Precise respiratory-posturo-facial patterns are related to specific basic emotions

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The soul desires to dwell with the body because without the members of the body it can neither act nor feel.

(Leonardo da Vinci)

Introduction

The study of emotions has been approached from different directions. Psychotherapists are mainly concerned with the experiential aspects of emotions and do not put the stress on the physiological processes involved. Experimental psychologists deal with the more 'measurable' characteristics of emotions, and social psychologists with their communicative role, both ignoring the so to say 'non measurable' subjective arousal. Finally physiologists are interested in the electrophysiological, chemical or neurohumoral elements, but for obvious reasons, mainly in the animal model thus necessarily eliminating the possibility to look at the subjective processes co-occuring. On the other hand, direct practitioners either work with the body (Alexander, Feldenkrais, Rolfing) or the voice, or the breathing. As a consequence of these different approaches a fragmentation of the emotional event has resulted and a dualistic body-mind view about emotions keeps emerging. Such dualism is even present in the terminology which differentiates feelings from emotions, as if they were *separate* processes.

By simple common experience though, we know that whether the arousing emotional situation comes from the external or internal world, the evoked feeling is generally accompanied by modifications in facial expression, direction of gaze, body posture (all expressive components of an emotion) as well as by certain changes in visceral functions (increase in heart rate, stomach contraction, changes in respiratory rate, 'redness' or pallor of the skin...), even if we are not always aware of them.

The theories which try to explain how emotional states are triggered range from those which postulate that emotions are determined by a cognitive appraisal of the situation, to those in favor of the notion forwarded by William James which states that emotions are a direct consequence of the perception of bodily changes (James, 1884).

We would like to define an emotion as a complex and dynamic functional state of the entire organism, triggered by an external or internal stimulus, integrated in the central nervous and neuroendocrine systems, involving simultaneously a particular group of effector organs (visceral, humoral, neuromuscular) *and* a subjective experience (feeling).

The emotional effector patterns

Origins and first observations

In 1970 we started a research in Chile which aimed to relate some of the physiological activations present during an emotion and the corresponding subjective experience (Bloch & Santibáñez, 1972). Six basic emotions were studied: *joy/laughter, sadness/crying, anger/agression, fear/anxiety, erotic love and tenderness*. These emotions were considered as basic because they correspond to universal invariants of behaviour – in a Darwinian sense – and are present in the animal and in the human infant either as innate behaviours or apparent at very early stages of post-natal development.

Our first observations came from clinical practice. Santibáñez (Santibáñez & Bloch, 1986) had recorded the respiratory movements of patients with anxiety neurosis. He observed that as a patient spoke about personal conflictual events, changes appeared in the breathing records at the moment when the content approached the peak of anxiety. If the patient was told to breathe very evenly and relaxed and to relate the event again while maintaining this regular respiratory rhythm, the story still contained the same anxiogenic elements but talking about them became less stressful and the patient reported feeling less anxious.

With these clinical observations in mind, we did a more systematic study in the laboratory, by recording different physiological parameters (heart rate, respiratory movements, arterial pressure, changes in muscular tonus) from normal subjects who were intensively reliving an emotional episode under deep hypnosis and from actors who were evoking strong emotional memories (Bloch & Santibáñez, 1972; Santibáñez & Bloch, 1986). We found that if we instructed the subject to keep the breathing very even and rhythmic independently of the 'emotogenic' situation, the corresponding posturo-facial attitudes and the subjective feeling would not be triggered as long as the subject kept the even breathing rhythm. These observations can be joined to those of Nina Bull and her collaborators who suggested to their hypnotized subjects to try to get into a sad mood while keeping a posture of 'elation' (arms open and chest lifted). During post-hypnotic questioning, their subjects reported not being able to enter into the feeling of sadness while they kept such posture (Guido-Frank & Bull, 1950; Pasquarelli & Bull, 1951).

All the above observations suggested the existence of a *unique* association between particular bodily changes and a corresponding subjective experience. According to this general working hypothesis we postulated that specific respiratory-postural-facial configurations are associated to particular emotional states. These configurations are part of the complex physiological reactions we had pre-

viously observed during emotional states but have in common the possibility of being under voluntary control. What we did then was to select for each basic emotion, the most typical changes of the recorded respiratory movements, of the postural changes and of the facial modifications. We named these prototypical respiratory-posturo-facial changes 'emotional effector patterns' (Santibáñez & Bloch, 1986; Bloch, 1986; Bloch, Orthous & Santibáñez, 1987).

