

EMBODIED POSTURE MODULATES AFFECTIVE STATES AND WORKING MEMORY EFFICIENCY

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Abstract

This pilot study examined whether brief changes in bodily posture can modulate affective states and influence working memory efficiency. For this aim, fifty-one healthy adults were randomly assigned to adopt either an expansive high-power or contractive low-power posture and completed a series of measures designed to assess both subjective and cognitive responses. After collecting demographic and behavioral covariates, participants completed baseline ratings of perceived power, happiness, energy, and a 2-back task. They then maintained the assigned posture for two minutes and subsequently completed the same affective ratings and an experimental 2-back task. Results showed that expansive posture increased perceived power and energy relative to the contractive posture, while no differences emerged for happiness. In addition, performance on the n-back task indicated that participants in the expansive condition exhibited higher accuracy and faster reaction times compared to those in the contractive condition. Although modest, these effects suggest that bodily configuration can influence both affective appraisal and the efficiency of executive operations, and the findings provide preliminary evidence for a link between posture, subjective experience, and working memory performance, highlighting promising directions for future research on embodied cognitive modulation.

Key words: embodiment, feelings, posture, power, working memory

Introduction

Over evolutionary times, body posture has served as one of the most fundamental systems for signaling dominance, submission, threat, or affiliation. In many social mammals, expansive body postures, such as standing tall, broad chest, limbs spread, act as agonistic displays, conveying greater access to resources or readiness to fight. All of these behavioral strategies have been extensively documented in ethology (Grant, 1963; Schenkel, 1967; Stevenson & Poole, 1976; Hagelin, 2002). Far from being common communicative signals, such postures modulate internal physiological states, arousal, muscular tension, autonomic activation, readiness for action, and thus influence the probability of initiating or avoiding conflict (Cacioppo et al., 2007). Such phylogenetically ancient forms of embodied signaling offer an evolutionary framework that helps illuminate the dynamics through which bodily configurations interact with human cognitive and affective processes.

In humans, the body continues to play this dual role, that is, a visible communicative signal, and an internal modulator of cognition, affect, and motivation (Niedenthal, 2007). Ethological signatures of dominance (open posture, spatial expansiveness, upright stance) appear reliably in interpersonal and power dynamics in everyday social interactions, paralleling findings in nonhuman species (Hall et al., 2005; Tracy & Matsumoto, 2008). The same way, theoretical frameworks such as the power approach/inhibition model posit that perceived power activates motivational systems oriented toward approach, exploration, and risk-taking, while low perceived power sensitizes systems toward avoidance, vigilance, and threat detection (Keltner et al., 2003; Guinote, 2017).

This embodied view finds its most systematic expression in the paradigm of embodied cognition (Barsalou, 1999), according to which cognition does not unfold in a modal symbolic space, but rather emerges from continuous interaction among the brain, the body, and the environment (Varela et al., 1991; Barsalou, 1999; Gallagher, 2005). In this regard, sensorimotor, proprioceptive, and interoceptive signals are not epiphenomenal by-products, but, instead, they are constitutive ingredients of cognitive processing. Memory, attention, decision-making, and emotional evaluation depend on ongoing somatic feedback (Glenberg, 1997; Caruana & Borghi, 2013), and under this background, altering bodily states constitutes an experimental manipulation of cognition itself; postural configuration becomes a lever influencing thought, feeling, and action.

Within this embodied perspective, body postures themselves become a variable of interest because they would seem to influence physiological parameters such as autonomic arousal (skin conductance, heart rate variability), respiratory patterns, and muscle tone (Saggese et al., 2018; Wilson & Peper, 2004; Nair et al., 2014; Bazanova & Kovaleva, 2022). For instance, the study by Saggese et al. (2018) reported that adopting low-power and contracted postures significantly increased skin conductance levels, indicative of elevated sympathetic activation, suggesting that closed, defensive body schemas may mobilize internal stress physiology. In contrast, expansive stances may foster physiological states compatible with calm readiness and risk-taking motivation.

Building on these foundations, the “power poses” paradigm emerged as a prominent experimental instantiation of embodied power supporting that brief adoption of expansive or contractive postures, hypothesized to influence mood, risk propensity, physiological arousal, and behavioral outcomes. In light of ongoing debates, seminal work by Carney and colleagues (2010) reported that participants assuming high-power poses (open, expansive postures) exhibited increased self-reported feelings of power, greater risk-taking behavior, higher testosterone and lower cortisol levels, compared to those adopting low-power poses, gaining wide social traction, partly due to popularization via media and a TED talk (Cuddy, 2012).

