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Familial clustering in burnout: a twin-family study

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ABSTRACT

Background. Research on risk factors for burnout has mainly focused on circumstances at work and on personal characteristics. The aim of this study was to investigate whether burnout clusters within families and, if so, whether this is due to genetic influences or to environmental factors shared by family members. Finally, we tried to identify specific risk factors for burnout.

Method. In 2707 twins, 736 of their siblings and 575 of their spouses from a population-based twin-family sample, burnout was measured using a self-report questionnaire. Correlations in burnout scores were obtained for monozygotic and dizygotic twin pairs and sibling pairs conditional on the pairs' sex. Correlations for twins and their spouses were derived conditional on the length of the relationship.

Results. In the final model, correlations of the monozygotic and dizygotic twin pairs and sibling pairs were significantly different from zero, but not significantly different from each other. The correlation was estimated at 0·22. The correlation between spouses was also significant. This was mainly due to the group with a relationship longer than 5 years in which the correlation was 0·24. Burnout scores were higher in subjects whose parents had a high level of education.

Conclusions. There is familial clustering for burnout due to environmental factors shared by family members, explaining 22% of the variance. Genetic factors do not seem to be of importance. The significant correlation between spouses supports the conclusion that common environment plays a role in burnout. A high parental education is one of the familial risk factors.

INTRODUCTION

Burnout encompasses a work-related syndrome, which is defined by three dimensions: an overwhelming exhaustion, feelings of cynicism and detachment from the job, and a sense of ineffectiveness and lack of accomplishment at work (Maslach *et al*. 2001). Emotional exhaustion is regarded as the key dimension of the syndrome, and refers to feelings of being overextended and depleted of one's emotional and physical resources (Maslach *et al*. 2001). There has been considerable debate whether burnout is a distinct entity from depression. However, most research indicates that depression and burnout are not identical, although their symptoms are positively related (Leiter & Durup, 1994; Glass & Mcknight, 1996; Brenninkmeyer *et al*. 2001). Burnout is a common problem. A study performed in the Dutch general population revealed, for example, that 10% of the people participating in labour had symptoms of burnout (CBS, 1997).

Research on risk factors (for a review see Schaufeli & Enzmann, 1998) indicated that several job characteristics, such as experienced workload and time pressure, role conflict and role ambiguity, lack of social support at work, lack of feedback, little participation in decision making and lack of autonomy, are related to burnout. Furthermore, some personality characteristics are linked to burnout, e.g. high levels of neuroticism, an avoidant coping style and high levels of type A behaviour (competition, time-pressured lifestyle, hostility, and an excessive need for control). Age has also been consistently

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related to burnout. Among younger employees the level of burnout is reported to be higher than among those aged between 30 and 40 years. This could be a result of survival bias, i.e. those who burn out early in their careers are likely to quit their jobs, leaving behind the survivors who consequently exhibit lower levels of burnout. Data on the effect of gender are contradictory. Some studies show that burnout occurs more often in women than in men, some show the opposite and others find no overall differences. Most research suggests that characteristics of the work environment, particularly job stressors such as workload, work pressure, etc., are more strongly related to burnout than are personality and demographic factors (Lee & Ashforth, 1996; Schaufeli & Enzmann, 1998). This is confirmed by a recent study among Dutch medical specialists which revealed that the organizational factors are more important in managing stress than the personal factors (Visser *et al*. 2003).