Training

Our next step was to instruct naive subjects to reproduce a specific emotional effector pattern without giving its emotional label. In other words we just told the subject to breathe in a certain way, to tense or relax certain groups of muscles, to open or close more the eyelids and so on. We observed that if the instructions were correctly followed, the appropriate actions could trigger the corresponding subjective experience in the performer. Images or personal memories related to the emotional pattern being reproduced would appear (Bloch, 1989; Bloch et al., 1991b). Inversely it was possible to reestablish a 'non-emotional' neutral state by a special change of breathing and posture. We named such procedure the 'step-out' technique. (Bloch et al., 1987, 1991a). These results support the view that specific associations exist between particular bodily changes and subjective experiences, the breathing element having the, so to say, 'leading edge'.

Quantitative studies

In order to explore these patterns more systematically, we did a study at our laboratory in Paris with 36 young Danish actors whom one of us (S.B.) had previously trained to reproduce the effector patterns during workshops. Polygraphic recordings were done using two strain-gauge transducer belts for breathing (one placed on the higher thoracic region and the other around the waist) and conventional Ag/AgCl external electrodes for heart rate and electromyograms. At the same time, synchronous video films recorded the expressive as well as the auditory signals. Subjects were instructed to breathe very evenly, to keep relaxed and have the most neutral expression possible. This state provided a 'non-emotional' neutral baseline. Results showed that as the reproduction of the prototypical respiratory-posturo-facial actions went along, a progressive activation of the respiratory and expressive systems developed: breathing became closer to that observed during spontaneous emotional episodes, expressive features clearer and better defined and subjective experience and/or images more emotion-specific. The longer the exercise, the more intense the reported feeling. (Bloch et al., 1991b).

A separate physiological experiment also done in our laboratory, showed moreover that a particular set of neurovegetative reactions (not under voluntary control, such as skin conductance, heart rate, skin temperature) accompanied each emotional reproduction (Lemeignan et al., 1990).

An experimental model for generating controlled emotions

The property of driving other elements of an emotional system by reproducing well defined prototypical somatic actions, suggested the use of these emotional effector patterns as an experimental model for generating emotions in a controlled way (Bloch, 1989; Bloch et al., 1991; Bloch, in press). We think that this model which results from the joint activation of different somatic systems has the advantage of using precise, objective and reproducible actions. Such a 'bottom-up' procedure is essentially different from the most commonly employed techniques as for example presenting visual material containing strong emotional valence (e.g. Wagner, Mac Donald & Manstead, 1986) or instructing subjects to recall or imagine particular emotional events (e.g. Lang, Kozak, Miller, Levin & Mc Lean (Jr), 1980; Schwartz, Weinberger & Singer, 1981). With such classical procedures it is often difficult to determine what emotion is being evoked, whether it is pure or blended, and if present, when it begins and ends.

Let us now review the arguments which allow to validate the reproduction of the emotional effector patterns as an experimental model for generating emotions.

One important not yet mentioned argument derives from a recognition study which showed that naive observers correctly identify the emotion corresponding to each reproduction (Aguilera, Lemeignan & Bloch, 1990 & 'in press') and often report to have themselves 'felt' the emotion (Bloch, 1989a,b). This proves that the emotional message is unequivocally transmitted. Another strong argument is the notion that correctly reproduced patterns may induce in the performer the corresponding subjective feeling. The specificity of the respiratory and expressive elements as well as the particular sets of neurovegetative activations which develop also add to the validation arguments, though more indirectly. Finally the induction of a particular functional state in the subject, with clearly defined respiratory, expressive, visceral and subjective elements, supports the notion of the *uniqueness* of an emotional experience, as we all know intuitively that each emotion 'feels' differently. Looked at from another angle, our model provides strong scientific support for the specificity of different basic emotional states, favoring the discrete model over the dimensional model of primary emotions (Levenson, 1988).

