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THE EFFECT OF POSTURE ON STRESS AND SELF-ESTEEM: COMPARING CONTRACTIVE AND NEUTRAL POSTURES

Abstract:

A study on the effect of contractive posture was conducted in a laboratory setting. Following the previous literature on posture studies, this study examined the negative effects of contractive posture on task performance and confidence. This study modified the methodological errors made in previous studies by comparing the contractive posture effect to the neutral posture effect, rather than the power posture effect. The results revealed that contractive posture has negative effects on self-challenging behavior creativity, and immediate stress, specifically by inducing self-depreciative thoughts. On the other hand, posture was not found to affect relatively stable characteristics such as intelligence level, self-esteem, and life-satisfaction scores.

Keywords:

Power posture, Posture Effect, Contractive Posture, Confidence, Creativity, Self-Challenge, Intelligence,

From the moment of nascence, humans and other animals continuously project information through their body postures. This embodied information includes needs, attitudes, and emotions while also indicating power relations. A frightened monkey crouches in the presence of a dominant opponent, as do gorillas and chimpanzees (Weisfeld & Beresford, 1982). Boys who are dominant among their peers are associated with lowered brows, tensed mouths, and expansive movements. Previous researchers found that these body postures are not mere displays but can also affect cognitive processes (Petty & Cacioppo, & Schuman 1983). William James (1890) first found that muscular changes generate certain emotions—as does the inhibition of these muscle changes, such that inhibition of frowning facial muscles through Botox can reduce depression (Hexsel et al., 2013).

Among these studies on posture effects, empowering postures have become the prominent subject among organizational behavior scholars. A recent study by Carney, Cuddy, & Yap (2010) showed that high-power poses, as opposed to low-power poses, can produce the feeling of power. Here, Carney et al. (2010) defined power postures as expanding, upright, and open-body postures while low-power poses are defined as contractive, closed-body, slumped postures. The contrasting results of these two different postures involved two key hormones, testosterone and cortisol, that reflect dominance and stress in other situations. Carney (2010) demonstrated that high-power poses are associated with increased testosterone levels and decreased cortisol levels of the participants, suggesting that the feedback effect of power postures exist not only psychologically but also biologically. In alignment with Carney's study, other researchers have shown that high-power individuals have lower cortisol reactivity to stressors, a result that explains how the dominant children in a peer group display more relaxed behavior than the subordinates (Abbott et al., 2003; Weifeld & Beresford, 1982). Power postures can also reveal psychological aspects of power that may lead to dishonest behaviors such as stealing and cheating (Yap et al., 2013). By giving individuals a sense of control over their situations, power poses may cause them to become more bold and daring.

Inducing Powerlessness

The "embodied cognition" of powerful postures has been rigorously studied for almost a century, and many positive effects of these postures have been revealed. However, only a few research studies have been done to reveal the negative effects of low-power postures. In ergonomics studies, poor posture that initiates worker discomfort is related to workplace stress and low task performance (Bhatnager et al., 1985). Liao (2000) found that such effects are especially strong in computer-based typing tasks, which require greater motor control. Carney (2010) revealed that contractive postures cause a decrease in testosterone and increase in cortisol levels. However, such lines of research are usually discussed only to emphasize the positive effects of power postures. In these studies, low-power and high-power posture effects are evaluated on a continuous scale. However, the two stimuli (high-power postures and low-power postures) do not necessarily exist in a continuum. For example, a person with outstretched arms may reach a high level of confidence, while a person "without" outstretched arms may reach a relatively low level of confidence. However, this does not automatically mean that the confidence of the person with contractive arm posture will drop to a negative level. The middle ground does exist, as in neutral postures that neither contract nor expand body parts. In order to argue that power postures should be practiced, or contractive postures should be avoided, they should be compared to neutral postures.

Goals and Hypotheses of the Present Study

Recently, Ranchill et al. (2015) replicated Carney's (2010) study, showing some ambivalence toward the hormonal changes induced by high-power and low-power postures. With an enlarged sample (n = 200), the previous findings by Carney (2010) were rebuked. The two ambivalent results may be explained through general arousal: the inducement of artificial postures can cause change in neuroendocrine levels. Thus, in order to decide if power postures really generate hormonal response, we must compare them to the neutral postures. Also, to examine the difference between high versus low power postures, we must measure the specific cognitive response: is there different kinds of stress? Does similar neuroendocrine level always signify similar cognitive response? And so on. In relation to the existing power-posture literature, we suggest a new focus on the postures that may induce powerlessness. Instead of looking at which postures should be done, we examined which postures should not be done. Moreover, to clarify the effects of low-power postures, we contrasted them with neutral postures instead of high-power postures. Specifically, we evaluated how contractive postures can negatively affect a person's task performances and confidence.

