

Psychosocial factors at work, personality traits and depressive symptoms

Longitudinal results from the GAZEL Study[†]

S. PATERNITI, I. NIEDHAMMER, T. LANG and S. M. CONSOLI

Background An association between stressful job conditions and depressive symptoms has been reported. This association could be explained by personality traits.

Aims To examine the relationship between psychosocial factors at work and changes in depressive symptoms, taking into account personality traits.

Method The role of occupational characteristics, psychosocial stress and personality traits in predicting an increase of depressive symptoms was evaluated in 7729 men and 2790 women working at the French National Electricity and Gas Company, with a 3-year follow-up.

Results In men, high decision latitude was predictive of a decrease in the Centre for Epidemiologic Studies – Depression scale (CES–D) scores. In both genders, high job demands and low social support at work were predictive of increased scores, irrespective of personality traits and covariates.

Conclusions Adverse psychosocial work conditions are predictors of depressive symptom worsening, independent of personality traits.

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In several cross-sectional studies, an association was found between job stress and depressive symptoms or disorders (Karasek, 1979; Broadbent, 1985; Kawakami *et al*, 1990; Bromet *et al*, 1992; Chevalier *et al*, 1996). The results of longitudinal studies (Bromet *et al*, 1988; Kawakami *et al*, 1992; Niedhammer *et al*, 1998) confirmed the existence of a relationship between job stress and subsequent depressive symptoms or disorders, although those of one study (Carayon, 1993) did not. Certain personality traits, such as neuroticism, are associated with both depressive symptoms and perceived job stress and could have a confounding role in the relationship between job stress and depression (McRae, 1990). Our objective was to examine the effect of job stress on the risk of increase of depression in a 3-year follow-up study, in which we took into account personality traits.

METHOD

Population

The GAZEL Study is an ongoing longitudinal study including 20 624 subjects working at the French National Electricity and Gas Company (EDF–GDF). There were a total of 15 010 men and 5614 women, who were aged 40–50 and 35–50, respectively, in 1989. The aim of the GAZEL Study was to investigate the occupational risk factors of impaired physical and mental health (Goldberg *et al*, 1990). Since 1989, the cohort has been followed by means of yearly self-administered questionnaires. Independent data from the personnel and medical departments of EDF–GDF were also collected.

Depressive symptoms

In 1993 and 1996, the French version of the Center for Epidemiologic Studies – Depression scale (CES–D; Radloff, 1977;

Fuhrer & Rouillon 1989) was sent to the subjects to assess depressive symptoms. The CES–D is a 20-item self-report of depressive symptoms experienced in the past week. Each item is rated from 0 to 3 (0=rarely; 1=some of the time; 2=occasionally; 3=most of the time); the total score ranges from 0 (no depressive symptom) to 60. The CES–D scale has been used widely in epidemiological studies.

Psychosocial factors at work

In 1995, the self-administered questionnaire included 16 items concerning the psychosocial aspects of work. Details of this questionnaire are published elsewhere (Niedhammer *et al*, 1998). In brief, items were selected from two sources (Karasek, 1979; Johnson & Hall, 1988) as being particularly suitable for measuring job stress in a heterogeneous population. Three psychosocial work factors assessed the main components on the job strain model: psychological demands (a five-item indicator measuring job demands, time pressure and conflicting demands); decision latitude (a six-item indicator measuring the subject's influence on or control over his or her work, job variety, and the possibilities for learning new skills); and social support at work (a five-item indicator measuring contacts with co-workers during work and leisure).

Personality traits

In 1993 the subjects of the GAZEL cohort were sent a set of three psychosocial questionnaires designed to evaluate the role of personality traits in the risk of morbidity and mortality.

The Bortner scale (Bortner, 1969) and the Seeman and Syme scale (Seeman *et al*, 1995) were used to assess, respectively, pattern A behaviour and self-esteem. Both the Bortner scale and the Seeman and Syme self-esteem scale consist of 14 bipolar items graduated from 1 to 6; their scores range from 14 to 84. The Buss and Durkee Hostility Inventory (Buss & Durkee, 1957) consists of 75 true/false items and give rise to the computation of eight sub-scores: 'assault', 'verbal hostility', 'indirect hostility', 'irritability', 'negativism', 'suspicion', 'resentment' and 'guilt'. The sum of the first seven sub-scores leads to a total hostility score.

