

## Lower on the Totem Pole: The Influence of Sense of Control and Trait Anxiety on Cortisol at Lower Hierarchical Levels

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Several studies have found that hierarchical position either increases or reduces physiological stress. The purpose of this study was to investigate the moderating effect of sense of control or trait anxiety on the relationship between hierarchical position and physiological stress. Using a multilevel mixed-effects regression, we hypothesized that sense of control or trait anxiety could be buffers (accelerants) in lowering (increasing) physiological stress for those higher (lower) in the hierarchy. We draw on a sample of 202 Portuguese executives. Our findings indicate that relative to top-level managers, those lower in the hierarchical position had a lower salivary cortisol. Considering the moderating effects of sense of control or trait anxiety, executives lower in the hierarchy who have a higher sense of control or report higher trait anxiety levels had higher cortisol levels. Sense of control or trait anxiety may aid in the understanding of more subtle associations between hierarchical position and physiological stress.

*Keywords:* cortisol, anxiety, stress, sense of control, leadership

Stress in the workplace can affect employees at every level (Beehr, 2014). Stress influences outcomes ranging from job turnover and satisfaction to individual and group performance (Biron & Karanika-Murray, 2014). Managing employee stress is essential to improving the well-being of employees and is increasingly gaining importance as a critical managerial agenda (e.g., Pfeffer, 2009). Both direct (such as higher health insurance costs) and indirect (such as absenteeism or turnover) costs associated with employee stress affect organizational

performance (Landy, Quick, & Kasl, 1994). Given its mounting importance, studies have increasingly focused on variations in physiological manifestations of stress at different hierarchical levels in the organization. However, studies have found mixed support for the association between hierarchical position and physiological stress (e.g., Cahoon & Rowney, 1984, or Sherman et al., 2012).

Those higher in the hierarchy have more power and discretion (Carpenter & Golden, 1997), allowing them greater degrees of freedom in exercising a sense of control over their job tasks and in meeting job demands (Hage & Aiken, 1969). Conversely, those lower in the hierarchy have limited discretion in improving their job context or job tasks and therefore exercising sense of control to improve or change job context or job tasks may be less efficacious (Parker, 1998). In addition to the varying efficacy of sense of control at different hierarchical levels, those higher in the hierarchy must be more vigilant to threats, and greater trait anxiety could help devise more viable and informed actions (cf. Cisler & Koster, 2010). Anxiety induces greater vigilance to threats and impels individuals to devise strategies to overcome

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threats (Eysenck, 1989). Those exhibiting greater trait anxiety at lower levels of the hierarchy may react more negatively, as hierarchical constraints limit coping for such lower rung employees, whereas those at higher levels of the hierarchy could leverage trait anxiety as a vigilance tool to improve performance in face of complex and uncertain job tasks (Vie, Glasø, & Einarsen, 2010).

Tying the mixed findings on hierarchical position and stress with buffering roles of sense of control and trait anxiety contingent on hierarchical position, the purpose of this study is to assess whether employees, depending on their hierarchical position, could leverage sense of control (Keeton, Perry-Jenkins, & Sayer, 2008) or trait anxiety (Spielberger, 1983) to buffer against physiological stress. Although sense of control is generally construed as a positive employee characteristic, we test whether those lower in hierarchy may experience more stress when exercising sense of control. As such, we test the “dark side” of a sense of control. Although trait anxiety is generally construed as a negative trait, we test whether those with higher trait anxiety and higher in hierarchy may experience relatively lower stress. The findings provide a deeper understanding of physiologically manifested aspects of stress.

### Physiological Stress and Leadership Research

Stress occurs when “individuals perceive that they cannot adequately cope with the demands being made on them or with threats to their well-being” (Lazarus, 1966, p. 9). In particular, stress in the workplace arises with intensification of job demands, time pressure, lack of control, and more. During stressful and demanding periods, cortisol is secreted through increasing gluconeogenesis (Gröschl, 2008; Shabani, Dehghani, Hedayati, & Rezaei, 2011). Salivary cortisol, in particular, is used to measure free cortisol (Dorn, Lucke, Loucks, & Berga, 2007; Hellhammer, Wüst, & Kudielka, 2009), and it reflects a fraction of the serum concentration (Inder, Dimeski, & Russell, 2012; Papacosta & Nassis, 2011). Cortisol, an arousal hormone released by the hypothalamic-pituitary-adrenal (HPA) axis, is present in saliva, blood, and urine. Salivary cortisol is reliable and, according to Vining, McGinley, Maksy-

tis, and Ho (1983) and Gröschl (2008), provides several advantages because it is a noninvasive method that is presumably less stressful than blood collection. It also allows for repeated measures, is easily repeatable, has a simple collection procedure, and can be performed outside research laboratories (Inder et al., 2012).

