

## Job Satisfaction and Cortisol Awakening Response in Teachers Scoring high and low on Burnout

Luis Moya-Albiol, Miguel Ángel Serrano, and Alicia Salvador

Universitat de València (Spain)

The burnout syndrome is an important psychosocial risk in the job context, especially in professions with a strong social interaction, as in the case of teaching. High levels of burnout have been related to negative psychological indicators and hormonal alterations. This study compares job satisfaction and the cortisol awakening response (CAR) in teachers scoring high (HB) and low (LB) on burnout. HB teachers showed lower job satisfaction and no significant differences in the CAR when compared with the LB group. The results of the study suggest a general dissatisfaction with work along with a different functioning of the hypothalamo-pituitary-adrenocortical axis in HB teachers. Although non significantly, they showed a lower magnitude of the CAR than LB teachers. When considering the whole sample, emotional exhaustion and depersonalization correlated negatively and personal accomplishment positively with each subscale of the job satisfaction questionnaire whereas cortisol levels or CAR did not correlate significantly with both burnout subscales and job satisfaction. These results should be taken into account when working to prevent burnout in teachers, as the modified parameters could be considered indicators of the onset or development of the syndrome.

*Keywords:* burnout, job satisfaction, awakening cortisol response, teachers, experiment.

El síndrome de estar quemado o burnout es un factor importante de riesgo psicosocial en el contexto laboral, especialmente en profesiones que tienen una alta interacción social, como es el caso de la enseñanza. En este sentido, altos niveles de burnout han sido asociados a indicadores psicológicos negativos y a alteraciones hormonales. El objetivo de este trabajo es comparar la satisfacción laboral y la respuesta matutina de cortisol en profesores con altas y bajas puntuaciones en burnout. Los profesores con altas puntuaciones en burnout mostraron menor satisfacción laboral que los de puntuaciones bajas, aunque no se encontraron diferencias significativas en la respuesta matutina de cortisol. Estos resultados sugieren que los profesores con altas puntuaciones en burnout tienen un estado general de insatisfacción en el trabajo, junto a una ligera alteración del funcionamiento del eje hipotálamo-hipófiso-adrenal, ya que aunque las diferencias no alcanzaron la significación estadística, estos profesores mostraron menor respuesta matutina de cortisol que los de puntuaciones bajas. Al considerar toda la muestra, las subescalas de despersonalización y cinismo se asociaron negativamente mientras que la de eficacia profesional lo hizo positivamente con la satisfacción laboral. Por otro lado, no se obtuvieron correlaciones significativas entre los niveles de cortisol o la CAR y las diferentes subescalas de burnout o la satisfacción laboral. Estos resultados tienen que ser tenidos en cuenta para trabajar en la prevención de burnout en profesores, ya que los parámetros alterados podrían ser considerados como indicadores de la aparición o desarrollo del síndrome.

*Palabras clave:* burnout, satisfacción laboral, respuesta matutina de cortisol, profesores, experimento.

---

The authors wish to thank Esperanza González-Bono, Gabriel Rodríguez-Alarcón, Raquel Costa, Olga Pellicer, Sonia Martínez-Sanchis and Gema del Valle for their collaboration in the experimental procedure and Miriam Phillips for the revision of the English text. This study was supported by grants number TR-PROM/2000/95/46 and Groups 2004/15 from the Comunidad Valenciana, and grant number SEJ2006-14086/PSIC from The Spanish Ministerio de Educación.

Correspondence concerning this article should be addressed to Luis Moya-Albiol. Departamento de Psicobiología. Facultad de Psicología. Universidad de Valencia. Avenida Blasco Ibáñez, 21. 46010 Valencia. (Spain). Phone: +34-963864635. Fax: +34-963864668. E-mail: Luis.Moya@uv.es

Burnout produces a high rate of absenteeism in teachers and includes a large number of physical and psychological symptoms. These symptoms can be categorized as excessive exhaustion, a cynical work attitude and feelings of reduced competence (Maslach, Schaufeli, & Leiter, 2001). After carrying out a meta-analysis, Faragher, Cass, & Cooper, (2005) found job satisfaction to be more strongly related to mental and psychological problems than to physical complaints. The closest relationship was found between burnout and job satisfaction ( $r = .478$ ), as it failed to reach statistical significance in only 5 of the 62 studies on burnout analyzed. Job satisfaction has been viewed by some authors (Oshagbemi, 1999) as the positive emotional reactions and attitudes an individual has towards his/her job, whereas others have considered it a bi-dimensional construct consisting of "satisfaction/lack of satisfaction" and "dissatisfaction/lack of dissatisfaction" dimensions (Winefield, Tiggemann, & Goldney, 1988). Thus, it is not clear whether job satisfaction is a global concept or whether it is composed of facets of satisfaction with various aspects of one's job (Oshagbemi, 1999; Wanous, Reichers, & Hudy, 1997). Nevertheless, it has been suggested that the most important determinants of job satisfaction are whether an employee finds his/her job interesting, has good relationships with managers and colleagues, has a high income, is allowed to work independently, and has clearly defined career advancement opportunities (Sousa-Poza & Sousa-Poza, 2000).