[†]See editorial, pp. 96–98, this issue.

Occupational characteristics

In 1990, the questionnaire included questions about working hours and exposure to six physical workload factors: standing for long periods; work in uncomfortable positions; long, frequent or fast walking; handling or lifting heavy weights; use of vibrating tools; and the use of a computer screen.

Workers belonged to one of three occupational grades: low (clerks and blue-collar workers); intermediate (technicians and associated professionals); and high (professionals, managers and engineers). Occupational grade was indicated by the personnel department of the company and was studied for the year 1993.

Four of the stressful events included in the 1993 questionnaire concerned occupational situations occurring in the previous 12 months (job change, transfer, reconversion and departmental restructuring).

Potential confounding factors

Data were obtained by the self-administered questionnaire for 1993 concerning the following items: age; gender; marital status (married or cohabiting, single, divorced or widowed); stressful personal events during the previous year (admission to hospital or accidents); and the presence of one or more chronic diseases (asthma, infarction, angina, hypertension, diabetes, osteoarthritis, hypercholesterolaemia or cancer).

Information about monthly family income (tertiles of distribution were <€2000, €2000–2600 and >€2600) and educational level (primary, secondary or university) were collected at the beginning of the study, in 1989.

Statistical analysis

Separate analyses were performed for men and women.

We considered 1993 as the baseline evaluation and 1996 as the 3-year follow-up evaluation. We defined change in the CES–D score as the difference between the scores for 1996 and 1993. Psychosocial factors at work and personality traits were used as continuous variables in all the analyses.

The relationship between occupational characteristics and the change in CES–D score was tested by covariance analysis, adjusting for baseline CES–D score. The relationship between personality traits,

psychosocial factors at work and CES–D scores in 1993 was tested by Spearman's rank correlation coefficient because of the skewed distribution of CES–D scores. The relationship between the above variables and the change in CES–D score was tested by partial correlation analysis, adjusted for baseline CES–D score. The correlation between personality traits and psychosocial factors at work was evaluated by Pearson's coefficients.

Hierarchical linear regression analyses were used to ascertain whether psychosocial factors at work are predictive of an increase in the CES–D score, after adjustments for personality traits, occupational factors (occupational grade, stressful occupational events, working hours and physical workload factors) and covariates (age, education, income, marital status, stressful personal events and the presence of one or more chronic diseases). Three blocks of variables were entered. In the first block, change in CES–D scores was regressed on occupational factors and covariates. Psychosocial factors at work and personality traits were added respectively to the second and third blocks. Improvement of fit was tested by the *F*-test.

Analyses were carried out using SAS software (release 6.12; SAS Statistical Institute, Cary, North Carolina, USA).

RESULTS

Population

Of the 20 601 subjects in the initial 1989 cohort who were still alive in 1993, 15 080 (73%) participated in the 1993 personality assessment. Of these, 1648 subjects had retired, 45 had died and 6 had left the company by 1995. The 13 381 subjects who participated in the 1993 personality assessment and were still working in 1995 were all considered eligible for inclusion in the present study. However, 30 of these died before the 1996 assessment, and 2832 did not participate in one or more follow-up evaluations. Therefore, the response rate was 78.6% and the analyses were performed on 10 519 subjects comprising 7729 men and 2790 women.

Comparison of participants and non-participants

Socio-demographic characteristics and baseline depression scores were compared

for subjects included in the analysis and those who were not. The rate of participation was lower among women, single or cohabiting subjects, those with low incomes and those with at least one physical workload factor, a low educational level and a low occupational grade. Participants were slightly older than non-participants and had lower baseline CES–D scores.

Characteristics of the sample

Men and women differed for all the socio-demographic, occupational and psychosocial factors studied, as well as for CES–D scores and personality traits (Table 1).

Socio-demographic and work characteristics and change in CES–D scores

For both genders low family income, and for women an accident or admission to hospital during the previous 12 months, were associated with an increase in the CES–D score, after adjustment for baseline CES–D scores. In men, age was negatively and significantly correlated with the change in CES–D score; in women, the correlation was also negative but was not significant. The presence of a chronic disease was predictive of a CES–D increase in men. Marital status and educational level were not associated with CES–D change.