### Hierarchy and Physiological Stress

Studying the relationship between the hierarchical position (indicating increasing leadership responsibility) in humans and salivary cortisol has been less common. Indeed, the predominant literature that examines the relationship between hierarchical position and stress has focused on primates and other nonhuman species. Gesquiere et al. (2011) studied baboons and concluded that males in higher ranks had lower stress hormone levels. The pertinence and relevance of these findings related to the relationship between stress and hierarchies in humans is multicontextual. Sapolsky (2005) discussed how humans belong to multiple hierarchies (e.g., the workplace or community) and primarily value the one in which they hold a higher rank. Furthermore, humans possess psychological resources that enable them to rationalize and relativize the meaning and consequences of a rank (Sapolsky, 2005). The evidence on the association between stress and the hierarchical position in an organization is mixed.

On the one hand, some authors (e.g., Levinson, 1981; Cahoon & Roney, 1984) claim that individuals in top positions have higher stress levels. According to Sapolsky (2005), those in higher ranks are exposed to more physiological and psychological stressors and thus experience higher stress levels. This line of studies claims that top managers face important and demanding decisions. Advances in the hierarchy of an organization increase the responsibility, challenges, and demands (March & Weiner, 2003). Leaders are responsible for managing others (Sherman et al., 2012) and must handle conflicts, make important decisions, and have greater job responsibilities. Higher workload and frequent travel also increase physical demands on leaders (Campbell, Bales, Martin, & Meddings, 2007). Leaders can be expected to experience more stressful events (Levinson, 1981; Lovelace, Manz, & Alves, 2007). As such, they need to stay prepared for the physi-

ological consequences of the higher stakes decisions they make.

On the other hand, a parallel stream of research has found that those higher in the hierarchy experience less stress. Among primates, when hierarchies are stable and subordinates do not challenge the top ranks, the subordinates display higher stress levels (Sapolsky, 2005); conversely, if attaining higher ranks require frequent in-fighting, the subordinates display lower stress levels (Sapolsky, 2005). Moving up in the hierarchy brings greater control and power over resources and job tasks. Sherman et al. (2012) provide new insights to the field, advocating that higher leadership position leaders have psychological and physiological advantages. Sherman et al., in a sample from government and military personnel, found that individuals at higher leadership positions enjoy psychological advantages, which translate into lower levels of psychological stress. Highlighting the distinction in the job context between government or military personnel and firm executives, Sapolsky (2012, p. 17731) explained, "Neither the government nor the military seems likely to go out of business soon." Therefore, we use a sample of nonmilitary individuals because leaders in military and government positions are less likely to experience stress as their positions involve fewer threatening or confrontational situations.

Sherman et al. (2012) and Mehta and Josephs (2010) found that those who are in higher leadership positions are more capable of managing stress and thus show lower levels of stress, either psychological or physiological, compared with other nonleaders in an organization. Based on their findings and extending the still-scarce existing studies that relate hierarchical position and the stress hormone cortisol, we posit the following:

*Hypothesis 1:* There is a negative relationship between the hierarchical position and salivary cortisol.

### The Role of Sense of Control

Sense of control is the "earned, generalized belief that one can and does master, control, and shape one's own life" (Keeton et al., 2008, p. 213). High sense of control is linked to proactive behaviors and positive psychological out-

comes, such as lower anxiety levels (Mirowsky & Ross, 1991). Lower sense of control is related to depression, stress, and anxiety (e.g., Chorpita & Barlow, 1998; Shapiro, Schwartz, & Astin, 1996). Employees mitigate occupational stress by leveraging psychological resources such as sense of control to meet job demands (Hobfoll & Shirom, 2001; Schaubroeck & Merritt, 1997).

We posit that greater sense of control at lower levels of hierarchy increases physiological stress. Exercising sense of control requires greater decision-making autonomy and greater control of the worker's work environment (Batt & Valcour, 2003). Those lower in the hierarchy who are motivated to seek control of their work environment could face hurdles because of lower autonomy and limited discretion. Decreasing ability to influence tasks at lower hierarchical levels could be inconsistent with behaviors emanating from sense of control. For those in lower ranks of the hierarchy, exercising sense of control could increase explicit and implicit job demands, as in greater perceptions of sense of control strengthens perception of greater ability to influence job tasks; however, limited resources and hierarchical restraints could impede such efforts. As individuals lower in the hierarchy are more likely to receive feedback and instructions, with increasing sense of control, those at lower levels in the hierarchy may not be able to meet hierarchical demands and their internal sense of control that impels them to take initiatives (cf. Gaudet, Tremblay, & Doucet, 2014). For those lower in the hierarchy, exerting a sense of control may result in lower job satisfaction and greater emotional exhaustion because sense of control may lead to uncertainty in executing their job tasks.

