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Does that pose become you? Testing the effect of body postures on self-concept

Benita Jackson[a], Kelly Nault[a], Laura Smart Richman[b], Onawa LaBelle[c] and Nicolas Rohleder[d,e]

[a]Department of Psychology, Smith College, Northampton, MA, USA; [b]Department of Psychology and Neuroscience, Duke University, Durham, NC, USA; [c]Department of Psychology, University of Michigan, Ann Arbor, MI, USA; [d]Department of Psychology and Volen National Center for Complex Systems, Brandeis University, Waltham, MA USA; [e]Institute of Psychology, Friedrich-Alexander-University Erlangen-Nürnberg, Erlangen, Germany

ABSTRACT

Self-concept expansion predicts a range of adaptive outcomes. An intriguing possible cause of self-concept expansion is the posing of one's body expansively, that is, "power posing." In Study 1 ($N = 65$), we found that body expansion had an effect, of moderate magnitude ($d = 0.58$), on self-concept size in college women as measured by the Twenty Statements Test. Participants who were randomly assigned to hold expanded poses (vs. contracted) – under the guise of a cover story about holding different body positions to test the accuracy of wireless electrodes – wrote significantly more self-statements than those who assumed contracted positions. In pre-registered Study 2 we tested whether this finding was replicable and extended this research by aiming to characterize the process by which it occurred. One hundred and twenty-eight women students were randomly assigned to hold either expanded or contracted postures. They completed surveys measuring two general classes of potential mediators ("broaden-and-build" and "narrow-and-disrupt"), body self-objectification as a moderator, and four indices of self-concept size. Posture was not found to affect self-concept size, nor was it moderated by self-objectification. Though there was no effect on self-expansion, in exploratory analyses, assigned posture affected one of the broaden-and-build measures: psychological flexibility. Results of Study 2 could indicate that a mere two minutes of holding an expanded versus contracted body posture is not enough to induce changes in self-concept size; lack of main effects could in addition be due to a range of unmeasured confounders and/or the fragile and transient nature of the effect.

KEYWORDS

Posture; nonverbal; self-concept; psychological flexibility; self-objectification

Imagine sitting in a job interview having just been asked, "So what else can you tell me about yourself?" – and realizing you have nothing more to say. What if you could easily expand your range of self-descriptors, thus improving your chances for the next opportunity? Beyond shaping how we experience our own body, here we test whether the

CONTACT Benita Jackson alenatalini@hotmail.com Department of Psychology, Smith College, Clark Science Center, 44 College Lane, Northampton, MA 01063, USA

subjective experience of holding an expansive corporeal form, even briefly, can actually expand the accessibility of one's meaningful, core psychological self.

The array of beliefs describing oneself is self-concept. Self-concept contains descriptors that may include and are not limited to traits, goals, roles, relationships, and situations (McConnell & Strain, 2007; Showers & Zeigler-Hill, 2012) and differs across people, situations, and time (Markus & Kunda, 1986; McConnell, 2011; Richman, Slotter, Gardner, & DeWall, 2015; Showers & Zeigler-Hill, 2012). The structure of one's self-concept predicts a range of adaptive outcomes (Oyserman, Elmore, & Smith, 2012). Self-concept expansion, in particular, has been shown to heighten persistence on cognitive and physical tasks (Mattingly & Lewandowski, 2013a), increase self-efficacy (Mattingly & Lewandowski, 2013b), and predict job satisfaction and commitment (McIntyre, Mattingly, Lewandowski, & Simpson, 2014). Self-concept can expand or contract as a function of romantic and other interpersonal relationships and roles (Aron, Paris, & Aron, 1995; McIntyre et al., 2014; Slotter, Gardner, & Finkel, 2010; Showers & Zeigler-Hill, 2012), as well as intra-psychic drivers such as novelty or interest (Mattingly & Lewandowski, 2014).

An intriguing other possible cause of self-concept expansion may be the posing of one's body expansively, colloquially known as, "power posing." Carney, Cuddy, and Yap (2010) found that holding one's body briefly in expanded or contracted postures changed not only one's bodily self, but also one's conceptual self, related to self-reported states such as feeling powerful. These findings are congruent with psychological theories of embodiment, which focus on how "higher level processing is grounded in the organism's sensory and motor experiences" (Winkielman, Niedenthal, Wielgosz, Eelen, & Kavanagh, 2015, p. 151). However, structure of self-concept (e.g. size, other content) was neither central to Carney et al. (2010) nor measured as a consequence of body expansion in that or in subsequent studies (Cuddy, Wilmuth, Yap, & Carney, 2015; Fischer, Fischer, Englich, Aydin, & Frey, 2011; Huang, Galinsky, Gruenfeld, & Guillory, 2011; Park, Streamer, Huang, & Galinsky, 2013).

Findings from studies to replicate body expansion effects have not been entirely consistent. As Carney, Cuddy, and Yap (2015) note in a recent review of expansive versus contractive nonverbal displays, a few key moderators that might account for the inconsistencies across studies include participant awareness of the hypothesis, length of time holding the poses, involvement of social tasks during the manipulation, and experimenter bias. Thus, we do not expect that merely adopting an expansive or contractive pose necessarily will change self-concept. This is because expanded postures are imbued with different meanings depending on the social context, roles, and power of actors involved (Tiedens & Fragale, 2003). For example, even while adopting the very same expansive pose (or at least imagining so; Cesario & McDonald, 2013), being frisked by the police as a crime suspect and running a board meeting as an executive are two distinctly psychological experiences. Similarly, being socially excluded (vs. included) can attenuate the effects of expansive postures (Welker, Oberleitner, Cain, & Carré, 2013).

Still, under particular circumstances (e.g. neutral or nonthreatening to the posture holder) striking an expanded posture may be becoming – in the sense that it enhances a person's *presence*, as Cuddy argues in her book by the same title (Cuddy, 2015). But what if, more literally, our postures *become us* – insofar as expanded physical postures expand

the size and meaningful content of self-concept. If so, how might this happen? A person holding an open stance and head held high literally has a better view of the world than a closed-armed, head-hung counterpart. The theory of broaden-and-build predicts that positive emotions can lead to increased perceptual awareness, a change that allows individuals to build their cognitive resources and think in more flexible, abstract, and approach-oriented terms (Fredrickson, 2001). Each of these changes can increase the ability to bring novel skills and ideas into one's self-concept, rendering the self correspondingly more complex.

Consistent with this theory, studies replicating Carney et al.'s (2010) power posing experiment to date have found that expansive poses increase confidence-related thoughts (Briñol, Petty, & Wagner, 2009), boost mood (Nair, Sagar, Sollers, Consedine, & Broadbent, 2015), abstract thinking (Huang et al., 2011), and performance and nonverbal presence alike (Cuddy et al., 2015). It is worth noting that a growing literature suggests that self-structure is important to well-being (see Mattingly & Lewandowski, 2013a, 2013b; Mattingly, Lewandowski, & McIntyre, 2014) and that there are benefits of self-complexity (Gresky, Ten Eyck, Lord, & McIntyre, 2005; Linville, 1985, 1987; Rafaeli-Mor & Steinberg, 2002). However, other literature clarifies that it may not be self-complexity as such that is linked to adaptive outcomes but more specifically the personally meaningful and authentic characteristics (see Ryan, LaGuardia, & Rawsthorne, 2005; Schlegel, Hicks, Arndt, & King, 2009) and psychological flexibility (Kashdan & Rottenberg, 2010) accompanying phenomena such as (conceptual) self-expansion.

Conversely, do contractive postures result in a type of myopia that not only physically impedes one's view but also contracts self-concept? We argue that the flip side of "broaden-and-build" is "narrow-and-disrupt" processes that may be at work. Contractive postures are strong indicators of low social status (Martens, Tracy, & Shariff, 2012; Tiedens & Fragale, 2003). Seeing oneself as low social status has been shown to narrow and distort cognitive processing via ruminative coping (Jackson, Twenge, Souza, Chiang, & Goodman, 2011) which in turn impairs a host of self-concept shaping processes: problem solving, instrumental behavior, and social support (Lyubomirsky, Layous, Chancellor, & Nelson, 2015). Additionally, internalizing low social status (akin to integrating it into self-concept) thwarts the fulfillment of basic psychological needs (Jackson, Richman, LaBelle, Lempereur, & Twenge, 2014), fundamentally compromising self-flourishing and expansion.

Importantly, trait self-objectification may be a key moderator, amplifying the harmful effects of contractive poses. Studies demonstrate that situations inducing self-objectification cause nonverbal withdrawal in social situations (Saguy, Quinn, Dovidio, & Pratto, 2010) and compromise higher-order thinking for females in particular (Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998; Quinn, Kallen, Twenge, & Fredrickson, 2006), though growing research is also demonstrating a range of negative outcomes for men (for review see Moradi & Huang, 2008). Because objectification of female bodies is pervasive, accompanying self-objectification profoundly affects myriad negative psychological outcomes (Moradi & Huang, 2008) – to the point of being likened to "psychological cliterodectomy" especially for females living in Westernized countries (Grabe, 2013), and is thus a crucial variable to consider in the phenomenology of embodiment.