Subjects belonging to the lowest occupational grade had the largest CES–D score increase, as well as those who had experienced a stressful occupational event in the previous 12 months. The number of physical workload factors was predictive of the CES–D score increase, as experiencing a stressful occupational event in the previous 12 months. Working hours were associated with an increase in the CES–D score for men only (Table 2).

Psychosocial factors at work, personality traits and CES–D scores

In both genders, decision latitude, social support at work and self-esteem were predictive of a decrease in the CES–D score, and job demands, total hostility and pattern A behaviour of an increase in this score (Table 3).

Table 4 shows the correlations between personality traits and psychosocial factors

Table 1 Characteristics of the sample

Variables ¹	Men n=7729	Women n=2790
Age, years (mean (s.d.))	48.5 (2.6)	45.9 (3.9)
Family income (n (%))		
< €2000	3013 (39.9)	903 (33.8)
€2000–2600	2057 (27.3)	809 (30.3)
> €2600	2475 (32.8)	959 (35.9)
Educational level (n (%))		
Primary	5141 (67.4)	1993 (73.0)
Secondary	528 (6.9)	322 (11.8)
University	1961 (25.7)	415 (15.2)
Marital status (n (%))		
Married, cohabiting	7149 (92.7)	2138 (76.7)
Single, divorced, widowed	564 (7.3)	648 (23.3)
Stressful personal events (n (%))	1044 (13.7)	472 (17.2)
Presence of chronic diseases (n (%))	2063 (26.7)	476 (17.1)
Occupational grade (n (%))		
Low	679 (8.8)	511 (18.4)
Intermediate	3846 (49.9)	1931 (69.5)
High	3179 (41.3)	336 (12.1)
Stressful occupational events (n (%))	3371 (43.6)	1118 (40.1)
Working hours (n (%))		
Same every day	5931 (77.5)	2058 (75)
Different from day to day	1720 (22.5)	687 (25)
Number of physical workload factors (mean (s.d.))	1.5 (1.2)	1.1 (0.7)
Baseline CES–D score (mean (s.d.))	11.7 (8.1)	15.9 (10.6)
Decision latitude (mean (s.d.))	17.5 (2.5)	16.2 (2.8)
Job demands (mean (s.d.))	12.4 (2.5)	12.2 (2.6)
Social support at work ² (mean (s.d.))	9.6 (2.4)	10.6 (2.4)
Self-esteem (mean (s.d.))	61.8 (8.0)	60.4 (8.8)
Total hostility (mean (s.d.))	28.5 (9.8)	29.6 (9.5)
Pattern A behaviour (mean (s.d.))	52.9 (7.6)	54.5 (7.4)

CES–D, Center for Epidemiologic Studies – Depression scale.

1. Chi-squared test for qualitative variables and t-test for quantitative variables.

2. The higher the score, the lower the social support at work.

at work. Although statistically significant, the coefficients were low.

Multiple linear regressions

In the first step of linear regression analysis, we tested the effects of occupational characteristics on CES–D score increases, after adjustment for the baseline CES–D score, and other covariates (Table 5). For both men and women, occupational grade, stressful occupational events and the number of physical workload factors were predictive of an increase in CES–D scores. In the second step, psychosocial factors at work were added to the model. High job demands and low social support at work were associated with increase in CES–D

score between 1993 and 1996 for both genders. In men, high decision latitude was associated with a decrease in CES–D scores. Finally, personality traits were added to the model. Self-esteem and total hostility were significantly predictive of a CES–D change. The predictive effects of psychosocial factors at work remained significant after the inclusion of personality traits.

Because of the weak but significant correlations between personality traits and the three dimensions of job stress, we performed collinearity analysis using the SAS PROC REG (option COLLIN) procedure for multivariate linear regression. This analysis did not detect collinearity problems.

Finally, we tested possible interactions between each personality trait and each job stress factor included in the study of CES–D change. In men, significant interactions were found between decision latitude and total hostility ($B = -0.009$ (s.e.=0.003), $P = 0.005$) and between social support at work and self-esteem ($B = -0.01$ (s.e.=0.004), $P = 0.005$). Among hostile men, decision latitude was associated with a larger decrease in the CES–D score than in non-hostile men. In addition, among men with low self-esteem, low social support at work was related to a larger increase in CES–D score.