Expanding this line of reasoning, more recent empirical work adds depth to this nuance because a 2023 qualitative investigation asked participants to adopt a variety of expansive, contractive, or neutral postures and then interviewed them about their subjective experience (Lin & Broadbent, 2023). Looking at the evidence, results showed that expansive poses were frequently associated with feelings of power and confidence, but also, importantly, with aggression, intimidation, or discomfort. On the other hand, contractive postures seem to elicit sadness, low control, or vulnerability, while neutral postures, in contrast, tend to evoke relaxation and comfort, suggesting that postural expansiveness is not univocally “beneficial”, and context, individual interpretation, and social meaning modulate embodied effects.

Simultaneously, evidence accumulates that posture influences higher cognitive functions beyond mood and motivation. In this case, recent studies have begun to explore how posture modulation affects attention, memory, and creative thinking. For instance, Awad et al. (2021) manipulated posture implicitly and observed that upright postures enhanced processing speed and improved mood, though they did not find effects on processing accuracy, and their data hinted at a dissociation that posture may benefit speed (possibly via arousal or activation), while mood influences speed but not necessarily precision.

Neuroscientific approaches also lend support. A very recent EEG study (Wainio-Theberge et al., 2024, 2025) reported that adopting an expansive posture increased right-lateralized frontal asymmetry, in other words, a neural signature previously associated with approach motivation and positive affect (Lacey & Gable, 2022), and that this shift correlated with self-reported mood changes. The pattern of results indicates that postural manipulation can influence large-scale functional

brain dynamics, with potential consequences for how attentional and working memory resources are distributed.

Concurrently, emerging work in embodied cognitive therapy too shows that posture and movement can potentiate cognitive restructuring: a 2024 study by O'Toole and Michalak found that integrating body postures and motoric exercises in a therapeutic protocol led to greater reduction of dysfunctional beliefs than traditional verbal-only methods (O'Toole & Michalak, 2024), and even though this is outside the scope of normative cognitive tasks, it demonstrates that posture affects deeply cognitive-affective processes when leveraged in a structured way.

However, subsequent scrutiny revealed substantial variability and difficulty in replicating physiological and behavioral effects, such as large-sample preregistered replications (Ranehill et al., 2015) that failed to find consistent effects on hormones or risk behavior, though they did observe modest but reliable increases in subjective feelings of power. A closer look reveals that meta-analyses concluded that while expansive postures appear to robustly influence phenomenological feelings of power and confidence, effects on physiological or long-term behavioral outcomes are inconsistent or negligible (Körner & Schütz, 2020; Cesario & Johnson, 2018). Some authors, therefore, argue for a reconceptualization; indeed, rather than viewing expansive poses as a performance-enhancing “hack,” they may be better understood as symbolic postural cues that alter internal state insofar as they modulate affect and motivational orientation (Witkower et al., 2020).

So, while the existing literature has produced valuable insights, the trajectory of research on posture and power demonstrates a pattern of contrasting outcomes that calls for more precise investigation. Early enthusiasm for expansive body postures stemmed from studies that, before being reported, described effects that appeared simultaneously psychological, behavioral, and biological.

And we were able to ascertain that these findings prompted the idea that a brief manipulation could reliably alter a broad spectrum of human functioning. But it is also true that as the field matured, however, attempts to replicate these outcomes produced a mosaic of results because some confirmed enhancements in confidence and approach tendencies, others found attenuated or context-dependent effects, and still others reported null outcomes, especially concerning hormonal markers or risk-taking behavior. This divergence cannot be dismissed as noise because each group of studies was conducted with legitimate methodological rigor and, for that reason, we assume that the variability suggests posture manipulations interact with elements of the experimental environment and with the internal landscape of the participants in ways that remain insufficiently understood.

There is also another dimension that has contributed to inconsistent findings, and it relates to the temporal structure of postural manipulations. The duration of the pose, the presence of movement versus stillness, and the intensity of muscular engagement can certainly influence whether manipulation activates a transient sense of power or a more global shift in motivational readiness. Many protocols differ sharply on these parameters, yet they are often treated as equivalent, and this heterogeneity in experimental design complicates meta-analytic synthesis because subtle procedural variations may produce disproportionately large effects on subjective or cognitive outcomes.

For these reasons, further research will be required in order to take a necessary step forward to clarify the architecture of embodied influence. The field is now positioned to move beyond binary questions about whether power poses “work” and toward a more nuanced mapping of the mechanisms through which bodily configurations interact with psychological and cognitive processes.

Against this backdrop, the present study was designed to rigorously test whether body postures associated with high vs. low power modulate subjective affective states (power, happiness, energy), working memory performance (n-back accuracy), and reaction times (n-back speed), within a strictly controlled within-subjects or between-subjects design. By combining standardized postural manipulations, subjective self-report, and objectively scored cognitive tasks, we aim to clarify whether posture-induced embodied states translate into measurable variation in executive functioning, beyond self-perception and motivation. Moreover, we hope such findings will contribute to bridging the gap between embodied cognition theory and empirical neuroscience, helping to map how skeletal-muscular configuration interfaces with neural network dynamics and cognitive control systems.