So far, to our knowledge, no studies have investigated whether burnout clusters in families. In general, familial clustering can be due to shared genetic or common environmental factors. When familial clustering is absent, unique environmental factors are primarily important. Twin-family studies provide a good method to estimate the influence of genes, common environment and unique environment on individual differences in behavioural and other traits (Boomsma *et al*. 2002*a*). These studies make use of the fact that monozygotic (MZ) twin pairs share all (or nearly all) of their genes whereas dizygotic (DZ) twin pairs share on average half of their segregating genes. Consequently, if MZ twin pairs are more similar for a trait than DZ twin pairs, this suggests that genetic factors influence this trait. If, on the other hand, MZ twin pairs and DZ twin pairs show the same amount of similarity, then common environmental factors, shared by family members, probably play a role. The differences within MZ twin pairs are explained by unique environmental factors. Siblings, like DZ twin pairs, share on average half of their segregating genes. But twins and siblings may differ in the amount of environment they share. For example, prenatal conditions are different for singletons than for twins and twins grow up together with someone of their own age. Consequently, DZ twin pairs are the perfect controls for MZ twin pairs. Additional information on the similarity between siblings increases the power of a study to detect effects of common environment (Posthuma & Boomsma, 2000). Finally, by including the spouses of twins in the sample, assortative mating can be studied. Similarities between spouses can develop during the relationship; it is then a consequence of shared environment. It is also possible that similarities already existed at the beginning of the relationship. Therefore, spouses might have chosen each other based on phenotypic similarity.

No twin or family studies have investigated whether burnout clusters in families, but there is a wealth of twin studies on related conditions and traits. Job satisfaction, which shares 20% of its variance with burnout (Schaufeli & Enzmann, 1998), has been studied in both US twins reared apart and US twins reared together (Arvey *et al*. 1989, 1994). Job satisfaction clusters in families, but unique environmental factors explain most of the variance (around 70%). Familial clustering in job satisfaction is a result of genetic factors only.

Chronic fatigue is comparable with the dimension of emotional exhaustion in burnout, but does not require that it is work related. Twin studies on symptoms of fatigue have shown that familial clustering is present, but unique environmental factors play a significant role too, explaining between 50% and 80% of the variance (Hickie *et al*. 1999*a*, *b*, 2001; Buchwald *et al*. 2001; Sullivan *et al*. 2003). Regarding causes for familial clustering, results differ between studies. Results of the volunteer Australian Twin Registry have indicated that familial clustering for fatigue is due to genetic factors only (Hickie *et al*. 1999*a*, *b*, 2001), whereas in a US sample of twins partly recruited from patients' support groups, both genetic and family environmental factors are causes for familial clustering (Buchwald *et al*. 2001). Finally, in a community sample of US twins (the Mid-Atlantic Twin Registry, formerly known as the Virginia Twin Registry) familial clustering was a result of common environmental factors in males, while in females genetic factors explained familial clustering (Sullivan *et al*. 2003).

With respect to personality characteristics related to burnout, the influences of genetic and environmental factors have been studied

extensively, especially for neuroticism. Reviews of several population-based twin studies (Eaves *et al.* 1989; Sherman *et al.* 1997; Lake *et al.* 2000) have concluded that familial clustering is present in neuroticism as a result of genetic factors only. Neuroticism is further influenced by unique environmental factors. The same seems to account for type A behaviour, although this trait has been studied less extensively (Pedersen *et al.* 1989; Sims *et al.* 1991; Duffy *et al.* 1994; Sluyter *et al.* 2000). Regarding avoidant coping style, results are less straightforward. One twin study assessed coping with 14 items chosen from the Ways of Coping checklist. In a factor analysis, four of these 14 items were found to load on a factor called 'denial'. Twin resemblance for this factor was fully explained by common environmental factors (Kendler *et al.* 1991). In another twin study no such factor appeared from the factor analysis (Busjahn *et al.* 1999). The results of the analysis of the individual items of the questionnaire were also published. Items comparable with the items loading on 'denial' in the paper of Kendler *et al.* (1991) were 'Play down', 'Distraction from situation', 'Avoidance' and 'Flight tendency'. Twin resemblance for 'Play down' and 'Flight tendency' was explained by genetic factors, for 'Distraction from situation' by common environmental factors and for 'Avoidance' by both genetic and common environmental factors (Busjahn *et al.* 1999). Again, unique environmental factors were also found to be important in avoidant coping style, explaining 50–90% of the variance (Kendler *et al.* 1991; Busjahn *et al.* 1999).

