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SPECIAL ISSUE

How Posture Affects Memory Recall and Mood

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Body posture reflects emotional states, and this study investigates the effect of posture sitting in a slouched or upright position on recall of either negative (hopeless, helpless, powerless, or defeated) memories or positive (empowered or optimistic) memories. Two hundred and sixteen college students sat in either a slouched or an erect position while recalling negative memories and then in a second step, recalling positive memories. They then sat in the opposite body position while recalling negative and then positive memories. Eighty-six percent of the students reported that it was easier to recall/access negative memories in the collapsed position than in the erect position ($p < .01$), and 87% of the students reported that it was easier to recall/access positive images in the erect position than in the collapsed position ($p < .01$). Participants who reported being most depressed over the previous two years reported significantly more recall of negative memories in both the slouched position ($p = .01$) and erect position ($p < .05$). For those who were most depressed, there were no differences in recalling positive memories. We recommend that therapists teach clients posture awareness and to sit more upright in the office and at home as a strategy to increase positive affect and decrease depression.

Background

When I sat collapsed looking down, negative memories flooded me and I found it difficult to shift and think of positive memories. While sitting erect, I found it easier to think of positive memories.

—Student participant

The link between posture and mood is embedded in idiomatic phrases such as *walking tall*, *standing proud*, and *an upstanding citizen*, versus *collapsed*, *defeated*, or *in a slump*; this language suggests that posture and mood/emotions are connected. Slumped posture is commonly observed in depression (Canales, Cordas, Fiquer, Cavalcante, & Moreno, 2010; Michalak et al., 2009) and adapting an upright posture increases positive affect, reduces fatigue, and increases energy in people with mild to moderate depression (Peper & Lin, 2012; Wilkes, Kydd, Sagar, & Broadbent, 2017).

Most psychotherapies tend to focus on the mind component of the body-mind relationship. On the other hand, exercise and posture focus on the body component of the mind/emotion/body relationship. Physical activity in general has been demonstrated to improve mood and exercise has been successfully used to treat depression with lower recidivism rates than pharmaceuticals such as sertraline (Zoloft) (Babyak et al., 2000). Although the role of exercise as a treatment strategy for depression has been accepted, the role of posture is not usually included in cognitive behavior therapy or biofeedback or neurofeedback therapy.

Hormone levels also change in a collapsed posture (Carney, Cuddy, & Yap, 2010). For example, 2 minutes of standing in a collapsed position significantly decreased testosterone and increased cortisol as compared to a "power posture," which significantly increased testosterone and decreased cortisol while standing. As Cuddy pointed out in a Technology, Entertainment and Design (TED) talk, "By changing posture, you not only present yourself differently to the world around you, you actually change your hormones" (Cuddy, 2012).

Wilkes et al. (2017) and Peper and Lin (2012) have suggested a link between posture, emotions, and cognitions that describes the importance of postural interventions to counter symptoms of depression and low energy. Peper and Lin (2012) demonstrated that if people tried skipping rather than walking in a slouched posture, subjective energy after the exercise was significantly higher. Among the participants who had reported the highest level of depression during the last 2 years, there was a significant decrease of subjective energy when they walked in slouched position compared with those who reported a low level of depression. Earlier, Wilson and Peper (2004) demonstrated

that in a collapsed posture, students more easily accessed hopeless, powerless, defeated and other negative memories as compared to memories accessed in an upright position. More recently, Tsai, Peper, and Lin (2016) showed that when participants sat in a collapsed position, evoking positive thoughts required more "brain activation" (i.e., greater mental effort) compared to that required when walking in an upright position.

The purpose of this study is to expand on our observations with more than 3,000 students and workshop participants. We observed that body posture and position affects recall of emotional memory and a history of self-described depression appears to affect the recall of either positive or negative memories.

Method

Two hundred and sixteen college students (65 males, 142 females, 9 undeclared),with an average age of 24.6 years ($SD = 7.6$) participated in a regularly planned classroom demonstration regarding the relationship between posture and mood. As an evaluation of a classroom activity, this report of findings was exempted from Institutional Review Board oversight.

Procedure

While sitting in a class, students filled out a short, anonymous questionnaire, which asked them to rate their history of depression over the last 2 years, their level of depression and energy at this moment, and how easy it was for them to change their moods and energy level (on a scale from 1–10). The students also rated the extent they became emotionally absorbed or "captured" by their positive or negative memory recall. Half of the students were asked to rate how they sat in front of their computer, tablet, or mobile device on a scale from 1 (sitting upright) to 10 (completely slouched).