Although the use of self-reports may provide extensive information about burnout, physiological measures are objective indexes of the consequences of the burnout syndrome on our physical health, unless they are also causes or, at least, biological predisposers to the syndrome. Burnout, as well as other syndromes related to chronic stress, produces alterations in the hypothalamo-pituitary-adrenocortical axis (HPA). One way of studying these effects is by using non invasive measures, such as cortisol levels or cortisol awakening response (CAR). Due to the high variability in the cortisol levels throughout the day, the CAR has been used as a marker that makes it possible to control this aspect (Wahbeh, Kishiyama, Zajdel, & Oken, 2008). This endocrine marker is quite consistent and shows good intra-individual stability across time, as the mean correlation is .55 across studies (Wust et al., 2000a). Indeed, a significant impact of genetic factors on the CAR has been described when comparing monozygotic and dizygotic twin pairs. Thus, the heritability ( $h^2$ ) for mean increases is about .40, and for areas under the curve it is .48 (Wust, Federenko, Hellhammer, & Kirschbaum, 2000b). Hence, the CAR has been proposed as a useful index of HPA activity in general (Briken, Nika, Krausz, & Naber, 2002; Federenko, Nagamine, Hellhammer, Wadhwa, & Wust, 2004; Hazell & Stuart, 2003). It is characterized by a sharp increase in the cortisol released into the blood stream of about 38

to 75% of the awakening levels, reaching a maximum approximately 30 min after awakening (Fries, Dettenborn, & Kirschbaum, 2009; Pruessner et al., 1997), which signifies an increase equal to or greater than 2.5 nmol/l in absolute terms (Briken et al., 2002; Edwards, Clow, Evans, & Hucklebridge, 2001; Edwards, Evans, Hucklebridge, & Clow, 2001; Wust et al., 2000a). This response was found to be independent of the time of awakening, sleep duration, sleep quality, physical activity, or morning routines (Wust et al., 2000a). The interest in the CAR is now focused on the fact that it can be considered an indicator of allostatic load, and a large number of studies have evaluated the CAR in potential unbalanced states and/or pathologies such as burnout (Bellingrath, Weigl, & Kudielka, 2008; Grossi et al., 2005; Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006a; Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006b; Pruessner, Hellhammer, & Kirschbaum, 1999; Schwerdtfeger, Konermann, & Schonhofen, 2008).

Although blunted cortisol levels during the first hour after awakening on two consecutive days have been reported in teachers with high burnout scores (Pruessner et al., 1999), in other studies burnout patients or subjects with high scores on burnout showed elevated cortisol levels during the first hour after awakening in comparison to healthy controls or subjects with low burnout scores (De Vente, Olf, Van Amsterdam, Kamphuis, & Emmelkamp, 2003; Grossi et al., 2005). Another study observed a lack of differences in CAR between clinically diagnosed burnout individuals and healthy controls (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006a). More recently, no associations between CAR and burnout scores (evaluated using the MBI) were found in school teachers, but after using a very low-dose dexamethasone suppression test, higher burnout was significantly related to stronger cortisol suppression, pointing to altered HPA axis negative feedback sensitivity (Bellingrath et al., 2008). Moreover, teachers high in self-efficacy have exhibited an attenuated CAR and fewer cardiac complaints, indicating that teacher self-efficacy might act as a physiological toughening agent with favorable health outcomes (Schwerdtfeger et al., 2008). Hence, the literature is very inconsistent in the findings relating burnout and CAR. This discrepancy could be due to several factors, such as differences in the time when the saliva samples were taken, the way the data were collected (laboratory or natural context), and the duration of the study (short-term or longitudinal). For all of these reasons, there is a need to carry out more studies in this field to clarify this question.

On the other hand, when studying the cortisol levels during the work day, higher levels of resting cortisol values were described in people with high burnout scores (Melamed et al., 1999), although a lack of relationship between burnout and cortisol levels has also been observed (De Vente et al., 2003; Grossi, Perski, Evengard, Blomkvist,

& Orth-Gomer, 2003; Mommersteeg, Heijnen, Kavelaars, & van Doornen, 2008). However, low levels of cortisol have also been reported (Tops et al., 2007), and due to similarities with chronic fatigue syndrome and atypical depression, burnout is suspected to be a hypocortisolismic syndrome (Tops, Riese, Oldehinkel, Rijdsdijk, & Ormel, 2008; Tops, van Peer, Wijers, & Korf, 2006). The direction of the association might be due to the characteristics of the sample studied (Chida & Steptoe, 2009; Kudielka, Bellingrath, & Hellhammer, 2006) and to the point in time and procedure with which the HPA axis is assessed, as when using the dexamethasone suppression test (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006a; Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006b). Thus, the picture is much more complex than initially thought.