The aim of the current study was to investigate in males and females whether familial clustering is present in burnout and, if so, whether this is due to genetic or common environmental factors. The results of the twin studies on job satisfaction, chronic fatigue and on the personality characteristics related to burnout lead to the expectation that burnout will cluster in families mainly as a result of genetic factors. However, since studies on the risk factors for burnout have found that work characteristics are more important than personal factors, unique environmental factors will probably explain most of the variance. A self-report questionnaire on burnout was used that was completed by MZ twins, DZ twins, their siblings and their spouses. Correlations for the burnout scores were calculated between MZ twin pairs, DZ twin pairs, sibling pairs and between twins and their spouses. As pointed out above, by comparing these correlations between the different groups the proportion of influence of genetic, common environmental and unique environmental factors can be estimated for males and females. To investigate whether assortative mating is important, correlations were calculated for three groups of twins and their spouses conditional on the length of the relationship. Finally, taking into account the results of these analyses, we tried to identify specific risk factors for burnout.

METHOD

Subjects

This study is part of a longitudinal questionnaire study of the Netherlands Twin Register (NTR) that has assessed families with adolescent and young adult twins roughly every 2 years since 1991. Sample selection and response rates are described in detail in (Boomsma *et al.* 2002*b*). For this paper, data were used from the survey in 2000, which included several items assessing burnout. Twins and their siblings were requested to complete the survey. Spouses of twins aged between 25 and 30 years were also asked to participate. Mean duration of the relationship of twins and spouses was 6·5 years with a maximum of 16 years. The survey was completed by 6701 subjects (excluding half sibs, adoptive sibs and triplets). In the majority of the twin pairs zygosity was determined from questions about physical similarity and confusion of the twins by family members, friends and strangers. On 804 same-sex twin pairs information on their zygosity was available from DNA polymorphisms. The agreement between zygosity diagnoses from the questionnaire and DNA data was 98%.

Since burnout is a work-related syndrome, subjects younger than 18 years or older than 65 years of age as well as subjects who were unemployed at the time they completed the questionnaire, were excluded from the study. Table 1 summarizes the number of subjects per inclusion criterion. It can be seen that from the population between 18 and 65 years of age, around 70% of the subjects were employed. This percentage

Table 1. *Numbers of subjects per inclusion criterion*

	Male twins	Female twins	Male sibs	Female sibs	Male spouses	Female spouses
Total population	1502	3046	585	863	442	263
All subjects between 18 and 65 years	1403	2869	531	816	431	259
All employed subjects	1021	1888	428	568	406	199
(% full time/% part-time)*	(92/8)	(58/42)	(95/5)	(51/49)	(95/5)	(70/30)
All burnout questions completed	950	1757	408	530	392	183

* Full time is defined as working more than 32 hours per week.

was higher than in the general population (CBS, 1997), probably because this was a relatively young sample. In the group of people participating in labour, more men work full time and more women work part-time. This is comparable with the general population (CBS, 1997). Of the working people, 290 subjects were excluded, because they did not complete all the questions about burnout. One sibling per family was included, i.e. the sibling who was closest in age to the twin pair. This led to the exclusion of 202 siblings. Finally, 4018 subjects from 2328 families were included in the analysis.

Questionnaire

Burnout was measured by a Dutch version of the emotional exhaustion subscale of the Maslach Burnout Inventory – General Survey (Schaufeli *et al*. 1996). This questionnaire was chosen, because it was also used in the study in the Dutch general population (CBS, 1997). The subscale consists of five items with an answer range between 1 and 7 (never, a few times a year, monthly, a few times a month, every week, a few times a week, every day). The 5 items can be summarized as (1) emotionally exhausted because of work, (2) feeling empty after work, (3) feeling tired in the morning when confronted with work, (4) completely exhausted because of work, (5) feeling worn out. Cronbach's alpha was 0·87 in our sample. The total score of the five items was used for the analysis. The scores were not normally distributed (skewness 2·0, kurtosis 4·4). Therefore, correlations were calculated for the log-transformed total burnout score. This led to an improvement of the skewness and kurtosis to 0·8 and 0·1 respectively.