According to conservation of resources framework, resources play an important role in stress management (Hobfoll, 1988). According to the conservation of resource theory, when resources are "lost, depleted, or threatened, individuals experience stress" (Bolino, Valcea, & Harvey, 2010, p. 329), employees can leverage sense of control as they buffer resources to manage stress. Although those higher in the hierarchy have a greater level of responsibilities, they also have greater discretion in decision making (Carpenter & Golden, 1997). As a result of the lower ability to control job tasks at lower levels of hierarchy, sense of control could be less valuable and could increase less effica-

scious efforts to exercise control, as such employees have lower control and limited access to resources, rendering the value of sense of control significantly lower (Wall, Cordery, & Clegg, 2002). With increasing administrative intensity at lower levels of the hierarchy (Freeman & Kronenfeld, 1973), those lower in the hierarchy must abide by more rules and procedures than those higher in the hierarchy. The lower hierarchical levels also have lower discretion in decision making and execution of job tasks (cf. Carpenter & Golden, 1997). As an alternate lens to explain greater stress among those with a higher sense of control at lower ranks of the hierarchy, resource dependence theory states that power is negatively associated with dependence (Bolino et al., 2010). Those at lower levels of the hierarchy have lower power; therefore, they are dependent on others to acquire, leverage, and synthesize resources to accomplish job tasks. As such, sense of control may be a less efficacious buffer in lowering stress for those lower in the hierarchy.

With greater sense of control, those lower in the hierarchy could take initiatives to reconceptualize and reevaluate their job tasks, which could then introduce uncertainty and instability in how they must acquire and organize resources with increasingly lower power at lower levels of hierarchy. For those higher in the hierarchy, stress levels could be lower, as they can leverage their sense of control better through greater stability and security of power and access to resources. The coping mechanism from a sense of control is generally reactive and has limited long-term effects (cf. Kompier, Cooper, & Geurts, 2000). Lower discretion and decision authority at lower levels of the hierarchy along with lower control are at odds with a higher sense of control. Drawing from demand-control model (Karasek, 1998), those at lower levels in the hierarchy may have lower control over their jobs, and exerting a higher sense of control could exacerbate stress. Those higher in the hierarchy have greater autonomy and latitude in decision making as well as greater access to resources. Sense of control for those higher in the hierarchy adds to more favorable coping mechanisms such that the individuals experience lower stress. Those higher in the hierarchy have greater autonomy and discretion, allowing them to manage their job tasks and create buffers against job demands and control

mismatch so that they adjust better to varying job demands (cf. Lachman & Weaver, 1998).

We propose the following hypothesis:

*Hypothesis 2:* Sense of control moderates the relationship between leadership position and salivary cortisol such that those with a higher sense of control at lower levels of organizational hierarchy will have higher salivary cortisol.

### Trait Anxiety and Hierarchy

Trait anxiety refers to a context-dependent tendency to respond to perceived environmental threats with anxiety (Spielberger, 1983, p. 3); it is contingent on the hierarchical position, and stress could be understood through affective events theory. Affective events theory explains how work-related events elicit affective responses that then influence job attitudes, cognition, and behavior (Weiss & Cropanzano, 1996). Factors driving affective response include stressful work place events, work-group dynamics, and leader-member exchange (Weiss & Beal, 2005). Employee cognition and behaviors are more likely to be included by felt emotions, whereas negative emotions can increase perceived anxiety. Emotions drive tendencies toward affect-driven actions, instead of judgment-driven actions, which could result in more stressful outcomes (Lazarus, 1990). Those with higher trait anxiety have a negative outlook and are more likely to interpret ambiguous situations more negatively. Anxiety elicits a tendency toward avoidance or escape, resulting in feelings of ambiguity wherein an individual could face further threats when acting (Beehr, 2014).

Trait anxiety could benefit those higher in the hierarchy and be less beneficial to those lower in the hierarchy. Those lower in the hierarchy must fulfill standards and expectations from supervisors, which leads to anxiety of insufficiency (Muschalla, Linden, & Olbrich, 2010) and is further fueled by competition with colleagues, resulting in health-related anxiety (Muschalla et al., 2010). The expectations from those above and the need to maintain parity with coworkers could lead to greater stress in those with higher trait anxiety (Fehm & Schmidt, 2006). Although there is increasing structure for tasks at lower levels of the hierarchy, greater



feelings of anxiety could increase inaction, restrict the ability to accomplish tasks, increase pessimistic evaluation of the job context, and lower situational control. Therefore, those reporting higher state anxiety may not be able to buffer against job demands at lower levels of the hierarchy and instead experience higher physiological stress (cf. Spielberger, Anton, & Bedell, 2015).