General Background

The methodological structure adopted in the present study is grounded in the growing body of research demonstrating that bodily configurations can modulate affective, motivational, and cognitive processes through a combination of autonomic, proprioceptive, and sensorimotor channels. As already said, although the literature on posture and power has revealed heterogeneous outcomes, a consistent thread emerges, that is, postural states shape internal physiology and subjective appraisal in ways that may directly influence attentional allocation and working memory functioning, providing the rationale for combining postural manipulation, self-report measures, and a performance-based cognitive task within a unified experimental protocol.

Across several domains, empirical work has shown that bodily stance modulates physiological activation patterns that are known to interact with executive functions (Busch et al., 2025). Changes in sympathetic arousal, respiratory rhythm, and muscular tension have been observed during contractive, defensive postures as well as expansive, open ones, implicating autonomic feedback loops that may influence the efficiency of cognitive control operations (Takayama & Sekiya, 2023).

Within this framework, working memory performance is a theoretically meaningful outcome measure because it is sensitive to fluctuations in arousal, affect, and action readiness (Ashby et al., 2002; Hou & Cai, 2022).

In this regard, the n-back paradigm, in particular, imposes continuous updating and monitoring demands, making it responsive to subtle changes in internal state (Kane et al., 2007). That task is a continuous performance paradigm used to assess working memory updating and monitoring. Participants in n-back tasks are presented with a sequence of stimuli and must respond whenever the current item matches the one shown n positions earlier (e.g., one trial back in a 1-back task, two trials back in a 2-back task). As n increases, the task places greater demands on maintaining, updating, and inhibiting irrelevant information, and because of its parametric difficulty and sensitivity to cognitive load, the n-back is widely used in cognitive neuroscience and experimental psychology (Gilmour et al., 2019).

Prior research has shown that increases in sympathetic activation or shifts in motivational orientation can either facilitate or disrupt task performance depending on the interaction between task difficulty and individual differences (Lee & Shields, 2022). And if arousal and motivational orientation modulate performance on the n-back, and bodily posture is capable of shifting these internal states, then postural manipulation may indirectly alter working memory efficiency. Changes in activation or approach-avoidance tendencies could influence how participants allocate attentional resources during the task, and this makes posture a plausible upstream factor shaping both accuracy and response dynamics in the n-back paradigm.

From a broader perspective, the decision to integrate subjective ratings with VAS scales before and after the postural manipulation stems from the need to assess not only whether posture affects executive functioning, but also whether changes in affective states mediate or parallel such effects. That's the reason why we decided to measure feelings of happiness, perceived power, and energy, which index the experiential dimension of embodiment and allow for the examination of whether shifts in phenomenology correspond to changes in behavioral performance.

This multimethod structure, combining self-report, postural manipulation, and an objective cognitive measure, aligns with methodological recommendations in embodied cognition research, which emphasize the importance of triangulating across physiological, experiential, and behavioral domains to capture the multidimensional architecture of embodied influence.

In this analytical horizon, taken together, these methodological choices attempt to operationalize the theoretical insights of embodied cognition within a rigorous experimental design capable of detecting whether and how bodily configurations meaningfully interact with the mechanisms underlying working memory performance.

Sample

The study involved 51 adult (26 females) participants in good health recruited via web advertisement in the area of the city of Salerno, Campania, Italy, from community volunteers. All participants were between age 19 and 40 (mean age = 30, standard deviation = $\pm 6,82$) years old and reported normal or corrected-to-normal vision, with no history of neurological or psychiatric condition.

Participants were asked to sign an informed consent and were made aware of the European general data protection regulations and Italian laws about privacy and anonymity. The final sample was randomly assigned to either the high-power or low-power posture condition, and participants provided informed consent prior to participation and received no compensation.

Instrument and Procedures

The experiment was conducted in a 5x5 square meter room with controlled lighting and minimal external distractions, air-conditioned at 23° Celsius. The room temperature was kept unvarying throughout the entire experimental phase.

All tasks were programmed and administered using PsychoPy and displayed on a standard desktop monitor (black screen and white font) at a comfortable viewing distance. Each participant, upon arrival, was assigned an identification code, asked to sign the informed consent, and told that the experiment included the recording of physiological data, in particular, EEG data levels.

None of the participants possessed knowledge of the true purpose of the research, thereby mitigating any potential for bias, and although the experimenter's instruction referred to a forthcoming EEG recording, no physiological measurements were actually collected.

