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# Physical Posture: Could It Have Regulatory or Feedback Effects on Motivation and Emotion?[1]

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*Four studies were conducted in a laboratory setting to examine whether variations in physical posture can have a regulatory or feedback role affecting motivation and emotion. The results of the first study, which were replicated in the second study, revealed that subjects who had been temporarily placed in a slumped, depressed physical posture later appeared to develop helplessness more readily, as assessed by their lack of persistence in a standard learned helplessness task, than did subjects who had been placed in an expansive, upright posture; surprisingly, there were no differences in verbal reports. The third study established that physical posture was an important cue in observers' verbal reports of depression in another person. The fourth study further explored the role of posture in self-reports of emotion using another posture. The results indicated that subjects who were placed in a hunched, threatened physical posture verbally reported self-perceptions of greater stress than subjects who were placed in a relaxed position. The findings of these studies are interpreted in terms of self-perception theory. It is suggested that physical postures of the body are one of several types of cues that can affect emotional experience and behavior.*

Recent research on the relationship between facial expressions and emotional experience has begun to focus more closely on the nature of the factors underlying that relationship (e.g., Laird, 1974). This research has

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questioned whether the facial expressions of a person not only socially communicate an emotional reaction but also have a feedback function in the regulation of that reaction. In two of the first experiments, Laird tried to manipulate his subjects' facial expressions into a smile or a frown without specifically asking them to make those expressions or allowing them to be aware of the nature of the expressions and the relevance of them to his experiments. This was done by telling subjects to contract certain facial muscles (e.g., "bring your eyebrows down and together and contract your jaw" to achieve a "frowning" expression). Using the pretense that the dependent measures were to control for random mood fluctuation and were incidental to the true purposes of the experiment, Laird asked subjects to rate their own emotional states. He found that subjects rated their emotions as more elated and as less aggressive in quality when they were "smiling" than when they were frowning." Since Laird published his studies, a number of other studies have replicated and confirmed the basic finding that proprioceptive cues from facial feedback can affect the quality of emotion (e.g., Duncan & Laird, 1980; Laird & Crosby, 1974; McArthur, Solomon, & Jaffe, 1980). Moreover, other studies have shown that facial feedback can also affect the intensity of emotion (e.g., Lanzetta, Cartwright-Smith, & Kleck, 1976; Vaughn & Lanzetta, 1981; see Buck, 1980, for a review). Although such facial feedback effects are sometimes not found (e.g., Torganeau & Ellsworth, 1979), it seems to be reasonably well established now that peripheral feedback from the face can contribute to emotional experience.

Previous research on the effects of peripheral expressive feedback on emotion has largely overlooked the effects of the *physical posture* of a person. This neglect of postures is surprising because a person normally socially communicates his/her current feelings and immediate outlook to other people with differences in posture (Mehrabian, 1971, 1972; also, James, 1922). Mehrabian's work indicates that body postures are quite varied and match closely with different emotional states, such as differences between submission and dominance, appehension and calm, and liking and disliking. Thus, it seems likely that postures could also contribute to these feelings. In this context, the present studies examined the possible peripheral feedback effects of physical postures. This was done through an experimental design in which the physical postures of subjects were modified, and the effects of these changes on emotion and behavior were assessed.

The likelihood that the postures of a person's body can have feedback effects on his/her emotional experience and inner states has been implied by a number of theorists (Izard, 1971, 1972; James, 1922; Lowen, 1975; Tomkins, 1962). William James, for example, postulated that bodily changes, including those in physical posture, are an integral part of emotional experience, as well as a major influence on emotion. For James, physical bodily changes *are* the emotion and are critical cues for the emotion. Thus, a person doesn't cringe because he/she is frightened, but rather, the person knows he/she is frightened because he/she notices that his/her body is cringing. Izard and Tomkins have each postulated that the expressive facial and postural responses of a person influence his/her emotional experiences through innate neuromuscular feedback mechanisms. Although couched in different terms, Lowen's nonverbal psychotherapeutic theory of "bioenergetics" seems to similarly emphasize that the body postures of a person have a regulatory function in his/her emotional experience that is based on a neuromuscular excitation mechanism.

Possible peripheral feedback effects of physical posture can also be very profitably understood within the framework of Bem's (1967, 1972) theory of self-perception. Bem assumes that to the extent that internal cues for emotions are weak, ambiguous, or unavailable, a person is functionally in the same position as an outside observer who must infer his/her emotions from self-observations. Elaborating this self-perception theory, Laird (1974) has proposed that a person identifies his/her emotional experiences on the basis of "interpretations" of his/her expressive-nonverbal behavior and its social context. Laird says that it is much as if a person makes the self-observation "I am smiling" and then infers, "There is no reason to deny the relevance of this expressive behavior, so I must be feeling happy." This position implies that proprioceptive stimulation from postures, facial expressions, and other peripheral responses constitutes one of several possible types of cues (or "data," cf. Laird, 1974) that can contribute to emotion through a process of self-perception. Unlike what some theories might suggest, self-perception theory does *not* imply that expressive behaviors are *necessary or sufficient conditions* (see Buck, 1980, for a discussion of this issue) for the occurrence of any emotion.

These studies and theories suggest that it might prove fruitful to examine the effects of body postures on behavior and emotional experience. The following studies attempted to investigate experimentally the hypothesis that body postures can have a regulatory function, each study focusing on a different type of body posture pattern and type of emotional reaction or internal state.

## STUDY 1 – HELPLESSNESS PERFORMANCE DEFICITS AND STOOPED POSTURE

Several writers have noted a relationship between postural responses and states of depression and helplessness. For example, Mendels (1970) has stated that "appearance frequently signals the depressed person. His sad, unhappy face, dejected attitude and bowed posture, strongly suggest the condition" (p. 9). Lowen (1975) has similarly written that "the individual with a so-called noble carriage or regal bearing can be distinguished from an individual whose bent back, rounded shoulders, and slightly bowed head indicate submission to burdens weighing heavily on him" (p. 55).

