDL-cholesterol). Levels of LDL-cholesterol were calculated by means of the formula: total cholesterol minus HDL minus (.45 × triglycerides).

Design

The design was quasi-experimental with one measurement during the reorganization in 1994 and one measurement in the autumn of 1997.

Data Analysis

Values for GGT, glucose, triglycerides, and prolactin were logarithmized due to excessive skewness. Cross-sectional relationships were analyzed by means of Spearman's rank correlations and multivatiate regressions. Changes in self-rated psychosocial work-environment, self-rated psychological and somatic health complaints, and physiological variables were analyzed with two-tailed t-tests for dependent samples. Change scores for all variables were obtained by subtracting absolute values at Time 2 from the absolute values at Time 1. Associations between changes in self-rated psychosocial work-environment and changes in physiological variables were analyzed with multivariate regression analyses, controlling for the confounding influences of age and gender. An alpha level of .05 was considered to be of statistical significance, but a Bonferroni correction is discussed.

Results

Attrition

Four subjects (11%) did not participate in the follow-up assessment. The statistical analyses were thus performed on thirty-two subjects. Single data were lost due to occasional technical mishaps, as indicated by the n values and the number of degrees of freedom.

TABLE 1
Means and standard deviations for self-rated psychosocial work-conditions and symptomatology during and three years after a reorganization (n=32)

	During	*After*
Worry about employment	2.83 ± 1.21	2.00 ± .93**
Work load	3.44 ± .86	2.88 ± 1.01*
Relationships with management	3.32 ± 1.05	3.91 ± 1.07*
Emotional reactions	3.91 ± 3.26	3.78 ± 3.43
Somatic reactions	1.76 ± .52	1.92 ± .55
Behavioural reactions	1.62 ± .54	1.62 ± .57
Burnout	2.08 ± .52	2.06 ± .46

* $p<.05$**$p<.01$

Associations between Worry about Employment, Self-rated Health and Physiological Measures

Firstly, the associations between *worry about employment,* self-rated health, and physiological measures during the reorganization were analyzed by means of Spearman's rank correlations and multivariate regression analysis. *Worry about employment* was significantly associated with symptoms of *burnout* (z=3.34, $p<.001$), but only marginally associated with *somatic* (z=1.73, $p<.07$) and *emotional stress reactions* (z=1.68, $p<.10$). No significant associations were observed between *worry about employment* and other self-rated health indices, i.e., *cognitive* and *behavioral stress reactions,* or any of the physiological measures. Further analyses were conducted to assess the associations between *burnout* and physiological variables. A positive relationship was observed between *burnout* and HDL-cholesterol (z=2.54, $p<.05$). However, this association was disconfirmed by a multivariate regression analysis in which age and gender were controlled for.

Changes in Self-rated Psychosocial Work-conditions and Health Measures

Analyses with paired t-tests showed significant changes in self-rated psychosocial work-environment from the first to the second measurement. The results are illustrated in Table 1. While mean scores for the Stress Profile sub-scales *worry about employment* (t (31) = 3.30, $p<.01$) and *work-load* (t (31) = 2.21, $p<.05$) decreased, an impairment in *relationship with management* was noticed (t (31) = –2.04, $p<05$). No significant changes were observed in terms of Stress Profile sub-scales related to *burnout* or *emotional, cognitive, somatic,* or *behavioral stress reactions.*

Changes in Physiological Measures

Changes in physiological measures are shown in Table 2. Analyses by means of paired t-tests showed significant decreases in total cholesterol (t (30) = 4.85, $p<.0001$), LDL-cholesterol (t (28) = 5.04, $p<.0001$), LDL/HDL-ratio (t (28) = 3.03, $p<.01$), prolactin (t (29) 4.61, $p<.0001$), as well as increases in testosterone (t (29) = –2.98, $p<.01$) and cortisol (t (29) = –4.23, $p<.001$). A marginally significant decrease in s-glucose (t (30) = 1.92, $p<.07$) was also observed.

