Leadership is associated with lower levels of stress

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As leaders ascend to more powerful positions in their groups, they face ever-increasing demands. As a result, there is a common perception that leaders have higher stress levels than nonleaders. However, if leaders also experience a heightened sense of control—a psychological factor known to have powerful stress-buffering effects—leadership should be associated with reduced stress levels. Using unique samples of real leaders, including military officers and government officials, we found that, compared with nonleaders, leaders had lower levels of the stress hormone cortisol and lower reports of anxiety (study 1). In study 2, leaders holding more powerful positions exhibited lower cortisol levels and less anxiety than leaders holding less powerful positions, a relationship explained significantly by their greater sense of control. Altogether, these findings reveal a clear relationship between leadership and stress, with leadership level being inversely related to stress.


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*Additionally, a recent study of rhesus macaques found that changes in social rank alter the expression of various genes, such as those genes that control immune functioning (10), providing a potential mechanism by which social rank could affect stress and health. The study, however, does not answer the question of whether the changes in gene expression that come with social rank are associated with better or worse health (we thank an anonymous reviewer for pointing out this question). Future research is needed to verify the viability of this potential mechanism.
whether the lower stress of high-level leaders could be explained by a greater sense of control.

**Study 1**

**Overview.** In study 1, we examined the leadership–stress relationship by testing whether leaders—those individuals who indicated that they were responsible for managing others—and nonleaders differed in their levels of salivary cortisol, a physiological indicator of stress, and/or anxiety reports.

**Results and Discussion.** Cortisol and anxiety reports were not related to each other (r = 0.06, P = 0.34), consistent with research showing that psychological and physiological manifestations of stress are often loosely coupled (25). For example, one study found that individuals with generalized anxiety disorder differed from a control group in terms of both self-report symptoms (e.g., worry) and autonomic physiology (e.g., elevated heart rate) but that the two types of indicators were uncorrelated (26). Similarly, in the current study, salivary cortisol and anxiety reports may capture largely independent manifestations of the stress response. If so, they may both relate to leadership, despite being uncorrelated.

A model predicting cortisol from leadership (dummy-coded) revealed that leaders had significantly lower cortisol than nonleaders (β = −0.26, P < 0.001). The average leader’s cortisol level was 0.54 SDs lower than the average nonleader (Fig. 1). Analysis of anxiety reports provided convergent evidence that leaders experienced less stress: leaders had lower levels of anxiety than nonleaders (β = −0.23, P < 0.001) (Fig. 1). Leadership remained a significant predictor of both cortisol and anxiety reports when controlling for demographic variables (sex, age, education, and income) and mood.

Research on nonhuman primates suggests that the leadership–stress relationship may depend on whether the social hierarchy is uncontested (8, 27), raising the possibility that the observed relationship between leadership and stress in human leaders may depend on leaders occupying relatively stable positions. The majority of the leaders in the current sample came from an executive education program that targets individuals from organizations that are highly committed to their advancement. Moreover, organizations currently experiencing substantial instability or change would be unlikely to send one of their employees to such a program. As a result, the leaders in the sample, on average, presumably enjoyed a high level of stability and security, making the current study most comparable with nonhuman primate studies on stable, uncontested hierarchies. The lack of any serious instability in the leader group prevents us from thoroughly testing the potential moderating role of stability in the observed leadership–stress relationship. Nevertheless, participants (leaders and nonleaders) were asked to indicate the length of time that they had occupied their current position (i.e., tenure). If individuals develop a sense of job security over time, with a longer tenure providing a greater sense of stability, then tenure may serve as a rough proxy for the extent to which one’s status as a leader (or nonleader) is firmly entrenched. However, neither of the observed relationships—between leadership and cortisol and between leadership and anxiety—was moderated by tenure (r values < 1).

**Study 2**

**Overview.** A leadership role may confer lower stress by elevating one’s sense of control. In study 2, we extended our findings by testing the prediction that the relationship between leadership and stress is mediated by differences in the sense of control. In a second group, consisting exclusively of leaders, we examined links among leadership level, sense of control, and our two indicators of stress (cortisol and anxiety). Leaders can vary in their rank or power in a variety of ways. A high-ranking leader might be responsible for personally managing a large number of individuals, might have many subordinates (including those individuals who do not report directly to him or her), or might be given great authority and autonomy to make decisions concerning his or her subordinates. To capture the different forms of leadership, we assessed leadership level in each of these ways—total number of subordinates, number of direct reports, and authority. Additionally, we used these different indicators to test whether certain leadership dimensions display a particularly strong relation to sense of control and consequently, stress.

