European Journal of Social Psychology, Eur. J. Soc. Psychol. **43**, 201–211 (2013)
Published online in Wiley Online Library (wileyonlinelibrary.com) **DOI**: 10.1002/ejsp.1937

Research article

Power increases performance in a social evaluation situation as a result of decreased stress responses

PETRA C. SCHMID[1,2]* AND MARIANNE SCHMID MAST[1]
[1]*Department of Work and Organizational Psychology, University of Neuchatel, Neuchatel, Switzerland;*
[2]*Psychology Department, New York University, New York, USA*

Abstract

We tested whether power reduces responses related to social stress and thus increases performance evaluation in social evaluation situations. We hypothesized and found that thinking about having power reduced fear of negative evaluation and physiological arousal during a self-presentation task (Studies 1 and 2). In Study 2, we also showed that simply thinking about having power made individuals perform better in a social evaluation situation. Our results confirmed our hypotheses that the mechanism explaining this power–performance link was that high power participants felt less fear of negative evaluation. The reduced fear of negative evaluation generated fewer signs of behavioral nervousness, which caused their performance to be evaluated more positively (serial mediation). Simply thinking of having power can therefore have important positive consequences for a person in an evaluation situation in terms of how he or she feels and how he or she is evaluated. Copyright © 2013 John Wiley & Sons, Ltd.

Social evaluation situations are characterized by one or several evaluators observing and assessing the performance of a person in a face-to-face encounter. They are common in work contexts, such as job interviews, meetings, or when giving public speeches or presentations. Social evaluation situations usually provoke stress-related responses in the person being assessed, such as fear of negative evaluation, physiological stress responses (Al'Absi, et al., 1997; Kirschbaum, Pirke, & Hellhammer, 1993), and nervous behavior (Karam & Ragsdale, 1994). In this article, we posit that being reminded of one's own power, the latter defined as the extent to which a person feels or is able to influence or control other people (Halevy, Chou, & Galinsky, 2011; Schmid Mast, 2002), reduces stress-related responses in social evaluation situations. We therefore claim that power acts as a stress buffer in social evaluation situations in that it reduces the fear of negative evaluation, physiological arousal, and nonverbal signs of nervousness.

That power reduces fear of negative evaluation, defined as "…the degree to which people experience apprehension at the prospect of being evaluated negatively" (Leary, 1983, p. 371), is theoretically founded in the approach/inhibition theory of power (Keltner, Gruenfeld, & Anderson, 2003). According to this theory, high power people pay less attention to threats. A social evaluation situation creates such a potential threat by inducing worries about making an unfavorable impression (i.e., fear of negative evaluation). To the extent that high power people are prone to ignore threats, they should be relatively immune towards the fear of negative evaluation.

Moreover, according to the approach/inhibition theory (Keltner, et al., 2003), high power is associated with relatively more positive mood and less negative emotions. Specifically, the emotions of fear and embarrassment have been documented to be negatively related to power (Anderson, Langner, & Keltner, 2001), emotions that are genuine to the concept of fear of negative evaluation (Leary, 1983; Watson & Friend, 1969). There is preliminary evidence that high power might reduce negative feelings in socially stressful situations. Zhou, Vohs, and Baumeister (2009; Study 3) showed that counting money made participants feel less socially distressed in a social exclusion game (the cyberball game; Eisenberger, Lieberman, & Williams, 2003). Counting money is not an established power manipulation; however, like power, money is a resource that makes people feel stronger and more confident about their ability to solve a task (Zhou, et al., 2009). This study may therefore serve as evidence that power-related feelings (elicited by counting money) can reduce negative feelings of distress in socially stressful situations (i.e., social exclusion game).

A prototypical stressful social evaluation situation is a job interview. The experimental state-of-the art equivalent to create it is called the Trier Social Stress Test (TSST; Kirschbaum, et al., 1993). In the TSST, participants are asked to present themselves in front of a jury who evaluates their performance. The TSST does not only elicit fear of evaluation but also robust stress-related physiological responses, as shown in a meta-analysis (Dickerson & Kemeny, 2004). There are several ways to measure stress-related physiological responses; for

*Correspondence to: Petra C. Schmid, New York University, 6 Washington Place, New York, NY 10003.
E-mail: pcs308@nyu.edu

Received 14 August 2012, Accepted 30 January 2013

presentation situations in general and for the TSST in particular, the most widely used measures are salivary cortisol and heart rate. Findings for both measures are very robust; there is an increase of the release of cortisol, as well as an increase of heart rate, as a result of the stress-inducing TSST (Kirschbaum, et al., 1993; Kudielka, Schommer, Hellhammer, & Kirschbaum, 2004; Schommer, Hellhammer, & Kirschbaum, 2003). We have chosen heart rate as our indicator for stress-related physiological response, because unlike salivary cortisol, heart rate is independent of the time of the day. Salivary cortisol levels are higher during the morning than during the afternoon, whereas heart rate remains stable throughout the day (Kudielka, et al., 2004). Moreover, self-reported feelings of controllability have been found to be related to heart rate but not to endocrine measures of stress (e.g., cortisol and adrenocorticotropic hormone) (Schommer, et al., 2003). As being in control is an important aspect of power, we expect heart rate to be more sensitive to our power manipulation, which is why we have chosen to assess heart rate as the physiological indicator of social stress in the present research. Moreover, measuring heart rate is a low cost-intensive and easy-to-handle measure of stress.

There is evidence that power decreases physiological stress responses. Carney, Cuddy, and Yap (2010) found that power posing (taking a powerful, expansive versus a submissive, restricted posing) affects the release of stress-related hormones, in that powerful posing is related to a relatively lower release of cortisol. When comparing the cortisol levels with before-power manipulation measures, it was observed that the cortisol level decreased for participants with the powerful posing and increased for participants with the powerless posing, suggesting that both high and low power have an effect on stress (although in opposite directions). Moreover, there is evidence that people with higher socioeconomic status have lower basal cortisol levels than people with relatively lower socioeconomic status (Cohen, Doyle, & Baum, 2006). Bohns and Wiltermuth (2012) showed that high power posing increased resistance to physical stress (pain) compared with low power posing and control. Despite this evidence, the potential stress-buffering effect of power in social evaluation situations has not yet been investigated.

We predict that power acts as a buffer to stress-related responses (e.g., fear of negative evaluation and physiological arousal) elicited by stressful social situations (Studies 1 and 2). We focus on the effects of high power (versus control) and not on the effects of low power because most of the existing empirical evidence investigated and showed that high power can reduce stress compared with control conditions (Bohns & Wiltermuth, 2012; Carney, et al., 2010). Another reason we focus on the high power individuals and compare them with a control group is that people who have to deal with social evaluation situations are typically interested in learning about techniques to reduce stress. With an applied context in mind, it makes sense to establish a means to reduce stress (such as thinking about having power, as we hypothesize) rather than one to increase stress.