The main aim of this study was to compare job satisfaction and the CAR in teachers scoring high (HB) and low (LB) on burnout. This general objective should advance the knowledge about burnout syndrome. Based on previous research, we hypothesized lower job satisfaction (Faragher, Cass, & Cooper, 2005; Maslach et al., 2001; Van Humbeeck, Van Audehove, & Declercq, 2004) and lower CAR (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006a; Pruessner et al., 1999) in the HB group. Another purpose of our study was to analyze the relationships between each component of the MBI (emotional exhaustion, depersonalization and personal accomplishment) and job satisfaction and CAR across all subjects, as well as the possible association between CAR and job satisfaction. These latter aims would offer more specific information about the role of each main factor of the burnout syndrome in the development of low job satisfaction or in presenting an altered CAR, as well as information about the role of job satisfaction in the cortisol levels or response to awakening in teachers.

## Methods

### *Participants and procedure*

The final sample was composed of 64 full-time school teachers, 13 men and 51 women, with a mean age of 42.83 years ( $SD = 9.21$ ) and a mean body mass index of  $23.15 \text{ Kg/m}^2$  ( $SD = 2.77$ ). The proportion of men to women is representative of the percentage of each gender teaching in the public schools in the Valencian Community. A total of 10 different schools were investigated. They were selected by taking into account different criteria, such as the educational level of the students, as all of them had a medium educational level, and the area in which they were located, as all the schools were located in Valencia (Spain). Both variables could influence the level of burnout experienced by the teachers. After contacting the schools, an interview with the director of each school was held in order to explain

the procedure and characteristics of the study. Out of a total of 10 schools, only 6 decided to participate in the study. Teachers gave written informed consent to participate in the study, and they received no monetary incentive. Subjects were initially screened using a general questionnaire to evaluate habits, health aspects, and drug intake. The sample was selected from a larger one composed of 80 subjects; those who smoked, were not medication-free, used oral contraceptives, were pregnant, or had any type of illness were eliminated. An informative meeting was programmed for teachers from each school. Afterwards, appointments were made with those teachers who voluntarily decided to participate in the study. They were asked to take a sample of saliva on a work day, at the time of awakening and 30 minutes later, and to complete a battery of questionnaires that included the Maslach Burnout Inventory (MBI) and the Occupational Stress Indicator (OSI).

### *Psychological Profiles*

The MBI is composed of 16 items which may be classified into three subscales: emotional exhaustion, depersonalization and personal accomplishment (Maslach, 1993; Maslach & Jackson, 1986). Emotional exhaustion refers to feelings of being overextended and depleted of one's emotional resources, depersonalization refers to unfeeling and impersonal responses to other people, and reduced personal accomplishment is a decline in one's feeling of competence and successful achievement at work. A total score for burnout was obtained by calculating the mean of the three subscales.

Job satisfaction was evaluated by means of the OSI (Cooper, Sloan, & Williams, 1988). This instrument is composed of 6 main scales, but only the job satisfaction scale, which is divided into 6 Likert-type rating subscales, was administered. High scores on the scale indicate greater satisfaction. The scale includes 22 items measuring achievement value and growth, the job itself, organization design and structure, organizational processes, and personal relationships. The OSI has been widely used in the UK and other countries, and it has an established reliability of .92 (Shanfa, Sparks, & Cooper, 1998) and both predictive and criterion validity (Cooper & Bramwell, 1992; Kirkcaldy & Cooper, 1992; Langan-Fox & Poole, 1995). The OSI has been translated into Spanish and used in several studies with Spanish populations (Osca, González-Camino, Bardera, & Peiró, 2003).

### *Saliva collection and hormonal determination*

Subjects were informed about the necessity of following the instructions regarding the time schedule for saliva sampling, in order to obtain valuable data. They were told to start saliva sampling immediately upon awakening and

not to have breakfast until they were told to do so, with the purpose of avoiding contamination of saliva with food or drinks. Teachers were also instructed not to brush their teeth before completion of the saliva sampling. Two samples were directly collected from mouth to tube (*Unitek R*). They were used to analyze cortisol values, and it was confirmed that the instructions had been correctly followed.

Samples were centrifuged (5000 rpm, 15±2°C) and frozen at -20°C until determination by radioimmunoassay (RIA) at our laboratory (*Central Research Unit, Faculty of Medicine, University of Valencia, Spain*). Samples from each subject were run in duplicate in the same assay. Salivary cortisol was determined by a commercial kit adapted as recommended in the protocol (*Orion Diagnostica, Espoo, Finland*). 125I-cortisol tracer and a high specific antibody were used. Salivary cortisol was expressed in nmol/l, the sensitivity was 1 nmol/l, and internal and external controls were included in the assays. Good precision was obtained, with intra- and interassay variation coefficients below 5%.