Current investigation

There are little data so far about whether the expansion of the body is experienced as an expansion of self. Here we seek to test several boundary conditions of power posing. Specifically, we test an outcome novel to this literature: whether power posing can affect self-concept. Because gender can affect how body postures are subjectively experienced from the inside (e.g. internal proprioceptive feedback; Roberts & Arefi-Afshar, 2007), we will conduct our examination in an all-female sample (Allen, Gervais, & Smith, 2013 is among the few with all-female samples in this literature) and test trait self-objectification as a moderator.

Beyond these extensions, we otherwise plan to closely replicate the manipulation used by Carney et al. (2010). Specifically, we will retain the same cover story (testing physiological sensors), similar affective context (no intentional induction of strong emotions, such as the Trier Social Stress Test; cf. Nair et al., 2015), amount of time the poses are held (2 min total per condition, i.e. 2 poses for 1 min each), experimenter presence during posing (not in the room, but videotaping), distractor task during the manipulation (paying attention to faces), and general population (drawn from campus settings, meaning they are status-primed by virtue of being in higher education).

Experimental aims and hypotheses

Our primary aim is to test if size of postures (expanded v. contracted) cause differences in size and content of self-concept. Given that self-expansion has been shown to result from increased positively valenced self-concept content (Mattingly et al., 2014; McIntyre et al., 2014), we hypothesize that expanded postures will activate more meaningful self-concept content and yield relatively greater positive self-concept size. If our main hypothesis is confirmed, we will explore potential mechanisms accounting for this link. We hypothesize a dual-process model, such that expanded postures increase positive self-concept size and meaning via a range of broaden-and-build processes. Furthermore, contracted postures should activate self-contraction, which is the loss of positive self-concept content (Mattingly et al., 2014; McIntyre et al., 2014). Thus we also predict that a complementary host of "narrow-and-disrupt" processes reduces positive self-concept size. See Appendix 1 for constructs and predictions about which condition will have higher scores for each variable. Additionally, we hypothesize that higher trait self-objectification will attenuate the benefits seen in the expanded postures condition and amplify the decrements seen in the contracted postures condition. Finally, we will test for potential confounding by verbal response style (Mattingly & Lewandowski, 2014).

Study 1

Participants and design

This non-registered pilot study included 65 participants as part of a larger investigation examining the effects of posture on a variety of outcome measures. Participants were female, between 18–27 years old, and not taking hormonal birth control or hormonal supplements. Approval to conduct the research was obtained from the Institutional

Review Board of the college campus at which the participants were recruited. Students participated in the study in exchange for $10 or credit in a psychology course. Student of color organizations were included in recruitment efforts toward generating a racially/ethnically diverse participant pool. The racial/ethnic distribution of the sample was approximately 42% White, 40% Asian heritage, 12% Black, 5% mixed heritage, 2% Latina.

This was a between-groups experiment in which we manipulated one independent variable with two levels. Participants were placed in either expanded (head up, arms away from the body) or contracted (head down, limbs close to the body) poses (2 poses for 1 min each) identical to those used in Carney et al. (2010). Participants were then asked to complete a range of measures including one about self-concept, which is our dependent variable of interest. (Measures not part of the current investigation are not included in this article; data not shown.)

Procedure

We scheduled individual laboratory sessions. After giving informed consent, participants were told they would be helping the laboratory test new wireless heart rate monitors, specifically investigating whether the monitors worked adequately when the body was placed in different positions (cover story adapted from Carney et al., 2010). The main experimenter placed wireless leads on both calves and the inner arm of the participant's nondominant hand and verbally instructed the participant into the first pose (either contractive or expansive), which was a seated position.

As the main experimenter was leaving the room, a video camera was set up by a second experimenter, who then left so the participant was alone during the bulk of the posing time. The purpose of the video recording was as a manipulation check to ensure the participant held the pose correctly, and this was explained to the participant during the session. While assuming the pose, participants completed a task requiring them to view a series of faces showing different emotions. Faces were adapted from materials used in Carney et al. (2010). For each of the two posture holds per condition, nine different faces in succession appeared on the screen over the course of 1 min. Images were set to automatically advance after ~5–7 s intervals timed in a Power Point presentation viewed on a laptop sitting on a desk in front of the participant. After the first pose was held for a minute (timed by the experimenters), the experimenter re-entered the room and verbally instructed participants into the second, standing, position. The experimenter then left and participants again completed the faces filler task, with a different set of nine faces but otherwise same as before, while holding the pose for 1 min. At the end of the second posture, the experimenter instructed participants to come out of the pose and complete the measures, which included the self-concept measure.

Materials

We assessed self-concept size using the Twenty Statements Test (TST; Kuhn & McPartland, 1954). The TST asks participants to respond by filling up to 20 blank lines with their answers to the following prompt modified for our study to read:

> In the twenty blanks below please make twenty different statements about yourself that complete the sentence "I am _____." Complete the statements as if you were describing yourself to yourself, not to somebody else. Write your answers in the order they occur to you. Don't worry about logic or "importance." It's okay if you don't fill them all in.

Responses were later coded for analysis by noting the number of statements each participant completed, which served as the dependent variable. Study materials, including raw data, can be found in Appendix 3 and at https://osf.io/g85ep/?view_only=a4bc9c796ae347b08c4188251cebfe85.

Results and discussion

We used an independent samples *t*-test to compare self-concept size for expanded and contracted posers. There was a significant difference in the number of statements made between the expanded (n = 32, M = 18.2, SD = 3.25) and contracted (n = 33, M = 16.0, SD = 4.10) posing conditions, $t(63) = -2.31$, $p = .024$, 95% CI[−3.97, −0.29]. The magnitude of the difference between the means revealed a medium effect size (Cohen's $d = 0.58$).

We next used a one-way between-groups analysis of covariance to determine if the postural effect on self-concept size would persist beyond demographic information. Age, class year, and highest education of each parent were entered as covariates in the analysis. With their inclusion, the difference between the number of statements made by those placed in expanded (n = 32, M = 18.0, SE = 0.66) versus contracted (n = 32, M = 16.2, SE = 0.65) positions was attenuated but remained, $F(1, 59) = 3.99$, $p = .050$, $\eta^2_{\text{partial}} = .063$. The magnitude of the difference remained a medium effect size (Cohen's $d = 0.50$).

Our results from Study 1 indicate that "power posing" has an effect, of moderate magnitude, on self-concept size. Participants placed in the contractive postures wrote significantly fewer self-statements than those who assumed expansive positions. Study 1 provides proof-of-principle that "expanded postures expand the self" to the extent that participants who briefly held expanded (vs. contracted) poses reported more self-concept descriptors.

In Study 2 we will test whether this finding is replicable. We will again use the same laboratory experimental paradigm. Furthermore, we extend Study 1 by adding additional measures of self-concept, including one that relies on a checklist rather than spontaneous generation of content; two nonverbal measures of self-concept size; and beyond self-concept size, assessments emphasizing authentic self-concept. If the effect of posture on self-concept is replicated, we will conduct two sets of exploratory analyses to clarify the nature of this association. Specifically, we will test if trait self-objectification modifies the effects of posture on self-concept. Finally, we will explore potential mediators of a posture–self-concept link. We suspect this link, if it indeed is a true association, is mediated by both "broaden-and-build" processes activated by holding expansive postures and "narrow-and-disrupt" processes activated by assuming constrictive ones. To rule out whether the main finding regarding posture–predicting self-concept size, should it emerge, is confounded by verbal response set we will include a corresponding indicator to be tested as a potential covariate.

Study 2

Participants

We plan to recruit 128 students, identifying as female, from college campuses in Western Massachusetts, United States. Participants will be pre-screened to ensure they do not have any injuries to their extremities and will therefore be able to correctly hold the two poses. Participants will receive either a $10 gift card or course credit for their participation in the study. Recruitment will include student of color organizations to ensure a racially/ethnically diverse subject pool.

Video recordings of the postures will be examined immediately after the laboratory session. Participants will be excluded if they fail to hold one or both of the poses correctly. In the data collection phase, recruited participants will be replaced only if they are excluded for such a technical error. In the pilot study, compliance to the instructions for posing was excellent; no participants were deemed in the video review to have failed properly holding the poses.