Seligman (1975) has identified situational or reactive depression with "learned helplessness," which results from the learning or perception that aversive events are generally independent of the person's behavior and hence uncontrollable. Such learned helplessness leads to a loss of appropriate motivation to respond, which, in turn, causes a deterioration in the person's willingness to persist in frustrating tasks of problem solving. Findings by Glass and Singer (1972) and others (see Seligman, 1975) provide some basis for the assumption that a sense of helplessness lowers persistence on a task such as the one to be used here.

The first of the persent studies attempted to examine the specific possible peripheral feedback effects of a stooped, relative to an upright, physical posture in contributing to the performance deficits that are seen in learned helplessness. The study tested the self-perception hypothesis that physical postures don't just nonverbally hint at a person's depressed mood or readiness to behave helplessly, but that they have stimulus properties that can reinforce or change a person's own definition of a situation and thus his subsequent behavior. Through a slumped-over, relative to an upright, physical posture, a person may, in effect, be nonverbally depreciating himself/herself and thus increase the person's *readiness to behave helplessly* in a subsequent task that requires persistence.

In order to manipulate physical posture without revealing the purpose of the study, a cover story and pretext analogous to the one used by Laird (1974) was used to put half of the subjects into a slumped-over body posture and the remaining subjects into an expansive body posture. There was no mention of the "emotional" nature of the physical postures, of their specific nature, or of their true relevance to the experiment. When subjects subsequently resumed normal postures, their persistence was measured on a frustrating task. This persistence was measured by a second experimenter, who was blind to their previous posture.

## Method

### *Overview*

Under the pretext that the experimenter was collecting physiological measurements, half of the subjects were placed in a slumped physical posture and the other half were placed in an upwardly expansive physical posture. While seated in this posture, the subjects received false success feedback from a previously completed test. (It was assumed that success and failure fall on a continuum so far as helplessness or mastery are concerned—see Abramson, Seligman, & Teasdale, 1978—and that greater helplessness might be produced at any point of this continuum by modifying physical posture.) Subsequently, in what was supposedly a second, separate study, another experimenter in another room measured the subject's persistence on a frustrating task.

### *Subjects*

Subjects were 20 undergraduate males in introductory psychology classes at the University of Maryland who received extra credit toward their course grade for participation. They were randomly assigned to the two experimental conditions: Slumped physical position and Expansive physical position. Two subjects (one in each condition) proved to be suspicious of the experimenters' intent when questioned in the postexperimental interview. Their results were excluded from analysis.

### *Procedure*

The subject was told that the purpose of the first study was to validate new test problems relating to spatial thinking. Experimenter 1 administered the test, a shortened version of the Bennett, Seashore, and Westman Spatial Relations Form of the Differential Aptitude Test (1947).

While the subject awaited the scoring of the test, he was asked to participate in a short physiological experiment conducted in another room by Experimenter 2. Experimenter 2 told him that she was trying to gather information about the relationship between muscle response and galvanic skin response. To do this, "electrodes," hooked up to several impressive-looking machines with dials and lights, were attached to the subject's neck and wrist. The experimenter said there was no danger of electric shock. Experimenter 2 then said that she needed information about muscle activity under controlled conditions and that she would position the subject exactly as she wanted him to sit. She then placed the subject in one of the following two positions (which in each case were held for about 8 minutes).

*Slumped Physical Posture.* Experimenter 2 pushed the subject's torso so that it was bent forward at the waist, and his chest and neck dropped downward. The subject's head and neck was pushed forward and down so that his back was stooped and hunched over, and his head dropped and slumped from the neck.

*Upright Physical Posture.* Experimenter 2 pushed the subject's shoulders from the spine and straightened his spine so that his back was erect and upright. She raised his shoulders slightly and pulled them back so that the chest was posed in a full and expansive position. The subject's head was raised slightly at the chin so that he looked forward and slightly upward.

During the time that the subject was in the room, Experimenter 2 pretended to monitor his physiological readings and readjusted his posture as necessary to maintain the posture in which he had been placed. After the subject had been in the position for about 3 minutes, he was given the success feedback, a note indicating that he had scored in the top quarter of all the people who had previously taken the test. The subject was given questionnaires to complete containing 13 adjectives (e.g., *sad, strong, weak*) that assessed his feelings or mood state. These were attached to a clipboard to ensure as little disturbance of the body posture as possible. (It was explained that the purpose of this procedure was to control for random mood fluctuations that might affect the instrumentation.)

When the subject had finished the questionnaires, Experimenter 2 sent him back to the room where he had been at the beginning of the experiment. Experimenter 1, who was blind to the subject's experimental condition or posture, then administered what she described as a second test of spatial thinking. The test was actually a measure of persistence at solving insoluble puzzles (see Glass & Singer, 1972).

In this task, the subject worked to solve four geometric puzzles, the first two being insoluble and the last two soluble. To solve each puzzle, the subject had to trace over a diagram of the figure without lifting his pencil or going over any line twice. It was assumed that the fewer trials a subject spent on the insoluble puzzle, the lower his tolerance for an intrinsically frustrating task. The instructions and procedure were identical to that used by Glass and Singer (1972) except that the subject was signaled by Experimenter 1 calling "time" every 20 seconds, at which time he had to decide to take a card from the pile he had been working on or to go on to a new pile. This procedure was intended to reduce variability between subjects in the amount of time spent on any one card and variability in the total number of cards used. There were 20 trials during the approximately 7-minute session.

When the subject had finished, he was probed for suspicion of the purpose of the experiment before being thoroughly debriefed and allowed to leave.