**Results and Discussion.** As in study 1, cortisol and anxiety reports were uncorrelated (r = 0.06, P = 0.62). As predicted, higher leadership level, which we indexed with a composite of our three measures of leadership (total number of subordinates, number of direct reports, and authority) was associated with lower cortisol (β = −0.36, P = 0.001) and lower anxiety (β = −0.23, P = 0.03). Next, to explore whether these two leadership–stress relationships could be explained by sense of control, we tested mediation models (28). The inverse relationship between leadership level and cortisol (β = −0.36, P = 0.001) was significantly mediated by sense of control [95% confidence interval (CI) for indirect effect = −0.28 to −0.004]; higher leadership level predicted greater sense of control (β = 0.36, P < 0.001), which in turn, predicted lower cortisol (β = −0.20, P = 0.09) (Fig. 3A). The same pattern emerged for anxiety reports. The inverse relation-

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1Because the moderating effect of tenure may be nonlinear (e.g., the leadership–stress relationship may emerge after stability reaches a critical threshold), when testing moderation by tenure, we tested for both linear and nonlinear moderation. We tested in a regression model that included both the linear and quadratic terms of the tenure variable and their interaction with leadership. Repeating these analyses in study 2 also revealed no evidence of moderation by tenure (r values < 1.21, P values > 0.23).
ship between leadership level and anxiety (β = −0.23, P = 0.03) was significantly and completely mediated by sense of control (95% CI for indirect effect = −0.52 to −0.12); higher leadership level predicted greater sense of control (β = 0.36, P < 0.001), which in turn, predicted lower anxiety (β = −0.61, P < 0.001) (Fig. 3B). After sense of control was taken into account, the relationship between leadership level and anxiety was no longer significant (β = −0.01, P = 0.94). For both measures, the mediating role of sense of control remained significant when demographic variables and mood were entered as covariates. Additionally, despite the parallel pattern of results for the two measures of stress, the models were not redundant; for each outcome, there was significant mediation, even when the other outcome was included as a covariate.

To follow up on this primary analysis, we conducted a supplementary analysis to test whether any of the specific indicators of leadership were particularly strongly related to sense of control and stress. We tested separate mediation models for each indicator of leadership level. For number of subordinates, there was significant mediation for both indicators of stress; having more subordinates predicted a greater sense of control, which in turn, predicted less stress (for cortisol, 95% CI for indirect effect = −0.19 to −0.001; for anxiety, 95% CI = −0.38 to −0.02). For authority, the same pattern held. Possessing greater authority over subordinates predicted a greater sense of control, which in turn, predicted less stress (for cortisol, 95% CI = −0.30 to −0.02; for anxiety, 95% CI = −0.40 to −0.10). For number of direct reports, however, mediation was nonsignificant (for cortisol, 95% CI = −0.18 to 0.03; for anxiety, 95% CI = −0.32 to 0.04). The lack of significant mediation for number of direct reports seems largely attributable to the fact that managing many people was not associated with a heightened sense of control (r = 0.14, P = 0.19). In contrast, both having a greater total number of subordinates and having greater authority over those subordinates were associated with a boost in sense of control (r = 0.24, P = 0.03 and r = 0.38, P < 0.001, respectively).

The results of study 2 provide strong support for our hypothesis across two different indicators of stress, one indicator that captures a psychological manifestation of stress (anxiety reports) and one indicator that captures a physiological manifestation of stress (cortisol). These findings extend the findings of study 1 in three ways. First, they show a dose–response relationship between leadership and stress. Leaders do not possess equally low stress levels. Instead, among leaders, lower stress levels go hand in hand with greater rank and power. Second, the findings identify sense of control as a mediator of the relationship between leadership and stress. Third, analyses of specific forms of leadership level revealed that the stress-buffering effects of leadership are not necessarily conferred to those leaders responsible for managing many people but rather, those leaders who occupy a position characterized by many total subordinates and those leaders who feel that they have substantial authority over those subordinates.