The second goal of this research was to investigate whether the effects of power on fear of negative evaluation and on physiological arousal transpire into the powerful person's nonverbal behavior and how such behavior is evaluated by external judges in terms of performance. Such third-person judgment might have long-term consequences for the speakers (e.g., job offers and promotion). Research shows that subjective feelings of anxiety (e.g., fear of negative evaluation) and physiological arousal are expressed in behavior (Burgoon, Kelley, Newton, & Keeley-Dyreson, 1989; Wegner, Erber, & Zanakos, 1993). Typical stress-related behaviors are lower speech quality such as nonfluent, fragmented sentences (Berthold & Jameson, 1999; Siegman, 1979, 1987) and more self-touching and random movement (Burgoon, et al., 1989; Ekman & Friesen, 1972). Nonverbal behavior is important for performance evaluations. For instance, the so-called Dr. Fox effect (Ware & Williams, 1975) shows that by adopting a persuasive communication style, one might receive positive performance evaluations even when the content of the message hardly makes any sense. In line with these findings, fluent speech influences competence perceptions: people speaking nonfluently are perceived as less competent (Barge, Schlueter, & Pritchard, 1989; Miller & Hewgill, 1964). Also, in general, people who appear anxious convey a less competent impression (McCroskey & Richmond, 1976; Mulac & Sherman, 1975).

All in all, previous research suggests that power has a stress-buffering effect and is negatively correlated with the experience of negative emotions such as fear. Fear and stress can leak into nonverbal behavior, and nonverbal behavior is used by observers to infer a person's competence. Some of these effects have been found in individual studies but mostly not in the context of a social evaluation situation. More importantly, although some links are documented in the literature, the entire train of argument has so far not been investigated. We thus tested whether thinking about having power causes people perform better in a social evaluation situation because high power reduces stress-related reactions to the evaluation situation. This in turn may reduce the exhibited nonverbal signs of nervousness, which then results in a more favorable evaluation (Study 2).

STUDY 1

In Study 1, we tested whether thinking about high power reduces fear of negative evaluation and physiological arousal (i.e., heart rate) in a social evaluation situation.

Method

Participants

We recruited 39 students (19 men and 20 women) majoring in different study areas. The average age was 23.18 ($SD = 2.98$). Participants were approached by the experimenter in public places (e.g., cafeteria) in the different university buildings of the University of Neuchâtel. They were remunerated with the equivalent of $20 for their participation.

Procedure

Participants were run individually, and each testing session lasted about 45 minutes. They were greeted and presented with the informed consent form to sign. Their baseline physiological arousal (heart rate) was measured. Participants were randomly assigned either to the high power priming or to a priming control condition. Immediately after the priming, we measured how positive and powerful they felt (manipulation check). Participants then prepared the self-presentation task of the TSST. They were told that they would be paid according to their performance and that this would be either the equivalent of \$5, \$10, \$15, or \$20. Participants then filled in the fear of negative evaluation questionnaire and proceeded with the self-presentation task. During the self-presentation task, participants' heart rate was measured. Participants then filled in a questionnaire about their motivation to perform well (task relevance), and we assessed their demographic data and control variables for the physiological arousal analysis. Participants were thanked and debriefed, and all received \$20.

Power Manipulation

We used the standard recall power priming introduced by Galinsky, Gruenfeld, and Magee (2003). In the high power condition, participants were instructed to recall a situation in which they had power over another individual and told to write both a description of the situation and how they felt during the situation. The control group recalled and wrote down their activities of the previous day. The high power priming increased positive mood in previous studies (Schmid Mast, Jonas, & Hall, 2009). This mood effect could be—at least partially—responsible for the observed effects. To control for such a possible mood effect, we asked participants how they felt right after the priming with a single item "How do you feel at this moment?" (1 = *extremely negative*, 7 = *extremely positive*).

Trier Social Stress Test

The TSST (Kirschbaum, et al., 1993) is a validated procedure that puts participants in socially stressful evaluation situations. We used the first task of this test, a 5-minute self-presentation in the context of a job interview, during which participants were asked to present their strengths to an evaluator. Participants had 3 minutes to prepare the self-presentation task. They were free to take notes; however, they were not allowed to use their notes during the self-presentation. A female experimenter played the role of the evaluator. Participants were informed that the experimenter would evaluate their performance and that they would be paid according to this performance evaluation. As part of the standard procedure for the TSST, participants were also informed that the evaluator was trained in detecting signs of stress and nervousness. During the self-presentation task, the evaluator sat in front of the participant with a sheet of paper and appeared to take notes. Participants were instructed to talk for 5 minutes. When participants stopped before the 5 minutes had expired, the evaluator informed them that there was time left and told them to proceed. If participants stopped speaking again for more than 20 seconds, the evaluator started to ask predefined questions. These questions included the following: "What are your major shortcomings?", "Do you have enemies? And why?", and "What do your collaborators or colleagues think of you?" As described in the protocol of the TSST, the experimenter was trained to behave similarly with all participants. She followed a strict protocol and only gave the participant the minimal instructions mentioned earlier. She was also instructed to convey a neutral facial expression. Therefore, neither verbal nor facial feedback was given to participants.

Felt Power

Felt power was assessed as a power priming manipulation check. Participants were asked to indicate directly after the priming to what extent they experienced five power-related feelings (strong, superior, dominant, weak—reverse scored, and powerless—reverse scored) on a 5-point scale (1 = *not at all*, 5 = *very much*) ($M = 3.75$, $SD = 0.52$, $\alpha = .75$).

Fear of Negative Evaluation

Fear of negative evaluation was measured using a 9-item (3 reversed) scale adapted from the Fear of Negative Evaluation Scale by Watson and Friend (1969). Items were adapted to the self-presentation task. A sample item was "I worry about the impression I will make during the self-presentation." The scale was a 5-point Likert scale, 1 = *do not agree at all*, 5 = *do strongly agree* ($M = 3.05$, $SD = 0.64$, $\alpha = .69$).

Task Relevance

We measured whether participants considered the self-presentation task to be relevant to them by asking "To what extent did you perceive the task to be relevant to train yourself for your future job interviews?", which they rated on a 5-point scale (1 = *not at all*, 5 = *very much*). The mean score was 4.21, $SD = 1.13$.

Physiological Arousal

Similar to Kirschbaum and collaborators (Kirschbaum, et al., 1993; Schommer, et al., 2003), we used a wireless signal transmission device (Polar RS200) to measure heart rate. As soon as participants arrived in the lab, their baseline heart rate was assessed during a 2-minute period during which participants were asked to sit down and relax while looking at an emotionally neutral screen saver (validated by Rottenberg, Ray, and Gross (2007)). Because of data transmission and handling errors, we lost the data of seven participants. Analyses for this measure therefore include 32 participants. The mean heart rate during this period served as the baseline measure. To obtain a measure of individual increase in heart rate for the self-presentation task of the TSST, we subtracted the baseline heart rate from the mean heart rate during the 5-minute self-presentation task. Comparable with previous studies using wireless transmission devices during the TSST (Kirschbaum, et al., 1993; Schommer, et al., 2003), the mean increase of heart rate was $M = 18.31$, $SD = 11.32$. We assessed participants' age, weight, height, sports activities, the consumption of coffee, cigarettes, and alcohol, as well as problems with hypertension and physical or mental illnesses, as all of these variables are known to have an impact on heart rate.

Gender

Although not the focus of the present research, we added gender as a variable to our analyses because research showed that women who behave dominantly (induced by priming of high power) are generally rather negatively evaluated by others (e.g., Eagly and Karau (2002) and Rudman (1998)). It is therefore possible that power interacts with gender when it comes to performance evaluations.

Results

Preliminary Analyses

Note that all of the following analyses include gender as an independent variable. The power priming did not affect participants' mood, $F(1, 35) = 0.00$, $p = .994$, $\eta_p^2 = .00$; we therefore did not control for mood in the subsequent analyses. A power manipulation check showed that the power priming was successful. High power-primed individuals felt significantly more powerful ($M = 3.94$, $SE = 0.12$) than controls ($M = 3.57$, $SE = 0.12$), $F(1, 35) = 4.86$, $p = .034$, $\eta_p^2 = .12$.