### Statistical analysis

The sample was divided into two groups according to the mean of the total score on the MBI (1.98±1.19), following another study that used the same procedure (Pruessner et al., 1999). Other studies have used similar procedures, such as the mean split plus chronic criteria (Melamed et al., 1999), or the quartile split method (Grossi et al., 2003). Subjects with scores equal to or higher than the mean were classified as the HB group, whereas those who scored below the mean were categorized as the LB group. *T tests* were performed to compare the two groups on sample characteristics and psychological profiles.

To analyze the CAR, a repeated measures 2 x 2 ANOVA was carried out, with 'time of day' (values upon awakening and 30 minutes later) as the within-subjects factor and 'group' as the between-subjects factor. Moreover, the magnitude of this response was calculated by means of change scores (levels at 30 minutes minus levels at awakening), and a *T test* was calculated to analyze the effect of 'group'.

Spearman rank correlation tests were carried out to examine relationships among the MBI subscales (emotional exhaustion, depersonalization, and personal accomplishment) and job satisfaction (total scores and each subscale: achievement value and growth, the job itself, organization design, organization structure, organizational processes and personal relationships) and CAR. The significance levels for the correlations were adjusted for multiple tests.

All the analyses were carried out using the *SPSS 15.0* for Windows. Average values are expressed in the tables as mean ± *SD*. The alpha level (*p*) was fixed at .05. The observed power (*P*) (*1-beta*) or probability of rejecting the null hypothesis when it is false was also included in the results.

## Results

### Sample characteristics

Information on the characteristics of the participants is presented in Table 1. Groups differed in age  $t(56.80) = -2.42$ ,  $p < .05$ , with the older teachers scoring higher on the MBI. Nevertheless, there were no differences between groups in the number of years they had been teaching. No significant differences between groups for gender, weight, height, and body mass index were found.

### Job Satisfaction

Table 2 shows burnout and job satisfaction scores for the HB and LB groups. HB subjects showed lower scores on all the scales of job satisfaction ( $t(61) = 4.45$ ,  $p < .001$ ;  $t(61) = 4.04$ ,  $p < .001$ ;  $t(61) = 3.56$ ,  $p < .001$ ;  $t(45.49) = 4.22$ ,  $p < .001$ ;  $t(61) = 3.67$ ,  $p < .001$  and  $t(43.89) = 4.41$ ,  $p < .001$  for achievement value and growth, the job itself, organization design, organizational processes, personal relationships and total job satisfaction, respectively).

### CAR

When studying the Csal response to awakening, it was revealed that across all subjects Csal levels 30 minutes

Table 1  
General characteristics of HB and LB subjects (Mean±SD)

	HB group (n = 29)		LB (n = 35)	
	men (n = 8)	women (n = 21)	men (n = 5)	women (n = 30)
Age (years)*	45.65 ± 6.32		40.49 ± 10.58	
Years teaching	20.32 ± 7.50		17.23 ± 10.67	
Weight (Kg)	65.33 ± 11.23		61.32 ± 9.32	
Height (cm)	165.19 ± 8.91		164.62 ± 7.71	
BMI (Kg/m <sup>2</sup> )	23.89 ± 2.81		22.58 ± 2.64	

\* $p < .05$

after awakening were significantly higher than those at the moment the subjects woke up  $F(1,61) = 7.58, p < .01; P = .77$ . Indeed, the entire sample increased their Csal levels from  $19.32 \pm 8.87$  nmol/l at awakening to  $23.35 \pm 8.57$  nmol/l 30 minutes later, which signifies an increase of 20.85% of the awakening levels, corresponding to a rise of 4.03 nmol/l in absolute terms. Moreover, groups did not differ significantly in their Csal levels at awakening ( $19.09 \pm 8.16$  and  $19.52 \pm 9.56$  for teachers scoring high and low on burnout, respectively) or in the Csal levels 30 min after awakening ( $21.50 \pm 6.27$  and  $24.93 \pm 9.95$  for teachers scoring high and low on burnout, respectively), or in the CAR, although the magnitude of the response was lower in HB teachers (Figure 1). Thus, in the HB group there was an increase of 12.62% of the awakening levels, which represents a rise of 2.41 nmol/l in absolute terms, whereas the LB teachers showed a sharp increase of 27.71% of the awakening levels (a rise of 5.41 nmol/l in absolute terms).

On the other hand, negative CARs in subjects were analyzed as signs of non compliance. Thus, in the HB group 41.4% of the sample showed a negative CAR, whereas in the low burnout group only 29.4% of the subjects presented this kind of CAR.

### Relationships among burnout subscales, job satisfaction and CAR.

As can be observed in Table 3, both emotional exhaustion and depersonalization correlated negatively and personal accomplishment positively with each subscale of the job satisfaction questionnaire (for all  $p < .01$ ).