Procedure

We will recruit participants via paper, email flyer, and snowball sampling for participation in a 60-min experimental study on postures. After expressing interest via email to be part of the study, potential participants wishing to continue will give consent and complete a brief online survey confirming that they fit all of the study criteria and measuring trait self-objectification (instrument explained later). This completed initial survey will prompt scheduling of an individual session to complete the in-laboratory experiment at a later date. Once in the laboratory, participants will be told they are aiding laboratory staff to test new wireless physiological monitors, specifically whether the heart rate monitors work effectively when the body is placed in different positions (cover story adapted from Carney et al., 2010). After obtaining informed consent for the laboratory portion, we will randomly assign participants to either the expansive or contracted poses condition. The main experimenter will be naïve to condition but will inform the participant of the brief slideshow of female and male faces portraying varying emotions as described in Study 1, telling participants that identifying emotions can affect heart rate and will thus indicate if the sensors are working properly. The experimenter will then exit the room. A lab technician will enter and place four electrode pads on the participant – on the inside of both calves and on the inside of both arms.

Participants will follow verbal instructions of the same length for each condition from the lab technician on how to assume the first position and will be asked to hold the pose for 1 min.

> *Expansive Pose 1*: "Please stay seated, and put your feet crossed, on the table with toes above heart level. It's ok for knees to bend. Put your hands behind your head. Interlace fingers, elbows moving in line with your ears, so the sensor is above heart level. Tilt your head slightly up but make sure you can still see the computer screen comfortably. Are you ready?"
> *Contractive Pose 1*: "Please stay seated and put your knees together and feet together on the ground. Fold your hands with your non-dominant hand over the other one, and place them

> in your lap, so the sensor is right about at hip level. Tilt your head slightly down; make sure you can still see the computer screen comfortably. Are you ready?"

During this time, the lab technician will direct the participant's attention to the computer screen and then exit the room. After the minute, the lab technician will re-enter the room and give instructions for assuming the second pose.

> *Expansive Pose 2*: "Please stand up facing the table. Take a step forward, with your dominant foot in front. Place your finger tips on the table, a little wider than shoulder-width apart, and your fingers slightly spread for support. Again, tilt your head slightly up, but make sure you can still see the computer screen comfortably. Are you ready?"
> *Contractive Pose 2*: "Please stand up facing the table. Cross your legs; it does not matter which leg is in front of the other. Place your non-dominant hand on the opposite arm and your dominant hand on the opposite side of your torso. Again, tilt your head slightly down, but make sure you can still see the computer screen comfortably. Are you ready?"

As before, participants will hold this pose for 1 min while completing the faces filler task. After completing the manipulation, the participant will be asked to complete questionnaires. Upon finishing the measures, participants will be thoroughly debriefed, thanked, and compensated for their time.

Measures

All measures will be adapted so stems prompt participants to describe their thoughts and feelings "in the moment." Self-concept measures and mediators will be block randomized to minimize order effects.

Self-concept size

Participants will complete a TST (Kuhn & McPartland, 1954) in which they will be given 20 lines to answer the question "Who am I?" Instructions will read,

> In the blanks below please write answers to the simple question 'Who am I?' Answer as if you were giving the answers to yourself – not someone else. Write your answers in the order they occur to you. It's ok if you don't fill them all in. Describe your true, authentic, deepest self. WHO AM I?

More lines completed will indicate greater size of self-concept. Participants will also complete the Self-Concept Size Checklist (Mattingly & Lewandowski, 2014), which asks respondents to indicate via an extensive checklist of words those they see as self-descriptive. Examples of words used include anxious, blunt, and polite. Higher scores indicate larger self-concept, though to further capture size of the domain capturing specifically the most meaningful and authentic self-descriptors, we will modify the instructions to read

> You will now view a list of traits that describe different kinds of people. Think about each of these traits carefully and let us know which of these traits best describes your true, authentic, deepest self. If a trait describes the 'truest you' please circle it. If a trait does not, leave it uncircled.

As a third measure of self-concept, participants will be given a compass and asked to practice drawing a circle once. Then, again using the compass, participants will draw a circle representing their sense of authentic self, to represent "all of those things that make up who you are as a person" (adapted from Mattingly & Lewandowski, 2013b). The diameter of the circle in centimeter will indicate self-concept size. Last, a mind-mapping task, adapted from Buzan and Abbott (2005), will be used to evaluate self-concept size. For this activity participants will be asked to depict their "self" through nodes and branches. Subjects will be instructed to

> Start in the center of the paper with a word or image that describes your true, authentic, deepest self. Use lines to connect your central word or image to other qualities, roles, or traits that describe your true, authentic, deepest self. You can choose to include as many or as few branches as you like. We'll give you a few minutes to do this.

Higher numbers of branches will indicate larger self-concept, specifically those true, authentic facets of the self that we aim to capture with all of our self-concept measures.

Broaden-and-build processes

Participants will complete a 21-item basic psychological needs satisfaction scale (Gagné, 2003; Johnston & Finney, 2010) containing items measuring autonomy, competence, and relatedness. Sample items include "I feel like I am free to decide for myself how to live my life" (autonomy), "Most days I feel a sense of accomplishment from what I do" (competence), and "I really like the people I interact with" (relatedness). Participants will respond to each item with a scale from 1 (not at all true) to 7 (very true), with higher scores indicating higher psychological needs fulfillment, which we hypothesize frees up correspondingly more attentional resources. Cronbach's alpha for the 21-item measure was high in a comparable sample (.95, Jackson et al., 2014).

Participants will complete a question asking how powerful and in charge they feel at this moment (Carney et al., 2010). We will also use a modified Subjective Social Status scale (Adler, Epel, Castellazzo, & Ickovics, 2000) to measure how participants view themselves in relation to their community and to the United States as a whole. Participants will be presented with a 10-runged ladder and prompted to select the rung that most closely fits their perceived status. Directions at the top of the page will make explicit the directionality of the ladder (the top of the ladder represents those with the highest standing and the bottom of the ladder those with the lowest standing). Participants will also be asked "How much do you think it's your own doing that you are at the rung you selected?" as a measure of internalization of status, with less internalization an indicator of greater broaden-and-build capacity, as will be greater perceived power and social status.

Participants will complete the Willingness to Communicate scale (McCroskey, 1992) as a measure of how likely they are to initiate communication, which is an interpersonal way of building one's resources. The measure directs participants to indicate what percentage of the time they would choose to communicate in 20 given situations, and adapted for this study, participants will be asked to imagine if they were in these situations given how they are currently feeling. Sample situations include "Talk with a physician" and "Talk in a large meeting of acquaintances." Cronbach's alpha is reportedly high (.92, McCroskey, 1992).

A 20-item Positive Affect Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) will direct participants to rate from 1 (very slightly or not at all) to 5 (extremely) different emotions depending on how they feel "at the present moment." Sample positive feelings include "interested" and "excited." Reliabilities for the positive affect subscale have been reported to range from .86 to .90 (Watson et al., 1988).

Participants will also complete a six-item Subjective Vitality scale (Ryan & Frederick, 1997), capturing how alive and alert participants feel. They will rate statements based on how they feel in the moment on a scale from 1 (not at all true) to 7 (very true). Sample statements include "I feel alive and vital" and "I am looking forward to each new day." This scale demonstrates good reliability, reported as .84 in Bostic, Rubio, and Hood (2000).

To capture psychological flexibility, the shortened Committed Action Questionnaire (CAQ-8; McCracken, Chilcot, & Norton, 2015) measures committed action as part of the process of flexible persistence in goal-directed behavior. Participants will be asked to rate four negatively and four positively phrased items on a scale from 0 (never true) to 6 (always true). Examples of statements include "I can remain committed to my goals even when there are times that I fail to reach them" (positively phrased) and "If I feel distressed or discouraged, I let my commitments slide" (negatively phrased). The reliability of the scale is reported as high, Cronbach's alpha = .91 (McCracken et al., 2015).

Participants will also complete the Five Facet Mindfulness Questionnaire (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) which assesses five elements of mindfulness: observing, describing, acting with awareness, nonjudging of inner experience, and nonreactivity to inner experience. With this questionnaire, participants will rate statements such as "When I'm walking, I deliberately notice the sensations of my body moving" (observing) and "When I do things, my mind wanders off and I'm easily distracted" (awareness) on a scale from 1 (never or very rarely true) to 5 (very often or always true). Items have been adapted to encourage participants to imagine these scenarios in the present moment. This scale has shown good internal consistency (Cronbach's alpha .89; Baer et al., 2006).

Narrow-and-disrupt processes

The PANAS described earlier includes a negative affect subscale, which will be used here. Sample negative feelings include "distressed" and "upset." Reliabilities for the negative affect subscales have been reported to range from .84 to .87 (Watson et al., 1988).

We will use the 10-item Ruminative Responses Scale, which asks participants to rate how they react when they are upset (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). The scale has been validated to reflect two factors: reflection and brooding. Sample items include "Go someplace alone to think about your feelings" (reflection) and "Think about a recent situation, wishing it had gone better" (brooding). Responses will be rated on a 4-point scale ranging from 1 (never or almost never) to 4 (always or almost always). The prompt will be modified so that participants were instructed to answer how it applies to them "right now" and for the purposes of this study, we will use the brooding subscale (not reflection) to indicate narrow-and-disrupt processes. The alpha in a community-based adult sample for this subscale was .77 (Treynor et al., 2003).