Lower stress for those with higher trait anxiety and who are higher in the hierarchy is salient because leaders not only have latitude for action—they must also increasingly resolve environmental threats. Those with higher trait anxiety attend more often to threat-related information and stimuli (Mogg, Mathews, Bird, & Macgregor-Morris, 1990). Based on the idea that only the paranoid survive (Grove, 1996), trait anxiety, although it may not lower stress, provides buffers for those higher in the hierarchy. Mughal, Walsh, and Wilding (1996) propose that “subjects high in anxiety allegedly invest greater task effort in attaining a given level of effectiveness, with a resulting reduction in efficiency” (p. 685). Those higher in the hierarchy are less focused on efficiency and more focused on effectiveness.

Continuing from this logic, we hypothesize that those lower in the hierarchy who display higher trait anxiety may have higher stress levels. Those lower in the hierarchy have more structured tasks than individuals higher in the hierarchy (cf. Halevy, Chou, & Galinsky, 2011). Higher trait anxiety could significantly increase threat perceptions for routinized tasks at lower levels in the hierarchy, increasing stress levels. Owing to the limited discretion at lower levels in a hierarchy (cf. Osterman, 1994), instability could increase stress, as more anxious individuals could perceive such changes to routinized tasks as more threatening. Anxiety elicits behaviors that increase psychological resource drain (Hobfoll, 1989), which further increases the gap between job demand and control.

We propose the following hypothesis:

*Hypothesis 3:* Trait anxiety moderates the relationship between leadership position and salivary cortisol such that those with higher trait anxiety at lower levels of the organizational hierarchy will have higher salivary cortisol levels.

## Method

Salivary cortisol has been used increasingly in the field of physiological stress research (Ahn, Lee, Choi, Kwon, & Chun, 2007; Hellhammer et al., 2009; Inder et al., 2012; Kirschbaum & Hellhammer, 1989). Cortisol as a manifestation of stress is also popular in diverse fields, including clinical endocrinology, fertility, sports medicine, and behavioral research (Gröschl, 2008). As the self-report measures of stress are subject to bias, adding to research on hormones in the leadership context (Mehta & Josephs, 2010), we focus on the hormone cortisol as a proxy for physiological stress.

## Sample

The target population of the study was employees at different hierarchical positions in nongovernmental organizations. The participants were recruited from executive courses at a university in Lisbon, Portugal, a research institute, and three private companies. This selection procedure ensured representativeness among the participants, companies, and sectors.

The participants received an e-mail inviting them to take part in the study. The e-mail described the study and informed participants on date, time (between 12:00 and 14:00), and location for providing saliva sample. The e-mail instructed participants to abstain from eating, brushing teeth, ingesting medicines or any drugs, exercising, smoking, or drinking coffee 1 hr before providing the saliva sample (e.g., Sherman et al., 2012). At the time of providing saliva sample, the participants were also required to complete a questionnaire. The questionnaire (average response time: 15 min) was pretested in an executive class with 12 students at a university in Lisbon to verify that the respondents understood the content and clarity of the items as well as all directions. All participants signed a consent form for participating in the study, in which confidentiality and anonymity were guaranteed. To thank the participants, we offered lunch at the university and free parking.

Prior research has noted that the salivary cortisol response can be mitigated or mistaken as stressful events in the presence of several factors, including mood states such as depression or strong psychological challenges and long-

term exercise. Additionally, oral contraceptives, the menstrual cycle, and pregnancy can affect the analysis, and the results must be interpreted with care (Gröschl, 2008; Hellhammer et al., 2009; Hjortskov, Garde, Ørbæk, & Hansen, 2004; Kirschbaum, Platte, Pirke, & Hellhammer, 1996). Certain behaviors, such as alcohol intake, caffeine consumption, and smoking, should also be considered (Stephoe et al., 1998). Accordingly, the participants were screened for exercise, heart conditions, pregnancy, and several other contraindications such as diabetes or hypertension. We excluded individuals who were pregnant or were breastfeeding; had any heart conditions, such as arrhythmia, a pacemaker, or requiring heart medication; or had a chronic medical condition such as diabetes or hypertension.

After this exclusion, saliva samples were available for 211 participants. Among these 211 participants, we were only able to gather usable personal information for 202 individuals (97 women; 105 men), who had an average age of 40 years ( $SD = 9.8$  years). The leadership positions of the participants were distributed as follows: 42% were nonleaders, and the leaders were distributed as 12% top managers, 16% first-line managers, and 29% intermediate managers. The majority of the participants (89%) had an academic degree, and 65% were married. In terms of income, half of the participants had a gross annual income of less than €29,999 (about \$34,000), and only 3% had a gross annual income higher than €105,000 (around \$118,000). The majority of the participants worked in the private sector (66%), 19% worked in the nonprofit sector, and the remaining 15% worked in the public sector. The most frequent reported industries were consultancy and scientific (31%) and finance and insurance (11%). The least frequent sectors represented in the sample were agriculture, forestry, and fishing; construction; transportation; and storage—each with .5%. Approximately 47% of the participants worked in organizations with more than 251 employees, and only 6% worked in organizations with fewer than nine employees.