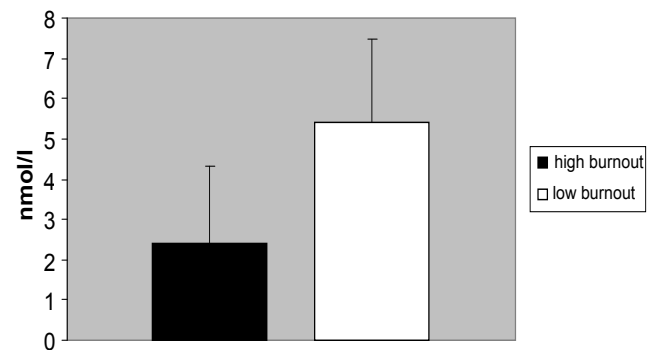


Figure 1. CAR (nmol/l) in HB and LB teachers (Mean±SD).

Table 2

### Burnout and Job Satisfaction in HB and LB teachers (Mean±SD)

	HB group (n = 29)	LB group (n = 35)
Burnout total scores**	2.94 (.98)	1.18 (.63)
Emotional exhaustion**	4.28 (.89)	1.99 (1.24)
Depersonalization**	2.56 (1.54)	.81 (.82)
Personal accomplishment**	4.02 (1.34)	5.25 (.79)
Total job satisfaction**	3.61 (.99)	4.53 (.59)
Achievement and growth**	3.54 (.97)	4.47 (.69)
Job itself**	4.04 (.93)	4.84 (.62)
Organization design**	3.26 (.88)	4.04 (.84)
Organization processes**	3.72 (1.08)	4.70 (.67)
Personal relationships**	3.83 (.96)	4.58 (.67)

\*\* $p < .01$

Table 3

### Relationships between Burnout Subscales and Job Satisfaction

	Emotional exhaustion	Depersonalization	Personal accomplishment
Total job satisfaction	-.426**	-.517**	.597**
Achievement and growth	-.466**	-.460**	.667**
Job itself	-.548**	-.544**	.649**
Organization design	-.418**	-.422**	.451**
Organization processes	-.437**	-.565**	.499**
Personal relationships	-.435**	-.514**	.526**

\*\* $p < .01$

No significant correlations were found between cortisol salivary levels at awakening, 30 minutes after, or CAR and each MBI subscale or between the former and total job satisfaction or each subscale of the questionnaire for either the HB or LB teachers (for all  $p > .10$ ).

### Discussion

HB teachers, compared with the LB group, showed lower job satisfaction and no significant difference in the CAR, but the magnitude of the response was lower in HB teachers. Although job dissatisfaction has been more closely related to mental and psychological problems (Faragher et al., 2005), it could be a consequence of burnout, but reflects only some of the symptoms of the syndrome. Hence, burnout teachers show, apart from a lack of idealism at work and a cynical work attitude (together with low job satisfaction), a feeling of reduced competence, negative and inappropriate attitudes toward students, the wish to change or leave the profession, and excessive exhaustion (Maslach et al., 2001). Our results emphasize that teacher with high scores on burnout, although not clinically diagnosed, show clear job dissatisfaction when compared with LB teachers. Thus, putting it another way, employees with low levels of job satisfaction are more likely to experience emotional burnout, which, as previously hypothesized (Faragher et al., 2005), could be due to the fact that many people spend an important proportion of their waking hours at work. If their job fails to provide adequate personal satisfaction, or even causes actual dissatisfaction, they are likely to feel unhappy or unfulfilled for long periods of the working day. Consequently, they might reach a state of emotional exhaustion and experience other symptoms that characterize the burnout syndrome. When analyzing each component of the burnout syndrome separately, both emotional exhaustion and depersonalization are negatively associated whereas personal accomplishment is positively related with total job satisfaction and with each subscale of the questionnaire. These results point out the need to analyze the relationship between job satisfaction and each component of the burnout syndrome separately, and to consider these relationships in future studies in this field.

Across all subjects we found an increase of 20.85% of the awakening Csal levels 30 minutes later, which means that all the participants (with low or high burnout scores) exhibited a statistically significant increase in morning cortisol. However, this increase in the total sample does not reach the criterion for a sharp increase (an increase in cortisol released into the blood stream of about 38 to 75% of awakening levels (Fries et al., 2009; Pruessner et al., 1997), although in this case cortisol was analyzed in saliva. Nevertheless, there was a rise of 4.03 *nmol/l* in absolute terms, which exceeds the criterion of an increase equal to or higher than 2.5 *nmol/l* (Briken et al., 2002; Edwards et al., 2001a; Edwards et al., 2001b; Wust et al., 2000a).