This information was intentionally provided to ensure that participants remained unaware of the true purpose of the study and would adopt and maintain the assigned posture with minimal suspicion. Framing the posture as necessary for obtaining a stable physiological baseline allowed manipulation to be implemented credibly while preserving the integrity of the experimental blinding.

Participants were then invited to sit in a comfortable position, and before any task began, they completed a brief set of behavioral covariates, including gender, age, caffeine consumption in the past hour, weekly physical activity (0-3 scale), and hours of sleep the previous night.

They then completed three VAS Scales (Wewers & Lowe, 1990) assessing current levels of happiness, perceived power, and energy (0-10 range). Participants first performed a 1-back working memory task, preceded by a standardized instruction screen requiring them to respond by pressing the spacebar whenever the current digit matched the one immediately preceding it. The sequence consisted of 15 digits with five predetermined targets. Each digit appeared for 1500 ms, followed by a 1500 ms blank interval, and participants could respond only during stimulus presentation.

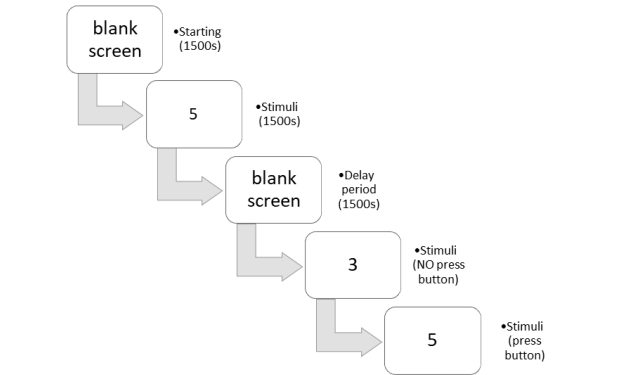
Immediate feedback was provided on each trial ("correct," "wrong," or "missed"), displayed in green, red, or white lettering at the lower portion of the screen. It is important to say that the 1-back task was administered as a practice block solely to familiarize participants with the underlying working-memory principle; indeed, using a 2-back practice trial would have introduced a learning effect capable of inflating or distorting the accuracy recorded during the actual baseline and experimental 2-back blocks.

Following this practice 1-back block, participants proceeded to a baseline 2-back task using a 50-digit sequence containing 13 targets.

Instructions emphasized pressing the spacebar when the current digit matched the one presented two positions earlier. No performance feedback was delivered in this block, and timing parameters remained identical to the 1-back task.

A schematic example of how the 2-back task operates is illustrated in Figure 1.

Figure 1
Visual representation of the 2-back working memory task



Notably, the choice to give no feedback during either of the 2-back blocks was made because informing participants about the correctness of each response, even implicitly, could have altered their moment-to-moment emotional state, thereby influencing subsequent VAS ratings and introducing an unwanted confound between performance awareness and the affective shifts that the study aimed to attribute exclusively to the postural manipulation.

After completing the baseline cognitive measures, participants were asked to stand up and follow the experimenter’s instructions. The foremost experimenter placed a wireless 14-channel Emotiv EEG headset (<https://www.emotiv.com>) on the participant’s head and explained that, for the system to obtain a stable and interpretable physiological baseline, it was essential to maintain a precise body posture that would be demonstrated and adjusted carefully before the recording phase.

The two postures exploited in the proposed experiment of powerfulness (high-powered posture) and powerlessness (low-powered posture), respectively, were the same 2 proposed by Saggese et al. (2018). In particular, the selected high-power posture refers to a standing position, with legs apart, hands on the hips with extended arms to occupy space around, and a straightforward gaze. The low-power posture refers to a sitting position, with crossed ankles, closed arms, hands in the middle of the knees, and bowed head and shoulders. Both postures are illustrated in Figure 2.

Figure 2
The two postures exploited in the proposed experiment: on the left, the high-power; and on the right, the low-power posture