## Measures

**Salivary cortisol.** To reduce reliance on self-report stress data, we directly measured the participants' cortisol levels. Although salivary

cortisol has proven to be of merit in stress research, cortisol collection requires several precautions. First, the collection procedure, storage, and preparation of the samples must follow rigorous and established protocols, as noted by Gröschl (2008). Second, the collection time is influential because of the adrenal secretion associated with circadian rhythms (Gröschl, 2008; Vining et al., 1983). Healthy individuals have a decrease in cortisol levels from morning to evening, and the peak level is reached after awakening (Gröschl, Rauh, & Dörr, 2003). To overcome all potential challenges, we followed strict protocols and procedures of collection, storage, and analysis of the samples. The time of the study, for example, was chosen carefully to address these concerns. The sessions were conducted between 12:00 and 14:00 to lower the effects of the circadian fluctuations in cortisol (e.g., Mehta & Josephs, 2010; Sherman et al., 2012). Each participant provided a 2-mL saliva sample in a container and completed the questionnaire. The procedure was assisted and supervised by two laboratory technicians, who immediately took control and stored the samples. The samples were stored at between 2 °C and 8 °C until analysis using the electrochemiluminescence technique (limit of sensitivity between 0.5 nmol/L and 1,750 nmol/L).

**Trait anxiety.** We used the Portuguese version of the State-Trait Anxiety Inventory (STAI), which was developed by Spielberger (1983), translated to Portuguese by T. McIntyre and McIntyre (1995), and validated by S. McIntyre, McIntyre, and Silvério (2000) and Fernandes and McIntyre (2002) on the Portuguese population.

Participants were asked to respond about how they usually feel on a 4-point scale (1 = *almost never* to 4 = *almost always*) related to a number of statements, such as “I feel nervous and restless,” “I worry too much over something that really does not matter,” and “I feel pleasant” and “I am a steady person.” Cronbach's alpha indicated a reliability of .87.

**Sense of control.** To evaluate the participants' sense of control or power within their relationships, we used the scale developed by Anderson, John, and Keltner (2012). The scale includes eight items and assesses the degree of power and control in the individuals' relationships. The participants indicated their agree-

ment with statements such as “I think I have a great deal of power” and “My ideas and opinions are often ignored,” on a scale that ranged from 1 = *disagree strongly* to 7 = *agree strongly* ( $\alpha = .80$ ).

**Hierarchical position.** We captured the respondents’ leadership with categorical variables, in which 1 = top manager (reference category), 2 = first-line managers, 3 = intermediate managers, and 4 = nonleaders (i.e., a respondent who was not responsible for managing others).

**Controls.** We controlled for the size of the organization (categorical variable; 1 = *less than or equal to 9 employees*; 2 = *between 10 and 49 employees*; 3 = *between 51 and 249 employees*; and 4 = *more than 250 employees*). We also controlled for sociodemographic variables such as work experience (total number of years of work experience), gender (1 = women, 0 = men), marital status (1 = not married, i.e., single, divorced or widowed; 0 = married, cohabiting, or consensual union), education (categorical variable; 1 = *less than high/secondary school*, 5 = *PhD*); income (categorical variable; 1 = total individual gross income is  $\leq$ €29,999; 0 =  $\epsilon > 30,000$  ); and socioeconomic status (SES). We obtained an adapted self-reported measure of the subjective SES based on the work of Adler, Epel, Castellazzo, and Ickovics (2000). The participants were presented with a picture of three ladders and were asked to choose a rung from the 10 available that best represented where they stood in the country, their communities, and their jobs. The three scales were averaged to create the self-reported subjective SES index ( $\alpha = .79$ ).

**Results**

Table 1 presents the means, standard deviations, and correlations of the study variables. Table 2 presents the ANOVA analysis.