Statistical methods

Statistical analyses were performed with the software programme Mx, modelling the dependency that exists between measures of pairs of relatives (Neale *et al*. 1999). Families may have different numbers of observations within the family, e.g. families with one participating twin and one sibling, families with two participating twins without sibling. To use all data, analyses were performed on raw data using the raw likelihood method. To test whether means and correlations were significantly different between the groups of male and female twins, siblings and spouses, the likelihood of the model in which all parameters were estimated was compared to the likelihood of the model in which the parameters were constrained to be equal in different groups. Twice the difference between the log-likelihood of two models is distributed asymptotically as χ^2. The degrees of freedom (df) for these tests are equal to the difference in parameters being estimated. Utilizing the principle of parsimony, the most restrictive model was accepted as the best-fitting one in case the difference between a nested and a more comprehensive model was not significant (Neale & Cardon, 1992).

To investigate assortative mating, the total group of twins and their spouses was divided in three groups according to the length of the relationship: shorter than 5 years, between 5 and 10 years and more than 10 years. Correlations between burnout scores of spouses were calculated for the separate groups.

Table 2. *Average age (years) and total burnout score*

	n	Age (S.D.)	Total burnout score (S.D.)
Male twins	950	31·0 (9·2)	9·5 (5·1)
Female twins	1757	30·5 (8·6)	9·7 (5·6)
Brothers	318	32·6 (8·9)	9·7 (5·6)
Sisters	418	31·4 (7·8)	9·6 (5·0)
Male spouses	392	30·8 (4·0)	9·3 (4·6)
Female spouses	183	27·2 (3·8)	10·0 (5·3)

Table 3. *Number of family members and correlations between twin pairs and sibling pairs*

	MZM	DZM	MZF	DZF	DOS	SibMM*	SibFF*	SibOS*
No. individuals in pairs	260	124	568	264	282	156/104	216/240	332/272
No. twins or siblings from incomplete pairs†	159	127	327	260	336	70	125	101
Correlations estimated in full model	0·37	0·41	0·26	0·21	0·12	0·16	0·20	0·12
CIs for full model								
Lower values	0·20	0·13	0·16	0·02	−0·08	−0·07	0·05	−0·03
Upper values	0·50	0·59	0·36	0·38	0·30	0·35	0·34	0·25
Correlations in constrained model	0·22	0·22	0·22	0·22	0·22	0·22	0·22	0·22

MZM, Monozygotic males; DZM, dizygotic males; MZF, monozygotic females; DZF, dizygotic females; DOS, dizygotic twins of opposite sex; SibMM, brothers; SibFF, sisters; SibOS, sibs of opposite sex; CI, 95% confidence interval.

* Two values are given for the number of individuals in pairs, because siblings can form two pairs: a sib with twin 1 and a sib with twin 2.

† Incomplete pairs arise due to (1) subjects who did not participate in the survey (2) subjects who did not complete the burnout questionnaire (e.g. because they were unemployed).

Table 4. *Likelihood of the different models for the twin and sibling pairs*

	−2 log likelihood	Δdf	χ^2	*p*
(1) Full model	30236·945			
(2) rMZM = rDZM	30237·016	1	0·071	N.S.
(3) rMZM = rDZM = rSibMM	30240·439	1	3·423	N.S.
(4) rMZF = rDZF	30240·691	1	0·252	N.S.
(5) rMZF = rDZF = rSibFF	30241·055	1	0·364	N.S.
(6) rMZM = rDZM = rSibMM = rMZF = rDZF = rSibFF	30241·934	1	0·879	N.S.
(7) rSame sex twins and sibs = rDOS = rSibOS	30246·336	2	4·402	N.S.

See Table 3 for explanation of the abbreviations.

Table 5. *Spouse correlations*

	Total	Length of relationship (years)		
		0–5	5–10	10–16
No. individuals in pairs*	956	330	408	200
No. spouses from incomplete pairs	97	29	35	27
Full model	0·18	0·09	0·22	0·29
CIs for full model				
Lower values	0·09	−0·06	0·09	0·08
Upper values	0·26	0·24	0·34	0·46
Best-fitting model	0·18	0	0·24	0·24

* The length of the relationship was unknown in 18 individuals.

RESULTS

Table 2 shows the average ages and total burnout scores in male and female twins, siblings and spouses. Total burnout scores were not significantly different between the groups. Keeping in mind that the total burnout score ranges from 7–35 it is obvious that most subjects scored low. Scores were comparable with Dutch general population-based data (CBS, 1997).