We controlled whether the participants took the task seriously with the *task relevance* item. A one-sample *t*-test against the value of 3 (neutral) showed that on average, participants' scores were significantly higher, $t(38) = 6.67$, $p < .001$. Also, there was no difference between the power priming groups, $F(1, 35) = 0.11$, $p = .744$, $\eta_p^2 = .00$, which is why we conclude that all participants considered the task to be relevant.

For physiological arousal, we tested whether there were group differences with regard to heart rate-related variables such as participants' age, weight, height, sports activities, consumption of coffee, cigarettes, or alcohol, and problems with hypertension or physical or mental illnesses. There were no differences between the control group and the high power group, all Fs < 2.45, all ps $> .126$, $\eta_p^2 < .05$. Baseline heart rate did also not differ between groups, $F(1, 35) = 0.36$, $p = .550$, $\eta_p^2 = .01$.

Power Effects on Stress-related Responses

We computed ANOVAs with power priming (high power versus control) and gender as the independent variables separately from the dependent variables of fear of negative evaluation and physiological arousal. See Table 1 for an overview of the power main effects and means. Confirming our hypothesis, high power-primed participants experienced significantly less fear of negative evaluation than controls, $F(1, 35) = 12.57$, $p = .001$, $\eta_p^2 = .26$., and high power-primed participants had a marginally significantly lower increase of heart rate than controls, $F(1, 28) = 3.88$, $p = .059$, $\eta_p^2 = .12$. Fear of negative evaluation and increase of heart rate were not significantly related, $pr = -.09$, $p = .638$ (controlling for the power priming condition).

Gender Interaction and Main Effects

No significant gender by power interaction effect emerged, neither for fear of negative evaluation nor for physiological arousal, all Fs < 1.84, all ps $> .186$, $\eta_p^2 < .06$. There was a significant gender main effect for fear of negative evaluation, showing that men scored lower ($M = 2.76$, $SE = 0.13$) than women ($M = 3.27$, $SE = 0.13$), $F(1, 35) = 8.03$, $p = .008$, $\eta_p^2 = .19$. Gender did not show a significant main effect for physiological arousal, $F(1, 28) = 0.26$, $p = .617$, $\eta_p^2 = 01$.

Table 1. Means, standard errors (in parentheses) and *F* values of the power main effects on the anxiety-related responses, self-efficacy, and performance evaluation

	Power condition		
Outcome variables	High power	Control	*F*
Study 1			
Fear of negative evaluation	2.69 (0.13)	3.33 (0.13)	12.57***
Physiological arousal	13.35 (2.30)	21.29 (2.69)	3.88^{+}
Study 2			
Fear of negative evaluation	3.11 (0.12)	3.67 (0.12)	10.06**
Physiological arousal	17.64 (2.10)	24.82 (2.04)	5.70*
Nonverbal signs of nervousness	2.13 (0.16)	2.64 (0.16)	5.03*
Self-efficacy	3.54 (0.10)	3.36 (0.10)	1.63
Performance evaluation	3.39 (0.17)	2.81 (0.17)	5.41*

$^{+}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Discussion

Study 1 confirmed our hypothesis that high power priming reduces fear of negative evaluation and physiological arousal in a social evaluation situation. Fear of negative evaluation and physiological arousal were uncorrelated, which is in line with existing literature (Mauss, Wilhelm, & Gross, 2004; Schwerdtfeger, 2004). Although physiological arousal is a typical measure to assess social stress (Al'Absi, et al., 1997; Kirschbaum, et al., 1993; Tomaka, Blascovich, Kelsey, & Leittena, 1993; Tomaka, Blascovich, Kibler, & Ernst, 1997), previous research showed that self-report measures of stress such as fear of negative evaluation are usually not correlated with physiological arousal when giving public presentations (Mauss, et al., 2004; Schommer, et al., 2003; Schwerdtfeger, 2004). This might be because physiological arousal such as heart rate (as well as cortisol) also increases when a person is challenged and not only when he or she is apprehensive about a situation (Bremner et al., 2003). According to the biopsychosocial model (Blascovich & Tomaka, 1996), a situation can be perceived as challenging versus threatening depending on whether one feels able to deal with the situation (challenge) or not (threat). The lacking relationship between physiological arousal and self-report measures of stress in social evaluation situations might be a consequence of the fact that physiological arousal includes more facets than just fear of negative evaluation (Tomaka, et al., 1993; Tomaka, et al., 1997).

Heart rate is sensitive to movements; the more one moves, the higher their heart rate is. A meta-analysis by Hall, Coats, and Smith LeBeau (2005) showed that power does not influence body and leg shifting or foot movements. However, to make sure that our power effects on heart rate cannot be explained by differences in how much participants moved, we coded participants' body movements during the talk in Study 2 to rule out this alternative explanation concerning the results.

Another limitation of Study 1 was that the experimenter handed out the instructions for the power priming. The power priming instructions were on the second page; the first page was a cover page with the study title, contact addresses, and the university logo. However, when distributing the pages, the experimenter potentially could have seen to which power condition the participant belonged. Also, some participants might have asked questions regarding the writing task of the power manipulation, which might have revealed their condition to the experimenter. Note, however, that the experimenter was a research assistant who was not implied in our theoretical discussions and not informed about our hypotheses. Also, the experimenter had been trained to behave in the same way with each participant, and the interaction of the experimenter with the participant during the self-presentation task was minimal. This reduces the possibility that the expectations of the experimenter could have given subtle behavioral indicators to the participant that could have affected how the participant felt (the experimenter effect; Rosenthal, 1966). Although we judge an experimenter effect to be very unlikely, we took the precaution to avoid any influence of the evaluator on the participant by using a completely standardized interaction partner in Study 2. We used Immersive Virtual Environment Technology (IVET) and virtual humans as evaluators (explained in more detail in the succeeding texts).

Note also that we measured fear of negative evaluation before the self-presentation task. When assessed before the task, fear of negative evaluation might reflect feelings of self-efficacy, meaning participants' feelings of confidence concerning their task mastery. In Study 2, we addressed this possible limitation and changed the position of the fear of negative evaluation questionnaire (after the task) and added a self-efficacy measure before the task.

STUDY 2

The aim of Study 2 was to replicate the results from Study 1 under more rigorous experimental conditions and with slightly different power manipulations and with a different experimental setting (interaction with a virtual evaluation panel instead of one human evaluator). Moreover, we also tested whether power affects a person's performance during a social evaluation situation via reduced fear of negative evaluation (or reduced physiological arousal) and reduced signs of nonverbal nervousness. We thus tested a serial mediation effect in which power affects performance evaluation because it reduces fear of negative evaluation (or because it reduces physiological arousal). This, in turn, entails fewer nonverbal signs of nervousness, which then positively affect the performance evaluation.