TABLE 2
Means and standard deviations for physiological variables during and three years after a reorganization

	During	*After*
s-GGT (μkat/L)	.65 ± .67	.65 ± .53
s-glucose (mmol/L)	5.89 ±3.10	5.06 ± .85
s-triglycerides (mmol/L)	1.71 ±1.01	1.60 ± .91
s-HDL (mmol/L)	1.35 ± .32	1.34 ± .38
s-LDL (mmol/l)	4.03 ± .93	3.49 ± .77***
LDL/HDL-ratio	3.03 ± .92	2.73 ± .91***
total s-cholesterol (mmol/L)	6.06 ±1.04	5.48 ± .88***
s-prolactin (μg/L)	8.07 ±3.63	5.82 ±2.51***
s-testosterone (nmol/L)	12.04 ±7.61	13.86 ±8.40**
s-cortisol (nmol/L)	341.53 ±157.19	472.84 ±105.82***

** $p<.01$ ***$p<.001$

Associations between Physiological Changes and Changes in Self-rated Variables

Table 3 illustrates observed associations between physiological changes and self-rated changes in psychosocial work conditions. Controlling for age and gender, multivariate regression analyses showed associations between change scores for prolactin and change scores for the Stress Profile criterion item *satisfaction with work* (beta = .480, s.e. = .020, $p<.05$). The result indicates that subjects who reported decreased satisfaction with the work environment manifested the most modest decreases in prolactin. Change scores for *ethics and moral* were significantly associated with change scores for s-cortisol (beta = –.066, s.e. = .29, $p<.05$), i.e., subjects who perceived deteriorations in the ethical and moral standards of the organization increased their cortisol level to a lower degree than their counterparts.

As illustrated in Table 4, subjects who experienced deteriorations in *psychosocial work environment* decreased their mean glucose levels to a larger extent than their counterparts (beta = –.100, s.e. = .036, $p<.05$). Associations were also observed between change scores for s-glucose and change scores for three areas of the psychosocial work environment, i.e., *information* (beta = –.035, s.e. = .016, $p<.05$), *task-oriented leadership* (beta = –.064, s.e. = .020, $p<.05$), and *respect and dignity* (beta = –.048, s.e. = .022, $p<.05$). The results indicate that perceived deteriorations in these aspects of the work environment were related to larger decreases in s-glucose levels.

Discussion

The study investigated associations between perceived threat of unemployment, self-rated health and physiological variables among police inspectors exposed to organizational change. Another aim was to study changes over time in self-rated psychosocial work environment, self-rated health complaints and physiological variables among the participants. A third aim was to study the associations between changes taking place in the psychosocial work-environment, changes in self-rated symptomatology and changes in the physiological measures. We hypothesized that threat of unemployment would be positively

TABLE 3
Multivariate regression analyses of the relationships between change scores (c.s.) for aspects of the psychosocial work environment and change scores for s-prolactin and s-cortisol
(n=30)

	s-prolactin (c.s.)		*s-cortisol (c.s.)*	
	Beta	*s.e.*	*Beta*	*s.e.*
Age	.093	.078	.095	.090
Gender	.003	.035	.045	.040
Satisfaction with work	.048*	.020	−.014	.026
Moral and ethics	−.014	.027	−.066*	.029

* $p<.05$

associated with psychological and somatic complaints, to serum levels of glucose, total cholesterol, LDL-cholesterol, LDL/HDL-ratio, triglycerides, cortisol, and prolactin, and inversely related to HDL-cholesterol and GGT. Experienced improvements in the psychosocial work-environments were expected to be related to decreased serum levels of GGT, glucose, total cholesterol, LDL-cholesterol, LDL/HDL-ratio, triglycerides and prolactin, as well as increased levels of HDL-cholesterol and testosterone.

Before interpreting the results in more detail, a discussion of the design is appropriate. Due to a number of limitations in the study, the findings should be interpreted cautiously. The lack of a comparison group is a major limitation of the study. However, since worry about employment decreased between measurements, it is reasonable to assume that the findings are due to favorable changes in employment status rather than to the passage of time. The small number of study participants is another caveat. Besides reducing the statistical power, the small n's made it impossible to perform separate analyses among males and females or to control for possible confounders, e.g., Body Mass Index, smoking or alcohol consumption. By applying the Bonferroni correction, only the findings concerning changes in lipids and hormones would reach acceptable significance. However, the results form a consistent pattern and were in most cases in accordance with the hypotheses.

In accordance with the first hypothesis, worry about employment was significantly associated with symptoms of burnout, although largely unrelated to other self-rated health complaints. Contrary to expectations, worry about employment and symptoms of burnout were unrelated to physiological variables. Also contrary to expectations, self-rated health did not increase or decrease between measurements. Study participants manifested low scores for all self-rated ill-health indices during the reorganization. This underreporting of symptoms may be a reflection of norms within the police force, where physical and psychological fitness are highly valued assets. The lack of findings between self-rated health and physiological variables may thus be mediated by coping mechanisms not assessed in the present study. Also, the initial low scores did not allow for extensive decreases in symptomatology over time.