Table I. Effects of Slumped Versus Expansive Posture Conditions

| | Slumped body position ($N = 9$) | Upright body position ($N = 9$) |
|---|---|---|
| | Study 1 | |
| Means for persistence on insoluble puzzles[a] | 10.78 | 17.11 |
| Self-report measures[b] | | |
| Self-confident | 6.1 | 6.8 |
| Feel strong and competent | 6.1 | 6.5 |
| Sad and cheerless | 2.2 | 3.2 |
| Fatigued | 5.6 | 4.6 |
| | Study 2: Replication | |
| Means for persistence on insoluble puzzles[a] | 8.20 | 13.18 |
| Self-report measures[b] | | |
| Cheerful | 5.88 | 6.7 |
| Tired | 5.11 | 4.18 |
| Drowsy | 5.44 | 4.36 |
| Sad | 5.34 | 5.28 |

[a] Higher numbers indicate greater persistence on the insoluble puzzles. *N*s are given in parenthesis. The possible range of scores was from 0 to 20.
[b] Higher numbers indicate higher scores on the self-report measures (on a 1-to-10 scale).

## Results

The results for persistence on a frustrating task, the behavioral indicator of helplessness and depression, can be seen in Table I. Table I indicates that the results strongly supported the hypothesis. There was much lower persistence on the insoluble puzzles by subjects who had been positioned in a stooped posture before the task than by subjects who had been positioned in an upwardly expansive posture ($F(1, 16) = 7.73$, $p < .02$). These results reflect lingering aftereffects of the manipulation when subjects were no longer in the postures.

Subjects' verbal reports of their subjective psychological states were assessed by means of the 13 items on the questionnaires. There were no significant differences between the two posture conditions for subjects' verbal reports of self-confidence, feelings of strength or weakness, depressed affect, or other self-report measures (all $F$s $< 2$). In addition, there were no differences for feelings of tiredness ($F < 2$). The means for some of these measures are presented in Table I.

# STUDY 2 – REPLICATION OF STUDY 1

## Method

### *Overview*

Study 2 attempted to replicate the first study using (a) a slightly modified experimental procedure for manipulating physical postures, (b) regionally different undergraduate subjects, and (c) different experimenters.

### *Subjects*

Subjects were 20 undergraduates (9 men and 11 women) at Texas A&M University who received credit toward their course grade for participation. They were randomly assigned to the two experimental conditions: slumped physical posture and upright physical posture.

### *Procedure*

The rationale for the study was the same as for Study 1; subjects received success feedback from the same test while posed in a body position under the pretext that the experiment was collecting biofeedback measurements; headbands with electrodes were used (in contrast to electrodes on the neck and wrist in Study 1). Half the subjects were seated in a slumped body posture and half in an upright body posture, according to the following instructions that were read to the subject.

> *Slumped Physical Posture.* Scoot your chair back. [Pause] Sit back in your chair. [Pause] Put your feet together and slide them completely under your chair. [Pause] Drop your rib cage and curl your shoulders forward and inward. [Pause] Drop your head.

> *Upright Physical Posture.* Scoot your chair back. [Pause] Sit back in your chair. [Pause] Plant your feet flat on the floor underneath your knees, shoulders' width apart. [Pause] Lift your rib cage up. [Pause] In other words, lift the upper part of your body up. [Pause] Lift your shoulders and bring them back slightly. [Pause] Elevate your chin.

In both of the positions, the experimenter paused after each statement, before going on to the next part of the instructions. He or she was careful not to mimic the position to be taken by the subject in any way. The experimenter concluded the instructions by saying, "try to remain in this position until I tell you to stop."

The procedure continued as in Study 1, with subjects completing the same questionnaires and then going to another room where the measure of persistence at solving insoluble puzzles was administered by an experimenter who was blind to the posture manipulation.

## RESULTS

The results for persistence on the insoluble puzzles indicated a significant difference ($t(18) = 2.03$, $p < .05$, one-tailed); subjects in the slump-over physical posture persisted less ($M = 8.2$ puzzles) than subjects in the upright physical posture ($M = 13.2$ puzzles). (It might be noted that the male and female subjects showed the same trends, although the effect of changing posture was slightly, but not significantly, greater for the males.)

Analyses of results of the self-report measures of emotional experience revealed no statistically significant differences (all $t$'s $< 1.5$, $p$'s = n.s.). Subjects in the slumped posture was no more tired, sad, cheerful, etc. (see Table I for means).

## Discussion

Taken together, studies 1 and 2 provide strong support for the prediction that the subjects who had been set into the slumped-over posture would show lower persistence on the subsequent learned helplessness task than the subjects who had been set into the upright posture. This residual aftereffect of the physical posture treatment on performance was obtained when subjects were in a different experimental room, with a different experimenter, during a time when they were no longer in the physical postures. It must be clearly remembered here that the experimenters who presented the persistence task were blind to the subject's previous posture. The end result of this methodological procedure is that the significant carry-over effect (or aftereffects) of the physical posture manipulation are relatively closed to demand effects or experimenter bias interpretations. In this regard, Buck (1980) has criticized many facial feedback studies for being open to such interpretations.

The absence of self-report differences in both studies seems to further weigh against the possibility of a criticism in terms of demand characteristics. If subjects had been merely responding to demand effects, they would have been expected to have shown significant differences in their self-reports of mood, even before they would do so for the less obvious behavioral measure, which was assessed later in a different room. The demand effects interpretation can further be countered by the fact that careful postexperimental debriefing found little suspicion by the subjects of the physical postural manipulation, or suspicion by them of the relevance of the manipulation of physical posture to the experiment. Subjects seemed to believe that they were in some soft of a "biofeedback" experiment, and this seemed to provide a perfectly plausible explanation for the positions they were put into.

Another plausible alternative explanation for the first study is that the more slumped-over physical posture produced a "physiological deficit" (for example, fatigue, discomfort) that lowered subsequent persistance. The present study found no support for this with relevant self-report measures. In addition, Riskind (1982) included an "uncomfortable tense" control condition in his experiment. He found that this condition produced greater "tiredness" and "tenseness" than the slumped-over physical posture, but did *not* produce lower persistence. To the contrary, the control condition seemed to produce higher subsequent persistence on the insoluble puzzles task than the slumped-over physical posture did; thus, the "physiological deficit" explanation does not appear to be either plausible or promising.