Two different sitting postures were clearly defined for participants: slouched/collapsed and erect/upright, as shown in Figure 1. To assume the collapsed position, they were asked to slouch and look down while slightly rounding the back. For the erect position, they were asked to sit upright with a slight arch in their back, while looking upward.

After experiencing both postures, half the students sat in the collapsed position while the other half sat in the upright position. While in this position, they were asked to recall/evoke as many hopeless, helpless, powerless, or defeated memories as possible, one after the other, for 30 seconds.

After 30 seconds they were reminded to keep their same position and let go of thinking negative memories. They were then asked to recall/evoke only positive, optimistic, or empowering memories for 30 seconds.

The participants were then asked to switch positions. Those who were collapsed switched to sitting erect, and those who were erect switched to sitting collapsed. Then they were again asked to recall/evoke as many hopeless, helpless, powerless, or defeated memories as possible one after the other for 30 seconds. After 30 seconds they were reminded to keep their same position and again let go of thinking of negative memories. They were then asked to recall/evoke only positive, optimistic, or empowering memories for 30 seconds, while still retaining the second posture.

The participants then rated their subjective experience in recalling negative or positive memories and the degree to which they were absorbed or captured by the memories in each position, and in which position it was easier to recall positive or negative experiences.

Results

Among the participants, 86% reported that it was easier to recall/access negative memories in the collapsed position than in the erect position, which was significantly different as determined by one-way analysis of variance, $F(1, 430) = 110.193$, $p < .01$, and 87% of participants reported that it was easier to recall/access positive images in the erect position than in the collapsed position, which was significantly different as determined by one-way analysis of variance, $F(1, 430) = 173.861$, $p < .01$, as shown in Figure 2. The difficulty or ease of recalling negative or positive memories varied depending on position as shown in Figure 3.

The participants with a high level of depression over the last 2 years (top 23% of participants who scored 7 or higher on the scale of 1–10) reported that it was significantly more difficult to change their mood from negative to positive, $t(110) = 4.08$, $p < .01$, than was reported by those with a low level of depression (lowest 29% of the participants who scored 3 or less on the scale of 1–10). It was significantly easier for more depressed students to recall/evoke negative memories in the collapsed posture, $t(109) = 2.55$, $p = .01$, and in the upright posture, $t(110) = 2.41$, $p \leq .05$, and no significant difference in recalling positive memories in either posture, as shown in Figure 4.

For all participants, there was a significant correlation ($r = .4$) between subjective energy level and ease with which they could change from negative to positive mood. There were no significance differences for gender in all measures except that males reported a significantly higher energy

