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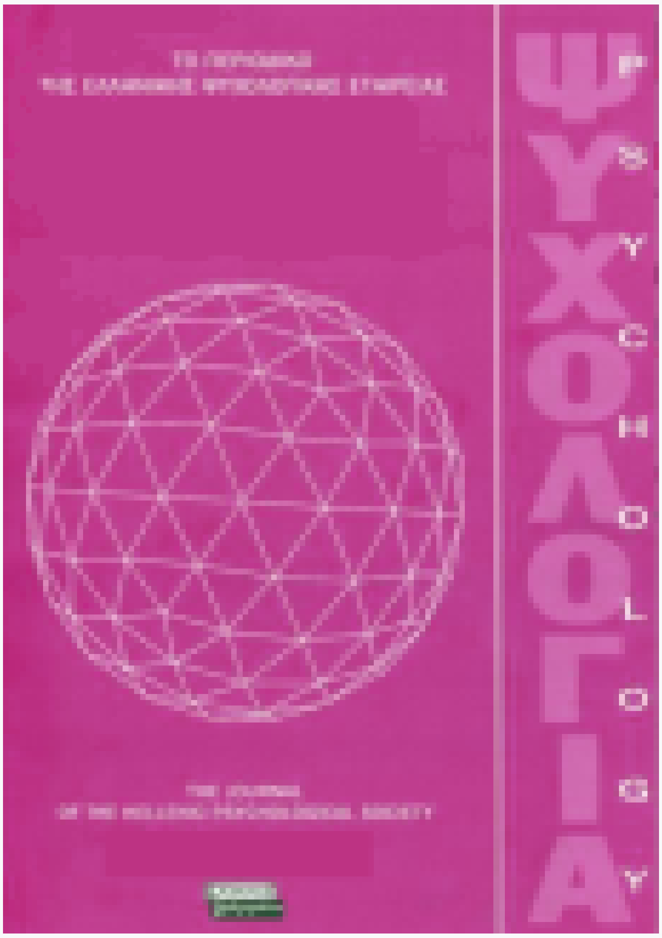

Nonverbal cued in the recognition of affect during imagery

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Nonverbal cues in the recognition of affect during imagery

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ABSTRACT The role of nonverbal cues other than codable facial activity in the recognition of affect from short video clips was investigated. A three-step analysis was performed in order to assess conditions under which minimal nonverbal cues allow recognition of experienced affect while engaging in affective imagery. Firstly, 17 five-second video clips of persons engaged in positive or negative imagery were selected out of a total of 19 clips with the criterion that no facial activity occured codable according to the Facial Action Coding System (FACS) coding rules. In a second step, these clips were shown to fifteen subjects. Presentation of single video clips (either positive or negative imagery) were followed by the paired presentation of both positive and negative imagery clips. Viewing of single video items resulted in a limited rate of correct identification (65%) of affect. In contrast, viewing in succession (video clips of positive and negative imagery in balanced order) resulted in correct identifications (88%) of the affective state of the stimulus persons at an above chance level. Thirdly, a micro-behavioral analysis specified head position and gaze direction as well as subtle changes in the lip corners as the cues presumably contributing to recognition of affect. The findings suggest that a) in the absence of codable facial expressions these cues convey adequate information about experienced affective state when attended to in dynamic sequence, b) that through the method of immediate comparison subtle changes in the configuration of these nonverbal cues become apparent, and c) that it is the perceived change of the cues that renders them indicators of affect. This implies that the investigation of the processes involved in decoding affect need also to consider the more subtle channels of nonverbal expression in their dynamic configuration.

Key words: Affect, cues, face.

Major theorists of affect and its expression propose that the experiencing of affect triggers the activation of facial muscles producing thus the specific facial expression corresponding to each of the basic emotions (Buck, 1984; Ekman, 1972, 1977; Izard, 1977; Tomkins, 1962).

A large body of literature has been concerned with demonstrating that facial expression is important and effective in communicating various affective states (Ekman, 1993) in social interaction (DePaulo, 1992) and that certain facial expressions of affect are recognized as such across different cultures (Ekman, 1992; Ekman & Oster, 1979).