Participants will be presented with the Self-Objectification Questionnaire (Noll & Fredrickson, 1998) to assess the relative importance of appearance-related (objectified)

and competence-related (nonobjectified) attributes. The measure will ask participants to rank order 10 different body attributes from 0 (least impact) to 9 (greatest impact) based on how important each is to self-body concept. Examples of appearance-related attributes include "physical attractiveness" and "firm/sculpted muscles," whereas examples of competence-related attributes include "health" and "physical fitness level." Self-objectification scores will be calculated by subtracting the sum of the ranked competence items. Positive scores represent primary focus on body appearance, whereas negative scores indicate primary focus on body functionality.

As a final narrow-and-disrupt indicator, we will code the TST above for the number of first-person words used by each participant (Tausczik & Pennebaker, 2010), which have been shown to be used more by people in slumped versus upright postures (Nair et al., 2015). More first-person words indicate greater psychological narrowing-and-disrupting.

Demographics

For the purposes of describing the sample, we will collect demographic information from each participant including academic institution, parent education, age, year in school or role on campus, grade point average (GPA) if applicable, race/ethnicity, gender identity, and sexual orientation.

Potential covariates

Verbal response set will be measured for use as a potential covariate, using the Kitchen Tools Checklist (Mattingly & Lewandowski, 2014), which asks respondents to circle all items they believe belong in a well-stocked kitchen (e.g. nutcracker, whisk). The number of items parallels that of the Self-Concept Checklist. The rationale underlying this measure is that some people may check more items not reflecting more self-content, but simply reflecting the tendency to verbalize. Following Mattingly and Lewandowski (2014), we will examine whether the effects of manipulated posture on self-concept size persisted beyond the number of items endorsed on the Kitchen Tools Checklist. Finally, prior exposure to the power posing paradigm could interfere with the strength of the cover story as well as participant responses. Thus we will ask participants if they are familiar with the concept of power posing and if they have seen Amy Cuddy's TED talk on power posing. For manipulation checks, see Appendix 2, Analysis Pipeline, item 1.

Results and discussion

Pre-registered analyses

One hundred and thirty-three female students participated in Study 2. Two participants missing the video data to enable their postures to be verified were excluded from analyses (Table 1). Data were deemed incomplete if participants completed less than 75% of scale items; three participants were excluded for this reason due to clerical error at the time of data collection. These exclusions yielded an analytic sample of 128 participants.

We queried participants on a range of demographic indices. At the time of data collection, most participants (95.3%) were drawn from a college in Western Massachusetts, and they included both undergraduate and graduate students; the

Table 1. Descriptives – manipulation checks, demographics, and potential covariates by experimental condition.

		Posture					
		Contracted			*Expanded*		
Construct	Variable	*n*	%	*M* (SD)	*n*	%	*M* (SD)
Manipulation checks	Postures – Video review	68			65		
	Acceptable	66	97.1	–	65	100	–
	Unacceptable	0	0	–	0	0	–
	No verification	2	2.9	–	0	0	–
	Postures – Self-report	65			63		
	Contracted	57	87.7	–	24	38.1	–
	Expanded	8	12.3	–	39	61.9	–
Demographics	Parent education	65			63		
	Less than a college degree	16	24.6	–	13	20.6	–
	College degree	18	27.7	–	17	27.0	–
	Some graduate school	31	47.7	–	33	52.4	–
	Age	65		20.7 (1.85)	63		20.8 (1.94)
	Year in school	65	–		63		
	First year/Sophomore	17	26.2	–	16	25.4	–
	Junior/senior/graduate	48	73.8	–	47	74.6	–
	GPA	61		3.57 (.28)	63		3.61 (.35)
	Race/ethnicity	65			63		
	White	27	41.5	–	25	39.7	–
	Multiracial	16	24.6	–	16	25.4	–
	Asian/Latina/Black	22	33.8	–	22	34.9	–
	Sexual orientation	65			63		
	Completely Heterosexual	15	23.1	–	16	25.4	–
	Mostly heterosexual	13	20.0	–	30	47.6	–
	Other	37	56.9	–	17	27.0	–
Potential covariates							
Verbal response set	Kitchen Tools Checklist	65		38.9 (11.5)	63		35.6 (12.8)
Exposure to power posing	Know about power posing?	65			63		
	No knowledge of it	51	78.5	–	48	76.2	–
	Some knowledge of it	14	21.5	–	15	23.8	–
Experimenter bias	Experimenter + tech pair	65			63		
	Seasoned + Seasoned	32	49.2	–	29	46.0	–
	Any newbie in the pair	33	50.8	–	34	54.0	–

Postures – Video review is from the data set before any exclusions, $N = 133$. All else are from the main analytic dataset, $N = 128$. Each multinominal variable under consideration as a covariate (i.e. parent education, year in school, race/ethnicity, sexual orientation variable, previous knowledge about power posing, and experimenter + tech pair) was recoded to retain the largest number of categories while ensuring that each cell stratified by posture condition would have at least 10 or more participants.

remaining participants attended five other colleges or universities in the near vicinity and across the southern New England region of the United States. Table 2 presents remaining demographic indices stratified by randomly assigned posture (contracted vs. expanded). On average the sample was composed of college juniors but ranged from first- to ninth-year student in higher education (college or graduate studies), SD = 1.63. Before coming to the laboratory session, all participants indicated that they were female in response to an initial closed-ended screening question (yes/no?); at the end of the session, when asked to write in their gender identity, 96.9% identified as a female, and 3.1% identified as something else (e.g., androgynous, non-binary female-aligned). For analytic purposes so that multinominal categorical variables had at least 10 participants per cell in analyses stratified by experimental condition (see Table 1), we combined categories when possible while also maximizing the number of categories. Otherwise – as with the case of educational institution and gender identity, when one category held 95% or more of participants – we omitted the variable for consideration as a covariate.

Table 2. Associations of manipulation check, demographics, and potential covariates with self-concept size variables.

	Self-concept size variables											
	Twenty Statements Test			Self-Concept Checklist			Drawn circle			Mind map		
	r	*F*	*p*	*r*	*F*	*p*	*r*	*F*	*p*	*r*	*F*	*p*
Manipulation check												
Postures – Self-report	–	0.12	.73	–	0.20	.66	–	0.64	.43		0.010	.92
Demographics												
Parent education	–	0.66	.52	–	1.42	.25	–	0.99	.38	–	0.41	.66
Age	−.002	–	.99	−.11	–	.23	−.030	–	.74	−.085	–	.34
Year in school		0.000	.99		.083	.77		0.061	.81		0.88	.35
GPA	.091	–	.31	−.017	–	.85	.13	–	.17	−.056	–	.54
Race/ethnicity	–	1.12	.33	–	0.37	.69	–	0.18	.84	–	2.82	.063
Sexual orientation	–	0.47	.63	–	0.69	.50	–	0.38	.69	–	**3.16**	**.046**
Potential covariates												
Verbal response set	−.053		.56	.17		.051	.085		.34	−.040		.65
Exposure to power posing	–	1.85	.18	–	2.99	.086	–	2.7	.11	–	0.012	.91
Experimenter bias	–	0.86	.36	–	0.083	.77	–	0.013	.91	–	0.92	.34

Each association was analyzed using data from 128 participants, except for those with GPA, which had 123 participants with data. Correlations were run to examine the association between continuous demographic variables (age, GPA) and each self-concept size variable, respectively. ANOVAs were used when independent variables were categorical. Parameter in **bold** denotes a test where statistical significance was $p < .05$.

We collected pilot data to validate Carney et al. (2010) initial findings (p. 1364) that there were no differences between the poses by condition on comfort, difficulty, or pain. Before doing this, we ensured that the desk and the chair heights minimized difficulty, effort, and pain and more generally, paying attention to the directions we offered participants so the poses were comparable on these dimensions. We collected data within participants (with order of contracted vs. expanded poses randomized) which allowed participants to be their own controls. Paired-samples *t*-tests showed no differences in contracted versus expanded postures on comfort ($t[9] = 0.18$, $p = .87$), difficulty ($t[9] = -0.83$, $p = .43$), or pain ($t[9] = -0.30$, $p = .77$), respectively.

We explored demographic variables as possible covariates by conducting bivariate analyses of each demographic variable with each self-concept size variable (Table 2). For the self-concept variables, we calculated a Pearson's correlation coefficient with each continuous demographic variable (age and GPA), and analysis of variance (ANOVA) with each categorical demographic variable (highest parent education, year in school, race/ethnicity, and sexual orientation). There was not homogeneity of variance across the dependent measures to warrant multivariate analysis of variance. None of the demographic variables were associated (all $ps > .05$) with any of the self-concept variables, except for sexual orientation which was associated with the mind map measure of self-concept (final model: assigned posture, $F(2, 125) = 3.16$, $p = .046$, $\eta^2_{\text{partial}} = .048$); thus it was retained as a covariate.