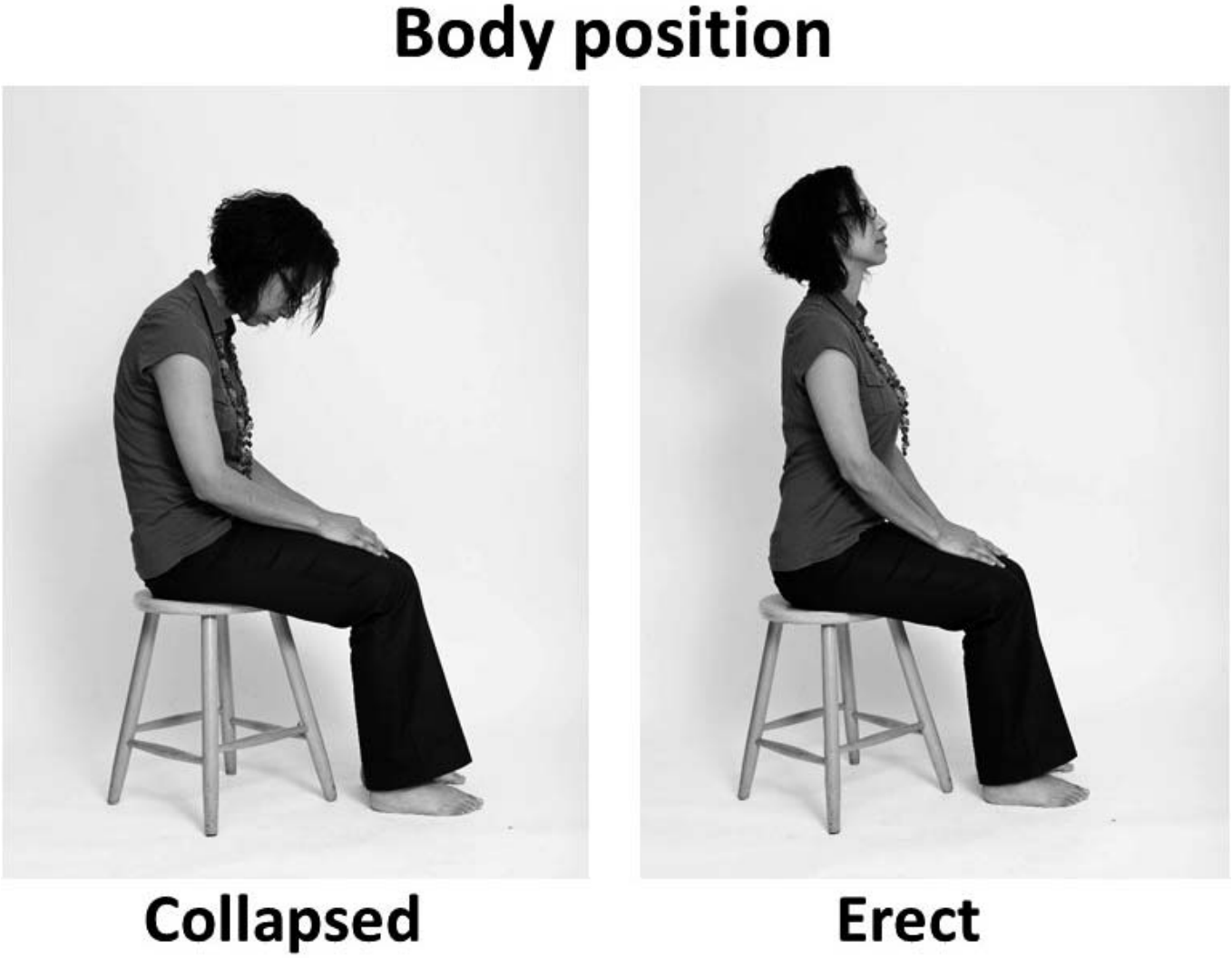

Figure 1. Sitting in a collapsed position and upright position (photo by Jana Asenbrennerova). Reprinted by permission from Gorter and Peper (2011).

level than females ($M = 5.5$, $SD = 3.0$ and $M = 4.7$, $SD = 3.8$, respectively; $t[203] = 2.78$, $p < .01$).

A subset of students also rated their posture when sitting in front of a computer or using a digital device (tablet or cell phone) on a scale from 1 (upright) to 10 (completely slouched). The students with the highest levels of depression over the last 2 years reporting slouching significantly more than those with the lowest level of depression over the last 2 years ($M = 6.4$, $SD = 3.5$ and $M = 4.6$, $SD = 2.6$; $t[46] = 3.5$, $p < .01$).

There were no other order effects except of accessing fewer negative memories in the collapsed posture after accessing positive memories in the erect posture, $t(159) = 2.7$, $p < .01$. Approximately half of the students who also rated being "captured" by their positive or negative memories were significantly more captured by the negative memories in the collapsed posture than in the erect posture, $t(197) = 6.8$, $p < .01$, and were significantly more captured by positive memories in the erect posture than the collapsed posture, $t(197) = 7.6$, $p < .01$, as shown in Figure 5.

Discussion

Posture significantly influenced access to negative and positive memory recall and confirms the report by Wilson and Peper (2004). The collapsed/slouched position was associated with significantly easier access to negative memories. This is a useful clinical observation because ruminating on negative memories tends to decrease subjective energy and increase depressive feelings (Michl, McLaughlin, Shepherd, & Nolen-Hoeksema, 2015). When working with clients to change their cognitions, especially in the treatment of depression, the posture may affect the

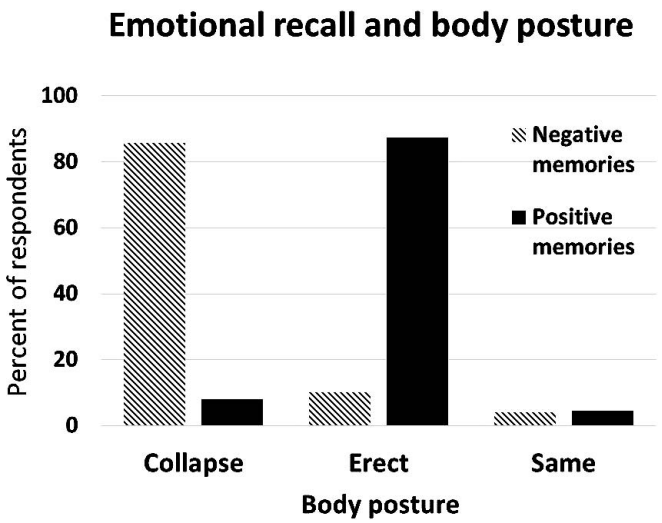

Figure 2. Percent of respondents who reported that it was easier to recall positive or negative memories in an upright or slouched posture.

outcome. Thus, therapists should consider posture retraining as a clinical intervention. This would include teaching clients to change their posture in the office and at home as a strategy to optimize access to positive memories and thereby reduce access or fixation on negative memories. Thus if one is in a negative mood, then slouching could maintain this negative mood while changing body posture to an erect posture, would make it easier to shift to a positive mood.