The present decoding study investigates the informative and communicative value of nonverbal cues in the head area which besides facial activity may contribute to the recognition of affect. In addition, it addresses a methodological issue regarding the effects of access to behavioral information inherent in visual material. Namely, whether accurate detection of subtle

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nonverbal cues may be facilitated by focusing on comparing their change rather than on their absolute ratings. In normal experimental settings a response is required on the basis of a stimulus. The mode of presentation, however, of this stimulus may well influence the response.

During affective imagery an affective state is cognitively processed and experienced internally. This can be assessed on the basis of either verbal reports of subjective feelings or of nonverbal expressive actions. Psychophysiological studies provide evidence that affective imagery and cognitions activate an arousal system (Tucker, 1981) that leads to either covert (physiological) or overt (motoric) expression. With regard to physiological activation, Schwartz, Fair, Salt, Mandler, and Klerman (1976), in an electromyographic study, showed that affective imagery produced differential facial muscle patterning in depressed and non-depressed subjects. Furthermore, the relation of muscle activity in the face and affective patterns has been investigated in a number of studies reviewed by Fridlund and Izard (1983). Also, experimental investigations have shown that cognitive processes and affective imagery affect eye movements (Hugdahl & Carlgren, 1980; Tucker, Roth, Arneson, & Buckingham, 1977).

With respect to motoric activation, a number of nonverbal cues can be assumed to provide adequate information about affective states. Degree of anxiety has been accurately rated when using the hands, eyes, mouth, and torso as the most salient cues (Waxer, 1977). Similarly, depth of depression was accurately identified on the basis of cues such as eye contact, head angle, and mouth angle (Waxer, 1974). Furthermore the affective state of depressed patients has been readily identified on the basis of their nonverbal behavior alone as shown on video recordings (Vanger, Summerfield, Rosen, & Watson, 1992) and aspects of their paralinguistic behavior such as speech rate have been shown to correlate with severity of depression (Vanger, Summerfield, Rosen, & Watson, 1991). Other decoding studies have shown that specific facial expressions are readily associated with specific emotions, with a high degree of agreement between decoders (Frijda, 1968; Toner & Gates, 1985).

Nevertheless, overt expression of affect may take place not only through the habitual and most salient channels, such as distinct facial actions, but also through the activation of motoric behavior that is not conventionally associated with, or emitted as signs of, specific emotions (Ekman, 1973).

With respect to the recognition of affective states from the face area there arise two major questions. First, what intensitiy of a facial action is necessary for visual detection? The dichotomy between overt and covert expression may not be clearcut. There may exist certain thresholds of physiological activity beyond which subtle changes in muscle activity become visible. Secondly, what is the role of other nonverbal cues in the area of the face in combination with, or in the absence of facial muscle activity.

The Facial Action Coding System or FACS (Ekman & Friesen, 1978) is based on an anatomy notation system developed by Hjortsjo (1970) that describes the muscular basis of facial expression and classifies the appearance changes on the face mediated by muscular activity. FACS represents all possible appearance changes in the face. Trained coders can note the single elements that make up complicated facial expressions without providing an interpretation of facial activity. That is a face will not be described as happy, sad or aggressive but rather will be coded according to specified Action Units such as 4 (= frown) + 15 (= lip corner depressor) + 17 (=chin lift). The interpretation of the combination of these appearance changes in the face as aggressive, happy etc. remains open. FACS provides high accuracy in detecting and describing produced changes in the facial musculature from either still photos or video records. Many facial actions break out intensely and clearly, thus allowing a highly reliable coding with FACS. FACS provides criteria that define appearance changes in the face that need to be present in order to code a facial action unit. The lowest intensity is described as a "trace level" where the action is just detectable. At times, however, change in facial actions may be so gradual and subtle that, in the continuous flow of time, appearance changes are almost impossible to perceive. This poses a technical problem in applying FACS for the detection of such subtle changes in the face.

The aims of the present study were a) to select stimulus material of persons in affective imagery with no codable facial activity, b) to determine specific conditions of presentation of visual material that may increase decoding accuracy in detecting subtle changes in the face, and c) to identify additional nonverbal cues in the head that lead to accurate recognition of experienced affect.

Method

A three step procedure was adopted consisting of a) the selection of stimulus material under the specified affective imagery conditions, b) the decoding study, and c) the behavioral micro-analysis.