DISCUSSION

Main results

The main results of this study were the association found in both genders between psychosocial factors at work (i.e. high job demands and low social support at work), and in men between low decision latitude, and an increase of the CES–D score at 3-year follow-up. These associations were independent of personality traits and other confounding factors. Personality traits (hostility and low self-esteem) were also independent predictors of an increase of depressive symptoms.

Psychosocial factors at work influence subsequent affective symptoms

Our findings are in agreement with those of previous longitudinal studies showing that job stress influences subsequent affective symptoms. Thus, in a sample of 325 male employees followed-up for 1 year, Bromet *et al* (1988) found that job demands were predictive of affective disorders (an episode of depression or a generalised anxiety disorder), whereas co-worker support seemed to decrease this effect. Niedhammer *et al* (1998) found that high psychological demands and low decision latitude and social support at work were associated with subsequent high depressive symptoms. Kawakami *et al* (1992) found that job unsuitability and poor human relations in the workplace were risk factors for depressive symptoms 2 and 3 years after the baseline evaluation.

In our study we considered three personality traits that could affect psychosocial factors at work and/or could be associated with depressive symptoms. Subjects with low self-esteem can drift into jobs in which

Table 2 Change in Center for Epidemiologic Studies – Depression scale (CES–D) scores by occupational characteristics and stressful occupational events

Variables	Men	Women
	CES–D score change Adjusted mean (s.e.) ¹	CES–D score change Adjusted mean (s.e.) ¹
Occupational grade		
Low	1.35 (0.27)	2.51 (0.42)
Intermediate	0.99 (0.11)	1.70 (0.22)
High	0.34 (0.12)	–0.38 (0.52)
F (d.f.)	10.7 (2.7019)	9.67 (2.2482)
p ²	0.0001	0.0001
Stressful occupational events		
No	0.52 (0.10)	1.17 (0.23)
Yes	1.05 (0.12)	2.18 (0.28)
F (d.f.)	11.4 (1.7044)	7.4 (1.2495)
p ²	0.0007	0.006
Working hours		
Same every day	0.66 (0.09)	1.53 (0.21)
Different from day to day	1.08 (0.17)	1.76 (0.37)
F (d.f.)	5.1 (1.6980)	0.29 (1.2456)
p ²	0.02	0.58
Number of physical workload factors³		
0	0.15 (0.19)	0.33 (0.57)
1	0.64 (0.13)	1.53 (0.24)
2	0.98 (0.17)	2.49 (0.52)
3 or more	1.07 (0.20)	3.79 (1.06)
F (d.f.)	5.95 (3.6943)	4.35 (3.244)
P	0.0004	0.007

1. Means adjusted for CES–D scores in 1993.
 2. Analysis of covariance (ANCOVA) adjusted for CES–D scores in 1993.
 3. ANCOVA (test for linear trend) adjusted for CES–D scores in 1993.

they have little control over decision-making. Personality traits such as hostility and pattern A behaviour can directly affect the choice of work or modify the work environment (Miller *et al*, 1996), and could also influence perception of both depressive symptoms and psychosocial factors at work.

The strength of the association between psychosocial factors at work and increase of depressive symptoms was not altered in our study by introducing measures involving personality traits into multivariate models. Our results are in agreement with one cross-sectional study which found that cynicism and hostility did not alter the relationship between psychosocial work conditions and psychological distress (Bourbonnais *et al*, 1996). Kawakami *et al* (1992) found a similar result when the type A behaviour pattern was included among the covariates in a longitudinal analysis of the effects of psychosocial factors at work on depressive symptoms.

In the female sample studied here, decision latitude was not associated with a

CES–D score increase when other covariates, particularly occupational grade, were taken into account. However, as occupational grade strongly affected psychosocial factors at work, the true association

Table 3 Correlations between Center for Epidemiologic Studies – Depression scale (CES–D) scores and psychosocial and personality traits

	Men		Women	
	CES–D scores 1993 rho	CES–D score change r	CES–D scores 1993 rho	CES–D score change r
Decision latitude	–0.15	–0.07	–0.17	–0.05
Job demands	0.12	0.14	0.11	0.10
Social support at work ¹	0.14	0.11	0.12	0.08
Self-esteem	–0.49	–0.14	–0.50	–0.13
Total hostility	0.41	0.13	0.40	0.15
Pattern A behaviour	0.10	0.06	0.12	0.07

rho, Spearman's rho coefficient; r, Pearson correlation coefficient, adjusted for CES–D scores in 1993. All correlations are significant at P=0.0001, except for decision latitude in women (P=0.01).
 1. The higher the score, the lower the social support at work.

between psychosocial factors at work and depressive outcome could have been underestimated by adjusting for grade (North *et al*, 1996).