Table 3 shows the correlations and 95% confidence intervals for the full model, in which all correlations are estimated without constraints, and for the final model for all twin and sibling pairs: monozygotic male twin pairs (MZM), dizygotic male twin pairs (DZM), monozygotic female twin pairs (MZF), dizygotic female twin pairs (DZF), dizygotic twin pairs of opposite sex (DOS), brothers (SibMM), sisters (SibFF), siblings of opposite sex (SibOS). All these correlations could be constrained to be equal. Table 4 shows the statistics of this procedure. The significant correlation indicates that familial clustering is present. Since the correlations between MZ and DZ twin pairs were not significantly different, familial clustering is due to common environmental factors only, explaining 22% of the variance. Unique environmental factors explain the remaining 78% of the variance.

Table 5 shows the correlations between twins and their spouses for the total population and after division into three groups conditional on the length of relationship: shorter than 5 years, between 5 and 10 years and more than 10 years (maximum duration is 16 years). The correlation in the total group was significantly different from zero. The analysis of the three groups revealed that this significant correlation is due to the pairs of spouses with a relationship over 5 years since the correlation of the pairs with a relationship shorter than 5 years could be constrained to zero ($\chi^2 = 1{\cdot}427$, 1 df). The correlations of the other two groups were

Table 6. *Age and burnout scores for males and females working full time or part-time*

	Males			Females		
	*n**	Age	Burnout score	*n**	Age	Burnout score
Employment >32 hours per week	1495	31·2	9·5	1308	28·0	10·3
Employment between 12 and 32 hours per week	90	30·9	9·7	842	33·2	9·2
Employment <12 hours	17	25·2	6·8	111	34·9	7·3

* Working hours were unknown for 58 males and 97 females.

significantly different from zero ($\chi^2 = 17{\cdot}396$, 2 df). They could be constrained to be equal ($\chi^2 = 0{\cdot}330$, 1 df). This again suggests an influence of common environment.

To make sure that the influence of common environment was not an effect of twins and siblings having (nearly) the same age, a linear regression analysis was performed with age and total burnout score. Only in females was there a significant negative relation ($p < 0{\cdot}001$), but this explained only 0·7% of the variance. Consequently, age cannot be responsible for the total influence of the common environment, which explains 22% of the variance. However, it is interesting that this apparent age effect is probably due to the fact that women who work part-time are, on average, older and have lower burnout scores (Table 6). In males this effect is absent, since only a minority of them work part-time whatever their age.

To identify specific risk factors for burnout, a univariate analysis of variance was performed with items of the questionnaire from the year 2000 that assessed environmental factors shared by family members, i.e. religious upbringing and education of the parents. Burnout scores were significantly higher in subjects with a highly educated father or mother ($p < 0{\cdot}001$ for both items). No differences were found in burnout scores between subjects with or without a religious upbringing ($p = 0{\cdot}11$).

DISCUSSION

The results indicate that familial clustering is present in burnout. This is due to common environmental factors, since the correlations of all pairs of relatives are significant and equal. Furthermore, it is apparent that unique environmental factors are most important in the symptoms of burnout, explaining 78% of the variance. These results are the same for males and females. The significant spouse correlation supports the finding that common environment is of importance in burnout; especially since the partner correlation tends to increase with the length of the relationship. Age cannot account for the effect of common environment. A possible common environmental risk factor is a high level of education of the parents.

A limitation of this study and of all other studies on symptoms of burnout is that subjects need to be working to complete the questionnaire. This means that if subjects do not work any more, because they suffer from burnout, they are not included in the study. In our sample with regard to the males this does not seem to be a problem (Table 1). The majority work full time and most subjects who do not work are students. With respect to women, a survival bias might have influenced our results. Around 40% are working part-time or engaged in housekeeping. Possibly these women choose not to work full time because of symptoms of burnout. However, the results of a study on non-response bias in the same population of twins and siblings suggested that the data collected on health, personality and lifestyle are relatively unbiased (Vink *et al.* in press). The analyses in this study were based on the idea that when the variable of interest has a familial component, data from respondents can be used as proxy for the data from their non-responding family members. Therefore, mean burnout scores of participants from families with a high response rate (more than 80% of the family members participated) were compared with mean burnout scores of participants from families with a low response rate (less than 80% of the family members participated). No significant difference in burnout scores were found.