When comparing HB and LB teachers, there was no difference in their Csal levels at awakening and 30 minutes later or in the CAR. In previous studies, groups with a high score on a burnout questionnaire presented lower, higher or unchanged Csal levels after waking (Grossi et al., 2003; Melamed et al., 1999; Pruessner et al., 1999). In the case of clinically diagnosed burnout subjects, a lower (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006b), higher (De Vente et al., 2003; Grossi et al., 2005) or unchanged (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006a) CAR has been described when compared to healthy controls. The HB group augmented their Csal levels by a percentage of 12.62% of the awakening levels, but the LB group showed an increase of 27.71% of the awakening levels. Although neither group reached the sharp increase of about 38 to 75% of awakening levels (Fries et al., 2009; Pruessner et al., 1997), the increase was higher in the case of the LB teachers. When analyzing this rise in absolute terms, it is clear that only the LB group fulfilled the criterion of an increase equal to or higher than 2.5 *nmol/l* (Briken et al., 2002; Edwards et al., 2001a; Edwards et al., 2001b; Wust et al., 2000a), as this group showed a sharp increase with a rise of 5.41 *nmol/l*. In contrast, in the HB group the change only represented a rise of 2.41 *nmol/l*, which almost reach the criterion. Moreover, 41.4% of the HB group and 29.4% of the LB group showed a negative CAR, which means that in the former more teachers presented signs of non compliance. Thus, HB teachers showed lower CAR, a trend that could reach significance when considering subjects clinically diagnosed with burnout, instead of studying those who differ on their MBI scores but have not been diagnosed.

In addition, our data are partially inconsistent with the literature. This could be due to several factors. Indeed, one methodological problem could be the fact that salivary cortisol was only evaluated twice in one working day, once at awakening and again 30 minutes later. Although the most appropriate moment used to evaluate the CAR is the one selected in this study (de Vugt et al., 2005; Federenko et al., 2004; Wahbeh et al., 2008; Wust et al., 2000a), recent studies suggest taking four different samples (awakening and 30, 45 and 60 minutes after) and doing so on two different days (Fries et al., 2009; Hellhammer et al., 2007; Kudielka, Hellhammer, & Wust, 2009). Thus, the major limitations of this work are the insufficient sampling frequency and the low compliance. Hence, it is well known that a one-day sample mainly reflects the present state (Hellhammer et al., 2007), and there is a compliance of 41% in the HB group and of 29% in the LB group. In addition, it is important to consider that a lower CAR in the HB group may be due to the larger number of negative CAR in this group.

Unlike various burnout studies carried out in the laboratory under controlled conditions, the present study was carried out in a natural context, using data collected from different state school teachers. For this reason, the study cannot deliver "cause or effect analyses" to describe the complex relationships between the different variables

investigated. Although it offers a closer perspective of the syndrome, unlike other studies, there is a different proportion of each gender in the sample analyzed, which could affect all the physiological variables, especially the cortisol data. However, in our study there were no significant differences between HB and LB teachers based on gender, and men and women were not compared. In any case, men and women did not differ significantly in their cortisol levels at awakening or 30 minutes later or in their CAR. Interesting results have been found using the mean of the MBI to differentiate groups, but a selection of extreme groups would clarify the psychophysiological responses characteristic of burnout teachers. Thus, a screening test could be used to investigate teachers affected by burnout, selecting only those teachers with high and low burnout scores, as has been done in other studies. Some of the factors mentioned, such as gender, health status or stress perception, along with others, such as the anticipation of the upcoming day, have been recently pointed out as modulators of the CAR (Fries et al., 2009).

No significant relationships between each component of the burnout syndrome (emotional exhaustion, depersonalization and personal accomplishment) and salivary cortisol levels or the CAR were found across all subjects. This result could be partially explained by the specific previously mentioned factors inherent to our study. Only one study recently analyzed one of the components of burnout separately, showing that teachers high in self-efficacy exhibited an attenuated CAR (Schwerdtfeger et al., 2008). Following the strategy we used, future studies should examine the relationships between each component of burnout and cortisol, in order to make it possible to understand how they separately affect the HPA axis. Moreover, CAR and job satisfaction have been shown to be independent variables, as there were no significant correlations between them in HB or LB teachers.

In conclusion, HB teachers showed lower job satisfaction than LB teachers, but no differences in the case of CAR, although the magnitude of the response was lower in HB teachers. Job satisfaction is negatively associated to emotional exhaustion and depersonalization but positively to personal accomplishment, whereas there is no association between each component of the burnout syndrome and salivary cortisol levels or CAR. Future research could amplify the results obtained by taking different samples of salivary cortisol (at least at four times during the day) at different moments throughout the academic year, making it possible to obtain a description of the evolution of the CAR depending on the burnout scores. In addition, an analysis of each burnout component and its relationship with job satisfaction and CAR in teachers clinically diagnosed with burnout would broaden the results obtained up until now. The results of this study should be taken into account when working to prevent burnout in teachers, as the modified parameters could be considered indicators of the onset or development of the syndrome.