**General Discussion**

In two studies, we found clear evidence that leadership is associated with lower levels of stress. This relationship emerged when we compared leaders with nonleaders (study 1) and when we looked at variations in status within a group of leaders (study 2). Furthermore, in both cases, the relationship appeared across two distinct manifestations of stress—one physiological (salivary cortisol) and one psychological (anxiety reports). Finally, by showing the mediating role of the psychological sense of control, we delineate a clear pathway by which an increase in one’s leadership level might provide stress-buffering benefits.

The current findings also provide insight into the particular forms of leadership that most clearly boost one’s sense of control and as a result, buffer against stress. In particular, occupying a position marked by a large number of subordinates and possessing substantial authority over one’s subordinates are two aspects of leadership that confer such benefits. That these positions elevate one’s psychological experience of control is not surprising; they are likely to be marked by prestige as well as objective power and influence. In contrast, personally managing a large number of people was not associated with a greater sense of control or less stress, perhaps because ascendancy to a high-ranking position encourages one to delegate the day-to-day management of subordinates to lower-ranking officials. Altogether, these results highlight the importance of distinguishing between total number of subordinates and number of direct reports, and they suggest that the rank–stress relationship within human organizations may be shaped by certain complexities that are not present within nonhuman primate dominance hierarchies.

In the current investigation, we have focused on sense of control, identifying it as a factor that is influenced by leadership status and in turn, shapes stress. It is known, however, that other factors, such as social support and active coping, also play a part in buffering against the negative effects of job strain (29, 30). In future research, it will be important to examine whether changes in one’s leadership level elicit corresponding changes in these factors and if so, whether these changes have implications for stress and health.

It is important to note that the low stress levels of leaders may both cause and result from leadership. That is, individuals with low stress levels may be particularly well-suited for leadership and as a result, may select into leadership positions. Conversely,
leadership roles may confer lower stress because of the psychological resources that they afford.

In both studies, we found no evidence that the leadership–stress relationship depended on the stability of rank. The current studies, however, were not designed to test for this possibility and do not provide ideal samples for such a test given the relatively higher job security of the participants recruited from the Harvard Executive Education program or the Army, Marines, and Air Force. A definitive conclusion regarding the role of stability (e.g., whether the leadership–stress relationship holds for leaders with a rank that is less secure or leaders working in less stable organizations) must await future research.

These findings build on research regarding social rank in nonhuman primates to provide a clear answer to the question of whether leadership, in humans, is associated with higher or lower levels of physiological and psychological stress. Both the social science and practitioner literatures have assumed that being a leader is highly stressful, but leaders’ physiology and psychology show otherwise. Leaders possess a particular psychological resource—a sense of control—that may buffer against stress.

Materials and Methods

Participants. Participants were recruited from the Boston metropolitan area and one of many executive education programs at Harvard University. This particular executive education program, which is designed primarily for senior-level officials in the public sector, was targeted to bring to our laboratory many middle- to high-level leaders not found in typical community samples. This program recruits individuals with a rank of GS14 or GS15 on the General Schedule ranking for civilians, which translates to O-5 and O-6 in military executive (i.e., Lt. Colonel or Colonel in the Army, Marines, and Air Force; Commander or Captain in the Navy or Coast Guard). SI Text has a detailed profile of the types of jobs and organizations represented in the Executive Education program. Community members were recruited from the greater Boston metropolitan area and screened to be similar to those individuals enrolled in the executive education program in terms of age, sex, and ethnicity. Because some community members were leaders and because not all executive education participants were leaders, we categorized participants as leaders or nonleaders based on their response to the question “are you responsible for managing others?” (yes = leader, no = nonleader).

In study 1 (n = 231), 216 participants (136 male; Mage = 46.20) consented to hormone testing and provided samples of sufficient quality. Among the leaders, the most frequent ethnicities were white (69.3%), black (9.2%), and other (9.2%). Among the nonleaders, the most frequent ethnicities were white (66.2%), black (12.2%), Hispanic (6.8%), and other (6.8%). Participants were asked to indicate how they had come to hold their current position. Of those participants who responded (n = 194), the majority indicated being selected through a standard job application process (64.4%), with approximately one-third having been appointed (35.1%) and a single individual reporting having been elected (0.5%). Participants were also asked to indicate the sector or in which they worked. For leaders, the most common responses were government (n = 62), military (n = 10), and defense (n = 10). For nonleaders, the following sectors/jobs were listed more than one time: education (n = 8), hospitality/services (n = 8), government (n = 5), technology (n = 4), nonprofit (n = 3), construction (n = 3), military (n = 2), finance (n = 2), telecommunications (n = 2), software (n = 2), and aerospace engineering (n = 2). A full list of all sectors is in SI Text.