It is consistent with earlier studies, which have found that work characteristics are more related to burnout than personal factors, that unique environmental factors are most important. It follows that circumstances at work should remain a focus of research. However, caution is

needed in defining a risk factor as part of the unique environment. Work values, for example, are partly influenced by genetic factors (Arvey *et al.* 1994). This signifies that the organization in which a subject is employed cannot be considered as a pure environmental factor. This problem can be tackled through comparing levels of burnout of MZ twins who work in different environments. Based on earlier results of twin studies on job satisfaction, chronic fatigue and personality characteristics related to burnout, we predicted that burnout would cluster in families mainly as a result of genetic factors. Hence, it was rather unexpected that familial clustering in burnout is due to common environmental factors and not to genetic factors, particularly because a recently published review (Bouchard & McGue, 2003) shows that most lifestyle and personality traits cluster in families because of genetic factors. However, all results of this study support the conclusion that common environmental factors are important in burnout. Two complementary explanations could be offered for these seemingly divergent findings. Overlapping unique environmental factors could underlie the relationship between burnout and the other traits, since unique environmental factors explain half or more of the variance in all these traits. To a lesser extent, this could also be the case for common environmental factors, since familial clustering in both an avoidant coping style and in fatigue has been found to be (partly) due to common environmental factors. Another explanation for the apparent absence of genetic influence on symptoms of burnout could be gene–unique environment interaction. In twin studies the effect of an interaction between genes and unique environment cannot be distinguished from the effect of unique environmental factors alone, since both will lead to differences between MZ twins. There is some support for the hypothesis that gene–environment interaction influences burnout. Burnout scores are more strongly influenced by job stressors in individuals who score high on negative affectivity, a symptom highly comparable with neuroticism, than in individuals who score low on negative affectivity (Houkes *et al.* 2003). This signifies that a trait, which is partly influenced by genetic factors, interacts with job stressors, which are possibly unique environmental factors. Although speculative, it can be hypothesized that this might be a result of an interaction between genes leading to negative affectivity and unique environmental factors leading to burnout.

Common environmental factors within the family have rarely been a focus of research on risk factors for burnout. There are a few articles on the effect of family environment on work attitudes. Barling *et al.* (1998) have investigated the effects of parents' job insecurity on work beliefs and attitudes of male and female undergraduate students. In the best-fitting model children who watch their parents experiencing layoffs and insecurity perceive this insecurity and develop negative work beliefs that predict their work-related attitudes (Barling *et al.* 1998). Loughlin & Barling (2001) describe how contemporary young workers in the US might be influenced by having seen their parents and others around them being 'rightsized' or 'downsized' or otherwise dismissed from their jobs during the 1980s and 1990s. They hypothesize that this new cohort of young workers are less willing to make sacrifices for the sake of their jobs (Loughlin & Barling, 2001). Since our study suggests that familial circumstances, e.g. high level of education of the parents, can lead to vulnerability for burnout, future research should pay more attention to the influence of the work characteristics and attitudes of the parents (e.g. profession, level of ambition, experiences of dismissal, etc.).

The influence of the environment shared by spouses on functioning at work has been studied much more, but is still not well understood (Grzywacz & Marks, 2000). These authors found that spouse disagreement, other family criticism/burden and spousal affective support are related with subjective functioning at work. No studies have investigated the effect of having a partner with symptoms of burnout. Regarding the significant correlation in burnout scores between spouses, it might be useful to study couples to find out which circumstances make both of them vulnerable for burnout, e.g. dual earner families with children, caregiving needs of parents or having a partner with symptoms of burnout.

To summarize, our major result is that burnout clusters in families as a result of environmental factors shared by family members. This should be a focus of future research.

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DECLARATION OF INTEREST

None.

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