How can the puzzling absence of self-report differences be explained? To start with, it is possible that self-perceptions of being in a slumped, relative to an upright, physical posture has a role as it affects *future readiness to develop* learned helplessness, when subjects are later faced with physical postures, by themselves, may not immediately produce any changes in self-reports of affective experience, prior to exposure to insoluble problems or other behavioral demands. As Nisbett and Valins (1972) point out, self-perception may initiate a process of hypothesis testing as an individual seeks to explain his views of the self. Later on, evidence from other studies will be discussed that is directly pertinent to this interpretation (Riskind, 1982).

A second plausible interpretation can also be offered. This is that the null self-report results reflect a relative incapacity of people to notice depressed affect in themselves, particularly during the initial phases of a sad mood. Consistent with this idea, both Miller and Norman (1979) and Zuroff (1981) concluded that learned helplessness training has not been shown to have a consistent relation with affect (cf. Buchwald, Coyne, & Cole, 1978). In a like manner, several experiments to induce depressed moods in typical undergraduates through different means (e.g., guilt induction) found that the subjects subsequently act more depressed on behavioral indicators, yet don't seem to notice depressed affect in themselves in their self-reports (Blatt, Quinlan, & D'Afflitti, 1972; Wallington, 1973). The difficulty in initially identifying depressed affect on any basis other than overt behavior itself is also frequently found in instances of actual clinical depression, as Mendels (1970) stated: "For many depressives, the first signs of the illness are in the area of their increasing inability to cope with their work and responsibilities. This may be the only overt manifestation of the illness at first" (p. 8).

Results of a recent study by McArthur et al. (1980) might appear to contradict this latter argument of the relative incapacity of people to initially detect sad affect. They found in a study on facial feedback that a "frowning" face (relative to a "neutral" face) had effects on sad mood, though this effect was obtained only for normal weight and not for overweight subjects. But McArthur et al. used a repeated-measures, within-subjects design, in which subjects were assigned to each of the facial expressions (in counterbalanced order). Such a design would probably be far more sensitive to detecting even very slight changes in affect than would a between-subjects design, such as was used here, and this apparently occurred only for a subgroup of their subjects. These many methodological differences make it difficult to compare the McArthur et al. study directly with the other studies.

The findings of the present study might also be interpreted by other explanations. These alternatives, as well as other evidence, will be considered in the final discussion. First, however, let us turn more closely to one of the assumptions underlying explanations based on the self-perception framework: To what extent do physical postures communicate emotional states?

## STUDY 3 – PERCEPTION OF OTHERS' EMOTIONS BASED ON PHYSICAL POSTURE CUES

### Method

#### *Design Overview*

Subjects were asked to judge the emotional responses of other persons who were photographically depicted in different physical postures. Specifically, individuals were shown in one of two seated physical postures: either a slumped or an upright position. Subjects were then asked to respond to a series of questions on the Hammen-Krantz depression scale in the same way that they imagined that the character in the photograph would do (see Krantz & Hammen, 1979, to be described below). Subjects were exposed to both photographs; thus a within-subjects design was used, with depicted physical posture as a repeated measures factor.

#### *Subjects*

Subjects were 28 undergraduates (13 males and 15 females) at Texas A&M University who participated in the study as partial fulfillment for a course requirement in introductory psychology.

### *Procedure*

When subjects in each of two sessions (with 14 subjects in each) arrived for the study, it was explained that the study's purpose was to examine factors that might affect how individuals respond to common everyday problem situations. The subjects were asked to respond to the Hammen–Krantz scale, which was modified to contain mimeographs of the central character in each story: The characters were depicted consistently in either slumped-over or upright physical postures. The faces of the persons in the photographs were obscured to nullify any unintended facial-cue variations. This helped guarantee that the only difference between the questionnaire booklets for the two conditions (slumped versus upright physical posture) was for physical posture.

The Hammen-Krantz scale (described more extensively by Krantz & Hammen, 1979) consists of six short descriptions of problem situations that are common to college students (e.g., achievement, social isolation). Subjects in the present study who responded to the scale were asked to put themselves in the place of the central character, whose picture was depicted in each story, and to imagine what he or she felt. Following each story were sets of four multiple-choice options that were designed to measure two separate factors or dimensions that are associated with depression. One response option represents negative cognitive interpretations of the problem situation that contains one of Beck's (1976) specific cognitive distortions, such as depressive, helpless overgeneralizations (e.g., "I will never, ever, meet anyone who will like me"). Another response option associated with each story represents a negative affective response (e.g., "Being alone makes me feel sad") to the problem situation but does not involve any of the specific cognitive distortions that Beck's (1976) theory highlights. The remaining two response options represent nondepressed responses. Subjects were asked to choose the one option that best represented the probable reaction of the person in the supplied picture to the problem situation.

When subjects had finished the first Hammen–Krantz, which consistently showed the central characters in one or the other of the physical postures, they were asked to respond to a second Hammen–Krantz in which the supplied pictures depicted all of the central characters consistently in the opposite physical posture from the one in the first booklet. Physical posture, a repeated-measures factor, was counterbalanced for order in the design.

When subjects finished the second of the Hammen–Krantz scales, they were fully debriefed and allowed to leave.

## Results

The Hammen–Krantz (HK) results of this study were analyzed by means of a 2(slumped versus upright depicted physical posture) × 2(depressed HK cognitive distortion versus depressed HK affect) × 2(order) analysis of variance, with physical posture and Hammen–Krantz depression score as repeated-measure factors (cf. Winer, 1962). The means for the perceptions that subjects inferred of the central characters depicted in different physical postures are presented in Table II. A preliminary analysis found that the sex-gender of subjects had no main effects or interaction effects with any other factor (all *F*s $< 2$); thus, the gender of subjects will not be considered any further in the results.

As can be seen from Table II, the persons in the problem scenarios were perceived as more generally depressed and helpless when they were depicted in a slumped-over, rather than in an upright, physical posture (*M*'s = 15.89 vs. 7.72). Analysis revealed that the main effect for depicted physical posture was statistically significant ($F(1, 26) = 33.10$, $p < .001$). Thus, the major prediction of this study was strongly supported: Emotions are inferred on the basis of physical posture cues.