In study 2 (n = 88 leaders), 75 leaders (59 male; Mage = 47.44) consented to hormone testing and provided saliva samples of sufficient quantity for testing. The most frequent ethnicities were white (77%), black (12.6%), and Hispanic (5.7%). A majority of participants indicated that they obtained their current position by being selected through a standard job application process (65.5%). One-third of participants were appointed (33.3%), and one participant was elected (1.1%). The most commonly reported sectors were government (n = 33), military (n = 11), and defense (n = 8). Other sectors listed more than one time were information technology (n = 3), education (n = 2), finance (n = 2), and healthcare (n = 2). A full list of all sectors is in SI Text.

Measures. Salivary cortisol. All participants were screened using the following set of questions, which were designed to identify and exclude those individuals who had medical conditions or were taking medications that might have influenced physiological functioning (including cardiovascular and hormonal measures). Participants were asked the following questions, with a yes response triggering exclusion. (i) “Do you currently have a pacemaker?” (ii) “Do you believe you might be pregnant?” (iii) “Have you been doctor-diagnosed with a heart murmur or arrhythmia?” (iv) “Have you been doctor-diagnosed with hypertension?” (v) “Are you currently taking any drugs or medications that might affect your cardiovascular functioning?” (vi) “Are you currently breast-feeding?” Additionally, before the study, participants were sent instructions informing them that, within 1 h of the study, they should not (i) eat dairy products (e.g., milk, cream, or cheese) or anything containing live bacterial cultures (e.g., yogurt), (ii) consume caffeine or alcohol, (iii) smoke cigarettes, (iv) exercise, or (v) brush their teeth.

Each participant provided a 1.5 mL saliva sample at ~30 PM (minimizing diurnal variability) through the passive drool method while completing various questionnaires. Samples were stored at −25 °C, shipped to Salimetrics, and immunooassayed (lower limit of sensitivity = 0.003 μg/dL; standard curve range = 0.012–3.0 μg/dL; average intraassay coefficient of variation = 3.5%; average interassay coefficient of variation = 5.1%). Cortisol values were log-transformed to reduce skewness. In both studies, there was a significant sex difference (study 1: Mfemales = 0.12, SDmale = 0.07 vs. Mmale = 0.09, SDmale = 0.06, t(213) = 2.92, P < 0.01; study 2: Mfemales = 0.11, SDmale = 0.07 vs. Mmale = 0.07, SDmale = 0.03, t(73) = 2.67, P < 0.01). Because of this difference, we standardized (z-scored) values separately for men and women, and therefore, a positive value indicated a level that was greater than the average score of individuals of the same sex (31). Outliers (values greater than 3 SDs above or below the mean) were excluded from analysis.

Table 1. Differences between leaders and nonleaders (means and SDs) in key demographic variables, mood, health practices, health conditions, and sleep behavior in study 1