Physiologically, an erect body posture allows participants to breathe more diaphragmatically because the diaphragm has more space for descent. It is easier for participants to learn slower breathing and increased heart

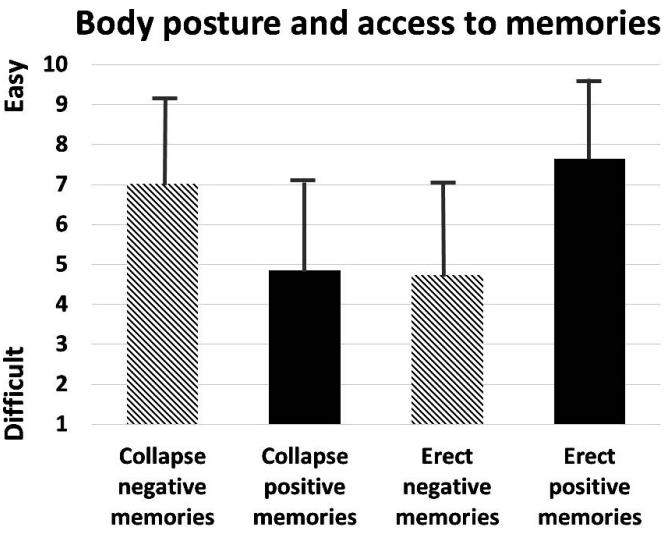

Figure 3. The relative subjective rating in the ease or difficulty of recalling negative and positive memories in collapsed and upright positions.

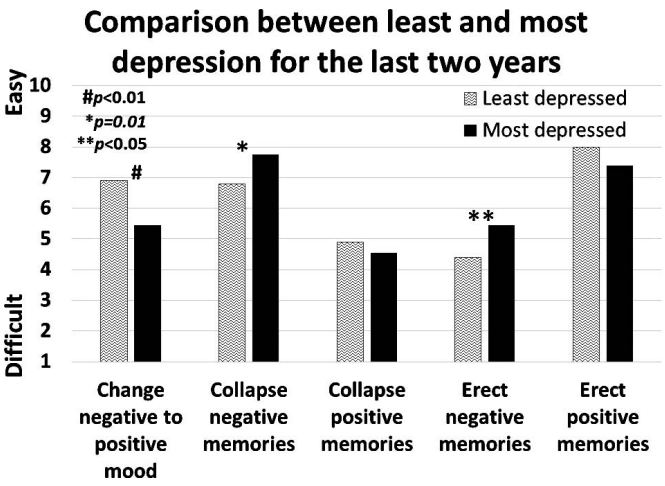

Figure 4. Differences is in memory access for participants with a history of least or most depression.

rate variability while sitting erect as compared to collapsed, as shown in Figure 6 (Mason et al., 2017).

The collapsed position also tends to increase neck and shoulder symptoms. This position is often observed in people who work at the computer or are constantly looking at their cell phone—a position sometimes labeled as the "i-Neck."

Implication for therapy

In most biofeedback and neurofeedback training sessions, posture is not assessed and clients sit in a comfortable chair, which automatically causes a slouched position. Similarly, at home, most clients sit on an easy chair or couch, which lets them slouch as they watch TV or surf the web. Finally, most people slouch when looking at their cellphone, tablet, or the computer screen (Guan et al., 2016). They usually

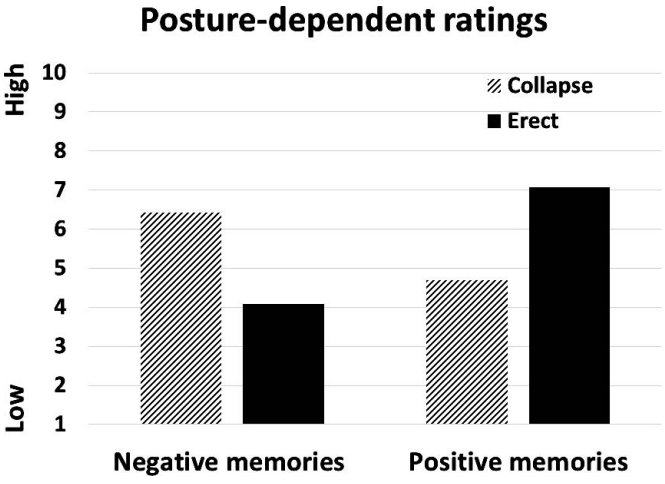

Figure 5. Subjective rating of being captured by negative and positive memories depending upon position.