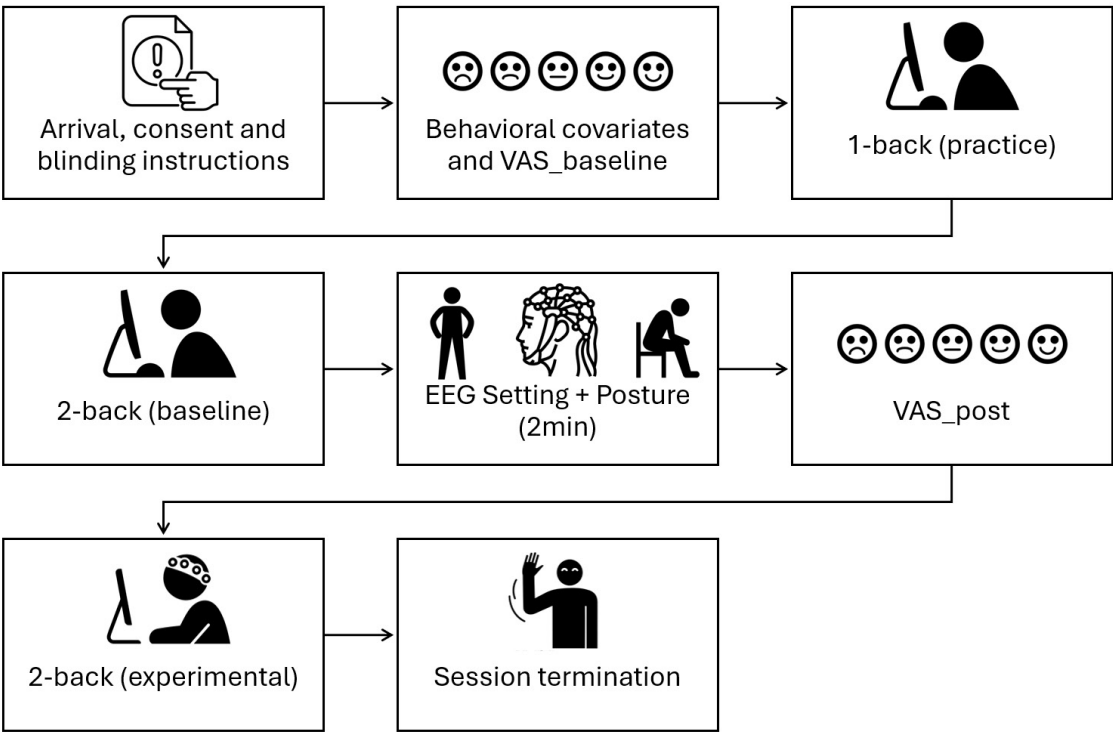


Therefore, participants were asked to adopt and maintain one, and only one, of the two proposed postures, a high or low power pose, for the next 2 minutes, and left her/him alone. After two minutes, the experimenter returned to the room and, immediately following the postural period, participants re-administered the 3-item VAS questionnaire.

Participants then completed the experimental 2-back task, structurally identical to the baseline version but featuring a different predetermined 50-digit sequence with 13 targets. Instructions reiterated the 2-back rule, specified that no feedback would be provided, and required participants to press the spacebar only during stimulus presentation. Upon completion of this final task, participants were thanked and dismissed. All behavioral data, including accuracy, reaction times for hits, false alarms, and VAS scores, were automatically recorded in a CSV file stored locally on the laboratory computer. An overview of the full experimental sequence, from arrival to final task completion, is presented in Figure 3.

Figure 3

Overview of the experimental procedure, illustrating the chronological sequence from participant arrival



Data Analysis

Statistical analyses were conducted through the statistical package for social sciences (SPSS), v.25 (Pallant, 2013). The analysis included 51 participants' results. To verify successful randomization into either the low-power condition (N = 26) or high-power condition (N = 25), a set of independent sample t-tests and Chi-square tests was run.

To test the hypothesis that power poses influence affective states, a series of 2 (Time = Pre, Post) × 2 (Condition = Low, High) mixed-design ANOVAs were conducted for feelings of Power, Happiness, and Energy. A one-way ANCOVA was performed on working memory performance (post-test accuracy), using baseline accuracy as the covariate, to account for any variability in participant's working memory performance prior to power posing intervention.

A separate ANCOVA was conducted to examine processing speed (Reaction Time), controlling for baseline speed. Significance was set at $p < .05$.

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Research Results

A. Sample characteristics and baseline measures

As shown in Table 1, the two groups were not statistically different for age, gender, the number of hours they slept, how much they exercised, and how much caffeine they consumed ($p > .05$). Additional analyses showed no statistically significant differences for each group on the baseline VAS scale and N-back accuracy and reaction time measures prior to the manipulation. Therefore, the groups were equal at the start of the study.

Table 1
Demographic Characteristics and Baseline Measures by Condition

Variable	Low-power ($n = 26$)	High-power ($n = 25$)	p -value
Age (years)	29.46 (6.29)	30.76 (7.42)	.503
Gender (Male / Female)	13 / 13	12 / 13	.886
Sleep (hours)	6.27 (1.49)	6.32 (1.03)	.888
Caffeine Consumption [Yes (%)]	14 (53.8%)	15 (60.0%)	.657
Physical Activity Level	1.65 (1.20)	2.00 (1.04)	.277
Baseline Happiness (0-10)	5.31 (2.13)	5.64 (2.27)	.592
Baseline Power (0-10)	5.27 (2.51)	5.68 (1.75)	.500
Baseline Energy (0-10)	5.31 (2.57)	5.96 (1.86)	.306
Baseline Accuracy (%)	62.39 (23.08)	69.62 (17.21)	.212
Baseline Reaction Time (s)	0.75 (0.16)	0.76 (0.15)	.957

Note. Data are presented as Mean (Standard Deviation) or Count (%). p -values were calculated using independent samples t -tests for continuous variables and Chi-square tests for categorical variables.