<table>
<thead>
<tr>
<th>Measure</th>
<th>Leaders</th>
<th>Nonleaders</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>46.68 (7.71)</td>
<td>44.95 (11.2)</td>
<td>0.20</td>
</tr>
<tr>
<td>Sex (male)</td>
<td>66.9%</td>
<td>53.9%</td>
<td>0.07</td>
</tr>
<tr>
<td>Ethnicity (white)</td>
<td>69.3%</td>
<td>69.9%</td>
<td>0.93</td>
</tr>
<tr>
<td>Education</td>
<td>4.45 (0.94)</td>
<td>3.63 (1.38)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Income</td>
<td>5.06 (1.59)</td>
<td>3.03 (1.72)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>State negative affect</td>
<td>2.18 (0.45)</td>
<td>2.24 (0.49)</td>
<td>0.38</td>
</tr>
<tr>
<td>State positive affect</td>
<td>1.67 (0.49)</td>
<td>1.70 (0.52)</td>
<td>0.63</td>
</tr>
<tr>
<td>Exercise regularly</td>
<td>81.6%</td>
<td>75.4%</td>
<td>0.30</td>
</tr>
<tr>
<td>Use tobacco</td>
<td>10.9%</td>
<td>16.9%</td>
<td>0.23</td>
</tr>
<tr>
<td>Consume caffeine</td>
<td>95.9%</td>
<td>86.2%</td>
<td>0.01</td>
</tr>
<tr>
<td>Asthma</td>
<td>3.3%</td>
<td>2.7%</td>
<td>0.83</td>
</tr>
<tr>
<td>Diabetes</td>
<td>2.0%</td>
<td>2.7%</td>
<td>0.72</td>
</tr>
<tr>
<td>Heart condition</td>
<td>4.0%</td>
<td>0.0%</td>
<td>0.09</td>
</tr>
<tr>
<td>Neurological disorder</td>
<td>1.4%</td>
<td>0.7%</td>
<td>0.60</td>
</tr>
<tr>
<td>Median awakening time</td>
<td>6:00 AM</td>
<td>7:30 AM</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hours slept</td>
<td>6.84 (1.12)</td>
<td>7.46 (0.99)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Sample sizes refer to those participants who consented to hormone testing and provided a saliva sample of sufficient quantity for testing.
management (i.e., direct and indirect reports)?” For the second measure, [number of direct reports (n = 0.60), participants answered the following two questions: “how many people do you, yourself, manage?” and “across your career, what is the maximum number of people that you, yourself, have managed?” Before being averaged into the composite measures, all quantitative measures were log-transformed to reduce skewness and standardized (z-scored). Finally, participants reported their authority and autonomy in making decisions about subordinates (authority: α = 0.89) by indicating their agreement with the following statements: “I can punish or reward subordinates;” “I can promote or demote subordinates;” “I am expected to motivate my subordinates;” and “I supervise subordinates and evaluate or correct their work as necessary” (seven-point scales: 1 = much less than others in my organization, 7 = much more than others in my organization). Although we averaged these three indicators into a single leadership-level composite (α = 0.61) for the primary analyses, we also report subsidiary analysis on the separate indicators.

**Sense of control (study 2).** Participants completed the eight-item Personal Sense of Power scale (33) (α = 0.69), which assesses the extent to which individuals experience a sense of control or power in their relationships. Specifically, participants indicated the extent to which they agreed (five-point scales: 1 = strongly disagree, 5 = strongly agree) that a series of statements is true of their relationships (e.g., “I can get people to listen to what I say”).

**Dimensions and mood.** Participants indicated their level of education (1 = high school, 2 = some college, 3 = 2-year degree, 4 = 4-year degree, 5 = postgraduate/professional degree, or other) and family income (1 = $0–$24,999, 2 = $25,000–$49,999, 3 = $50,000–$74,999, 4 = $75,000–$99,999, 5 = $100,000–$149,999, 6 = $150,000–$249,999, 7 = $250,000–$499,999, 8 = $500,000+). To account for transient differences in mood experienced while participants were participating in the laboratory (which could produce transient cortisol differences) (34), participants indicated their Positive Affect (α = 0.61) and Negative Affect (α = 0.61) during the study using the 10-item short form developed by Kercher (35) of the Positive and Negative Affect Schedule (36) plus the items angry and happy. In study 2, we also included a self-reported measure of subjective SES (37). In this measure, participants chose a rung from each of the two ladders labeled 1–10; the first ladder represented their standing in their community, and the second ladder represented their standing in the United States. The two scales were averaged to form a subjective SES composite (α = 0.78)

**Health-related practices and sleep (study 1).** To account for variability in cortisol because of health practices and sleep behavior (38), participants indicated whether they exercised at least one time per week, used tobacco products, or drank caffeinated beverages (all yes or no questions) (Table 1). None of these variables correlated significantly with cortisol (P values > 0.11). Participants also indicated the time that they awoke that morning and the number of hours that they slept the previous night. Leaders awoke earlier and slept less than nonleaders. Sleep duration was unrelated to cortisol (r = 0.07, P = 0.28). Although awakening time was related to cortisol (r = 0.24, P < 0.001), when controlling for awakening time, the difference between leaders and nonleaders in cortisol remained statistically significant. Finally, participants indicated whether they suffered from diabetes, asthma, a heart condition, or a neurological disorder. Each of these conditions was very rare in both groups (leaders and nonleaders), never occurring in more than 5% of participants (Table 1).

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