It can be seen from Table II that the main effect of depicted physical posture was much more pronounced for the depressed cognitive distortion score than for the depressed affect score of the Hammen–Krantz. The analysis of variance revealed that the interaction between depicted physical posture and Hammen-Krantz depression score was statistically significant ($F(1, 26) = 16.82$, $p < .001$). The persons in the problem stories were perceived as cognitively inferring more depressed and helpless beliefs about themselves when depicted in a slumped-over, rather than in an upright, physical posture (*M*'s = 9.43 vs. 1.69, simple effect $F(1, 26) = 37.93$, $p < .001$). But the persons were not perceived as significantly more depressed in affect (that did not involve cognitive distortion) when depicted in a slumped

**Table II.** Perception of Others' Depression Based on Posture Cues[a]

| | Depicted physical posture | |
|---|---|---|
| Hammen-Krantz measure | Slumped body position ($N = 14$) | Upright body position ($N = 14$) |
| Overall depression score | 15.89 | 7.72 |
| Depressed and helpless beliefs | 9.43 | 1.68 |
| Sad affect | 6.46 | 6.04 |

[a] Higher numbers indicate higher scores for perceptions of depression in others.

over, rather than in an upright, physical posture ($M$'s = 6.46 vs. 6.04, simple effect $p$ = n.s.). (As these different scores were obtained from a forced-choice format, caution should be used in interpreting the interaction effect.)

## STUDY 4 – SELF-PERCEPTIONS OF STRESS AND PHYSICAL POSTURE

Study 3 provided evidence that postural cues can communicate emotions. Specifically, a slumped, relative to an upright, physical posture, communicates greater depression, at least to observers. These findings lend support to our notion that self-perception processes may be involved in understanding the effects of physical posture. Some of the problems with measuring self-perceptions of one's own level of depression have already been discussed. Hence, in order to test whether the self-perception explanation supported by Study 3 holds when applied to an individual's own experience of emotion, a different posture-emotion complex was selected to be manipulated: tenseness and stress reactions.

Specifically, Study 4 attempted to examine the effects of a tensed (or threatened) physical posture, a cue that can affect a person's susceptibility to stress, relative to a relaxed physical posture. Nonverbal communication research (Mehrabian, 1971, 1972) has indicated that through physical posture (for example, a rigidly symmetrical posture and hunched shoulders) a person has the capacity to send nonverbal messages to others of *experienced threat.* Is it possible that the person has the capacity to send similar messages of emotion to his/her self-perceptions with physical posture?

While no data seem to exist bearing directly on this hypothesis, it is supported indirectly: First, it is supported by the vast self-perception literature (cf. Bem, 1972), and second, by studies on deep muscle relaxation (e.g., Paul, 1969). The latter studies (for a review, see Tarler-Benlolo, 1978) have supported Jacobson's (1938) and Wolpe's (1962) idea that relaxation of the skeletal muscles is incompatible with anxiety and reduces stress. With regard to this, a hunched-up physical posture is a more tense physical posture, and generalized feelings of tenseness might also provide data for self-perception (cf. Bem, 1972). For self-perception theory, of course, it would *not* be the hunched-up, tensed physical posture itself that is important: The person's self-perceptions and interpretation of bodily changes would have a primary role in determining stress reactions.

Subjects in this last study were led, without their knowledge, to assume either a hunched-up (tense and threatened) or a relaxed physical posture in either a high threat or a low threat situation. The cover story used was analogous to that of the previous study (also, of Laird, 1974). Hence, the true purpose of the physical posture manipulation was again cloaked with a cover story in order to conceal it from subjects.

Above and beyond the experimental manipulation of physical posture, this last study also explored the effect of a *contextual* manipulation. This was a manipulation of the level of *threat* that subjects seemed to objectively face in the external situation. According to our self-perception hypothesis, a subject might be predicted to be more likely to infer that a more hunched (tensed) physical posture reveals that he/she is more stressed by the situation when it is recognized that the situation is objectively threatening (high external threat). But when the situation is objectively less threatening (low external threat), a subject might be more likely to discount his/her tensed (threatened) posture and not to interpret the posture as showing that he/she is stressed.

## Method

### *Overview*

Under the pretext that the experimenter was collecting physiological measurements, half of the subjects were placed in a tense body posture and the other half were placed in a relaxed body posture. Crosscutting the posture manipulation, half of the subjects were told that they would take a test to measure their intelligence in a second experiment (high threat conditions), and half were told that they would take a test unrelated to intelligence (low threat conditions). Intelligence is one of college students' most valued and salient attributes. As such, any challenge to their level of intelligence may be quite threatening. For this reason, taking a supposedly well-established IQ test was chosen as a way of inducing perceived threat. Following these manipulations of physical posture and threat, self-perceptions of stress and anxiety were measured. (It is important to note that partial protection against demand effects or experimenter bias—(Buck, 1980)—was achieved in two ways: (1) the stress measures were described as included to control for random mood fluctuations that could affect physiological measurements, and (2) the experimenter who administered these measures and who manipulated physical posture was kept blind to the threat condition of the subject.)

### *Subjects*

Subjects were 41 undergraduate males enrolled in psychology classes at the University of Maryland who received credit toward their course grade for participation. They were randomly assigned to four experimental conditions: Tensed (threatened) posture-High threat; Tensed (threatened) posture-Low threat; Relaxed posture-High threat; Relaxed posture-Low threat. Three subjects were suspecious of the experiment's intent and their results were excluded from analysis.

## *Procedure*

The subject was told that he was participating in a study concerned with the effects of body positions on nerve impulse firing frequency. To do this, "electrodes," hooked up to several impressive-looking machines with dials and lights, were attached to the subject's wrist. Experimenter 1 said he needed information about nerve activity under controlled conditions and that he would position the subject exactly as he should sit.[3]

*Body Posture Manipulation.* Experimenter 1 placed the subject in one of the following two positions.