We used IVET for Study 2. IVET enabled us to achieve complete standardization of the evaluators (virtual humans), which thus ruled out that the behavior of participants was in any way affected by the behavior of the evaluator. As a consequence, all the variance in the behavior of the participant can be attributed solely to the participant. The utility and validity of using IVET in the context of creating a socially stressful environment are well documented in the literature. For instance, Zanbaka, Ulinski, Goolkasian, and Hodges (2004) showed in a social facilitation/inhibition experiment that the presence of a virtual human-affected participants' performance in the same way as the presence of a real human. The TSST has been programmed in virtual settings before, and the virtual version evoked physiological responses (heart rate and cortisol) that were comparable with the responses found in real-life versions of the TSST (Jönsson, et al., 2010; Wallergård, Jönsson, Österberg, Johansson, & Karlson, 2011). IVET is also used as an effective treatment to remedy fear of public speaking (e.g., North, North, and Coble (1998) and Wallach, Safir, and Bar-Zvi (2009)).

Method

Participants

Participants were 80 students majoring in different study domains (40 men and 40 women). They were recruited at the University of Neuchatel (cafeteria and hallway). Their average age was 24.17, $SD = 3.53$. Participants volunteered for the study, and no remuneration was provided.

Procedure

The experiment took place in a virtual word with two virtual human evaluators. After signing the informed consent form, participants were familiarized with the virtual world in which the subsequent TSST took place. In this familiarization phase, a virtual human in the role of an instructor entered the (virtual) room, introduced the two virtual members of the evaluation panel as experts in the detection of signs of stress and nervousness, and explained the self-presentation task to the participant. Participants then quit the virtual world and were randomly assigned to either the high power priming or to the control condition and subsequently completed the corresponding power priming writing task. Directly after the power priming, participants indicated their mood state. They then read the instructions for the self-presentation task and were informed that they would be video taped during the task for later evaluation of their verbal and nonverbal signs of nervousness and stress. Participants then had 3 minutes to prepare the task. Right before the self-presentation, participants were asked about their feelings of self-efficacy when thinking about the upcoming task. They then were reimmersed in the virtual world where they performed the self-presentation task. After the task, they left the virtual world to fill in the questionnaire about their feelings of power and of fear of negative evaluation during the self-presentation task. Participants were then thanked and debriefed.

Power Manipulation

In this study, we used a slightly different power priming procedure. When reading the power priming situations written by the participants in Study 1, we realized that they contained very different situations. To make our power priming more homogenous, we used an adaptation of the Galinsky et al. (2003) priming and instructed participants to comment on how they would feel in specific high power (or neutral) situations. Moreover, as mentioned before, the recall power priming sometimes elicits changes in mood state, and it is better to control for mood in the experimental design than by statistical procedures. Therefore, we instructed all participants to think about *positive* points in the specific situations. We described four different situations and had participants first imagine themselves in these situations and then write down three different positive points about being in each of these situations.

In the high power priming condition, participants imagined themselves in situations in which they had power over other people. Situations were as follows: "What do you like about being in charge and another person just following you?", "What makes you feel good about you taking a decision for the entire group you are part of?", "What are the positive aspects of being in a situation in which another person is dependent on you?", and "What would you like about the responsibilities that come along with being the leader of a group?"

Participants in the control condition imagined themselves in four situations that were power unrelated. Situations were as follows: "What makes you feel good about going out with friends?", "What are the positive things about having siblings?", "What do you like in the life of a student?", and "What do you like about Switzerland?" Typically, participants made lists with incomplete sentences to answer these questions (e.g., "having somebody to talk with" as a response to what they find positive about having siblings). Similar to Study 1, we assessed participants' mood right after the priming with a single item "How do you feel at this moment?" (1 = *extremely negative*, 7 = *extremely positive*).

Trier Social Stress Test

Participants performed the same self-presentation task as in Study 1, with the only difference being that in the current study, they gave the presentation in front of a two-people evaluation panel in a virtual environment.

Immersive Virtual Environment Technology

Participants performed the self-presentation task in a three-dimensional virtual environment by using IVET (Blascovich, et al., 2002). By wearing a head-mounted display, participants were immersed in a three-dimensional virtual world. For the purpose of this study, we used a virtual world consisting of a room with furniture including a table behind which the two evaluators (a female and male virtual human) sat, a microphone, and a camera (Figure 1). The virtual world featured also a male virtual human in the role of the instructor. He explained the self-presentation task to the participants. The virtual humans were able to speak preregistered sentences (human voices) synchronized with their lip movements. The experimenter controlled via keyboard when the virtual human uttered the sentences. For instance, after 5 minutes of the self-presentation, the experimenter had the women in the evaluation panel say "Thank you. Time is up. You can have a seat now at the table".

To assess whether participants found the virtual world immersive and whether they took it seriously, we asked them to agree or disagree (5-point scale: 1 = *do not agree at all*, 5 = *do strongly agree*) with the following statements: "I was not conscious about my real environment any more." and "For me, the situation in the virtual world was ridiculous" (reverse scored).

Figure 1. Two-people evaluation panel. The two-people evaluation panel was represented by a female and a male virtual human. During the self-presentation task of the Trier Social Stress Test, the participant stood in front of the virtual microphone and the camera (which existed in the virtual and the real world)

Felt Power

We measured participant's felt power after the self-presentation task of the TSST to check whether the manipulated high power and control states the participants were in lasted throughout the self-presentation. Participants indicated how they felt during the task with respect to four adjectives (strong, superior, dominant, and humiliated—reverse scored) using a 5-point scale (1 = *not at all*, 5 = *very much*) ($M = 2.59$, $SD = 0.73$, $\alpha = .70$).

Self-efficacy

Self-efficacy was measured with a 4-item 5-point scale questionnaire (1 = *not at all*, 5 = *very much*) adapted from the Generalized Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). A sample item is "I am confident, that I can master the self-presentation task." The higher the score, the more self-efficacious participants felt ($M = 3.45$, $SD = 0.67$, $\alpha = .80$).

Fear of Negative Evaluation

As in Study 1, we used nine self-report items (5-point scale) adapted from the Fear of Negative Evaluation Scale by Watson and Friend (1969) to assess how stressed participants felt during the self-presentation. Item scores were averaged, with higher values indicating more fear of negative evaluation ($M = 3.39$, $SD = 0.82$, $\alpha = .84$).

Physiological Arousal

Similar to Study 1, we recorded participants' heart rate during the experiment (baseline and self-presentation). As in Study 1, we calculated the increase of heart rate during the self-presentation task as a comparison with the baseline ($M = 21.41$, $SD = 12.34$). Because of difficulties in transferring the data on the computer and handling errors of the wireless transmission device by the experimenter, the heart rate data of six participants was lost. Therefore, the analyses including heart rate data are based on 74 participants. As in Study 1, we assessed participants' age, weight, height, sports activities, consumption of coffee, cigarettes, and alcohol, as well as problems with hypertension and physical or mental illnesses, as these variables are known to influence heart rate. Also, we coded how much participants moved during the self-presentation task on the basis of the videotapes. The data from four participants were not well registered, and we therefore were only able to code the behavior of 76 participants. Ratings were carried out by two coders that were blind to the conditions. Both coders rated 15 videos on how static the participant was and on how much the participant moved and gestured (0 = not at all, 5 = very much). Inter-rater reliability was high; $r = .83$ for static behavior, and $r = .77$ for moving and gesturing. A single coder then performed the final coding of all the videos. For static behavior, the mean was $M = 3.70$ ($SD = 1.07$), and for moving and gesturing, it was $M = 1.43$ ($SD = 1.61$). The two variables correlated negatively, p$r = -.35$, $p = .002$ (controlled for power priming condition). We therefore reversed the static behavior coding and averaged the two measures to form a composite movement measure, $M = 1.37$, $SD = 1.11$. Higher scores reflect more movement during the self-presentation task.