The results show that the subjects experienced changes in their psychosocial work environment between measurements. While perceived work-load and worry about retaining their positions decreased, a deterioration in the relationships with the management was noticeable.

Changes could be observed in terms of most physiological variables. Serum levels of total cholesterol, LDL-cholesterol, LDL/HDL-ratio, and prolactin decreased, while test-

TABLE 4
Multivariate regression analyses of the relationships between change scores (c.s.) for aspects of the psychosocial work environment and change scores for s-glucose (n=31)

	s-glucose (c.s.)	
	Beta	*s.e.*
Age	–.047	.057
Gender	.032	.027
Psychosocial work environment (c.s.)	–.100*	.036
Information (c.s.)	–.035*	.016
Task-oriented leadership (c.s.)	–.064*	.020
Respect and disnity (c.s.)	–.048*	.022

* $p<.05$

osterone and cortisol increased between measurements. A marginally significant decrease in glucose was also observed. The magnitude of these changes could not have been accounted for by mere inter-assay variations.

Prolactin levels are elevated within minutes following psychological stress (Meyerhoff et al., 1988; Schedlowski et al., 1992). Increased control in stressful situations has been associated with decreased levels of prolactin (Lökk et al., 1991; Theorell, 1992; Lökk and Arnetz, 1997). For instance, employees who were allocated to a psychosocial intervention in the work setting, manifested significant decreases in prolactin, in relation to a comparison group (Lökk and Arnetz, 1997). This notion may be consistent with our findings, although no associations were seen between self-rated stress reactions and any of the physiological variables, since the present sample reported decreased work load and decreased concern about being made redundant. The results also indicate that the subjects who reported the largest increases in work satisfaction manifested the largest decreases in prolactin concentrations. The main biological function of prolactin is unknown, although it is implicated in lactation and infant care (Bridges, 1990). In animals, prolactin influences behavioral responses to stress such as avoidance, induces analgesia, and enhances grooming behavior (Drago et al., 1989). The latter has been described as a displacement activity following stress exposure (Borchelt, 1980). High levels of prolactin exert a reduction of HPA-activity in rats exposed to physical stress (Drago et al., 1986). It has been assumed that prolactin may exert a protective function against negative biological sequelae of stress. For instance, Drago and co-authors (1986) have shown that hyperprolactinemic rats are more resistant to the development of gastric ulcers following stress exposure. Prolactin is also implicated in the activity of the immune-system by stimulating the differentiation of antigen-specific T cells in the perifery (Murphy et al., 1993) and by exerting a modulating influence on the immunosuppressant action of cortisol (Bernton et al., 1992; Walker, 1993; Wilder, 1995). It has been assumed that prolactin stimulates the human crying function (Theorell, 1992). High prolactin levels have also been associated with lowered libido (McNeilly, 1994). These functions may be of relevance when the individual has to withdraw after an uncontrollable event.

The glucocorticoid cortisol has immunosuppressant, lipolytic, and gluconeogenetic effects (Munck et al., 1984; Munck and Guyre, 1986; Chrousos et al., 1992). Elevated cortisol levels may exert a neurotoxic agency in the brain. Monkeys exposed to severe