Hypothesis 1. Participants' contractive posture will have negative effects on their task performances, such that (a) their intelligence test scores will be lower; (b) their creativity test scores will be lower; and (c) their levels of task completion will be lower than those of the neutral-posture group.

Hypothesis 2. The participants' contractive posture will have negative effects on their confidence, such that (a) their self-esteem scores will be lower; (b) their life-satisfaction scores will be lower; and (c) their psychological stress will be higher than that of the neutral-posture group.

Method

Participants

The participants consisted of 81 undergraduate students at the Seoul National University of Education. Among them, 41 were in the control group and 40 were in the experimental group. The average age was 21.6, and 65 of the participants were female.

Variables

The independent variable was the contractive posture induced by physical confinement. For dependent variables, Carter's (2007) *IQ and Psychometric Tests: Assess Your Personality* was used to assess creativity and intelligence. Also, Rosenberg's (1979) Self-Esteem Scale and the Life-Satisfaction Scale of Diener et al. (1985) were used to assess confidence, while the number of attempted IQ questions and Cognitive Stress Response Scale (CSRS) developed by Yim (1996) were used to assess task completion and psychological stress.

Procedure

Upon entering the laboratory, participants were seated at individual desks and told that they would be taking an IQ test. During the test, the experimental group experienced physical confinement in a transparent acrylic box that was made to induce natural contractive posture while sitting. In order to eliminate a possible third-variable problem, the box was designed so that it would not block noises or lights. The experimental group was told to take the test with their head and hands inside the box. The test consisted of the culture-fair intelligence test, part 1 of the creativity test from *IQ and Psychometric Tests* (Carter, 2007), and basic demographic information was also collected. The total amount of time given to complete the packet was 17 minutes.

Clinical and Neuropsychological Assessments

The following clinical and neuropsychological assessment tools were used in this study.

Rosenberg's Self-Esteem Scale (RSES). The RSES consists of 10 items that measure global

self-esteem by measuring both positive and negative feelings about the self, designed by Rosenberg (1965). It is designed as a Guttman scale, in which items represent a continuum of self-worth statements ranging from statements that can only be endorsed by individuals with high self-esteem to statements that even individuals with low-esteem can endorse. All items are answered using a 4-point Likert scale format, ranging from *strongly agree* (1) to *strongly disagree (4)*. Multiple studies have been conducted to investigate the validity and reliability of the RSE. The RSE has high internal reliability ranging from 0.77 to 0.88, test-retest reliability of 0.82-0.85, and criterion validity of 0.55; it was correlated -.64 with anxiety, -.54 with depression, and -.43 with anomie (Rosenberg, 1965).

Satisfaction with Life Scale (SWLS). The SWLS is a life-satisfaction scale composed of 5 items and designed by Diener et al. (1985). This short scale measures global cognitive judgments of satisfaction with one's life, and participants indicate how much they agree or disagree with each item using a 7-point scale that ranges from *strongly disagree* (1) to *strongly agree* (7). The validity and reliability of the scale were carefully tested by the developers; the scale had a two-month test-retest correlation coefficient of 0.82 and coefficient alpha of 0.87. There are moderately strong correlations with all of the subject well-being scales such as Fordyce, Dutch Personality Questionnaire (DPQ), and Bradburn-PAS, ranging from 0.47 to 0.68 (Diener et al., 1985).

Cognitive Stress Response Scale (CSRS). The SCRS designed by Koh and Park (2004) measures three types of psychological stress and cognitive response and assessment of stress situations. It consists of 9 items assessing extreme-negative (EN) thoughts, 4 items assessing aggressive-hostile (AH) thoughts and 8 items assessing self-depreciative (SD) thoughts; the items pertaining to types of psychological stress are randomly distributed within the questionnaire. The SCRS has a good reliability (test-retest reliability ranging from .87 to .95) with Cronbach's alpha for 3 subscales ranging from .82 to .91, and .94 for the total score. Convergent validity with the *global assessment of recent stress (GARS),* the *perceived stress questionnaire (PSQ)*, and *the symptom checklist-90-revised (SCL-90-R*) were also tested, and they were all at significant levels (Koh & Park, 2004).

Statistical analysis

IBM SPSS 20.0 was utilized for analysis. The statistical significance for all tests was set at $p < .05$. One-way analysis of variance (ANOVA) was used to test for main effects of each independent variable (control vs. experimental) on the dependent variables of number of questions attempted, number of correct answers, stress, life-satisfaction, and creativity.