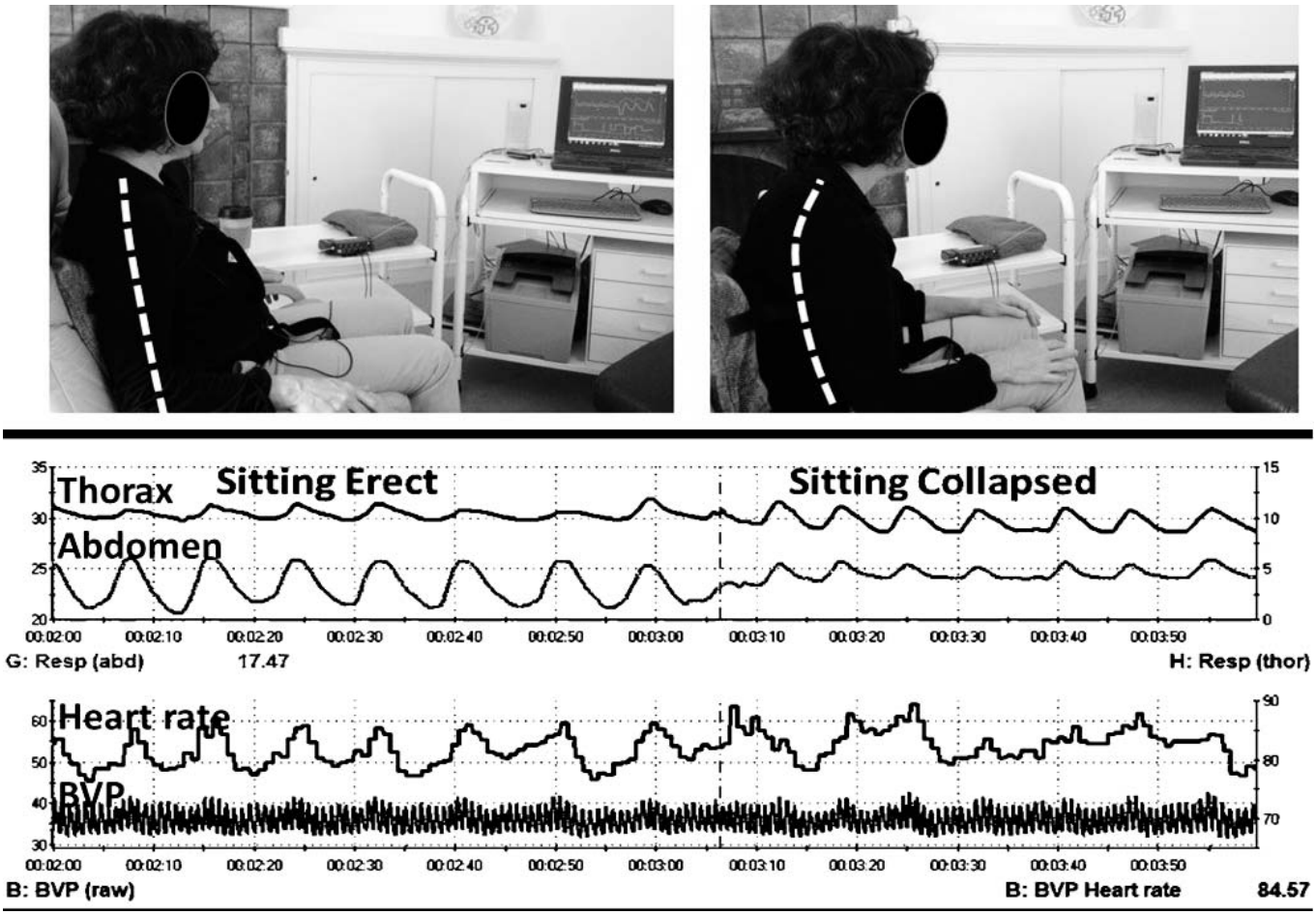

Figure 6. Effect of posture on respiratory breathing pattern and heart rate variability.

only become aware of slouching when they experience neck, shoulder, or back discomfort.

Clients and therapists are usually not aware that a slouched posture may decrease the client's energy level and increase the prevalence of a negative mood. Thus, we recommend that therapists incorporate posture awareness and training to optimize access to positive imagery and increase energy.

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