Characterisation of the emotional effector patterns

In the following section we shall briefly present the characteristics which we had observed during strongly relived emotional episodes and which constitute the basic structure of the emotional effector patterns.

Breathing

> Le souffle accompagne le sentiment et on peut pénétrer dans le sentiment par le souffle, à condition d'avoir su discriminer dans les souffles celui qui convient a cet sentiment. (Antonin Artaud, 1964, p. 205)

The great majority of studies concerning the relation between the respiratory system and emotions have been centered on the role of emotional states in respiratory and cardiovascular diseases and usually with respect to ventilatory problems (see reviews by Grossman, 1983 and by Bass & Gardner, 1985). Studies have also been done on the relationship between breathing characteristics and psychiatric disorders (e.g. Christie, 1935; Dudley & Pitts-Poarch, 1980) and with personality traits (e.g. Alexander & Saul, 1940; Shea, Walter, Murphy & Guz, 1987). Fewer studies have been devoted to the specificity of breathing parameters of several discrete non-pathological emotions (e.g. Felekey, 1916; Bloch & Santibáñez, 1972).

In our research on the emotional effector patterns, as already mentioned, we found that typical breathing patterns differentiate between the 6 basic emotions.

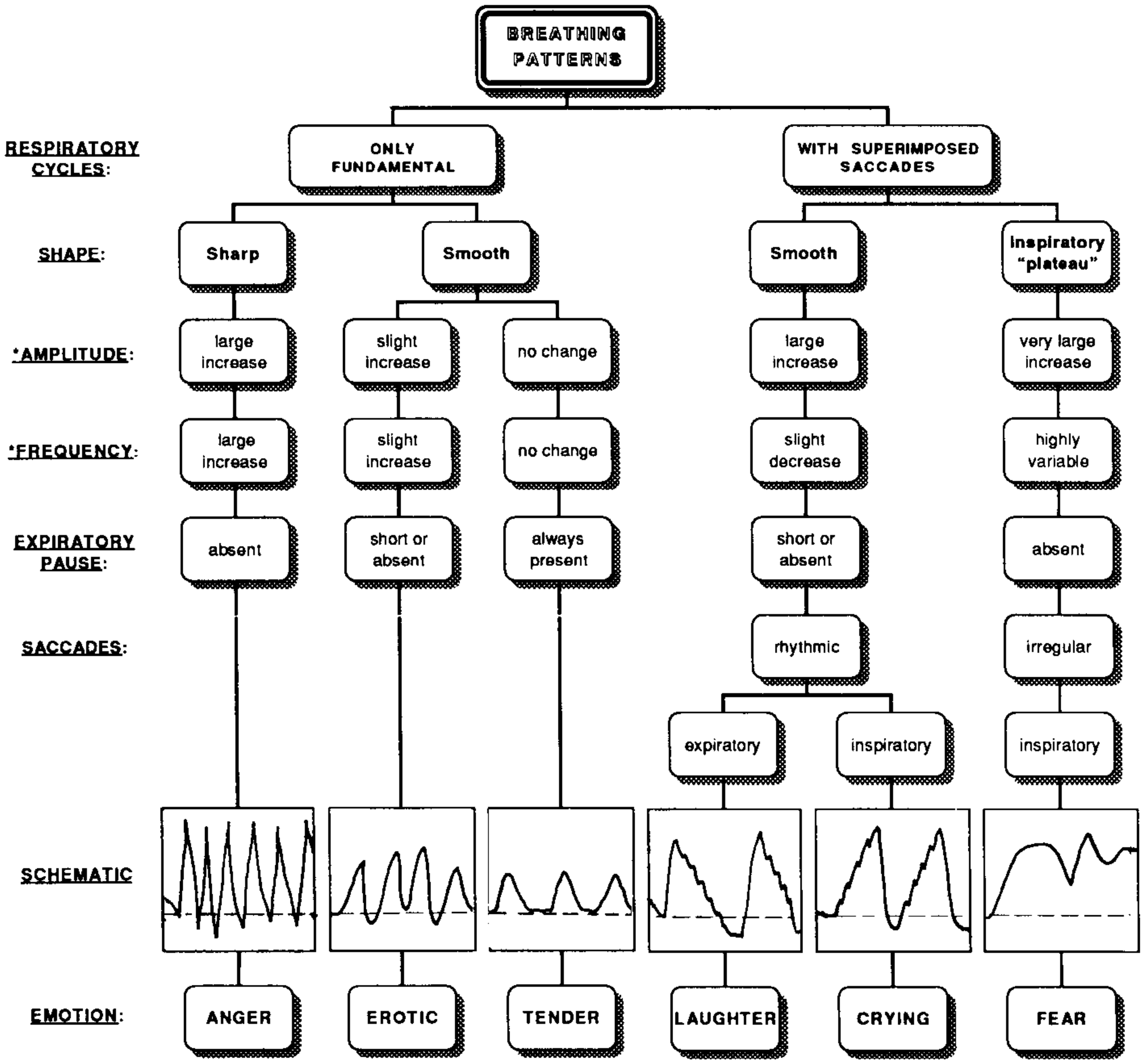

*Figure 1: Structural representation in form of a decision tree summarizing the main respiratory characteristics of the emotional effector patterns. To the left is underlined the name of the feature. *Amplitude and *Frequency descriptions correspond to changes from neutral baseline values. The pause refers to the period within the respiratory cycle during which no further expiratory movements could be detected. The dashed lines in the schematic representation of the respiratory prototypical patterns, give an indication of the lowest level of expiration attained during neutral non-emotional states.*

A structural representation in form of a decision tree summarizes the main respiratory features for each emotion (Figure 1). A more detailed and quantitative report of these results is published elsewhere (Bloch, Lemeignan & Aguilera, 1991). Results show quite clearly that breathing patterns are significant elements differentiating basic emotions.

Expressive components

> The qualities which fill and permeate each muscle of the entire body, will provoke within you feelings...and stimulate the depths of your own psychology. (Michael Chekhov, 1953, p. 65)

The relationship of facial muscles to emotions has been analyzed at length mainly by Eckman & Oster (1979) and by Izard (1971). A smaller number of experimental studies have dealt with the postural system (e.g. Riskind, 1984; Kudoh & Masumoto, 1985; Duclos, Laird, Schneider, Sexter, Stern & Van Lighten, 1989).