Table 2
Descriptive Statistics for Affective and Cognitive Measures (pre- and post-test)

Measure	Condition	Pre-Test M (SD)	Post-Test M (SD)
Power (0-10)	Low Power	5.27 (2.51)	5.12 (2.36)
	High Power	5.68 (1.75)	6.36 (1.63)
Happiness (0-10)	Low Power	5.31 (2.13)	5.42 (2.34)
	High Power	5.64 (2.27)	6.20 (1.73)
Energy (0-10)	Low Power	5.31 (2.57)	5.19 (2.37)
	High Power	5.96 (1.86)	6.52 (1.61)
Accuracy (%)	Low Power	62.39 (23.08)	64.75 (27.28)
	High Power	69.62 (17.21)	84.04 (13.08)
Reaction Time (s)	Low Power	0.75 (0.16)	0.78 (0.11)
	High Power	0.76 (0.15)	0.71 (0.14)

Note. M = Mean; SD = Standard Deviation. For Reaction Time, $n = 25$ for Low Power (one missing value excluded) and $n = 25$ for High Power.

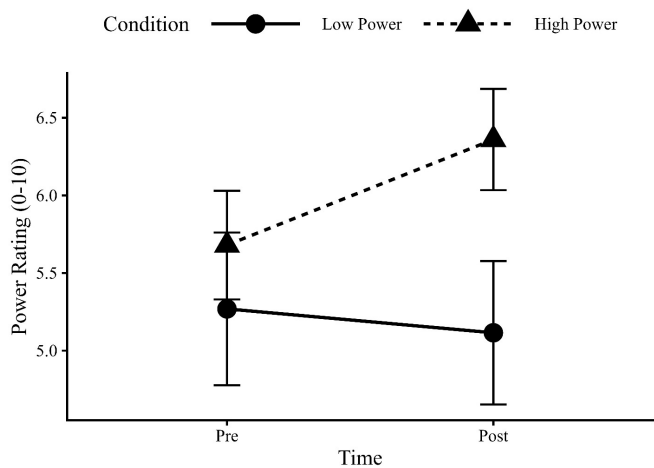
B. VAS Scales Analysis

Feelings of power

The analysis showed a statistically significant interaction between Time and Condition, $F(1, 49) = 4.22, p = .045, \eta^2p = .079$.

As illustrated in Fig. 4, participants in the high-power condition reported an increase in feelings of power from pre-test to post-test. In contrast, the low-power group showed a slight decrease in power ratings.

Figure 4
Interaction effect of power poses on feelings of Power

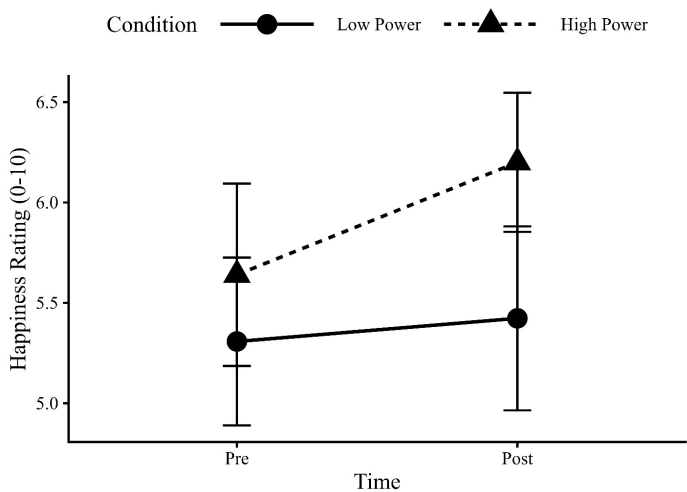


Feelings of happiness

And about the feelings of happiness, the interaction between Time and Condition was not statistically significant, $F(1, 49) = 1.74, p = .193, \eta^2p = .034$.