In this sample, cortisol had a mean of 18.60 nmol/L ( $SD = 8.64$ ) and a log mean of 1.22 nmol/L ( $SD = .20$ ). Women had significantly lower levels of cortisol than men ( $p = .002$ ). The higher the individual was in the hierarchical position, the higher are the values of cortisol (20.40 for top managers; 18.71 for first-line managers; 18.57 for intermediate managers; and 18.05 for nonleaders), and there was no significant effect of leadership position ( $F = .48, p =$

Table 1  
Descriptive Statistics, Reliabilities, and Correlations

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. (log) Cortisol	1.22	.20	1													
2. Top position	.12	.33	.08	1												
3. First-line managers	.16	.37	.02	-.17**	1											
4. Intermediate managers	.29	.46	-.01	-.24***	-.28***	1										
5. No management position	.42	.49	-.06	-.32***	-.38***	-.55***	1									
6. Sense of control	43.72	5.74	-.02	.29***	.16**	.03	-.34***	.87								
7. Anxiety	36.85	8.26	-.02	-.09	-.05	-.01	.11	-.36***	.80							
8. Size	3.16	.94	.06	-.14**	.04	.10	-.03	-.08	.06	1						
9. Experience	16.75	9.98	.08	.26***	.18	-.11	-.20***	.13	-.19***	.09	1					
10. Gender	.48	.50	-.22***	-.18	-.21***	-.05	.32***	-.25***	.20***	.00	-.20***	1				
11. Marital status	.35	.48	-.01	-.09	-.19***	.03	.17**	-.10	.10	-.16**	-.24***	.14**	1			
12. Education	3.06	1.21	-.06	.26***	.10	.05	-.29***	.16***	.06	-.04	.01	-.17**	-.02	1		
13. Income	.51	.50	-.07	-.26***	-.29***	-.02	.41***	-.24***	.10	-.30***	-.45***	.39***	.29***	-.30***	1	
14. SES	7.16	1.24	.05	.27***	.14**	.02	-.31***	.23***	-.30***	.03	.16**	-.30***	-.17***	.27***	-.39***	.79

Note.  $N = 202$ . The values in the diagonal are Cronbach’s alpha for the scale-based measures. SES = socioeconomic status. In bold is the Cronbach’s alpha.  
\*  $p < .10$ . \*\*  $p < .05$ . \*\*\*  $p < .01$ .

Table 2  
 Mean (and Standard Deviation) Differences in Cortisol, Sense of Control, and Anxiety According to Leadership Position

Variable	n	Cortisol		Sense of control		Anxiety	
		M (SD)	F	M (SD)	F	M (SD)	F
Leadership position			.48		12.43***		1.10
Top management	25	34.88 (9.33)		48.08 (4.86)		34.88 (9.33)	
First-line management	33	35.91 (8.34)		45.79 (5.47)		35.91 (8.34)	
Intermediate management	59	36.66 (7.58)		43.97 (5.78)		36.66 (7.58)	
Nonleader	85	37.92 (8.34)		41.47 (5.01)		37.92 (8.34)	

Note. N = 202.

\*\*\*  $p < .01$ .

.70). There was no significant difference in terms of age ( $\leq 39$  vs.  $> 40$  years old;  $p = .75$ ), tenure ( $\leq 5$  years vs.  $> 6$  years;  $p = .52$ ), marital status ( $p = .75$ ), education ( $p = .97$ ), income ( $p = .26$ ), or organization size (small firms vs. medium to large firms;  $p = .14$ ).

Anxiety had a mean of 36.85 ( $SD = 8.26$ ). Although women had lower cortisol levels, they presented with significantly higher levels of anxiety ( $p = .005$ ). The anxiety levels increased when descending the hierarchy (34.88 for top managers, 35.91 for first-line managers, 36.66 for intermediate managers, and 37.92 for non-leaders), and there was no significant effect of leadership position ( $F = 1.10$ ,  $p = .35$ ). There was no significant difference in terms of age ( $p = .13$ ), tenure ( $p = .32$ ), marital status ( $p = .16$ ), education ( $p = .73$ ), income ( $p = .16$ ), or size ( $p = .61$ ).

The mean value for a sense of control was 43.72 ( $SD = 5.74$ ), and individuals higher in the hierarchical position displayed higher values for a sense of control (48.08 for top managers, 45.79 for first-line managers, 43.97 for intermediate managers, and 41.47 for nonleaders), with a significant difference between groups ( $F = 12.43$ ,  $p < .001$ ). On average, men ( $p < .001$ ) and individuals with a higher level of education ( $p = .01$ ) and income ( $p < .001$ ) reported higher values of a sense of control.

To test our hypotheses, we ran a multilevel mixed-effects regression for (log) cortisol as the dependent variable. Specifically, we used two levels of nesting: (a) public versus private sector, and (b) industry codes (*Código das Atividades Empresariais* [economic activity code] industry codes from Codes A [agriculture, forestry and fishing] to U [activities of international organiza-

tions]). The nature of the tasks may significantly differ between the public and private sectors, in which variations in organizational goals and missions could lead to different levels of job demands and efficacies of hierarchical positions. Industries also systematically differ in the nature of the input-output processes. As such, to control for shared errors between employees in these sector and industry classes, we specified a mixed model in Stata 12.