1. Tensed (threatened) posture: Experimenter 1 tensed and raised the subject's shoulders until they were hunched and raised against the subject's neck, which is comparable to observed posture under conditions in which persons are perceived as threatened or anxious (see Mehrabian, 1972). The subject's legs were placed close together in a rigid, symmetrical position, and Experimenter 1 straightened the subject's back so that it was tensed and not supported by the chair.

2. Relaxed posture: Experimenter 1 placed the subject's shoulders in a loose and more natural position. The subject's legs were placed in an open, slightly assymmetrical position, comparable to observed physical posture under conditions in which persons are not socially perceived as anxious (see Mehrabian, 1972). Experimenter 1 placed the subject's back against the chair to minimize tenseness.

During the time that the subject was in the room, Experimenter 1 pretended to monitor physiological readings. Also the experimenter readjusted the subject's posture as necessary to maintain the position in which he had been placed.

*Threat Manipulation.* While the subject remained seated in position, Experimenter 2, who had been in the room, asked the subject to read in order to save time, a description of another experiment in which the subject would participate during the subsequent hour. The description of the experiment varied according to condition.

[3]Our thanks go to Christian Hopkins, Maurice Williams, and Stephanie Spicer for their assistance as experimenters in this study.

1. High threat: The description stated that the subject would be taking a test of spatial thinking. The test was highly correlated with intellectual ability and was widely accepted as a valid measure of intelligence that the university was currently considering adopting as a standard instrument for campus use.

2. Low threat: The description stated that the subject would be taking a test of spatial thinking. The test measured highly specific spatial skills unrelated or uncorrelated to general intelligence; thus, at times highly intelligent people scored low and less intelligent people scored high on the test, but this had no implication for general ability.

The subject (still in assigned posture) read the description of the experiment. Experimenter 1 (blind to instructions with respect to threat conditions) then asked him to complete some questionnaires. These assessed the subject's self-perceptions of stress and causal attributions for performance on the expected test. Although the self-perceptions of stress constituted the main dependent measures, they were presented as incidental to the true purposes of the study; the pretense used was that they were given only to control for random mood fluctuations that might affect the physiological readings.

After the questionnaires were completed, Experimenter 1 detached the electrodes and left the room while Experimenter 2 administered the test of spatial thinking. The test was actually the same measure of persistence at solving insoluble puzzles used previously (studies 1 and 2). There were no expectations about posture effects on this measure in this study.

When the subject had finished, he was probed for suspicion before being thoroughly debriefed and allowed to leave.

## Results

### *Self-Perceptions of Stress*

Self-perceptions of stress reactions were assessed by means of two self-report measures. The first measure consisted of the average of each subject's ratings on a 10-point scale (0 = agree, 10 = disagree) for each of seven "mood adjectives": *apprehensive, anxious, nervous, peaceful, relaxed, calm, tense.* The ratings for those adjectives representing the unstressed end of the continuum were recorded so that each subject's ratings could be combined into a composite measure of self-reported stress reactions.

The second of the measures was provided by the average of ratings on 10-point scales for each of 16 statements describing physiological-symptom reactions of emotional stress, such as, "There is a knotted feeling in my stomach," "I am all wound up inside," "There is an excitement, a sense of being keyed up, overstimulated"; these statements were taken from the Zung Anxiety Rating Scale (1971). The ratings for those statements representing the unstressed end of the continuum were recorded so that each subject's ratings would be combined into a single composite measure of physical (or physiological) symptoms of stress reactions.

It is clearly apparent from Table III that the data for both these measures were in agreement with the hypothesis that the physical posture changes would affect self-perceptions of stress reactions. Subject who had been positioned in a tensed (threatened) physical posture reported higher stress ratings and more physiological symptoms of stress reactions than subjects positioned in a relaxed physical posture. The analyses of variance on these data revealed that the main effects for the changes in physical posture were significant at the .03 level for both measure ($F(1, 34) = 5.23$ for the adjectives measures, and $F(1, 34) = 5.76$ for the symptoms measure). The analyses, however, found no main effects for the external threat variable ($F$s $< 2$). These results may suggest that the measure were not sensitive to perceived external threat and that more adequate measures might have tapped into differences in subjects' perceptions of the future test they would take.

The self-perception model that guided this experiment predicted a difference in rated stress reactions for changes in physical posture in the high threat condition; on the other hand, the difference in rated stress reactions might be in the same general direction in the low threat condition, but was not predicted to be significant. As is apparent from Table III, this is precisely the pattern of results that was obtained: Planned simple effects

**Table III.** Effects of Body Posture Tension and Degree of External Threat – Mean Scores

| | High threat | | Low threat | |
|---|---|---|---|---|
| Condition | Tense (9)[a] | Relaxed (10) | Tense (9) | Relaxed (10) |
| Stress-mood adjectives[b] | 6.4 | 4.2 | 5.3 | 4.6 |
| Physiological symptoms of stress[c] | 4.1 | 2.9 | 3.4 | 3.1 |
| Attributed task difficulty[d] | 24.4 | 17.5 | 18.6 | 28.5 |

[a] *N*s are given in parentheses.
[b] The higher the number, the greater the stress (on a 1-to-10 scale).
[c] The higher the number, the greater the physiological symptoms of stress (on a 1-to-10 scale).
[d] The higher the number, the greater the role attributed to task difficulty.

analyses revealed that the differences in rated stress reactions between a tensed (threatened) and a relaxed physical posture were statistically significant in the high external threat condition ($p$'s $< .02$ for both measures); but as the self-perception model predicted, the differences in rated stress reactions were *not* statistically significant in the low external threat condition ($F$s $< 2$, $p$'s = n.s.). These predicted simple effect results constitute support for a self-perception model of physical posture feedback.