Nonverbal Signs of Nervousness

Each participant's nervousness during the self-presentation task was coded on the basis of the videotapes. The data of four participants were not well registered, and we therefore were able to code the behavior of 76 participants only. Because a large part of participants' faces was covered with the head-mounted display, we based our measures of nonverbal signs of nervousness on established indicators of nervousness that are independent of facial information. We employed a measure of *gestural signs of nervousness* and one of *speech-related signs of nervousness*. Coding of gestural signs of nervousness consisted of an overall impression about the participants' gesture-based nervousness including behaviors such as tics, self-touch, and nervous gestures. Speech-related signs of nervousness were assessed as a global rating of nervous noises and stagnantly and nonfluent speech. A 6-point rating scale from 0 = *not at all nervous* to 5 = *very much nervous* was used for both assessments. Two raters (blind to the conditions) coded 15 participants on the two nervousness measures; inter-rater reliability was high ($r = .73$ for the gesture-related nervousness and $r = .76$ for the speech-related nervousness). The final coding for all participants was carried out by one coder. The mean nervousness score for the gesture-related nervousness was $M = 2.15$ ($SD = 1.23$), and the speech-related nervousness was $M = 2.62$, $SD = 1.18$. Gesture-related nervousness and speech-related nervousness were significantly correlated, p$r = .42$, $p < .001$ (controlled for power priming condition). We therefore formed a composite measure, the *nonverbal signs of nervousness* variable ($M = 2.39$, $SD = 1.02$) with higher scores being indicative of more nonverbal signs of nervousness.

Performance Evaluation

Two different raters (not the same as for the nervousness ratings), blind to the conditions, each coded 15 participants on task performance. Inter-rater reliability was $r = .82$. One coder then rated the whole sample. Raters were instructed to provide their global impression of the quality of the self-presentation of the participant including aspects of perceived competence, general quality of the presentation, whether they would hire the participant and whether the participant was selling himself or herself well. For each participant, this overall rating was performed on a scale from 0 = *very bad* to 5 = *very good* ($M = 3.11$, $SD = 1.08$).

Results

Preliminary Analyses

Again, gender was included in all analyses. We analyzed whether the power priming affected participants' mood. Although all participants had to reflect about positive things about specific situations, there was a significant power effect on mood, $F(1, 76) = 6.46$, $p = .013$, $\eta_p^2 = .08$. We therefore entered mood systematically as a covariate in all further analyses. Therefore, the following analyses are all univariate ANCOVAs with power and gender as independent variables and mood as a covariate. The power manipulation check indicated that the priming worked: high power-primed individuals felt significantly more powerful ($M = 2.75$, $SE = 0.09$) than controls ($M = 2.44$, $SE = 0.09$), $F(1, 75) = 4.23$, $p = .043$, $\eta_p^2 = .05$. Power did not affect how immersive participants experienced the virtual world, $F(1, 75) = 0.51$, $p = .479$, $\eta_p^2 = .01$ or how serious they took the virtual world, $F(1, 75) = 0.88$, $p = .352$, $\eta_p^2 = .01$.

As in Study 1, we checked whether there were power group differences with regard to the heart rate-related variables (age, weight, height, sport activities, consumption of coffee, cigarettes, and alcohol, problems with hypertension, physical or mental illness). This was not the case, all Fs < 1.80, all ps $> .193$, $\eta_p^2 < .02$. Also, baseline heart rate did not differ between the high power and the control group, $F(1, 69) = 0.78$, $p = .380$, $\eta_p^2 = .01$. Power priming did also not affect how much participants moved during the self-presentation, $F(1, 71) = 0.17$, $p = .678$, $\eta_p^2 = .00$. The amount of movements correlated marginally significantly with the increase of heart rate during the self-presentation task, p$r = .21$, $p = .083$ (controlled for power priming condition).

Power Effects on Performance Evaluation and Stress-related Responses

We tested whether power affected performance evaluation, fear of negative evaluation, physiological arousal, nonverbal signs of nervousness, and self-efficacy in the self-presentation task. An overview of all power main effects and the corresponding means is provided in Table 1.

Confirming the results of Study 1, power-primed participants felt significantly less fear of negative evaluation than controls, $F(1, 75) = 10.06$, $p = .002$, $\eta_p^2 = .12$, and they showed significantly lower physiological arousal (lower heart rate increase) compared with controls, $F(1, 69) = 5.70$, $p = .020$, $\eta_p^2 = .08$. Additionally, participants primed with power showed significantly fewer nonverbal signs of nervousness than controls, $F(1, 74) = 5.03$, $p = .028$, $\eta_p^2 = .06$, and there was a significant power priming main effect of performance evaluation,

$F(1, 71) = 5.41$, $p = .023$, $\eta_p^2 = .07$, showing that high power individuals' performance was evaluated better than the performance of individuals in the control condition. There was no significant main effect of power on self-efficacy, $F(1, 75) = 1.63$, $p = .206$, $\eta_p^2 = .02$.

Gender Effects

The only significant power by gender interaction effect emerged for self-efficacy, $F(1, 75) = 10.45$, $p = .002$, $\eta_p^2 = .12$. Separate ANCOVAs for men and women showed that high power women felt more self-efficacious ($M = 3.72$, $SE = 0.14$) than women in the control group ($M = 3.11$, $SE = 0.13$), $F(1, 37) = 8.44$, $p = .006$, $\eta_p^2 = .19$. For men, no significant difference was found, $F(1, 37) = 2.53$, $p = .120$, $\eta_p^2 = .06$ ($M = 3.35$, $SE = 0.13$ for the high power group; $M = 3.60$, $SE = 0.14$ for the control group). To further explore the interaction effect, we computed separate ANCOVAs for the control group and the high power condition. In the control group, men scored higher on self-efficacy than women, $F(1, 37) = 7.84$, $p = .008$, $\eta_p^2 = .18$. In the high power condition, however, women tended to score higher, $F(1, 37) = 3.49$, $p = .070$, $\eta_p^2 = .09$. All other gender by power interactions were not significant, all Fs < 1.85, all ps $> .178$, $\eta_p^2 < .02$. There was a marginally significant gender main effect for fear of negative evaluation: Women scored higher ($M = 3.56$, $SE = 0.12$) than men ($M = 3.22$, $SE = 0.12$), $F(1, 75) = 3.83$, $p = .054$, $\eta_p^2 = .05$. No significant gender main effects emerged for performance evaluation, physiological arousal, nonverbal signs of nervousness, or self-efficacy, all Fs < 2.99, all ps $> .088$, $\eta_p^2 < .04$.

Mediators of the Power–Performance Link

We tested our serial mediation hypothesis that power increases performance evaluation because power results in less subjective feelings of stress (or reduced physiological arousal), which translates into fewer signs of behavioral nervousness being then responsible for better performance evaluations. To do so, we first calculated partial correlations (controlling for power priming condition). These showed that fear of negative evaluation was positively correlated with nonverbal signs of nervousness ($r = .24$, $p = .044$) and that nonverbal signs of nervousness were negatively correlated with performance evaluation ($r = -.38$, $p = .001$). Note that fear of negative evaluation was not significantly related to performance evaluation, ($r = .04$, $p = .736$). For physiological arousal, there was no significant correlation with fear of negative evaluation nor with nonverbal signs of nervousness or performance evaluation (all rs $< .12$, all ps $> .324$).