Results

One-way analyses of variance (ANOVA) examined the effects of contractive postures (body posture: neutral vs. contractive) on task performance in terms of intelligence test scores, creativity, and level of task completion. As hypothesized, contractive posers (M = 2.36, SD = 1.16) had significantly lower creative scores compared to neutral posers (M = 3.02 SD = 0.98), $F\ (1,\ 79) = 7.86$, $p < .05$ (Table 1). Also consistent with our predictions, contractive posers (M = 8.51, SD = 1.45) were less likely than neutral posers (M = 9.43, SD = 1.11) to attempt more problems within a given period of time $F\ (1,\ 79) = 6.95$, $p < .05$ (Table 1). IQ scores were slightly higher among the individuals in neutral poses (M = 54.81, SD = 16.88) than among the individuals in contractive poses (M = 54.95, SD = 14.32), but the difference was not significant, $F\ (1,\ 79) = 0.08$, $p = 0.78$.

Table 1 *The Effect of Contractive Posture on Self-Challenge, Creativity, and Intelligence Scores*

	Sum of Squares	df	Mean Square	F	Sig.

# Attempted Q	Between groups	12.022	1	12.022	6.948	.010**
	Within groups	134.965	78	1.730		
	Total	146.988	79			
Creativity	Between groups	9.079	1	9.079	7.859	.006***
	Within groups	90.108	78	1.155		
	Total	99.188	79			
Score	Between groups	19.813	1	19.813	.080	.778
	Within groups	19223.987	78	246.461		
	Total	19243.800	79			

Note: # of attempted questions represents participants' self-challenge. Score indicates the number of correctly answered questions divided by the total number of questions attempted.

Correspondingly, one-way analyses of variance examined the effects of contractive postures (body posture: neutral vs. contractive) on confidence in terms of self-esteem, life-satisfaction scores, and psychological stress. There were no significant differences between groups in their self-esteem scores, $F\ (1,\ 40) = 1.80$, $p = 0.187$, or life-satisfaction scores, $F\ (1,\ 77) = 0.032$, $p = 0.86$ (Table 2). However, consistent with our predictions, the psychological stress of the contractive-posture group was indeed higher than that of the neutral posture group, but the significant difference was only limited to self-depreciative (SD) thoughts, $F\ (1,\ 77) = 5.35$, $p = 0.03 < 0.05$. The contractive posture group did not show higher extreme-negative thoughts, $F\ (1,\ 37) = 0.71$, $p = 0.41$, or aggressive-hostile thoughts, $F\ (1,\ 37) = 0.20$, $p = 0.66$, than the neutral-posture group.

Discussion

Our results show that contractive posture can cause psychological and behavioral changes. The direction of our results is consistent with the power-posture literature demonstrating the negative impacts of contractive postures in comparison to the positive impacts of power postures. On the other hand, our study showed more specific aspects of contractive posture effects, such as increased self-depreciative thoughts and decreased creativity. Unlike our hypotheses, the contractive posture did not have a negative effect on intelligence, self-esteem, or life satisfaction. This means that the contractive posture does not have an impact on stable variables such as individual IQ and life values. The posture effect only influenced short-term emotional responses such as stress, self-challenge, and imagining activities.

Table 2 *The Effect of Contractive Posture on Stress, Self-Esteem, and Life-Satisfaction*

Stress, Self-Esteem and Life-Satisfaction Variables		Sum of Squares	df	Mean Square	F	Sig.
EN	Between groups	23.469	1	23.469	.708	.405
	Within groups	1226.274	37	33.143		
	Total	1249.744	38			
AH	Between groups	.390	1	.390	.195	.661
	Within groups	73.969	37	1.999		
	Total	74.359	38			
SD	Between groups	25.936	1	25.936	5.346	.026*
	Within groups	179.500	37	4.851		
	Total	205.436	38			
CSRS	Between groups	116.679	1	116.679	1.803	.187
	Within groups	2588.107	40	64.703		
	Total	2704.786	41			
Rosenberg	Between groups	.013	1	.013	.003	.959
	Within groups	403.641	79	5.109		
	Total	403.654	80			
Diener	Between groups	25.407	1	25.407	.869	.354
	Within groups	2310.593	79	29.248		
	Total	2336.000	80			
Life Satisfaction	Between groups	.033	1	.033	.032	.858
	Within groups	79.511	77	1.033		
	Total	79.544	78			

Note: CSRS is the total measure for immediate stress response that includes EN (extreme-negative), AH (aggressive-hostile), and SD (self-depreciative). Life satisfaction scores were formed by total scores of the Rosenberg self-esteem scale and Diener life-satisfaction scale.

Although more thorough research should be done, our study suggests how discrepancies between the previous literature on power postures and its recent replication by Ranchill et al. (2015) can be explained. The recent study showed that there were no hormonal change differences between power-posture effects and contractive-posture effects. Yet, both power posing and contractive posing can induce changes in cortisol and testosterone levels because they both involve physical changes. We want to focus on the actual mechanisms in which these hormones are used; for example, both postures can induce stress hormones, but only contractive postures might induce stress related to self-depreciated thoughts.