Additionally, verbal response set, self-reported pose, exposure to power posing, and experimenter bias were studied to see if they were associated with self-concept size (Table 2). As before, a Pearson correlation coefficient with each self-concept size variable was calculated for the continuous variable (Kitchen Tools Checklist); with the remaining variables – which were all categorical (self-reported pose, exposure to power posing,

and the experimenter + tech pair) – ANOVA was performed. All associations exceeded $p > .05$. None of these variables were retained as covariates.

The four self-concept size measures were then examined for outliers, defined as values greater or lesser than three SDs from the mean. Outliers were found for two variables: the number of statements completed on the TST and the number of branches present in the mind maps. The values in the bottom and top 5% for each of these measures were subject to a 90th percentile Winsorization, which required changing these extreme values to the 5th and 95th percentile values, respectively (Aguinis, Gottfredson, & Joo, 2013, p. 279). Each of the mediator and moderator variables were also checked for outliers, resulting in a similar 90th percentile Winsorization of the PANAS negative affect subscale. After this process, the self-concept variables were checked for violations of normal skew and kurtosis (absolute values greater than 2; Osborne, 2002). All of them were normally distributed.

To finally begin the direct tests of our pre-registered hypotheses, we tested the hypothesis that participants who were assigned to hold expanded (vs. contracted) bodily postures would have higher self-concept size. Data for the four self-concept size measures were standardized to *z*-scores and then summed to create a composite self-concept size score. An independent samples *t*-test revealed no significant differences between contracted and expanded postures on this composite, $t(126) = -0.59$, $p = .56$, 95% CI[–0.29, 0.15]); including sexual orientation as a covariate did not change the findings (final model: assigned posture, $F(1, 125) = 0.77$, $p = .38$, $\eta^2_{\text{partial}} = .006$).

The last of our pre-registered analyses was to explore whether self-objectification moderated the link between posture and self-concept size change. Even though we did not observe our hypothesized main effect of posture, testing the effect modification was warranted; for example, in the case of a cross-over interaction there could be no main effects but a significant interaction. Hierarchical linear regression was used to explore the association between pre-manipulation trait self-objectification (collected via an internet survey that was part of scheduling participants for the in-person laboratory session) and self-concept size. Variables were entered in three steps: assigned posture, adding mean-centered trait self-objectification, and finally including an interaction term of the two. In neither the preliminary nor final models did any of the parameters predict the composite self-concept size variable (final models: assigned posture ($B = 0.063$, SE = 0.11, $\beta = 0.051$, 95% CI [–0.16, 0.28], $p = .57$); trait self-objectification ($B = 0.001$, SE = 0.006, $\beta = 0.023$, 95% CI [–0.011, 0.013], $p = .85$); and interaction term of assigned posture by self-objectification ($B = 0.003$, SE = 0.009, $\beta = 0.049$, 95% CI [–0.014, 0.020], $p = .70$).

Unregistered exploratory post-hoc analyses

Data from Study 2 did not support the idea that self-concept size expands as one holds an expanded posture. As there were no effects to mediate, we did not pursue examining the "broaden-and-build" and "narrow-and-disrupt" processes as mediators as proposed in the pre-registration. While these processes might not be mediators of self-concept expansion they could still be outcomes of body posture in their own right.

To explore this idea, in unregistered analyses we examined the "broaden-and-build" and "narrow-and-disrupt" variables as potential outcomes of postural expansion. We found that psychological flexibility was higher among participants holding expansive

Table 3. Main variables of interest by experimental condition.

		Posture			
		Contracted		*Expanded*	
Construct	Variable	*n*	*Mean* (SD)	*n*	*Mean* (SD)
Main dependent					
Self-concept size	Twenty Statements Test	65	14.8 (4.0)	63	15.3 (4.4)
	Self-Concept Checklist	65	47.5 (17.8)	63	49.8 (15.8)
	Drawn circle	65	14.1 (5.1)	63	13.7 (3.9)
	Mind map	65	15.9 (8.2)	63	16.8 (9.4)
	Composite (of above)	65	−0.032 (.617)	63	0.033 (.64)
Potential moderator	Trait self-objectification	65	4.8 (13.3)	63	5.7 (13.1)
Potential mediators					
Broaden-and-build	PANAS – Positive	65	2.49 (.84)	63	2.67 (.76)
	Vitality	65	4.27 (1.22)	63	4.49 (1.15)
	Basic psychological needs	65	5.20 (.70)	63	5.22 (.75)
	Mindfulness	65	3.23 (.47)	63	3.25 (.43)
	Psychological flexibility	65	4.34 (.86)	63	4.62 (.76)
	Willingness to communicate	65	60.6 (17.0)	63	62.0 (17.6)
	Perceived power	65	2.68 (.69)	63	2.71 (.71)
	Subjective Social Status (SSS)	64	5.61(1.81)	63	5.98 (1.56)
	SSS Internalization (reverse)	64	3.98 (.95)	63	3.90 (1.08)
	Composite broaden-and-build	65	−0.55 (5.97)	63	0.57 (4.95)
Narrow-and-Disrupt	PANAS – Negative	65	1.42 (.39)	63	1.41 (.39)
	Perspective: first person	65	4.29 (6.64)	63	6.71 (7.47)
	Ruminative coping	65	2.46 (.54)	63	2.48 (.57)
	Composite narrow-and-disrupt	65	−0.17 (1.99)	63	0.17 (2.10)

Each variable was analyzed with 128 cases, except for subjective social status and subjective social status internalization, which had 123. SSS (Subjective Social Status) Internalization was reverse-coded.

poses (Table 3, consistent with what we expected, $t(126) = -1.99$, 95% CI[–0.57, –0.002], $p = .048$). There were no additional effects of postural condition on any of the broaden-and-build or narrow-and-disrupt processes. Though theoretically consistent with our hypothesis generally, it is but one of an array of analyses exploring a more particular broaden-and-build mechanism. As an unregistered analysis it should be interpreted with care, but it may offer a clue toward future research about which broaden-and-build mechanisms to study downstream of expanded body postures.

Additionally, and not surprisingly, self-reported pose post-manipulation was associated with assigned pose. Perhaps more surprising was the fact that a notable subset of participants (25%!) demonstrated a mismatch between the poses they were assigned to hold – verified by video to have been performed correctly – and their perceptions of the poses (contracted vs. expanded) that they were assigned. The mismatch was statistically significant as shown by differences in perceived pose as a function of assigned pose, $\chi^2 = 33.9$, $p < .001$.

To examine if expanded postures affect psychological flexibility as a function of perceived condition, we ran moderator analyses set up similarly to those previously described for self-objectification. Variables were entered in three steps: assigned posture; perceived posture, endorsed after the experiment was complete (contracted vs. expanded); and finally an interaction term of the two. Perceived posture (final model: $B = 0.63$, SE = 0.30, $\beta = 0.37$, 95% CI [0.034, 1.23], $p = .038$) – specifically seeing oneself as having engaged in an expansive pose even when having been assigned and verified to have done a contracted one – independently predicted psychological flexibility above and beyond the effects of assigned posture; in the multivariate model assigned posture

did not predict the outcome (final model: assigned posture, $B = 0.20$, SE = 0.20, $\beta = 0.12$, 95% CI [–0.19, 0.59], $p = .31$), neither did their interaction (final model: perceived pose by assigned posture interaction, $B = –0.37$, SE = 0.37, $\beta = -0.21$, 95% CI [–1.09, 0.36], $p = .32$). Finally, we went back to Study 1 to see if there too was notable mismatch of the same type. Similar to Study 2, in Study 1, 20% of participants assigned to hold a contracted or expansive posture while post-manipulation endorsing instead that they actually held the other pose. The difference was also statistically significant as verified by χ^2 analyses = 25.2, $p < .001$.

General discussion

Taken together, we did not find compelling support that randomly assigned posture affects self-concept size. Though Study 1 ($N = 65$) demonstrated an effect of assigned posture on the number of TST responses generated, we did not replicate that finding in a better-powered Study 2 ($N = 128$) nor did it generalize to a self-concept size composite measure composed of three rather different self-concept size measures: a checklist, a compass drawing symbolic of the self, and the number of branches generate on a mind map describing oneself.

While previous research has shown effects of posture on outcomes including hormones (Carney et al., 2010), mood (Nair et al., 2015), and performance and presence (Cuddy et al., 2015), our key hypothesis that "expanded postures expand the self" remains unconfirmed. It may be that a one-time manipulation or the nature of our particular manipulation is not as potent as other factors that lead to self-expansion, such as falling in love (Aron et al., 1995), or that the effect, if it exists, is simply not robust enough to persist more than a few minutes in a laboratory session.