To test the serial mediation hypothesis, we used the "PROCESS" macro provided by Hayes (2013) that allows estimating direct and indirect effects in simple mediation models and multiple mediation models with mediators operating in serial. We tested whether fear of negative evaluation and nonverbal signs of nervousness mediate the power–performance link as serial mediators (first fear of negative evaluation, second nonverbal signs of nervousness). Physiological arousal was not included because it was unrelated to fear of negative evaluation, nonverbal signs of nervousness, and performance evaluation. Mood after priming was entered as a covariate. We computed the analysis with bias-corrected 95% bootstrap confidence intervals for the indirect effects by using 10,000 bootstrap samples. PROCESS analyses showed that there was a significant indirect effect of power on performance evaluation through fear of negative evaluation and nonverbal signs of nervousness when operating in serial, confidence interval [−.119, −.003] (Figure 2).

Discussion

Study 2 replicated the findings of Study 1 in a different experimental setting (virtual reality), as well as with slightly different power priming and with a larger sample size. As in Study 1, high power-primed participants felt less fear of negative evaluation and had lower physiological arousal during the self-presentation task. In addition, Study 2 showed that high power individuals appeared less nervous and were evaluated more positively than controls. Confirming our hypothesis, high power individuals were evaluated as performing better because thinking about having power made them less fearful of negative evaluation, which in turn resulted in fewer nonverbal signs of nervousness. This was then responsible for the more positive performance evaluation.

Study 2 enabled us to address some potential weaknesses of Study 1 while at the same time going a step further and showing the effects of power on performance evaluation. The fact that the findings of Study 1 were replicated in Study 2 makes us confident that they are real effects.

As in Study 1, physiological arousal was independent from the other stress-related measures (i.e., evaluation apprehension and signs of nervousness, in line with Mauss, et al. (2004) and Schwerdtfeger (2004)) and from performance evaluation. Physiological arousal correlated marginally significantly with movements made during the self-presentation task, so the

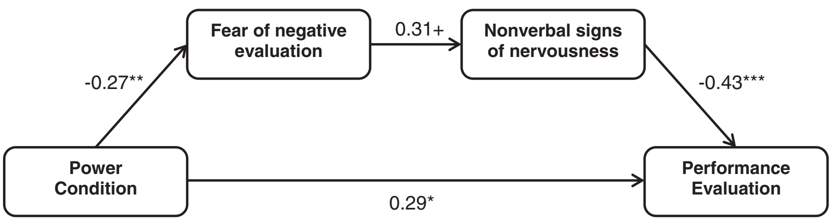

Figure 2. Indirect effect of power on performance evaluation. The power effect on performance evaluation in the self-presentation task was mediated by fear of negative evaluation and nonverbal signs of nervousness. Unstandardized coefficients are presented. The b value from Power Condition to Performance Evaluation is the b value of the total effect (the sum of the direct and indirect effects). The b value for the direct effect of the Power Condition–Performance Evaluation link is 0.24. $+p < .10$; $^*p < .05$; $^{**}p < .01$; $^{***}p < .001$

more participants moved, the more their heart rate increased. However, power did not affect movements during the self-presentation task, and the power effects on heart rate can therefore not be explained by differences in how much the high power group and the control group moved.

In both studies, women indicated more fear of negative evaluation than men (Study 2 marginally so). This finding is in line with previous research showing that on subjective measures of fear, but not on physiological measures (heart rate and cortisol), such gender differences might show up in the TSST (Kelly, Tyrka, Anderson, Price, & Carpenter, 2008).

Whether the fear of negative evaluation is measured before (Study 1) or after (Study 2) the task did not change the results. We are thus confident that in Study 1, we specifically measured fear of negative evaluation and not self-efficacy, despite presenting the fear of negative evaluation questionnaire before the self-presentation task in Study 1. For self-efficacy in Study 2, we found a power by gender interaction effect. Whereas men were higher in self-efficacy than women in the control condition, which confirmed existing findings (Christie & Segrin, 1998), women and men profited differentially from power for their self-efficacy: high power women felt more self-efficacious than women in the control condition, whereas this was not the case for men. The findings for the women are in line with the literature suggesting that powerful people feel more self-confident and self-efficacious (Anderson & Galinsky, 2006; Briñol, Petty, Valle, Rucker, & Becerra, 2007). For men, the power priming did not boost feelings of self-efficacy, perhaps because men's self-efficacy is already high by default (as was the case in the control condition). Previous studies did not include gender as a factor in their analyses concerning the influence of power on self-efficacy (Anderson & Galinsky, 2006; Briñol, et al., 2007). We therefore do not know whether our effect is a unique effect or whether it is replicable. More research is needed to investigate whether gender appears as a stable moderator to the power–self-efficacy link.

GENERAL DISCUSSION

In two studies, we showed that power priming reduced various stress-related responses in social evaluation situations such as subjective feelings of fear of negative evaluation (Studies 1 and 2), physiological arousal (Studies 1 and 2), and nonverbal signs of nervousness (Study 2). We also showed that power priming increased performance evaluation in a self-presentation task, and we provided insight into the underlying mechanism (Study 2): high power participants felt less fear of negative evaluation and therefore exhibited less nonverbal signs of nervousness, which was the reason why their performance was rated more favorably by observers.

Previous studies provided initial evidence that power decreases stress responses (Bohns & Wiltermuth, 2012; Carney, et al., 2010). We now showed that power has a stress-buffering effect in a social context, more specifically in a social evaluation situation and that this effect can be found for subjective feelings, physiological arousal, and behavior. Additionally, we showed that this stress-buffering effect of power has more far-reaching consequences, as it breeds to better performance evaluations. This provides a contribution to the theoretical understanding of how power affects performance ratings (i.e., through reduced feelings of stress and fewer signs of nonverbal nervousness). According to the approach/inhibition theory of power (Keltner, et al., 2003), high power people experience more positive mood and less negative emotions, and they also focus less on threats. But what accounts for the stress-buffering effect of power in our studies? Mood was not affected by the power priming in Study 1, and the effects of the power priming on the stress-related measures were found when controlling for mood in Study 2. This is evidence that the mechanism that explains the stress resistance of high power people is rather based on how much they care about a specific threat (the possibility of a negative evaluation) than on their general mood state.

Our research goes beyond showing that power reduces experienced stress. It shows that this stress resistance is beneficial for performance, at least when performance can be influenced by signs of nervousness. Because in the present paper, performance was evaluated by third observer ratings, this raises the question as to whether power also boosts performance in situations in which the performance measure is more objective (e.g., when there is a correct solution such as in a problem solving task). High power people might just be able to sell themselves better, but the objective performance might not necessarily be better. More research is needed to test this question.

Our research is not without limitations. The heart rate measure (wireless signal transmission device) was not the most precise measure of heart rate. However, similar devices have been widely and successfully used before to measure stress responses in the TSST (e.g., Ditzen, et al. (2007), Kirschbaum, et al. (1993), Rimmele, et al. (2007), and Schommer, et al. (2003)). The increase of heart rate found in our studies corresponds to what was found in previous studies (increase of about 20 bpm); also, we showed the effect of power on the increase of heart rate in two studies. We therefore believe that with the wireless signal transmission device, we were able to reliably and validly measure heart rate in our studies. Baseline heart rate was measured before the power manipulation. It might therefore be that the power manipulation directly decreased physiological arousal independent of the self-presentation task or alternatively, that power-primed participants just showed a lower increase of heart rate as a function of lower stress (or challenge, see discussion of Study 1) during the self-presentation task. Further research needs to clarify when the stress-buffering affect of power exactly occurs.