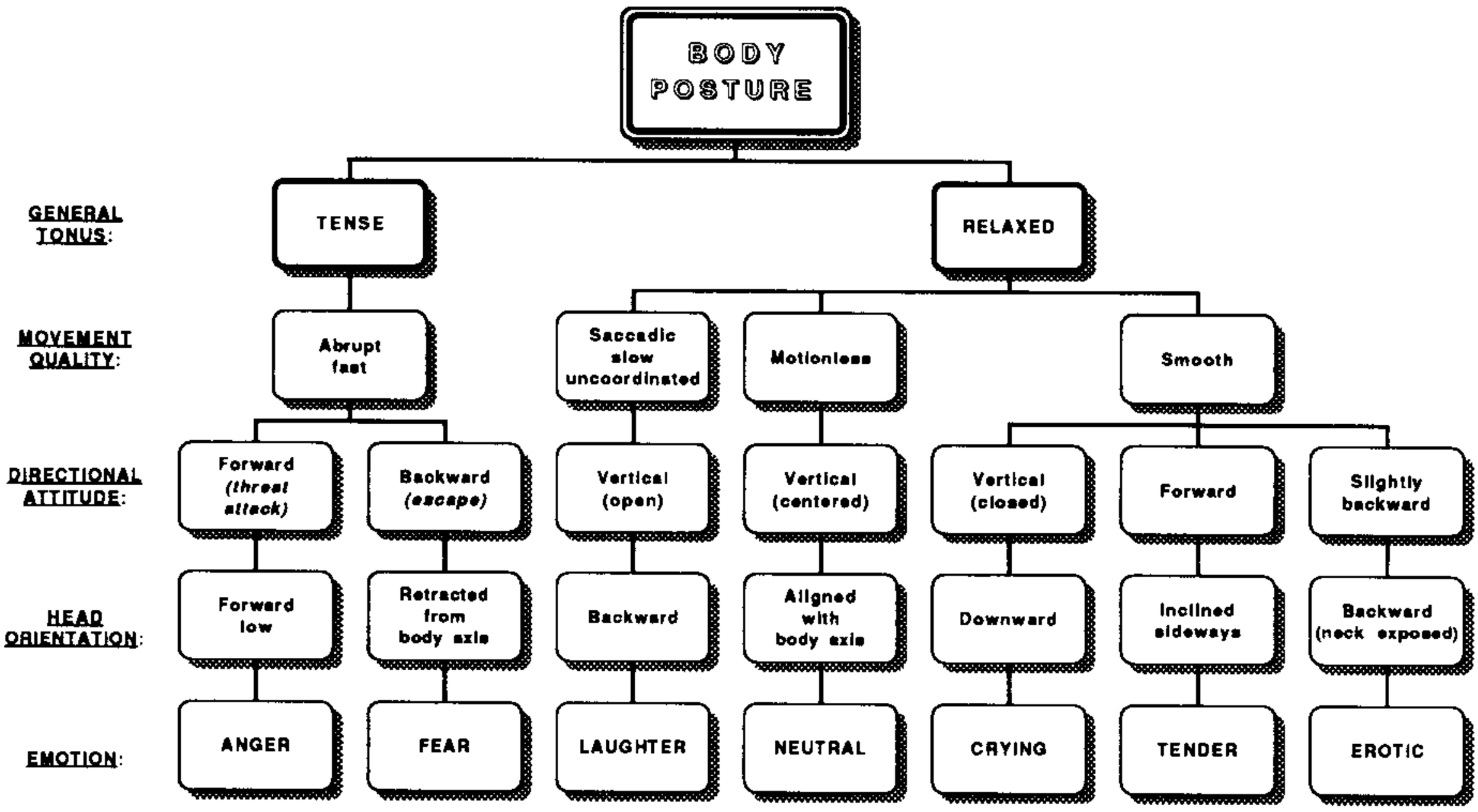

Figure 2: Prototypical features of body posture for each emotion: general tonus, movement quality, directional attitude and head orientation.

The prototypical postural features differentiating among the emotions we studied plus those of the neutral 'non-emotional' state, are shown schematically in Figure 2. They could be considered as 'archetypal' in the sense given by Michael Chekhov, serving '*as an original model for all possible gestures of the same kind*' (1953, p. 77).

Figure 3 arrays the main facial characteristics we observed for each emotion expressed in the lay terms by which naive subjects were guided to reproduce the facial components of the effector patterns. In most subjects, however, initiation of the correct breathing pattern brought on the corresponding typical facial adjustements. Particular facial instructions were therefore given only when facial components were either missing or unprecise.