## References

- Bellingrath, S., Weigl, T., & Kudielka, B. M. (2008). Cortisol dysregulation in school teachers in relation to burnout, vital exhaustion, and effort-reward-imbalance. *Biological Psychology*, 78(1), 104-113.
- Briken, P., Nika, E., Krausz, M., & Naber, D. (2002). Atypical neuroleptics in the treatment of aggression and hostility in schizophrenic patients. *Fortschritte Der Neurologie-Psychiatrie*, 70(3), 139-144.
- Chida, Y., & Steptoe, A. (2009). Cortisol awakening response and psychosocial factors: A systematic review and meta-analysis. *Biological Psychology*, 80(3), 265-278.
- Cooper, C. L., & Bramwell, R. (1992). Predictive validity of the strain components of the occupational stress indicator. *Stress Medicine*, 8, 56-60.
- Cooper, C. L., Sloan, S. J., & Williams, S. (1988). *The occupational stress indicator: Management guide*. Windsor: NFER Nelson.
- De Vente, W., Olf, M., Van Amsterdam, J. G., Kamphuis, J. H., & Emmelkamp, P. M. (2003). Physiological differences between burnout patients and healthy controls: Blood pressure, heart rate, and cortisol responses. *Occupational and Environmental Medicine*, 60 Suppl 1, 54-61.
- De Vugt, M. E., Nicolson, N. A., Aalten, P., Lousberg, R., Jolle, J., & Verhey, F. R. (2005). Behavioral problems in dementia patients and salivary cortisol patterns in caregivers. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 17(2), 201-207.
- Edwards, S., Clow, A., Evans, P., & Hucklebridge, F. (2001a). Exploration of the awakening cortisol response in relation to diurnal cortisol secretory activity. *Life Sciences*, 68(18), 2093-2103.
- Edwards, S., Evans, P., Hucklebridge, F., & Clow, A. (2001b). Association between time of awakening and diurnal cortisol secretory activity. *Psychoneuroendocrinology*, 26(6), 613-622.
- Faragher, E. B., Cass, M., & Cooper, C. L. (2005). The relationship between job satisfaction and health: A meta-analysis. *Occupational and Environmental Medicine*, 62(2), 105-112.
- Federenko, I. S., Nagamine, M., Hellhammer, D. H., Wadhwa, P. D., & Wust, S. (2004). The heritability of hypothalamus pituitary adrenal axis responses to psychosocial stress is context dependent. *The Journal of Clinical Endocrinology and Metabolism*, 89(12), 6244-6250.
- Fries, E., Dettenborn, L., & Kirschbaum, C. (2009). The cortisol awakening response (CAR): Facts and future directions. *International Journal of Psychophysiology: Official Journal of the International Organization of Psychophysiology*, 72(1), 67-73.
- Grossi, G., Perski, A., Ekstedt, M., Johansson, T., Lindstrom, M., & Holm, K. (2005). The morning salivary cortisol response in burnout. *Journal of Psychosomatic Research*, 59(2), 103-111.
- Grossi, G., Perski, A., Evengard, B., Blomkvist, V., & Orth-Gomer, K. (2003). Physiological correlates of burnout among women. *Journal of Psychosomatic Research*, 55(4), 309-316.