### *Attributions of Causality and Other Results*

Based on self-perception, it is likely that some causal attributions (which are kinds of belief-states) might be inferred at least partially on the basis of physical posture behavior. To explore this possibility, the present subjects were asked to divide 100 points among four possible causes of success and failure—ability, effect, task difficulty, and luck. This was to be done according to the importance that subjects expected each factor would have in determining the outcome of the next test they would take (which was differently described by their threat manipulation instructions).

It can be seen from Table III that causal attributions for the factor of task difficulty were influenced both by changes in physical posture and by manipulated task threat (interaction $F(1, 37) = 5.5, p < .03$). The greatest attributions to the task occurred under two conditions: (1) high task threat and hunched posture, or (2) low task threat and relaxed posture. In other words, subjects evidently made greatest attributions to the task when their changes in postural reactions *were in agreement* with the level of task threat. Why would this be?

One explanation is that subjects were most likely to infer beliefs about the difficulty of the task (and the extent it was threatening) when the beliefs were "justified" by the nature of the task itself. For example, subjects in the high threat task and hunched posture group may have been more likely to be inferring: "I'm feeling tense because I'm worrying about how I'm going to do on that difficult intelligence test I'm about to take." This would have led them to make greater attributions to task difficulty. Similarly, subjects in the low task threat and relaxed posture group may have been more likely to be inferring: "I'm feeling relaxed because that easy, especially low pressure, test I'm about to take should cause me no problems." This inference would have led them to make greater attributions to the task as well. (In this latter group, subjects were actually attributing their expected lack of problems to the expected *lack* of task difficulty of the test they would take.) This difference in the meaning of the task difficulty attributions here in the different groups can be viewed as analogous to the high attributions that people might make to task difficulty for success (i.e., attributing success to an easy task) and for failure (attributing failure to a difficult task).

There were no other findings for attributions, except for a marginal main effect of physical posture on effort attributions; there was a trend for subjects to attribute greater importance to effort when in a hunched physical posture than when in relaxed physical posture ($p < .10$).

As described above, there was no reason in this study to expect any effects of physical posture (hunched vs. relaxed) on persistence on the subsequent learned helplessness task. The analysis of variance obtained no main effects or interaction effects for either physical posture or threat on this measure ($F$s $< 2$).

## Discussion

Once again, the findings support the general hypothesis that physical postures are not just diagnostic of internal states, but can influence the *susceptibility* of a person to such states. Specifically, the findings are consistent with the expectation that a more hunched (threatened) physical posture would increase the susceptibility of subjects to stress reactions: Subjects who were positioned in the more hunched physical posture reported the highest stress reactions. These self-perception findings can be conceptualized as "mirror images" of findings that observers verbally report that they perceive persons in a hunched, relative to a relaxed, physical posture as more threatened (Mehrabian, 1972).

According to the self-perception hypothesis, subjects would rate themselves as having greater stress reactions from a more hunched-up (threatened) physical posture only when in a situation that was designed to involve a relatively high level of task threat. The findings for the planned simple effects analyses were in agreement with this; differences in self-rated stress reactions as a function of changes in physical posture were not significant in a situation that was designed to involve a relatively low level of task threat. These data agree with a hypothesis-testing self-perception model (Nisbett & Valins, 1972). Other data seem to indicate in a comparable way that people are hesitant to draw inference from observations unless they can test inferential hypotheses about themselves with an information search that supports that they are warranted. For example, Goldstein, Fink, and Mettee (1972) found that subjects hesitated to infer greater attraction for slides of nudes from perceptions of greater arousal unless their information-search of the situation indicated that this was warranted; male subjects were unlikely to infer greater attraction for male nudes (as compared to female ones), as the situation would appear to "fly in the face" of such a self-attribution.

The major findings in this fourth study were for self-rating of stress reactions. They may be more vulnerable to demand effects or experimenter bias than the first two studies, for which the main finding was for a behavioral measure of residual aftereffects. An objection to the study on this basis, however, may be mitigated by several facts: (1) The experimenter who manipulated physical posture was kept blind to the manipulation of external threat; (2) no explicit mention was made of the "emotional" nature of the physical postures or of their relevance to the study; (3) the stress rating questionnaires were administered with a pretext to obscure their true purpose; and (4) the subjects evidently saw no relationship between the self-rating measures and the assigned physical postures; the postexperimental debriefing indicated that subjects believed that the study was a sort of "biofeedback" study on (presumably, "emotionally neutral") physical positions.

## GENERAL DISCUSSION

A person cannot have existence apart from his/her physical body, and physical postures of the body frequently change in emotional experience. Feelings of elation or depression, assertiveness or helplessness, and stress or calm, are nonverbally communicated by the general positional shifts that occur in physical postures (Mehrabian, 1972).

Given this, it becomes important to determine whether the effects of physical postures feed back into the psychological system. Surprisingly, no previous studies have apparently examined this phenomenon, although some studies that could be viewed as similar have examined the facial feedback phenomenon (see Buck, 1980, for a review). The present studies have taken what appear to be the first step toward studying posture feedback effects by testing a self-perception (Bem, 1972) hypothesis: This posited that a person's physical postures are not just "windows" or passive indicators into emotion; instead, postures are behaviors with stimulus properties (social and proprioceptive) that can have a self-regulatory role as they affect the person's own self-perceptions and actions.

The most interesting finding, to us, was found in Study 1 and replicated in Study 2. The results showed that a slumped-over, relative to upright, physical posture had a significant *residual aftereffect* on performance on a subsequent helplessness task, when subjects were no longer in the physical postures. The subjects who had been experimentally positioned in the more slumped (depressed and submissive) physical posture showed significantly lower persistence on a standard learned helplessness task (the insoluble geometric puzzles of Glass & Singer, 1972). This finding was evidently not explicable in terms of demand effects or experimenter bias because the experimenter who administered the helplessness task was kept blind to each subject's previous manipulated posture. We interpreted this finding with our self-perception model in terms of a helplessness hypothesis.

With regard to this, the third study confirmed the assumption that observers could use postural cues in inferring the emotional state of another person. Typical college student subjects saw photographs of a stimulus person who was pictured in either a slumped or an upright physical posture; they treated the person who was sitting in a slumped position as feeling more depressed (and helpless) than the person sitting upright.