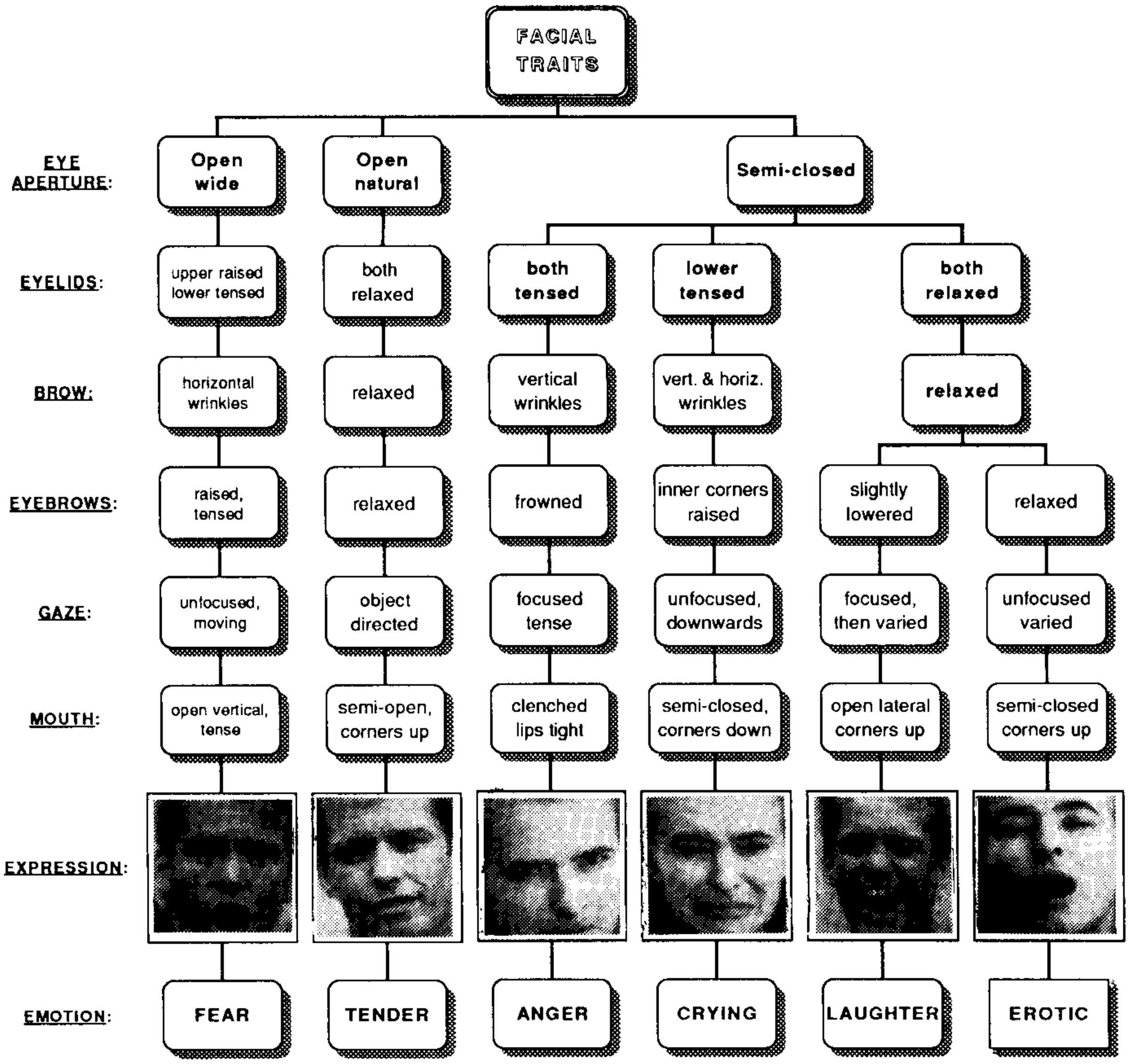

Figure 3: Main facial traits differentiating each emotion: degree of eye aperture, position and/or degree of tension/relaxation of eyelids, muscular tension of the brow, direction of gaze, mouth/lips configuration and examples of typical facial expressions.

Conclusions

The described emotional effector patterns are part of the human psychophysiological endowment. What we did essentially, was to extract the prototypical somatic 'triad' (breathing, postural attitude, facial expression) whose reproduction is sufficient to activate, partially or totally the corresponding emotional network. Once the prototypical patterns were well identified it was possible to teach subjects to 'play them back', so to speak. The possibility of inducing emotional states through the controlled physical actions proposed by our model can assist people to better recognize, express and control their emotions. It has been shown to be particularly useful to theatrical actors who need to sumon and control emotions for acting (Bloch et al., 1972b; 1987).

Furthermore we know that good breathing habits are related to well-being. We think that, for example, the breathing pattern of *tenderness*, with its slow abdominal rhythm and long expirations followed by a pause, might be well adapted

to re-educate people who suffer from respiratory disturbances. But what is important in such cases is to activate all the somatic actions involved in this emotion, i.e. the postural and facial elements as well. In this way one could go beyond a mere breathing 'exercise' and have the subject enter into the imagery and/or personal evocation of tenderness. We found, by the way, that this is the only emotion accompanied by a significant decrease in heart rate (Lemeignan & Bloch, manuscript in preparation). The reproduction of the entire emotional pattern of tenderness may have valuable clinical and therapeutic uses.

Finally, a warning should be made concerning danger of misusing the proposed model, as it deals with voluntary changes in breathing, which we know is a delicate issue. The reproduction of the emotional effector patterns, with the exception of that of tenderness, poses a serious ethical problem for both the teacher and the subject and must be used with great care, respect and sensibility. In fact such training should not be attempted without expert guidance.

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