Selection of stimulus material

In an investigation of the expression of affect (Vanger & Ellgring, 1985), seven normal males between the ages of 20 and 46 and twelve normal females between the ages of 24 and 51 were videotaped during an affect eliciting situation. They were all shown the same pleasant and unpleasant one-minute films. The pleasant film showed children riding on a coach through a beautiful landscape, singing, laughing and joking with each other. The negative film showed undernourished children in Africa living in a refugee camp. Following the viewing of each film, they were asked to concentrate on what they had just seen and think about it for one minute - without closing their eyes. The goal of this experimental task was to make subjects engage in affective imagery.

Subjects' ratings of the degree they felt at ease was indicated on a manually operated visual analogue scale ranging from very much at ease to discomfort. These ratings of subjective state just after viewing each film and just after the thinking session showed that their affect changed in the expected direction according to the films' positive and negative content.

Subjects' reports during debriefing indicated that concentration and vividness of affective imagery was highest at the beginning of the imagery task. For this reason, the first five seconds of the video recordings were used as stimulus material for the present decoding study.

FACS criteria (Ekman & Friesen, 1978) were used in order to code changes in the face. For 17 out of 19 video clips of thinking persons, no codable facial activity occurred during these initial five seconds. In order to use a homogeneous stimulus material and to eliminate facial activity as a possible cue to affect recognition during imagery, only those 17 video clips where no codable facial activity occured were employed for the present study. Only head and neck of each stimulus persons were visible. There was no sound to the video clips.

Decoding study
Subjects

Eight male and seven female subjects, other than the stimulus subjects, participated as subjects in this decoding study. Their ages ranged between 22 and 43, with a median of 26 years. They were all university students or staff with no particular expertise in nonverbal behavior.

Procedure

Subjects were presented with short video clips (5 secs.) of the 17 stimulus persons engaged in pleasant and unpleasant affective imagery (Figure 1). They first saw one single video clip of each stimulus person alone, either the positive or the negative, randomly selected, and rated it as expressing either a positive or a negative affect. Subsequently they were shown both the positive and the negative clips, one immediately after the other (Paired Item Presentation). They had to rate them again and

Table 1
Percentage of subjects correctly identifying items with and without slight-lip-corner-lift in the presented video clips

subjects correctly identifying		"slight-lip-corner-lift" in clip	
Number (N = 15)	Percentage %	Present (N = 10)	Absent (N = 7)
6	40%	1	0
7	46%	0	1
11	73%	0	2
12	80%	0	2
13	86%	3	2
14	93%	1	0
15	100%	5	0

read just their response, if necessary. Degree of difficulty for rating each item was also obtained on a 1 to 5 rating scale.

Behavioral micro-analysis

Since no codable facial activity occurred in the video clips it was assumed that other cues, such as slight changes in head orientation and gaze direction, may have been used in recognizing affective state. Head movements (Hadar, Steiner, & Clifford, 1984; Harrigan & Rosenthal, 1983) and gaze behavior (Rutter, 1984) have been shown to be important communicative signs in interactions. Furthermore, the role of gaze in the expression of both positive and negative affect has been indicated by Kimble and Olszewski (1980). In order to gain knowledge on the cues that had been used for the correct recognition, the stimulus video clips were analysed by FACS trained coders who did not limit their coding to facial actions but also rated any changes in nonverbal activity occurring between the two consecutive video clips.

Results and Discussion

Data analysis

For each video clip, the number of subjects correctly identifying the affective state of the stimulus persons was compared to the number of subjects who failed to do so. Statistical significance of correct identifications for each video clip was determined by Binomial tests (Siegel, 1956, p. 40) for both the first trial (Single Item Presentation) and the second trial (Paired Item Presentation). In order to test individual differences in identification performance and degree of difficulty between the two presentation modes a Sign test was conducted.

Single item presentation

Ten out of 17 items were correctly identified by at least 13 subjects ($N=15$, $x=3$, $p<0.004$) and one item by 12 subjects ($N=15$, $x=3$, $p<0.018$). That is, 64.7% of the stimulus items in single presentation were correctly identified by the subjects at a statistically significant level.