social stress manifest a depletion of hippocampal pyramidal neurons in the CA1 and CA3 regions (Sapolsky et al., 1990). Also in monkeys, implantation of a cortisol pellet in the proximity of the hippocampal area, leads to degeneration of hippocampal neurons in the CA3 region. Similar brain damage has been induced in monkey faetuses through dexamethasone injections to their mothers (Uno et al., 1994). Cortisol has therefore been implicated in the neurological deficiencies such as cerebral cortical atrophy observed among victims of extreme stress, e.g., torture (Jensen et al., 1982).The secretion of this hormone follows a diurnal variation with the highest levels in the morning (Kirschbaum and Hellhammer, 1989, 1994). In the present study, the smallest increases in cortisol were seen among subjects experiencing deteriorations in the ethical and moral standards of their organization. This finding stands in contrast to the notion that high levels of cortisol are related to situations involving lack of control (Lundberg and Frankenhaeuser, 1980; Frankenhaeuser, 1980, 1981, 1986). However, cortisol levels may be negatively related to personality variables, such as alexithymia (Mason et al., 1990) or defence mechanisms (Ursin and Olff, 1993). Also, basal levels of cortisol may be decreased in subjects with chronic fatigue syndrome (Demitrack et al., 1991), and stress related symptomatology, e.g., PTSD (Yehuda et al., 1991). Furthermore, cortisol reactivity seems to be blunted in chronically stressed individuals manifesting high levels of "vital exhaustion" (Kristenson et al., 1998). Cortisol levels increase following acute stress, but decrease due to heightened negative feedback at the hippocampal, hypothalamic, and pituitary levels, when stress exposure becomes permanent (Yehuda et al., 1991). In keeping with the present results, the increased cortisol levels manifested by the study sample could indicate a lower degree of perceived stress following the reorganization. It must however be kept in mind that levels of cortisol increase within minutes after stress exposure and one single measurement may therefore be an unreliable marker of chronic physiological arousal. Repeated salivary cortisol measurements may be a more viable approach to the assessment of physiological stress in field studies (Kirschbaum and Hellhammer, 1989, 1994).

Increased levels of testosterone are believed to reflect improvements in life-conditions, as well as increased anabolism which may protect against the noxious effects of stress. Animal studies have shown that testosterone levels decrease in response to psychosocial stress, e.g., among dominant monkeys that are defeated by other individuals of the same species (Henry and Stephens, 1977; Henry, 1992). Studies on humans lend support to these findings. A longitudinal study of Swedish men submitted to spontaneous variations in decision latitude at work, revealed that testosterone levels decreased when work conditions grew more tense and increased again when they became more relaxed (Theorell et al., 1990). In another Swedish study it was shown that testosterone levels increased among employees following a psychosocial intervention in the work-setting (Theorell et al., 1995). The employees who experienced the most substantial improvements in psychosocial work-conditions manifested the largest increases in testosterone. The present findings may indicate that the study participants had a stronger protection against stress when the second measurement was performed. However, no associations were found between change scores for variables related to the psychosocial work environment and increases in testosterone. A possible explanation is that the increased testosterone levels mirrored an increase in the overall activity level of the sample. However, the observed increases in testosterone and cortisol stand in contrast with the notion that the reproductive axis is inhibited by circulating corticosteroids (Chrousos et al., 1992).

The decrease in glucose observed in the study sample only approached significance. It was however found that deteriorations in various aspects of the psychosocial work envi-

ronment were related to larger decreases in glucose. This finding stands in contrast to the notion that stress may lead to elevations in s-glucose, through elevated levels of epinephrine and interference with insulin action (Hamburg, et al., 1980). A possible explanation of the finding is that glucose levels mirror a general state of activation, which may have been decreased among subjects who were disappointed with aspects of the psychosocial work-environment.

Psychosocial stress may induce increases in total cholesterol and tryglicerides, and decreases in HDL-cholesterol. The changes in lipoproteins are mediated by increased levels of catecholamines and cortisol (Klimov, 1976; Fredrikson and Blumenthal, 1989; Kjeldsen et al., 1992). The decreases in total cholesterol and LDL-cholesterol observed in the present study may thus indicate lower levels of psychosocial stress. However, decreased levels of cholesterol in middle-aged men have been associated with mortality related to suicide, homicide, and accidents (Muldoon et al., 1990). In a cross-sectional study, Lindberg and associates (1994) found significant negative associations between depressive symptomatology and total cholesterol and LDL-cholesterol among men. Among females, depressive symptomatology was inversely related to triglyceride levels. The associations were not ruled out by the influences of relevant confounders, i.e., age, smoking, alcohol intake, and Body Mass Index (Lindberg et al., 1994). Secondary analyses conducted in the present sample revealed no changes in nicotine consumption or food and alcohol intake, which could have explained the decreases in cholesterol. The finding regarding alcohol consumption is a possible explanation of the lack of observed changes in GGT levels. Decreased lipoprotein levels were not associated with changes in the psychosocial work environment or in self-rated symptomatology. It is also possible that the low power in the statistical analyses may have masked significant associations between these variables.

In summary, three years after having been exposed to organizational change and threat of unemployment, this group of police inspectors manifested a number of psychosocial and physiological improvements. Favorable changes in employment status and psychosocial work environment were thus related to improved physiological functioning.

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