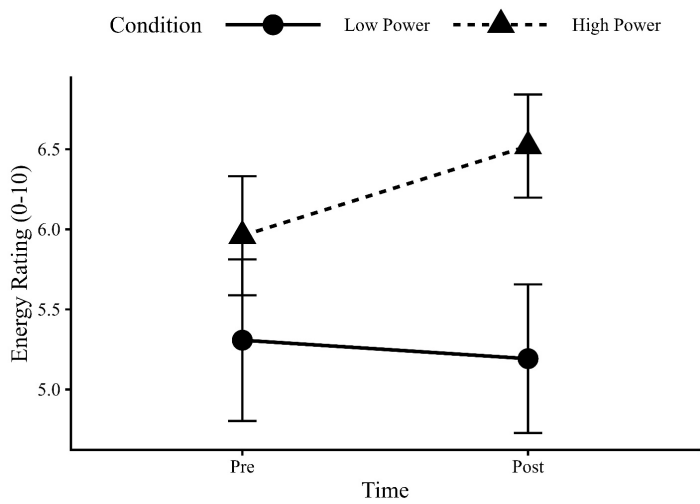
Although participants in the high-power condition showed a descriptive increase in happiness scores, this change was not significantly different from the low-power condition, which remained relatively stable (see Fig. 5).

Figure 5
Interaction effect of power poses on feelings of Happiness



Finally, feelings of energy, a highly significant Time $\times$ Condition interaction was found, $F(1, 49) = 7.34, p = .009, \eta^2p = .130$. Participants in the high-power condition reported an increase in energy levels from baseline to post-test. In contrast, the low-power group showed a slight decrease in energy ratings over time (Fig. 6).

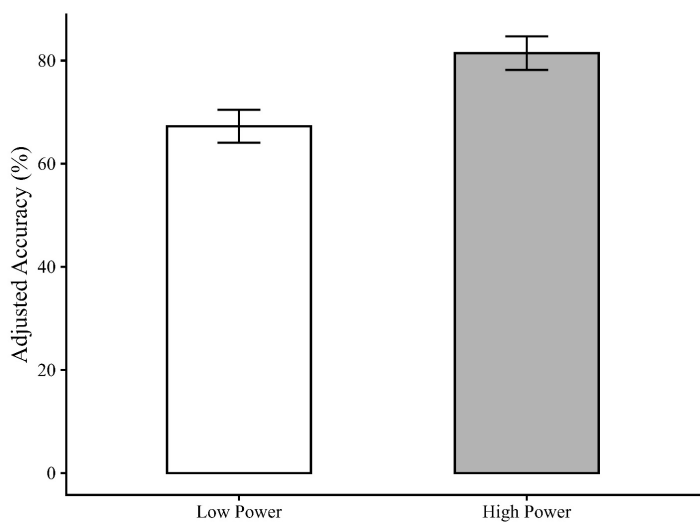
Figure 6
Interaction effect of power poses on feelings of Energy



C. N-back Accuracy

Results indicated a significant main effect of Condition on working memory accuracy, $F(1, 48) = 9.52, p = .041, \eta^2p = .071$. The estimated marginal means were also examined (Fig. 7). The participants who were in the high-power condition performed significantly better ($M_{adj} = 81.44\%$, $SE = 3.26$) than the participants who were in the low-power condition ($M_{adj} = 67.26\%$, $SE = 3.19$) after controlling baseline score differences. This indicates that using a more open body position increases updating accuracy.

Figure 7
Adjusted mean accuracy (%) by condition



D. Reaction Time

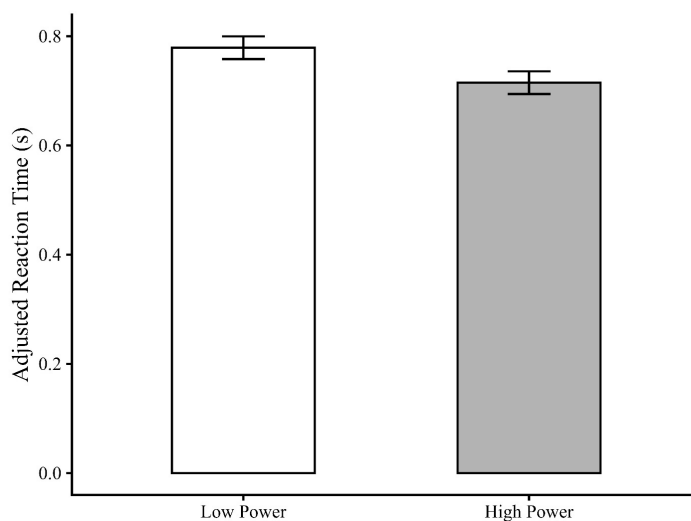
The analysis yielded a significant main effect of Condition, $F(1, 47) = 4.73$, $p = 0.035$, $\eta^2p = 0.091$.

Participants in the high-power condition made quicker decisions ($M_{\text{adj}} = 0.715$ seconds, $SE = 0.021$) compared to participants in the low-power condition ($M_{\text{adj}} = 0.779$ seconds, $SE = 0.021$).

Therefore, high power had a positive impact on working memory speed and accuracy.