The results are presented in Table 3. Model 1 includes the hierarchical position, sense of control, anxiety, and organizational and sociodemographic control variables. Based on Model 1, we assessed the role of hierarchy (top management as base category) on stress. Hypothesis 1 proposed that there is a negative relationship between the hierarchical position and salivary cortisol. The results show a negative association between intermediate or non-leader positions ( $\beta = -.06$ ,  $p < .001$  for intermediate managers and  $\beta = -.07$ ,  $p < .001$  for non-leaders) and salivary cortisol. Relative to top managers, individuals in lower hierarchical positions had lower stress.

Model 2 displays the results for Hypothesis 2, which proposed that a sense of control moderates the relationship between leadership position and salivary cortisol. At lower levels of the hierarchy, a sense of control exacerbated stress ( $\beta = .02$ ,  $p < .001$  for intermediate managers;  $\beta = .01$ ,  $p = .004$  for nonleaders). Therefore, individuals with a higher sense of control at lower levels of organizational hierarchy have higher salivary cortisol.

Hypothesis 3 proposed that trait anxiety moderates the relationship between leadership position and salivary cortisol. The results are shown in Model 3. Accordingly, anxiety exacerbates stress



Table 3  
 Multilevel Mixed-Effects Regression Analysis for Variables Predicting (Log) Cortisol ( $N = 202$ )

Model	Model 1	Model 2	Model 3	Model 4
	H1: Hierarchy and controls	H2: Sense of control interaction	H3: Anxiety interaction	Full model
Leadership position (reference = top managers)				
First-line managers	-.05 (-1.43)	-.49 (-1.52)	-.29*** (-3.02)	-1.22* (-1.84)
Intermediate managers	-.06*** (-4.72)	-.95*** (-5.47)	-.18 (-.72)	-1.66*** (-5.06)
No management position	-.07*** (-3.04)	-.65*** (-4.21)	-.31** (-2.07)	-1.41*** (-12.20)
Sense of control	-.003** (-2.35)	-.02*** (-64.79)	-.003*** (-3.04)	-.02*** (-5.10)
First-Line Managers × Sense of Control		.01 (1.47)		.02 (1.57)
Intermediate Managers × Sense of Control		.02*** (5.11)		.03*** (13.47)
Nonleaders × Sense of Control		.01*** (2.85)		.02*** (26.27)
Anxiety	.0004 (.25)	.0001 (.09)	-.005* (-1.90)	-.01*** (-3.68)
First-Line Managers × Anxiety			.01*** (3.66)	.01*** (2.74)
Intermediate Managers × Anxiety			.004 (.47)	.01 (1.50)
Nonleaders × Anxiety			.01* (1.81)	.01*** (3.68)
Size	.01 (1.25)	.02 (.94)	.02 (1.55)	.02 (1.08)
Experience	.001* (1.80)	.0005*** (3.00)	.001* (1.77)	.0004* (1.66)
Gender (reference = women)	-.09*** (-16.31)	-.09*** (-18.93)	-.10*** (-17.04)	-.10*** (-25.97)
Marital status (reference = not married)	.02 (.74)	.01 (.66)	.01 (.68)	.01 (.55)
Education (reference = less than high/secondary school)	-.02* (-1.85)	-.02 (-1.62)	-.02 (-1.49)	-.02* (-1.75)
Income (reference = gross annual income of less than €29,999)	.01* (1.77)	.02*** (34.42)	.01*** (4.35)	.02*** (6.73)
SES	.003 (.41)	.003 (.30)	.002 (.27)	.002 (.25)
Constant	1.39*** (11.69)	2.01*** (18.50)	1.59*** (6.38)	2.68*** (5.98)
LL	48.89	51.45	49.99	53.74
Observations	202	202	202	202
Public vs. private sector nesting groups	2	2	2	2
Industry digit nesting groups	21	21	21	21

Note. Robust  $z$  statistics in parentheses. H = Hypothesis; SES = socioeconomic status; LL = log likelihood.  
 \*  $p < .10$ . \*\*  $p < .05$ . \*\*\*  $p < .01$ .

for first-line managers and nonleaders relative to top managers ( $\beta = .01, p < .001$  for first-line managers;  $\beta = .01, p = .07$  for nonleaders).

Finally, Model 4 includes all variables, and the results are in line with the previous models.

### Discussion, Conclusions and Future Research Directions

The results of the present study advance the understanding of whether hierarchical positions

are associated with physiological stress (measured by the stress hormone cortisol) in humans. First, adding to the ongoing conversation on the mixed association between hierarchical position and stress (e.g., Cahoon & Rowney, 1984 or Sherman et al., 2012), we found that those lower in the hierarchy experience lower stress relative to those higher in the hierarchy.