Personality traits and depressive symptoms

In our study, self-esteem and total hostility were independent predictors of an increase of depressive symptoms. Lowered self-esteem is a well-recognised symptom of depressive illness and a prognostic factor in patients with depression (Andrew *et al*, 1993; Sherrington *et al*, 2001). However, it is unclear whether low self-esteem predicts the onset of depressive disorders in the general population. Hokanson *et al* (1989) found that low self-esteem predisposed individuals to subsequent general psychopathology, including depression. Some community surveys showed that low self-esteem does predict future episodes of depression in conjunction with other factors, such as environmental stressors or prior psychiatric consultations (Brown *et al*, 1986; Ingham *et al*, 1987). In a prospective study Roberts & Kendler (1999) suggest that neuroticism could explain the association between self-esteem and the risk of major depression. To our knowledge, there is no empirical literature on the role of hostility in increasing risk of depression, although studies have been published showing an association between the two dimensions (Schless *et al*, 1974).

Psychosocial factors at work and personality traits

Interestingly, low self-esteem and high hostility were both associated, in our study,

Table 4 Correlations between personality traits and psychosocial factors at work

	Decision latitude <i>r</i> (<i>P</i>)	Job demands <i>r</i> (<i>P</i>)	Social support at work ¹ <i>r</i> (<i>P</i>)
Men			
Self-esteem	0.19 (0.0001)	-0.03 (0.0005)	-0.15 (0.0001)
Total hostility	-0.11 (0.0002)	0.09 (0.002)	0.07 (0.0001)
Pattern A behaviour	0.17 (0.0001)	0.20 (0.0001)	0.02 (0.15)
Women			
Self-esteem	0.22 (0.0001)	-0.005 (0.81)	-0.10 (0.0001)
Total hostility	-0.07 (0.0008)	0.09 (0.0001)	0.04 (0.03)
Pattern A behaviour	0.11 (0.0001)	0.14 (0.0001)	0.06 (0.002)

r, Pearson correlation coefficient, adjusted for Center for Epidemiologic Studies – Depression scale (CES–D) scores in 1993.

1. The higher the score, the lower the social support at work.

with high job demands, low decision latitude and low social support at work, that is with dimensions known to be stressors at work. So, our results seem in agreement with those of Williams *et al* (1997), who found that psychosocial factors at work and dimensions of psychological distress cluster together. Our findings lead to the hypothesis that the same individuals suffering from low self-esteem and/or high hostility are perceiving high job strain conditions at work, that is the same

individuals do have personality and work factors that increase the risk of developing depressive symptoms. However, causal direction between psychosocial factors at work and personality traits may not be defined on the basis of our data. Work status is known to have an impact on self-esteem (Andrews & Brown, 1995) and personality traits could influence perception of job strain.

We found some interactions between personality traits and the psychosocial

factors at work in increasing depressive symptoms. Similarly, Stansfeld *et al* (1999) found that adjustment for hostility decreased the effect of job demands on psychiatric disorders in men.

Limitations of the study

Our study had some limitations. As our group only consisted of participants, there could have been a selection bias. In addition, subjects not included in the analyses had more depressive symptoms and more job stress factors at baseline than subjects that were included, thus suggesting a healthy worker effect, i.e. that subjects selected had fewer depressive symptoms and fewer job stress factors. This selection bias might have decreased the strength of the relationship between risk factors (job stress factors) and morbidity (CES–D score increase).