One might argue that the specific situation of the TSST is a rather low power situation with somebody else having the power to evaluate. Note, however, that giving a talk is a very common task for high power people (e.g., leaders and professors). When speaking in public or when giving presentations, it is crucial to convey a competent and confident impression so that the message is accepted by the listeners. Can our findings be generalized to other, more general presentation and evaluation situations? We think yes, because in our experiment, participants were not specifically asked whether they worry about not getting the job but whether they worry about making a good impression. This worry is relevant for other presentation tasks (even when there is no explicit evaluation occurring, such as giving a presentation in a meeting) and for evaluation situations in general (e.g., in oral exams). The question of whether we can generalize our findings is an empirical one; however, we do not see why the findings should be restricted to a self-presentation task for a job interview. The TSST is a well-established procedure to induce robust stress-related responses. As such, it provides the ideal tool to start testing how power affects stress responses in social evaluation situations.

Our studies might also inspire future work in more applied settings. For instance, in the present paper, our performance raters were not real recruiters. In a next step, it would be interesting whether real recruiters would rather hire applicants primed with high power than controls. Also, it would be interesting to study power effects on performance ratings in a professional context in which a hierarchical relationship is already established, for instance, when a superior evaluates his or her subordinates.

Countless are the situations in our lives in which observers (both unfamiliar and familiar ones) base their opinions and judgments on the target's behavior: Teachers evaluate presentations and oral contributions of their students, superiors judge the performance of their subordinates on the basis of the latter's contributions in meetings, professionals present their work at conferences, or recruiters make hiring decisions affected by candidates' self-presentations. Such judgments matter and have serious real-life consequences; this underpins the importance of studying how one can change his or her behavior to make a more favorable impression on others. An evaluator such as a recruiter might overestimate a target person's competence and skills because the target person feels powerful and therefore is able to present himself or herself especially well. From the perspective of the evaluated person, the results of the present studies provide an easy strategy to convey a more favorable impression to observers: simply "thinking of having power" does the trick. Such an imagination task can easily be administered just a few minutes before an actual evaluation situation with the effect that it makes a person feel significantly less stressed and others perceive this person as less nervous and more competent. Feeling powerful might therefore lead to more success. Note also that thinking about having power is a low cost, low time intensive, and relatively harmless way to obtain positive results compared with other techniques that have been developed to reduce signs of stress in such situations (e.g., learning relaxation techniques, hypnosis, or taking anxiety-reducing drugs).

REFERENCES

Al'Absi, M., Bongard, S., Buchanan, T., Pincomb, G. A., Licinio, J., & Lovallo, W. R. (1997). Cardiovascular and neuroendocrine adjustment to public speaking and mental arithmetic stressors. *Psychophysiology*, *34*, 266–275. doi: 10.1111/j.1469-8986.1997.tb02397.x

Anderson, A., & Galinsky, A. D. (2006). Power, optimism, and risk-taking. *European Journal of Social Psychology*, *36*, 511–536. doi: 10.1002/ejsp.324

Anderson, C., Langner, C., & Keltner, D. (2001). Status, power, and emotion. *Unpublished manuscript*.

Barge, J. K., Schlueter, D. W., & Pritchard, A. (1989). The effects of non-verbal communication and gender on impression formation in opening statements. *Southern Communication Journal*, *54*, 330–349. doi: 10.1080/10417948909372766

Berthold, A., & Jameson, A. (Eds.). (1999). *Interpreting symptoms of cognitive load in speech input*. Vienna, New York: Springer Wien New York.

Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. In P. Z. Mark (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 1–51): Academic Press: New York.

Blascovich, J., Loomis, J., Beall, A. C., Swinth, K. R., Hoyt, C. L., & Ballenson, J. N. (2002). Immersive Virtual Environment Technology as a methodological tool for social psychology. *Psychological Inquiry*, *13*, 103–124. doi: 10.1207/S15327965PLI1302_01

Bohns, V. K., & Wiltermuth, S. S. (2012). It hurts when I do this (or you do that): Posture and pain tolerance. *Journal of Experimental Social Psychology*, *48*, 341–345. doi: 10.1016/j.jesp.2011.05.022

Bremner, J. D., Vythilingam, M., Vermetten, E., Adil, J., Khan, S., Nazeer, A., et al. (2003). Cortisol response to a cognitive stress challenge in posttraumatic stress disorder (PTSD) related to childhood abuse. *Psychoneuroendocrinology*, *28*, 733–750.

Briñol, P., Petty, R. E., Valle, C., Rucker, D. D., & Becerra, A. (2007). The effects of message recipients' power before and after persuasion: A self-validation analysis. *Journal of Personality and Social Psychology*, *93*, 1040–1053. doi: 10.1037/98.93.6.1040

Burgoon, J. K., Kelley, D. L., Newton, D. A., & Keeley-Dyreson, M. P. (1989). The nature of arousal and nonverbal indices. *Human Communication Research*, *16*, 217–255. doi: 10.1111/j.1468-2958.1989.tb00210.x

Carney, D. R., Cuddy, A. J. C., & Yap, A. J. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science*, *21*, 1363–1368. doi: 10.1177/0956797610383437

Christie, V., & Segrin, C. (1998). The influence of self-efficacy and of gender on the perfromance of social and nonsocial tasks. *Journal of Applied Communication Research*, *26*, 374–389. doi: http://dx.doi.org/10.1080/00909889809365515

Cohen, S., Doyle, W. J., & Baum, A. (2006). Socioeconomic status is associated with stress hormones. *Psychosomatic Medicine*, *68*, 414–420. doi: 10.1097/01.psy.0000221236.37158.b9

Dickerson, S. S., & Kemeny, M. E. (2004). Acute stressors and cortisol responses: A theoretical integration and synthesis of laboratory research. *Psychological Bulletin*, *130*, 355–391. doi: 10.1037/0033-2909.130.3.355

Ditzen, B., Neumann, I. D., Bodenmann, G., von Dawans, B., Turner, R. A., Ehlert, U., et al. (2007). Effects of different kinds of couple interaction on cortisol and heart rate responses to stress in women. *Psychoneuroendocrinology*, *32*, 565–574. doi: 10.1016/j.psyneuen.2007.03.011

Eagly, A. H., & Karau, S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological Review*, *109*, 573–598. doi: 10.1037/0033-295X.109.3.573

Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science*, *302*, 290–292. doi: 10.1126/science.1089134

Ekman, P., & Friesen, W. V. (1972). Hand movements. *Journal of Communication*, *22*(4), 353–374. doi: 10.1111/j.1460-2466.1972.tb00163.x

Galinsky, A. D., Gruenfeld, D. H., & Magee, J. C. (2003). From power to action. *Journal of Personality and Social Psychology*, *85*, 453–466. doi: 10.1037/98.85.3.453

Halevy, N., Chou, E. Y., & Galinsky, A. D. (2011). A functional model of hierarchy. *Organizational Psychology Review*, *1*, 32–52. doi: 10.1177/2041386610380991

Hall, J. A., Coats, E. J., & Smith LeBeau, L. (2005). Nonverbal behavior and the vertical dimension of social relations: A meta-analysis. *Psychological Bulletin*, *131*, 898–924. doi: 10.1037/0033-2909.131.6.898

Hayes, A. F. (2013). An analytical primer and computational tool for observed variable moderation, mediation, and conditional process modeling. Manuscript submitted for publication.