- Hazell, P. L., & Stuart, J. E. (2003). A randomized controlled trial of clonidine added to psychostimulant medication for hyperactive and aggressive children. *Journal of the American Academy of Child and Adolescent Psychiatry*, 42(8), 886-894.
- Hellhammer, J., Fries, E., Schweisthal, O. W., Schlotz, W., Stone, A. A., & Hagemann, D. (2007). Several daily measurements are necessary to reliably assess the cortisol rise after awakening: State- and trait components. *Psychoneuroendocrinology*, 32(1), 80-86.
- Kirkcaldy, B. D., & Cooper, C. L. (1992). Managing the stress of change: Occupational stress among senior police officers in Berlin. *Stress Medicine*, 8, 219-231.
- Kudielka, B. M., Bellingrath, S., & Hellhammer, D. H. (2006). Cortisol in burnout and vital exhaustion: An overview. *Giornale Italiano Di Medicina Del Lavoro Ed Ergonomia*, 28(1) Suppl 1, 34-42.
- Kudielka, B. M., Hellhammer, D. H., & Wust, S. (2009). Why do we respond so differently? reviewing determinants of human salivary cortisol responses to challenge. *Psychoneuroendocrinology*, 34(1), 2-18.
- Langan-Fox, J., & Poole, M. E. (1995). Occupational stress in Australian business and professional women. *Stress Medicine*, 11, 113-122.
- Maslach, C. (1993). Burnout: A multidimensional perspective. In W. B. Schaufeli, C. Maslach & T. Marek (Eds.), *Professional burnout: Recent developments in theory and research* (pp. 19-32). Washington DC: Taylor & Francis.
- Maslach, C., & Jackson, S. E. (1986). *MBI: Maslach burnout inventory; manual research edition*. Palo Alto: Consulting Psychologists Press.
- Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology*, 52, 397-422.
- Melamed, S., Ugarten, U., Shirom, A., Kahana, L., Lerman, Y., & Froom, P. (1999). Chronic burnout, somatic arousal and elevated salivary cortisol levels. *Journal of Psychosomatic Research*, 46(6), 591-598.
- Mommersteeg, P. M., Heijnen, C. J., Kavelaars, A., & van Doornen, L. J. (2008). The HPA-axis and immune function in burnout. *Progress in Brain Research*, 167, 281-285.
- Mommersteeg, P. M., Heijnen, C. J., Verbraak, M. J., & van Doornen, L. J. (2006a). Clinical burnout is not reflected in the cortisol awakening response, the day-curve or the response to a low-dose dexamethasone suppression test. *Psychoneuroendocrinology*, 31(2), 216-225.
- Mommersteeg, P. M., Heijnen, C. J., Verbraak, M. J., & van Doornen, L. J. (2006b). A longitudinal study on cortisol and complaint reduction in burnout. *Psychoneuroendocrinology*, 31(7), 793-804.
- Osca, A., González-Camino, G., Bardera, P., & Peiró, J. M. (2003). Role of stress and its influence on physical and psychological well-being in professional soldiers. *Psicothema*, 15(1), 54-57.
- Oshagbemi (1999). Overall job satisfaction: How good are single vs. multiple-item measures? *Journal of Managerial Psychology*, 14, 388-403.
- Pruessner, J. C., Hellhammer, D. H., & Kirschbaum, C. (1999). Burnout, perceived stress, and cortisol responses to awakening. *Psychosomatic Medicine*, 61(2), 197-204.
- Pruessner, J. C., Wolf, O. T., Hellhammer, D. H., Buske-Kirschbaum, A., von Auer, K., Jobst, S., et al. (1997). Free cortisol levels after awakening: A reliable biological marker for the assessment of adrenocortical activity. *Life Sciences*, 61(26), 2539-2549.
- Schwerdtfeger, A., Konermann, L., & Schonhofen, K. (2008). Self-efficacy as a health-protective resource in teachers? A biopsychological approach. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, 27(3), 358-368.
- Shanfa, Y., Sparks, K., & Cooper, C. L. (1998). Occupational stress in workers and managers in steelworks in China. *International Journal of Stress Management*, 5, 237-245.
- Sousa-Poza, A., & Sousa-Poza, A. A. (2000). Well-being at work: A cross-sectional study of the levels and determinants of job satisfaction. *Journal of Socio-Economics*, 29, 517-538.
- Tops, M., Boksem, M. A., Wijers, A. A., van Duinen, H., Den Boer, J. A., Meijman, T. F., et al. (2007). The psychobiology of burnout: Are there two different syndromes? *Neuropsychobiology*, 55(3-4), 143-150.
- Tops, M., Riese, H., Oldehinkel, A. J., Rijdsdijk, F. V., & Ormel, J. (2008). Rejection sensitivity relates to hypocortisolism and depressed mood state in young women. *Psychoneuroendocrinology*, 33(5), 551-559.
- Tops, M., van Peer, J. M., Wijers, A. A., & Korf, J. (2006). Acute cortisol administration reduces subjective fatigue in healthy women. *Psychophysiology*, 43(6), 653-656.
- Van Humbeeck, G., Van Audehove, C., & Declercq, A. (2004). Mental health, burnout and job satisfaction among professionals in sheltered living in Flanders. A pilot study. *Social Psychiatry and Psychiatric Epidemiology*, 39(7), 569-575.
- Wahbeh, H., Kishiyama, S. S., Zajdel, D., & Oken, B. S. (2008). Salivary cortisol awakening response in mild Alzheimer disease, caregivers, and noncaregivers. *Alzheimer Disease and Associated Disorders*, 22(2), 181-183.
- Wanous, J. P., Reichers, A. E., & Hudy, M. J. (1997). Overall job satisfaction: How good are single-item measures? *The Journal of Applied Psychology*, 82(2), 247-252.
- Winefield, A. H., Tiggemann, M., & Goldney, R. D. (1988). Psychological concomitants of satisfactory employment and unemployment in young people. *Social Psychiatry and Psychiatric Epidemiology*, 23(3), 149-157.
- Wust, S., Federenko, I., Hellhammer, D. H., & Kirschbaum, C. (2000b). Genetic factors, perceived chronic stress, and the free cortisol response to awakening. *Psychoneuroendocrinology*, 25(7), 707-720.
- Wust, S., Wolf, J., Hellhammer, D. H., Federenko, I., Schommer, N., & Kirschbaum, C. (2000a). The cortisol awakening response - normal values and confounds. *Noise & Health*, 2(7), 79-88.

Received February 12, 2009

Revision received October 13, 2009

Accepted November 3, 2009