More importantly, we also show the relevance of potential buffers in managing physiological stress at higher hierarchical levels. Sense of con-

tol and trait anxiety exacerbate stress at lower levels of the hierarchy; however, those with higher sense of control and trait anxiety at higher levels in the hierarchy have lower stress. Although sense of control is construed as a positive psychological resource in most job contexts, the results show that relative to those higher in the hierarchy, those lower in the hierarchy are less able to leverage it to lower stress. Despite greater structure in job tasks at lower levels of the hierarchy, trait anxiety could exacerbate physiological stress.

The findings have the following implications. First, in the past few years, researchers have called attention to the harmful effects that psychological stress can have on employees and, most recently, organizations (see [Greenberg et al., 1999](#), for more on the costs associated with anxiety disorders). We find that individuals in top positions exhibit lower stress, which adds a boundary condition to understanding the efficacy of a sense of control. Second, when considering the moderating role of the sense of control, our findings for managers at higher hierarchical level having lower stress indirectly complement those of [Sherman et al. \(2012\)](#), who also found that a sense of control is a stress buffer. Third, findings on the exacerbating effect of trait anxiety also show that managers should match the appropriate individuals for the jobs/tasks for which they are able to perform well and develop coping or adaptation mechanisms to handle stress. Understanding the costs that stress can cause to organizations in terms of low productivity, medical or insurance expenses, absenteeism, or performance can help the organization implement strategies to deal with stress health issues. For example, awareness programs that impose breaks to stretch or have some fresh air, or recognizing alert signs from the employees, will contribute to the employees' overall well-being as well as the organization's performance.

Our study is not without some limitations. First, some of the measures are based on self-reports that could potentially lead to inflated estimates among variables because of the common method of variance. However, the observation of the correlations in [Table 1](#) shows that the correlations among the self-reported variables are, at most, .36, suggesting that it is unlikely that inflated views pose a major concern. Second, the results of our study may not be generalized to non-Portuguese contexts. Third, our study did not investigate the potential role of endocrine adaptation, which

shows that individuals who are exposed to constant stressors may develop endocrine adaptation (e.g., [Hek et al., 2013](#)), and thus produce lower levels of cortisol. Third, we are unable to observe microdynamics of stress, sense of control, and behaviors exhibited through the trait anxiety. Future studies, based on qualitative analysis, could further test for the complex unfolding of these dynamics. Future research could look at the role of mechanisms that individuals may adopt to cope with different stressors, how organizations can implement practices that can promote employees' well-being, and whether characteristics such as sex or the size of an organization can impact the hierarchy and stress association.

Future studies can focus on the link between reported stress and biological stress, contingent on hierarchical levels. Sociopsychological factors could influence reported and experienced stress, which could provide richer insights into the influence of hierarchy, the biological basis of stress, and the employee reports of such stress. Exploring this association is especially salient as research on the link between psychological and biological measures of stress has shown no association between the measures (e.g., [McLeod, Hoehn-Saric, & Stefan, 1986](#); [Sherman et al., 2012](#)). Although both represent stress responses, psychological stress (anxiety) has mainly been associated with elevated activity of the sympathetic nervous system and epinephrine secretion, whereas biological stress has been associated with the HPA axis and elevated secretion of cortisol (e.g., [Chorpita & Barlow, 1998](#)). [Kurina, Schneider, and Waite \(2004\)](#) explored the variability of diurnal cortisol patterns with the psychological symptomology and stress among healthy adults and reported no relationship between them.

Although we have an indicator of gender in the data, complex microdynamics undergird gender-specific variations in managing and coping with stress. In the context of leadership, the evidence suggests that women and men differ in reacting to stress (see, e.g., [Book, 2000](#); [Fisher, 2005](#)). The evidence suggests that women under stress react beyond the classic response of "fight or flight" by protecting themselves and their young, exhibiting nurturing behaviors ([Taylor, 2002](#)). Variations in personality traits, values, motivation, thinking, feeling styles, and biology lead to varying leadership behaviors between males and females ([Benbaun, Blakemore, & Beltz, 2011](#)). Because

women and men differ in terms of leadership positions and stress responses, future research should investigate the microdynamics of variations in the stress response between males and females at different levels of hierarchy.

As a third direction for future research, SES could act as a buffer against stress. Although we controlled for self-reported measures of SES, future research could draw on objective data to assess the role of this potential buffer. The seminal work of Marmot (2004) demonstrates that one's position in the hierarchy is closely related to health and life chances. It is plausible that the leadership position and stress may be moderated by SES (e.g., Kaplan & Manuck, 1999; Sapolsky, 1982).

Finally, organizational complexity could be an additional factor. Although firm size could be a proxy for organizational complexity, the reporting structure, span of control, and other factors could also influence the efficacy of the hierarchy. As such, although studies on nonhuman species have a simpler structure, organizational complexity could further add significantly to the role of hierarchy in explaining stress.

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