Jönsson, P., Wallergård, M., Österberg, K., Hansen, Å. M., Johansson, G., & Karlson, B. (2010). Cardiovascular and cortisol reactivity and habituation to a virtual reality version of the Trier Social Stress Test: A pilot study. *Psychoneuroendocrinology*, *35*, 1397–1403. doi: 10.1016/j.psyneuen.2010.04.003

Karam, T. J., & Ragsdale, J. G. (1994). *Can we talk? A handbook for public speakers*. Lanham, MD: University Press of America.

Kelly, M. M., Tyrka, A. R., Anderson, G. M., Price, L. H., & Carpenter, L. L. (2008). Sex differences in emotional and physiological responses to the Trier Social Stress Test. *Journal of Behavior Therapy and Experimental Psychiatry*, *39*(1), 87–98. doi: 10.1016/j.jbtep.2007.02.003

Keltner, D., Gruenfeld, D. H., & Anderson, A. (2003). Power, approach, and inhibition. *Psychological Review*, *110*, 265–284. doi: 10.1037/0033-295X.110.2.265

Kirschbaum, C., Pirke, K.-M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test' – A tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, *28*, 76–81. doi: 10.1159/000119004

Kudielka, B. M., Schommer, N. C., Hellhammer, D. H., & Kirschbaum, C. (2004). Acute HPA axis responses, heart rate, and mood changes to psychosocial stress (TSST) in humans at different times of day. *Psychoneuroendocrinology*, *29*, 983–992. doi: 10.1016/j.psyneuen.2003.08.009

Leary, M. R. (1983). A brief version of the Fear of Negative Evaluation Scale. *Personality and Social Psychology Bulletin*, *9*, 371–375.
Mauss, I., Wilhelm, F., & Gross, J. (2004). Is there less to social anxiety than meets the eye? Emotion experience, expression, and bodily responding. *Cognition & Emotion*, *18*, 631–642. doi: 10.1080/02699930341000112
McCroskey, J. C., & Richmond, V. P. (1976). The effects of communication apprehension on the perception of peers. *Western Speech Communication*, *40*, 14–21. doi: 10.1080/10570317609373881
Miller, G. R., & Hewgill, M. A. (1964). The effect of variations in nonfluency on audience ratings of source credibility. *The Quarterly Journal of Speech*, *50*, 36–44. doi: 10.1080/00335636409382644
Mulac, A., & Sherman, A. R. (1975). Relationships among four parameters of speaker evaluation: Speech skill, source credibility, subjective speech anxiety, and behavioral speech anxiety. *Speech Monographs*, *42*, 302–310. doi: 10.1080/03637757509375906
North, M. M., North, S. M., & Coble, J. R. (1998). Virtual reality therapy: An effective treatment for the fear of public speaking. *The International Journal of Virtual Reality*, *3*, 1–6.
Rimmele, U., Zellweger, B. C., Marti, B., Seiler, R., Mohiyeddini, C., Ehlert, U., et al. (2007). Trained men show lower cortisol, heart rate and psychological responses to psychosocial stress compared with untrained men. *Psychoneuroendocrinology*, *32*, 627–635. doi: 10.1016/j.psyneuen.2007.04.005
Rosenthal, R. (1966). *Experimenter effects in behavioral research*. NY: Appleton Century Crofts.
Rottenberg, J., Ray, R. R., & Gross, J. J. (2007). Emotion elicitation using films. In J. A. Coan & J. J. B. Allen (Eds.), *The handbook of emotion elicitation and assessment*. New York, NY: Oxford University Press.
Rudman, L. A. (1998). Self-promotion as a risk factor for women: The costs and benefits of counterstereotypical impression management. *Journal of Personality and Social Psychology*, *74*, 629–645. doi: 10.1037/0022-3514.74.3.629
Schmid Mast, M. (2002). Female dominance hierarchies: Are they any different from males? *Personality and Social Psychology Bulletin*, *28*, 29–39. doi: 10.1177/0146167202281003
Schmid Mast, M., Jonas, K., & Hall, J. A. (2009). Give a person power and he or she will show interpersonal sensitivity: The phenomenon and its why and when. *Journal of Personality and Social Psychology*, *97*, 835–850. doi: 10.1037/a0016234
Schommer, N. C., Hellhammer, D. H., & Kirschbaum, C. (2003). Dissociation between reactivity of the hypothalamus-pituitary-adrenal axis and the sympathetic-adrenal-medullary system to repeated psychosocial stress. *Psychosomatic Medicine*, *65*(3), 450–460. doi: 10.1097/01.psy.0000035721.12441.17
Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In S. W. J. Weinman & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. causal and control beliefs* (pp. 35–37). Windsor, UK: NFER-NELSON.
Schwerdtfeger, A. (2004). Predicting autonomic reactivity to public speaking: don't get fixed on self-report data! *International Journal of Psychophysiology*, *52*, 217–224. doi: 10.1016/j.ijpsycho.2003.10.008
Siegman, A. W. (1979). Cognition and hesitation in speech. *Of speech and time*: *Temporal speech patterns in interpersonal contexts*, 151–178.
Siegman, A. W. (1987). The telltale voice: Nonverbal messages of verbal communication. In A. W. S. S. Feldstein (Ed.), *Nonverbal behavior and communication* (2nd ed.) (pp. 351–433). Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc.
Tomaka, J., Blascovich, J., Kelsey, R., & Leittena, C. (1993). Subjective, physiological, and behavioral effects of threat and challenge appraisal. *Journal of Personality and Social Psychology*, *65*, 248–260. doi: citeulike-article-id:7353610
Tomaka, J., Blascovich, J., Kibler, J., & Ernst, J. M. (1997). Cognitive and physiological antecedents of threat and challenge appraisal. *Journal of Personality and Social Psychology*, *73*, 63–72. doi: 10.1037/98.73.1.63
Wallach, H. S., Safir, M. P., & Bar-Zvi, M. (2009). Virtual reality cognitive behavior therapy for public speaking anxiety: A randomized clinical trial. *Behavior Modification*, *33*, 314–338. doi: 10.1177/0145445509331926
Wallergård, M., Jönsson, P., Österberg, K., Johansson, G., & Karlson, B. (2011). A virtual reality version of the Trier Social Stress Test: A pilot study. *Presence: Teleoperators and Virtual Environments*, *20*, 325–336. doi: 10.1162/PRES_a_00052
Ware, J. E. J., & Williams, R. G. (1975). The Dr. Fox effect: A study of lecturer effectiveness and ratings of instruction. *Journal of Medical Education*, *50*, 149–156.
Watson, D., & Friend, R. (1969). Measurement of social-evaluative anxiety. *Journal of Consulting and Clinical Psychology*, *33*, 448–457. doi: 10.1037/h0027806
Wegner, D. M., Erber, R., & Zanakos, S. (1993). Ironic processes in the mental control of mood and mood-related thought. *Journal of Personality and Social Psychology*, *65*, 1093–1104. doi: 10.1037/98.65.6.1093
Zanbaka, C., Ulinski, A., Goolkasian, P., & Hodges, L. F. (2004). Effects of virtual human presence on task performance. *Proceedings of International Conference on Artificial Reality and Telexistence*, 174–181.
Zhou, X., Vohs, K. D., & Baumeister, R. F. (2009). The symbolic power of money. *Psychological Science*, *20*, 700–706. doi: 10.1111/j.1467-9280.2009.02353.x