One version of the helplessness hypothesis, as applied to the first two studies might be that slumped-over physical posture produced an *immediate* change in subjects' feelings and self-perceptions of helplessness. This, however, does not seem likely because there were no differences found in self-reports taken while subjects were in the physical postures. Another version of the hypothesis, which fits better with the Nisbett and Valins (1972) hypothesis-testing version of self-perception theory, is that the more slumped-over posture increased the susceptibility of subjects after they had the opportunity to make an information-search of the validity of the inferences from their postures. Thus, the more slumped-over posture may have led subjects to infer greater helplessness or submissiveness (cf. Rothbaum, Weisz, & Snyder, 1982), but the inference may apparently have taken the form of a hypothesis that subjects attempted to confirm before ultimately accepting it. Evidence for this hypothesis-testing assumption is found in a study by Riskind (1982). This study found that manipulating subjects' own physical postures had no immediately compelling effect on self-report of helplessness while subjects were in the positions after success feedback. After exposure to later insoluble problems, however, subjects previously in the slumped instead of the upright posture rated themselves as having significantly stronger feelings of helplessness and external control. The results of these studies suggest that the self-perception of being in a more slumped-over physical posture predisposes a person *to more speedily develop self-perceptions of helplessness* later, following exposure to problems that the person find to be insoluble; the insoluble problems, in a sense, provide the person with an opportunity to make an information-search to validate inferential hypotheses derived from physical posture. This line of reasoning is quite similar to that of Barefoot and Straub (1971), who found that only when there was sufficient time for a search for information (in their case, to view slides of women) could people find enough evidence to convince themselves about the meaning of inferences from physical cues (in Barefoot and Straub, males' experience of elevated heart rates).

Incidentially, this hypothesis-testing explanation may also account for the fact that self-reported differences in mood ratings were not found in studies 1 and 2, in spite of the fact that they were found in study 4 with a different kind of posture and emotion. Subjects in Study 4 (in the hunched as opposed to relaxed posture) did not have to wait until after they were out of the postures to confirm the inference that they were stressed because they had belief-congruent information they could use about the nature of the high threat they would be confronting (the threat manipulation). Subjects in studies 1 and 2 had no such belief-congruent information while in the posture, and presumably could not confirm inferences until they had the opportunity later.

Some different evidence that inferences of emotion can result from self-observations of postural cues was found in Study 4, in this case for stress reactions. This study showed that self-ratings of stress reactions were higher for subjects who were experimentally positioned in the hunched (tensed and threatened) physical posture instead of the more relaxed one. These self-perception findings might be conceptualized as "mirror images" of findings that observers verbally report that they perceive persons in a more hunched (tensed) physical posture as more subjectively threatened (Mehrabian, 1972). In this regard, Lanzetta and associates (e.g., Lanzetta et al., 1976; Vaughn & Lanzetta, 1981) have reported that stress reactions are increased when facial expressiveness to unpleasant situations (i.e., electric shocks) is increased. The present results in Study 4 might be viewed as extending Lanzetta et al., and seem analogously to indicate that increasing postural nonverbal expressiveness to stress-inducing situations can also augment stress reactions. (As pointed out by Buck, 1980, studies such as that of Notarius & Levenson, 1979, that examine nonverbal expressiveness as an individual-difference trait, instead of as an experimental manipulation, may produce a different outcome and must be considered as dealing with a separate hypothesis.)

The simple effects findings of Study 4 constitute further support for the self-perception model. As suggested by the model, subjects apparently inferred stronger stress reactions from a more hunched (tensed and threatened) posture *only when* there was confirmation in the situation that such an inference was warranted (they were expecting a highly threatening task). On the contrary, subjects apparently hesitated to infer heightened stress reactions from a more hunched posture when they were in a situation where there was no confirmation that an inference of stress was warranted (they were expecting a less threatening task).

With regard to the preceding results, self-perception theory (Bem, 1972; Laird, 1974; Nisbett & Valins, 1972) does not imply that postural or facial cues are in any way necessary or sufficient for emotional experience. Instead, the theory implies that body feedback constitutes one of several sorts of cues (including inner thoughts, recent experiences, and other factors in the situation) that may potentially be integrated into perceptions of one's own emotions (cf. Nisbett & Wilson, 1977). This is an especially vital and key point, as several recent investigators have criticized any orientation that holds that peripheral body feedback is either necessary or sufficient for emotions (cf. Buck, 1980; Torganeau & Ellsworth, 1979).

## CONCLUSIONS AND IMPLICATIONS

The studies presented here invite attention to physical posture feedback in motivation and emotion as a new phenomenon and problem for experimental study. The research contributes to literature on peripheral feedback (e.g., Laird, 1974; see Buck, 1980, for a review) because it indicates that physical postures as well as facial expressions have effects that can feed back into the psychological system. Methodologically, it might be added, the studies contribute to the peripheral feedback literature by indicating that nonverbal expressive responses (in this case, postures) can have residual aftereffects or carry-over effects on motivated behavior. Besides being theoretically interesting, such effects are relatively immune to the possibility of demand characteristics or experimenter bias. Buck (1980) has been critical of many facial feedback studies because they have not dealt well with this problem.

Finally, studying the self-regulatory role of postures might contribute by helping to counterbalance a recent tendency by many theorists to assume that central cognitive processes are the only organismic determinants of motivation and emotion (e.g., Abramson et al., 1978, on helplessness reactions). Evidence is mounting that the reactions of people to stimuli are frequently integrated (through some means; cf. Jacobson, 1938; Mendels, 1970) across body and cognitive reactions. This being the case, a broader eventual understanding of human motivation and emotion must perhaps consider not just the central cognitive processes in the person but also the feedback potentially provided by the person's own physical postures. Postures may constitute more than passive indicators of emotions (e.g., depressed, helpless reactions or stress reactions) because posture may have the capability of partially affecting the susceptibility of a person to such emotions.

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