Two other potential biases could have limited our conclusions about the possible causal effects of psychosocial factors at work on the increase of the severity of depressive symptoms. First, we did not use a full two-wave panel design, as only one evaluation of psychosocial stress factors at work was available. Therefore, we were

Table 5 Linear regression models: predictors of change in Center for Epidemiologic Studies – Depression scale (CES–D) scores

	Men (n=6145)			Women (n=2009)		
	B' (s.e.)	B' (s.e.)	B' (s.e.)	B' (s.e.)	B' (s.e.)	B' (s.e.)
Block 1						
Occupational grade						
Intermediate	0.63 (0.22)**	0.65 (0.22)**	0.66 (0.22)**	1.58 (0.72)*	1.79 (0.73)**	2.20 (0.72)**
Low	0.77 (0.37)*	0.44 (0.38)	0.51 (0.38)	1.86 (0.88)*	1.86 (0.91)*	2.35 (0.89)**
Stressful occupational events	0.53 (0.17)**	0.41 (0.17)**	0.39 (0.16)*	0.92 (0.40)*	0.79 (0.40)*	0.88 (0.40)*
Changing working hours	0.36 (0.20)	0.37 (0.20)	0.33 (0.19)	0.20 (0.46)	0.33 (0.46)	0.22 (0.45)
Number of physical workload factors	0.15 (0.08)*	0.09 (0.08)	0.10 (0.08)	0.71 (0.30)*	0.60 (0.30)*	0.61 (0.30)*
Block 2						
Decision latitude		-0.19 (0.04)***	-0.13 (0.04)***		-0.06 (0.08)	0.02 (0.08)
Job demands		0.36 (0.03)***	0.35 (0.03)***		0.28 (0.08)***	0.26 (0.08)***
Social support at work ²		0.22 (0.04)***	0.19 (0.04)***		0.20 (0.09)*	0.19 (0.08)*
Block 3						
Self-esteem			-0.13 (0.01)***			-0.17 (-0.03)***
Total hostility			0.07 (0.01)***			0.11 (0.02)***
Pattern A behaviour			0.02 (0.01)			0.03 (0.03)
R ²	22.0%	24.3%	26.5%	24.4%	25.2%	28.2%
Improvement in fit ³		0.0001	0.0001		0.0001	0.0001

P* < 0.05; *P* < 0.01; ****P* < 0.001.

1. Adjusted for covariates: age, educational level, marital status, family income, stressful personal events, presence of chronic diseases and CES–D score in 1993.

2. The higher the score, lower the social support at work.

3. Test F (*p*) – comparison with the previous model.

unable to test reciprocal causal relationships. Second, both exposure and outcome were measured by subjective means, i.e. self-evaluation. Subjects with depression report work conditions in a more negative manner than non-depression subjects do.

In our study, we had no objective measurement for the psychosocial work environment and we could not establish whether objective conditions had caused the perception of high stress at work. However, some studies indicate that self-reports of job stress are stronger predictors of health outcomes than objective indexes of job stress (Hammar *et al*, 1994). On the basis of the results of our study, we could hypothesise that the perception of high stress at work leads to an increase of depressive symptoms. However, it is not possible to exclude the possible presence of the following vicious cycle: being depressed handicaps coping and further impairs role functioning, thus increasing perceived job stress, which in turn increases depression.

Clinical implications

Psychosocial stress factors at work are predictive of an increase in the CES-D score. Interventions designed to reduce perception of excessive job demands and increase the degree of perceived decision latitude or social support could slow down the development of depression. In addition, our results suggest that better knowledge of the interactions between personality traits and job stress factors might be helpful for the choice of more effective interventions.

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CLINICAL IMPLICATIONS

■ Men and women who perceive their jobs as high in demands and low in social support, and men perceiving their jobs as low in decision latitude, are more at risk of developing depressive symptoms.

■ High hostility and low self-esteem are associated with a higher risk of depressive symptoms in both genders.

■ The effects of psychosocial factors at work on increase in depressive symptoms are independent of personality traits.

LIMITATIONS

■ A selection bias could have resulted from subjects not included in the analysis (21% of eligible sample).

■ Only one evaluation of psychosocial stress factors at work was available. Therefore, we were unable to test reciprocal causal relationships between depressive symptoms and psychosocial stress factors.

■ Both exposure and outcome were measured by subjective means, i.e. self-evaluation.

S. PATERNITI, MD, INSERM Unité 360, Paris, France; I. NIEDHAMMER, MD, INSERM U88, Paris, France; T. LANG, MD, INSERM U558, Toulouse, France; S. M. CONSOLI, MD, Georges Pompidou European Hospital, Paris, France

Correspondence: Sabrina Paterniti, INSERM U360, Hôpital de la Salpêtrière, 84 Bd de l'Hôpital, 75651 Paris CEDEX 13, France. Tel: +33 01 0142162554; fax: +33 01 0142162541; e-mail: paternit@chups.jussieu.fr

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