Our study also demonstrates an advanced methodology in measuring the posture effect. Previous research has focused on how power postures differ from power-reducing postures. Yet such a comparative method is flawed, because the two compared postures may not be on the same continuum scale. Also, people spend most of their time in neutral posture, neither expanding nor contracting their body parts on purpose. To see the posture effect on cognitive change, researchers must establish a baseline to which the manipulation effect can be contrasted. In our study, we compared

a contractive posture effect to neutral settings. Also, instead of demanding the participants take a certain posture, we naturally induced the posture through interior design. We thought that asking participants to submit to the experimenters' words could create a third-variable problem. For example, participants might feel obliged to follow the experimenter's orders, and such feelings of obligation could induce more stress. Our posture inducement method through interior seems more appropriate for studies measuring cognitive embodiment.

The present study has two conspicuous limitations that should be addressed in future studies. First, although our manipulation check assured that most of the participants in the experimental group were in contractive posture, some participants were small enough that their levels of contraction were less than others. In such cases, we cannot tell whether the physical contraction caused cognitive changes or the participants' belief that they were in a contractive pose changed their cognition and behavior. Second, in our demographics measure, we included a question asking if the participants had ever been diagnosed with depression. Because of ethical issues, we did not force the participants to answer the question, and the majority of them left it unanswered. There may be a possibility that our participants were in fact diagnosed with depression, which could significantly affect their life-satisfaction and self-esteem measures. We did use a randomized trial, thus greatly reducing such a possibility, yet future studies should address the issue by including depression measures in the working packet.

References

Abbott, D. H., Keverne, E. B., Bercovitch, F. B., Shively, C. A., Mendoza, S. P., Saltzman, W., ... & Sapolsky, R. M. (2003). Are subordinates always stressed? A comparative analysis of rank differences in cortisol levels among primates. *Hormones and Behavior*, *43*(1), 67–82.

Bhatnager, V., Drury, C. G., & Schiro, S. (1985). Posture, postural discomfort, and performance. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *27*(2), 189–199.

Carney, D. R., Cuddy, A. J., & Yap, A. J. (2010). Power posing: brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science*, *21*(10), 1363–1368.

Carney, D.R., Cuddy, A. J., & Yap, A. J. (2015). Review and summary of research on the embodied effects of expansive (vs. contractive) nonverbal displays. Psychological Science, commentary. 1-7.

Carter, P. (2007). *IQ and Psychometric tests: Assess your personality, aptitude and intelligence*. Philadelphia, PA: Kogan Page Publishers.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*, 71–75.

Frank, S., & Zyzanski, S. (1988). Stress in the clinical setting: The Brief Encounter Psychosocial Instrument. *Journal of Family Practice, 26(5),* 533–539.

Hexsel, D., Brum, C., Siega, C., Schilling, J., Souza, J., Forno, T. D., … & Rodrigues, T. C. (2013). Evaluation of self-esteem and depression symptoms in depressed and nondepressed subjects treated with onabotulinumtoxin A for glabellar lines. *Dermatologic Surgery*, *39*(7), 1088–1096.

James, W. (1890). *The principles of psychology* (Vol. 1). New York, NY: Holt.

Koh, K., & Park, J. (1994). Development of the Cognitive Stress Response Scale. *Journal of Korean Neuropsychiatric Association, 43*(3), 320–328.

Liao, M.H., & Drury, C. G. (2000). Posture, discomfort and performance in a VDT task. *Ergonomics*, *43*(3), 345–359.

Petty, R. E., Cacioppo, J. T., & Schumann, D. (1983). Central and peripheral routes to advertising effectiveness: The moderating role of involvement. *Journal of Consumer Research*, *10(2)*, 135–146.

Ranchill, E., Dreber, A., Johannesson, M., Leiberg, S., Sul, S., & Weber R. A. (2015). Assessing the robustness of power posing: No effect on hormones and risk tolerance in a large sample of men and women. *Psychological Science*, *26*(5), 653–656.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Weisfeld, G. E., & Beresford, J. M. (1982). Erectness of posture as an indicator of dominance or success in humans. *Motivation and Emotion*, *6*(2), 113–131.

Yap, A. J., Wazlawek, A. S., Lucas, B. J., Cuddy, A. J., & Carney, D. R. (2013). The ergonomics of dishonesty: the effect of incidental posture on stealing, cheating, and traffic violations. *Psychological Science*, *24*(11), 2281–2289.

Yim, J., Bae, J., Choi, S., Kim, S., Hwang, H., & Huh, R. (1996). The validity of modified Korean-translated BEPSI (Brief Encounter Psychosocial Instrument) as instrument of stress measurement in outpatient clinic. *Journal of Korean Academy of Family Medicine, 17(1),* 43–53.