Post-hoc analyses suggested that instead of affecting self-concept, type of posture affected one particular psychological mechanism that broadens and builds psychological resources – psychological flexibility – and not a wider array of broaden-and-build indicators. There was no effect on the narrow-and-disrupt measures while controlling for assigned pose. Additionally, in post-hoc analyses, we found a mismatch between assigned and self-reported pose, suggesting that the postures assigned as expansive and contractive were not always phenomenologically so for participants. Because the effect on psychological flexibility was driven by perceived posture beyond the effects of assigned posture, this mismatch might indicate that the effects are due to a placebo, at least in part. In exploratory analyses, we went back to Study 1 and found a similar pattern of mismatch between assigned pose and participants' perceptions of that pose, so this mismatch could be worth further consideration. Other researchers (Cesario & McDonald, 2013) have highlighted the importance of context in shaping the effects of body posture, noting that identical postures show divergent effects when participants are asked to interpret them in different ways.

The strengths of the current investigation include being an experimental procedure with a standardized protocol: experimenters were trained carefully and followed very specific scripts to ensure high uniformity across participants within each condition. The highly scripted protocol also helped minimize experimenter bias. We recruited a strong team of multiple experimenters to avoid burnout or boredom from running multiple long sessions and carefully kept them naïve to condition before and during the protocol. By

including numerous self measures in Study 2, we attempted to assess self-concept size from multiple perspectives, thus gaining a more complex picture of this construct than Study 1 could provide. Another strength of the experiment was the pilot testing done on the poses used during Study 2. By ensuring that the expanded and contracted conditions did not differ on comfort, difficulty, or pain, we could with some confidence rule out the effect of these variables on the manipulation. Additionally, by using an all-female sample we were able to minimize the confounding effects of gender as well as study a group for whom effects of power posing as such have not been explicitly and extensively characterized. Self-objectification has a rich base of theory and empirical findings over the past couple decades; as a field focused on the body, it is sensible to bring it into more explicit conversation with research on postures and status, and vice versa.

In many ways our efforts to adequately replicate Carney's 2010 methodology were successful. Our cover story matched the one used in the original Carney et al. study and allowed us to assess the effects of the posing without participant knowledge of the connection between the manipulation and the survey measures. We retained a similar, neutral affective context; kept our poses to 1 min each; used a similar distracter filler task during the posing; and had the experimenter leave the room during this time to minimize attention drawn to the manipulation. Additionally, we used a similar population of participants drawing from the local student community.

Despite our goal to exactly replicate our pilot study, there were a number of initially small changes that ultimately could have affected our ability to observe the same effects. In our interest to test potential mediators we may have undermined our ability to detect an effect of posture on self-concept. There were eight mediator measures preceding the four self-concept size measures; on average the mediators took about 9 min to complete, ranging from about 4 to 17 min. Moreover, three of the four self-concept measures required a fair amount of effort given that they were open-ended. The time between the manipulation and the self-concept size measures was relatively long; perhaps the effect of posture is more transitory than we anticipated.

Additionally, the TST was altered in Study 2. Participants were given only 5 min, instead of the original 8 in the pilot study to complete the task. As well, about 40% of our Study 2 sample had heard of "power posing" a phrase that was nowhere nearly as common in popular discourse during Study 1 data collection, which was in early 2011. Because of the current pervasiveness of the concept, as well as the popularity of Amy Cuddy's 2012 TED talk on power posing, there could be a history effect at work lessening the potency of the cover story. Regarding self-objectification, we measured the trait form as a moderator for Study 2; however, it may be that if there were effects, state self-objectification would be the more salient body-consciousness indicator with situational body focus (as in a power posing manipulation), or some combination thereof (Quinn et al., 2006).

Future investigations could try for a more direct replication of our pilot study, cutting down the time of the experimental session and looking solely at the direct effects of posing on our four self-concept size measures. A larger sample size would be beneficial. The small sample size in the pilot study, from which our original effect size was derived, might have served as an inadequate indicator of the sample size needed to see an effect in Study 2. A closer look at our data in Study 2 suggests high variability in our dependent measures, especially the composites. This is perhaps not surprising, given that they are composites, but in our efforts to block randomize the order of survey

administration (within the eight mediator measures and four self-concept size measures) to minimize order effects, we may have inadvertently introduced a high degree of variance that washed out experimental effects, especially ones that are delicate and transient. For example, if someone reads an extensive checklist before generating original content for a TST or a mind map about oneself, the experience of the open-ended questions is vastly different from someone who reads it afterwards. Theoretically, randomization would balance out the order effects, but in the process of a long survey protocol following the manipulation, experimental effects if there were any may too have been attenuated. Last, an experimenter protocol with no cover story would reduce variability in how participants interpret their body positions, which could lead to an easier detection of the main effect.

Although our study did not result in the differences in self-concept size that we hypothesized, there is still much to examine in the realm of postural expansion. Our findings on differences in psychological flexibility point to some other process being altered by manipulating body position. From this study we cannot say that holding a pose becomes you. Future research can determine whether by expanding one's body a person can become more psychologically flexible – perhaps even more helpful in acing a job interview than having an expanded self-concept.

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References

Aguinis, H., Gottfredson, R. K., & Joo, H. (2013). Best-practice recommendations for defining, identifying, and handling outliers. *Organizational Research Methods*, *16*(2), 270–301. doi:10.1177/1094428112470848

Aron, A., Paris, M., & Aron, E. N. (1995). Falling in love: Prospective studies of self-concept change. *Journal of Personality and Social Psychology*, *69*(6), 1102–1112. doi:10.1037/0022-3514.69.6.1102

Adler, N. E., Epel, E. S., Castellazzo, G., & Ickovics, J. R. (2000). Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, white women. *Health Psychology*, *19*(6), 586–592. doi:10.1037/0278-6133.19.6.586

Allen, J., Gervais, S. J., & Smith, J. L. (2013). Sit big to eat big: The interaction of body posture and body concern on restrained eating. *Psychology of Women Quarterly*, *37*(3), 325–336. doi:10.1177/0361684313476477

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27–45. doi:10.1177/1073191105283504

Bostic, T. J., Rubio, D. M., & Hood, M. (2000). A validation of the subjective vitality scale using structural equation modeling. *Social Indicators Research*, *52*(3), 313–324. doi:10.1023/A:1007136110218

Briñol, P., Petty, R. E., & Wagner, B. (2009). Body posture effects on self-evaluation: A self-validation approach. *European Journal of Social Psychology*, *39*(6), 1053–1064. doi:10.1002/ejsp.607

Buzan, T., & Abbott, S. (2005). *The ultimate book of mind maps: Unlock your creativity, boost your memory, change your life*. London: Thorsons.

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*(10), 1363–1368. doi:10.1177/0956797610383437

Carney, D. R., Cuddy, A. J. C., & Yap, A. J. (2015). Review and summary of research on the embodied effects of expansive (vs. contractive) nonverbal displays. *Psychological Science*, *26*(5), 657–663. doi:10.1177/0956797614566855

Cesario, J., & McDonald, M. M. (2013). Bodies in context: Power poses as a computation of action possibility. *Social Cognition*, *31*(2), 260–274. doi:10.1521/soco.2013.31.2.260

Cuddy, A. J. C., Wilmuth, C. A., Yap, A. J., & Carney, D. R. (2015). Preparatory power posing affects nonverbal presence and job interview performance. *Journal of Applied Psychology*, *100*(4), 1286–1295. doi:10.1037/a0038543

Cuddy, A. (2015). *Presence: Bringing your boldest self to your biggest challenges*. New York: Little, Brown and Company.

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). GPower 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. doi:10.3758/BF03193146

Fischer, J., Fischer, P., Englich, B., Aydin, N., & Frey, D. (2011). Empower my decisions: The effects of power gestures on confirmatory information processing. *Journal of Experimental Social Psychology*, *47*(6), 1146–1154. doi:10.1016/j.jesp.2011.06.008

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology. *American Psychologist*, *56*(3), 218–226. doi:10.1037/0003-066X.56.3.218

Fredrickson, B. L., Roberts, T., Noll, S. M., Quinn, D. M., & Twenge, J. M. (1998). That swimsuit becomes you: Sex differences in self-objectification, restrained eating, and math performance. *Journal of Personality and Social Psychology*, *75*(1), 269–284. doi:10.1037/0022-3514.75.1.269

Gagné, M. (2003). The role of autonomy support and autonomy orientation in prosocial behavior engagement. *Motivation and Emotion*, *27*(3), 199–223. doi:10.1023/A:1025007614869

Grabe, S. (2013). Psychological cliterodectomy: Body objectification as a human rights violation. In M. K. Ryan & N. R. Branscombe (Eds.), *The Sage handbook of gender and psychology* (pp. 412–427). London: Sage.