Figure 8

Adjusted mean reaction time (seconds) by condition



Discussion

The aim of this study was to examine whether adopting expansive versus contractive postures would influence affective states and working memory performance, and the findings provide a coherent, though not uniformly distributed, pattern of effects across subjective and cognitive measures.

Regarding affective outcomes, the manipulation successfully altered participants' perceived sense of power and energy, but not their reported happiness. High-power postures elicited small-to-moderate increases in perceived power and energy, whereas low-power postures were associated with stable or slightly reduced ratings on these dimensions, and this selective pattern aligns with recent theoretical perspectives suggesting that posture-related effects may be most pronounced in domains directly connected to motivational readiness and self-oriented appraisal, rather than more global emotional states such as happiness.

On the cognitive side, data suggests that posture may slightly modulate working memory efficiency, in fact after adjusting for baseline performance, participants in the high-power condition showed both higher accuracy and faster reaction times on the 2-back experimental task compared to those in the low-power condition. It is essential to underline that the lack of feedback during the 2-back tasks ensures that these differences cannot be attributed to performance-induced changes in motivation or affect, supporting the idea that posture itself exerted an immediate influence on executive functioning.

Taken together, the results indicate that brief postural manipulations can produce tiny measurable effects on subjective experience and cognitive performance. The absence of changes in happiness underscores that the posture-induced effects observed here are not simply reflections of broader mood enhancement but instead, they may reflect shifts in motivational direction, proprioceptive feedback, or embodied appraisal mechanisms that selectively influence feelings related

to agency and energetic readiness, as well as cognitive processes reliant on sustained updating and controlled attention.

Nonetheless, it is also fundamental to highlight several considerations that temper the interpretation of these findings. First, it is worth noting that the study employed a single session manipulation, making it difficult to infer whether the observed effects would persist beyond the immediate experimental window.

Second, it is also important to observe that although the manipulation was framed through a credible EEG cover story to reduce demand characteristics, subtle expectancy effects cannot be entirely ruled out. And third, the improvements in cognitive performance, while statistically significant, should be replicated using additional working memory paradigms to determine whether posture effects generalize across executive domains.

Furthermore, as a pilot study, we need to point out that the study has several limitations that should be acknowledged when interpreting the present findings. The sample size was modest, which restricts statistical power and limits the generalizability of the effects observed, and no information on participants' educational background was collected, preventing examination of whether cognitive performance differences might partially reflect disparities in scholastic experience. In addition to that, although the laboratory room was intentionally kept neutral and minimally distracting, some environmental objects may nonetheless have subtly influenced participants' perceptions or emotional states while assuming the postures. Moreover, the experimenter was not present during the two-minute postural manipulation; despite receiving clear instructions, it cannot be guaranteed that every participant maintained the assigned posture consistently for the full duration.

Conclusions and Implications

The present pilot study set out to explore whether brief changes in bodily configuration could shape affective experience and influence core components of executive functioning. The data point toward an intriguing convergence that expansive postures increased perceived power and energy while simultaneously enhancing accuracy and speed in a demanding working-memory task. These findings offer a compact yet meaningful contribution to the broader effort to understand how the body participates in cognitive regulation, suggesting that the link between posture and mental efficiency may be more immediate and dynamic than commonly assumed.

By demonstrating measurable changes after only two minutes of postural manipulation, this study aims to renew the question of how embodied cues might operate in real-world contexts where cognitive load and moment-to-moment self-regulation are fundamental. Our reflection based on the results leads us to think that if bodily organization can modulate the distribution of attentional resources in such a rapid and low-cost manner, future work might consider applications extending far beyond laboratory boundaries. One might imagine immersive learning environments in which posture becomes a deliberate cognitive tool, or clinical and educational programs where individuals are trained to harness somatic configurations to stabilize motivation, regulate arousal, and enhance executive control. In more speculative terms, developments in wearable sensing technology could eventually integrate postural biofeedback with adaptive cognitive interfaces, allowing users to shift cognitive states through micro-adjustments of the skeletal-muscular system, and devices such as those from Upright (<https://www.uprightpose.com/all-products/>) could be very useful.

Although these possibilities remain aspirational, the results of this study provide a starting point for envisioning a research trajectory, and the challenges ahead involve clarifying mechanisms, scaling the effects, and embedding them within ecologically valid contexts. Yet even in its preliminary form, this work suggests that the organization of the body may hold a practical, accessible, and surprisingly powerful role in shaping how individuals think, feel, and engage with cognitively demanding tasks.

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Maria Annarumma is the scientific supervisor and the author of the paragraphs:

Introduction and Conclusion

Davide Saggese is the author of the paragraphs *Research Results* and *Research Methodology*

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