Gresky, D. M., Ten Eyck, L. L., Lord, C. G., & McIntyre, R. B. (2005). Effects of salient multiple identities on women's performance under mathematics stereotype threat. *Sex Roles*, *53*(9–10), 703–716. doi:10.1007/s11199-005-7735-2

Huang, L., Galinsky, A. D., Gruenfeld, D. H., & Guillory, L. E. (2011). Powerful postures versus powerful roles: Which is the proximate correlate of thought and behavior? *Psychological Science*, *22*(1), 95–102. doi:10.1177/0956797610391912

Jackson, B., Twenge, J. M., Souza, C., Chiang, J., & Goodman, E. (2011). Low subjective social status promotes ruminative coping. *Journal of Applied Social Psychology*, *41*(10), 2434–2456. doi:10.1111/j.1559-1816.2011.00820.x

Jackson, B., Richman, L. S., LaBelle, O., Lempereur, M. S., & Twenge, J. M. (2014). Experimental evidence that low social status is most toxic to well-being when internalized. *Self and Identity*, *14*(2), 157–172. doi:10.1080/15298868.2014.965732

Johnston, M. M., & Finney, S. J. (2010). Measuring basic needs satisfaction: Evaluating previous research and conducting new psychometric evaluations of the basic needs satisfaction in general scale. *Contemporary Educational Psychology*, *35*(4), 280–296. doi:10.1016/j.cedpsych.2010.04.003

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878. Retrieved from http://search.ebscohost.com.libproxy.smith.edu:2048/login.aspx?direct=true&db=psyh&AN=2011-18081-003&site=ehost-live

Kuhn, M. H., & McPartland, T. S. (1954). An empirical investigation of self-attitudes. *American Sociological Review*, *19*(1), 68–76. Retrieved from http://www.jstor.org.libproxy.smith.edu:2048/stable/2088175

Linville, P. W. (1985). Self-complexity and affective extremity: Don't put all of your eggs in one cognitive basket. *Social Cognition*, *3*(1), 94–120. doi:10.1521/soco.1985.3.1.94

Linville, P. W. (1987). Self-complexity as a cognitive buffer against stress-related illness and depression. *Journal of Personality and Social Psychology*, *52*(4), 663–676. doi:10.1037/0022-3514.52.4.663

Lyubomirsky, S., Layous, K., Chancellor, J., & Nelson, S. K. (2015). Thinking about rumination: The scholarly contributions and intellectual legacy of Susan Nolen-Hoeksema. *Annual Review of Clinical Psychology*, *11*, 1–22. doi:10.1146/annurev-clinpsy-032814-112733

Markus, H., & Kunda, Z. (1986). Stability and malleability of the self-concept. *Journal of Personality and Social Psychology*, *51*(4), 858–866. doi:10.1037/0022-3514.51.4.858

Martens, J. P., Tracy, J. L., & Shariff, A. F. (2012). Status signals: Adaptive benefits of displaying and observing the nonverbal expressions of pride and shame. *Cognition and Emotion*, *26*(3), 390–406. doi:10.1080/02699931.2011.645281

Mattingly, B. A., & Lewandowski, G. W., Jr. (2013a). The power of one: Benefits of individual self-expansion. *Journal of Positive Psychology*, *8*(1), 12–22. doi:10.1080/17439760.2012.746999

Mattingly, B. A., & Lewandowski, G. W., Jr. (2013b). An expanded self is a more capable self: The association between self-concept size and self-efficacy. *Self and Identity*, *12*(6), 621–634. doi:10.1080/15298868.2012.718863

Mattingly, B. A., & Lewandowski, G. W., Jr. (2014). Expanding the self-brick by brick: Nonrelational self-expansion and self-concept size. *Social Psychological and Personality Science*, *5*(4), 484–490. doi:10.1177/1948550613503886

Mattingly, B. A., Lewandowski, G. W., Jr., & McIntyre, K. P. (2014). "You make me a better/worse person": A two-dimensional model of relationship self-change. *Personal Relationships*, *21*, 176–190. doi:10.1111/pere.12025

McConnell, A. R. (2011). The multiple self-aspects framework: Self-concept representation and its implications. *Personality and Social Psychology Review*, *15*(1), 3–27. doi:10.1177/1088868310371101

McConnell, A. R., & Strain, L. M. (2007). Content and structure of the self-concept. In C. Sedikides & S. J. Spencer (Eds.), *The self in social psychology* (pp. 51–73). New York, NY: Psychology Press.

McCracken, L. M., Chilcot, J., & Norton, S. (2015). Further development in the assessment of psychological flexibility: A shortened committed action questionnaire (CAQ-8). *European Journal of Pain*, *19*, 677–685. doi:10.1002/ejp.2015.19.issue-5

McCroskey, J. C. (1992). Reliability and validity of the willingness to communicate scale. *Communication Quarterly*, *40*(1), 16–25. doi:10.1080/01463379209369817

McIntyre, K. P., Mattingly, B. A., Lewandowski, G. W., Jr., & Simpson, A. (2014). Workplace self-expansion: Implications for job satisfaction, commitment, self-concept clarity, and self-esteem among the employed and unemployed. *Basic and Applied Social Psychology*, *36*, 59–69. doi:10.1080/01973533.2013.856788

Moradi, B., & Huang, Y. (2008). Objectification theory and psychology of women: A decade of advances and future directions. *Psychology of Women Quarterly*, *32*(4), 377–398. doi:10.1111/j.1471-6402.2008.00452.x

Nair, S., Sagar, M., Sollers, J. I., II, Consedine, N., & Broadbent, E. (2015). Do slumped and upright postures affect stress responses? A randomized trial. *Health Psychology*, *34*(6), 632–641. doi:10.1037/hea0000146

Noll, S. M., & Fredrickson, B. L. (1998). A mediational model linking self-objectification, body shame, and disordered eating. *Psychology of Women Quarterly*, *22*(4), 623–636. doi:10.1111/j.1471-6402.1998.tb00181.x

Osborne, J. (2002). Notes on the use of data transformations. *Practical Assessment, Research & Evaluation*, *8*(6). Retrieved from http://PAREonline.net/getvn.asp?v=8&n=6

Oyserman, D., Elmore, K., & Smith, G. (2012). Self, self-concept, and identity. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (2nd ed., pp. 69–104). New York, NY: Guilford Press.

Park, L. E., Streamer, L., Huang, L., & Galinsky, A. D. (2013). Stand tall, but don't put your feet up: Universal and culturally-specific effects of expansive postures on power. *Journal of Experimental Social Psychology*, *49*(6), 965–971. doi:10.1016/j.jesp.2013.06.001

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. doi:10.3758/BRM.40.3.879

Quinn, D. M., Kallen, R. W., Twenge, J. M., & Fredrickson, B. L. (2006). The disruptive effect of self-objectification on performance. *Psychology of Women Quarterly*, *30*(1), 59–64. doi:10.1111/j.1471-6402.2006.00262.x

Rafaeli-Mor, E., & Steinberg, J. (2002). Self-complexity and well-being: A review and research synthesis. *Personality and Social Psychology Review*, *6*(1), 31–58. doi:10.1207/S15327957PSPR0601_2

Richman, S. B., Slotter, E. B., Gardner, W. L., & DeWall, C. N. (2015). Reaching out by changing what's within: Social exclusion increases self-concept malleability. *Journal of Experimental Social Psychology*, *57*, 64–77. doi:10.1016/j.jesp.2014.11.008

Roberts, T., & Arefi-Afshar, Y. (2007). Not all who stand tall are proud: Gender differences in the proprioceptive effects of upright posture. *Cognition and Emotion*, *21*(4), 714–727. doi:10.1080/02699930600826432

Ryan, R. M., & Frederick, C. (1997). On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *Journal of Personality*, *65*(3), 529–565. doi:10.1111/jopy.1997.65.issue-3

Ryan, R. M., LaGuardia, J. G., & Rawsthorne, L. J. (2005). Self-complexity and the authenticity of self-aspects: Effects on well-being and resilience to stressful events. *North American Journal of Psychology*, *7*(3), 431–448.

Slotter, E. B., Gardner, W. L., & Finkel, E. J. (2010). Who am I without you? the influence of romantic breakup on the self-concept. *Personality and Social Psychology Bulletin*, *36*(2), 147–160. doi:10.1177/0146167209352250

Saguy, T., Quinn, D. M., Dovidio, J. F., & Pratto, F. (2010). Interacting like a body: Objectification can lead women to narrow their presence in social interactions. *Psychological Science*, *21*(2), 178–182. doi:10.1177/0956797609357751

Schlegel, R. J., Hicks, J. A., Arndt, J., & King, L. A. (2009). Thine own self: True self-concept accessibility and meaning in life. *Journal of Personality and Social Psychology*, *96*(2), 473–490. doi:10.1037/a0014060

Showers, C. J., & Zeigler-Hill, V. (2012). Organization of self-knowledge: Features, functions, and flexibility. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (2nd ed., pp. 105–123). New York, NY: Guilford Press.

Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, *29*(1), 24–54. doi:10.1177/0261927X09351676

Thoemmes, F., MacKinnon, D. P., & Reiser, M. R. (2010). Power analysis for complex mediational designs using Monte Carlo methods. *Structural Equation Modeling*, *17*(3), 510–534. doi:10.1080/10705511.2010.489379

Tiedens, L. Z., & Fragale, A. R. (2003). Power moves: Complementarity in dominant and submissive nonverbal behavior. *Journal of Personality and Social Psychology*, *84*(3), 558–568. doi:10.1037/0022-3514.84.3.558

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*(3), 247–259. doi:10.1023/A:1023910315561

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070. doi:10.1037/0022-3514.54.6.1063

Welker, K. M., Oberleitner, D. E., Cain, S., & Carré, J. M. (2013). Upright and left out: Posture moderates the effects of social exclusion on mood and threats to basic needs. *European Journal of Social Psychology*, *43*(5), 355–361. doi:10.1002/ejsp.1944

Winkielman, P., Niedenthal, P., Wielgosz, J., Eelen, J., & Kavanagh, L. (2015). Embodiment of cognition and emotion. In M. Mikulincer, P. R. Shaver, E. Borgida, & J. A. Bargh (Eds.), *APA handbook of personality and social psychology, volume 1: Attitudes and social cognition* (pp. 151–175). Washington, DC: American Psychological Association.

Appendix 1. Constructs, variables, and predictions about which condition will yield higher means

		Posture with higher mean	
Construct	Variable	*Contracted*	*Expanded*
Main dependent			
Positive self-concept	Twenty Statements Test		X
	Self-Concept Checklist		X
	Drawn circle representing the self		X
	Mind map of self		X
Potential moderator	Trait self-objectification		
Manipulation checks	Postures – Video review		
	Postures – Self-report		
Potential covariates			
Verbal response set	Kitchen Tools Checklist		
Manipulation check	Postures – Self-report		
Exposure to power posing	Know of or seen Cuddy TED talk?		
Experimenter bias	Experimenter + tech pair		
Potential mediators			
Broaden-and-build	PANAS – Positive		X
	Vitality		X
	Basic psychological needs fulfillment		X
	Mindfulness		X
	Psychological flexibility		X
	Willingness to communicate		X
	Perceived power		X
	Subjective Social Status (SSS)		X
	SSS Internationalization (reverse)		X
Narrow-and-disrupt	PANAS – Negative	X	
	Perspective: 1st person words in TST	X	
	Ruminative coping	X	
Demographics	Parent education		
	Age		
	Year in school or role on campus		
	GPA if applicable		
	Race/ethnicity		
	Gender identity		
	Sexual orientation		

SSS Internalization will be reverse-coded.

Appendix 2. Analysis pipeline

Once we complete data collection, analyses will be conducted in the following order:

(1) *Exclude* necessary participants, based on
  (a) Manipulation check failures (exclude entire participant data)
    (i) Two types of manipulation checks will be done.
      (1) Only the first one – the video–camera-based check of participants assuming the correct poses – will be used to exclude participants who fail to produce the correct poses.
      (2) As part of a second manipulation check we will query participants about which pose they thought they were holding. Responses to this question will yield a self-report manipulation check variable that will be used as a potential covariate.

(b) Incomplete data
  (i) Scales calculated by averaging scores of items must include at least 75% of the items to be considered complete; they otherwise will be deemed missing.

(2) *Examine* demographics and other potential covariates
  (a) Determine if any demographic variables or other potential covariates (Appendix 1) are associated $p < .05$ with self-concept size outcomes. If so, retain as covariates.

(3) *Examine* dependent variables
  (a) Determine if there are outliers, operationalized as values 3 SDs from the mean. If so, we will perform a 90th percentile Winsorization, transforming all data below the 5th percentile to the 5th percentile, and transforming all data above the 95th percentile to the 95th percentile (Aguinis et al., 2013, p. 279).
  (b) Determine if the data are normally distributed, operationalized as skew and/or kurtosis < 2.0. If not, perform natural log transformation to improve normality (Osborne, 2002).

(4) *Testing* our hypotheses.
  (a) We will start by testing the direct effect of posture on self-concept using *t*-tests:
    (i) To examine if there is a significant direct effect of posture on positive self-concept size, we will perform an independent samples *t*-test.
      (1) The independent variable will be posture (expansive vs. contracted).
      (2) The dependent variable will be a single composite of the four measures of positive self-concept as listed in Appendix 1, derived by standardizing and then averaging the scores.
  (b) In addition, we will re-run this test using ANCOVA to determine those variables as covariates that were significantly associated with positive self-concept size (see 2 earlier). Based on the pilot study we do not expect to be using more than two covariates to be tested in this manner.
  (c) Power calculations
    (i) Based on preliminary data derived from our pilot study, we expect a medium effect size ($d = 0.50$). Using the software tool g-power (Faul, Erdfelder, Lang, & Buchner, 2007) and aiming for a power of 0.80 with an alpha of 0.05, we computed a required *N* of 128 for a two-group design, that is, $n = 64$ participants per group.

(5) *Testing* whether the association of posture and self-concept is moderated by self-objectification using hierarchical linear regression
  (a) To test whether trait self-objectification moderates the association between pose and positive self-concept size, we will compute hierarchical linear regression analyses entering posture (expanded vs. contracted), trait self-objectification, and the interaction term of status and objectification as predictors of the DV indicating positive self-concept size.
  (b) Power calculations:
    (i) Using conservative estimates of small-to-medium effect sizes ($f^2 = 0.25$) for the two predictors posture and self-objectification, and a small additional

effect of the interaction of posture and self-objectification (R^2 change of 10% equaling an $f^2 = 0.11$), the required sample size computed using g-power (Faul et al., 2007) is $N = 90$.

(6) *Exploring* whether the association of posture and positive self-concept size is mediated by any of the proposed mediators:
   (a) Potential mediators: broaden-and-build processes, and narrow-and-disrupt. See also Appendix 1 for a complete list of variables.
      (i) Variables from each of these two classes of mediators will be factor analyzed to create an indicator for each
         (1) Do either of these, individually or in tandem, mediate the posture-positive self-concept size link?
         (2) Power calculations: There is less consensus on a priori power calculations for mediation models. We decided to first estimate the required sample size for a simple mediation model based on a medium effect following Thoemmes, MacKinnon, and Reiser (2010). Their results show that for such a mediation model, a sample of $N = 92$ would be sufficient to detect medium effects.
         (3) For mediation models in which we will be able to test simultaneously each class of proposed mediator, and in addition control for covariates (if applicable), we will use bootstrapping using the PROCESS macro in SPSS (Preacher & Hayes, 2008).

Our final determination of required sample size is that, based on the required N of 128 calculated for testing the direct effect of posture on self-concept size with an alpha of 0.05 and a power of 0.80 (see aforementioned points), we plan to have 128 participants with viable data in our sample.

Appendix 3. SPSS data set guide

All nonpilot in-person data collection took place after the In Principle Acceptance was received and occurred from 4 April 2016 to 12 July 2016.

A raw data set with all participants (before quality check exclusions) is available, as well as a data set with the final 128 participants and all variables. A third smaller data set is also available which includes the final 128 participants and only the variables used in the analyses outlined by the pre-registered analysis pipeline.

Syntax files with annotations are also available, corresponding to the pre-registered analysis pipeline as well as any additional analyses.

Entries from the TST were de-identified to maintain participant confidentiality. All X's are in place of first or last names.

Key variables

IV:

Posture (assigned posture of participants, expanded vs. contracted)

DVs:

IamNum (number of statements completed on the TST)

IamNumT (Winsorized number of statements completed on the TST)

SCSCTotal (total number of traits circled on the self-concept size checklist)

SDCA (diameter in cm of self-concept circle drawn with compass)

SDMM (number of branches counted in mind map)
SDMMT (Winsorized number of branches counted in mind map)
Demographics:
dAgeT (age of participant)
dSchYrT (year in school)
dGPAT (GPA on a 4.0 scale)
dParEdT (highest parent education level)
dRaceT (categorical race/ethnicity variable)
dSOT (categorical sexual orientation variable)
dGenT (categorical gender variable)
dColT (categorical school attended variable)
Potential covariates:
KTCTotal (total number of items circles on the Kitchen Tools Checklist)
SRPose (self-reported pose)
PPExpoT (exposure to power posing)
ETBiasT (experimenter bias)
Potential moderator:
SOQTotal (summed self-objectification scale)
Potential mediators:
PAMean (positive affect scale mean)
NAMeanT (transformed negative affect scale mean)
SelfDetMean (basic psychological needs scale mean)
VitMean (vitality scale mean)
FMMean (mindfulness scale mean)
PFMean (psychological flexibility scale mean)
WTCMean (willingness to communicate mean)
FOP (reported feelings of power)
SSSC (community subjective social status)
SSSIMeanT (reverse-coded mean of subjective social status internalization)
RCMean (ruminative coping scale mean)
IamI (number of TST statements containing first person words; me, myself, I, or the participant's first name)
BBComposite (standardized mean of all broaden and build mediators)
NDComposite (standardized mean of all narrow and disrupt mediators)
Interaction terms:
PosturexSOQ (assigned posture by self-objectification interaction term)
PosturexSRPose (assigned posture by self-reported pose interaction term)