A Binomial test indicated that the number of

Figure 1
Example of the stimulus material in still frames. Immediate comparison of the two conditions reveals subtle changes in the cues configuration such as gaze direction and slight-lip-corner-lift.

correctly identified items (11) was not different from the number of the wrongly identified items (6) for the given sample. That is, an accurate recognition of about 65% of the presented items was not at an above chance level. This rather low success rate is in accordance with findings reported by Wagner, MacDonald, and Manstead (1986). In an experimental procedure similar to that of the present study subjects rated videotaped facial expressions emitted by senders watching emotionally loaded slides and found that correct identification of the emotion experienced by the sender was relatively low and significant only for happy, angry, and disgusted faces.

Paired item presentation

A Binomial test showed that 12 out of 17 items were correctly identified by at least 13 subjects ($N=15$, $x=2$, $p<0.004$) and 3 items by 12 subjects ($N=15$, $x=3$, $p<0.018$). That is, 88.2% of the items were identified by the subjects at an above chance level.

Also, in order to determine whether the number of correctly identified items (15) differ from the number of items wrongly identified (2), a Binomial test was conducted ($N=17$, $x=2$, $p<0.001$). This shows that viewing items in succession resulted in overall accurate recognition of affective state of about 88% of the stimulus persons.

The high success rate during paired presentation suggests that nonverbal cues of affect became apparent and meaningful with respect to affective expression when their relative changes across affective states were compared. It seems that through a process of contrast enhancement, the alternation of positive and negative faces rendered the subtle positive cues more salient when compared with the negative ones and vice versa.

Changes in performance

Fourteen out of 15 subjects increased above chance level their correct identification rate when viewing items in immediate succession (N=14, x=1, Sign test: $p< 0.001$). That is, 86.6% of the subjects improved their performance when viewing the paired rather than the single items.

For each subject, the degree of difficulty in recognizing each item was compared across presentation conditions. A Sign test revealed that only three out of 15 subjects rated the recognition task as easier in the paired presentation mode. That is, for 80% of the subjects reported degree of difficulty of the task did not vary between viewing single and paired items. On a 5 point scale, mean degree of difficulty of all items was 2.8 and 2.6 when presented in single and paired fashion respectively. This indicates a moderate difficulty for both modes of presentation. The subjective evaluation of task difficulty did not change across presentation modes.

Behavioral data analysis

A coding of behavioral cues other than facial expression as such was undertaken. This coding revealed that, when comparing the two consecutive clips, changes occurred in the following behaviors: a) head orientation, b) gaze direction and c) in the mouth area, including a slight tendency of lifting the lip corners. This slight change in the lip corners, however, did not meet the minimum requirements of FACS for scoring it as Action Unit 12W or 12A, i.e., the lowest intensities that the Action Unit 12 (zygomaticus major) can have. This change became apparent only after repeated viewing of the paired video clips.

Figure 2 illustrates differences in frequency of occurence of the behavioral elements of head orientation, gaze direction and lips activity for both positive and negative affect conditions. Although these observational data have not been statistically treated because of the small number of observations they nevertheless reveal tendencies that differentiate the negative from the positive affect conditions. With regard to gaze direction it seems that persons engaging in positive affective imagery tended to look straight or up whereas persons engaging in negative imagery tended to turn their gaze sideways. With regard to head position head down was more frequent in the negative affect condition whereas head turned sideways was more frequent in the positive condition. However, these behavioral elements cannot be considered on their own as specific cues to positive or negative affect.

An apparent difference between the negative and positive imagery conditions was obtained for the slight lift of the lip corners which occurred 10 times during positive affect exclusively. In order to clarify whether this slight-lip-corner-lift might have been the cardinal cue in the correct identification of positive vs. negative affect, the stimulus persons emitting it were examined in those 10 video clips.

As Table 1 shows, nine out of ten of these clips were among those that had been correctly identified by more than 86% of the subjects. One of these clips, however, had the lowest correct identification rate (40%). From the remaining seven items where the slight-lip-corner-lift was absent, six were also correctly identified by more than 73% of the subjects, and one by 46%. From these findings it may be concluded that the slight-lip-corner-lift may be a facilitating cue in the correct identification of affect, but is not a necessary one.

The present results suggest that it is the configuration of the above mentioned cues that

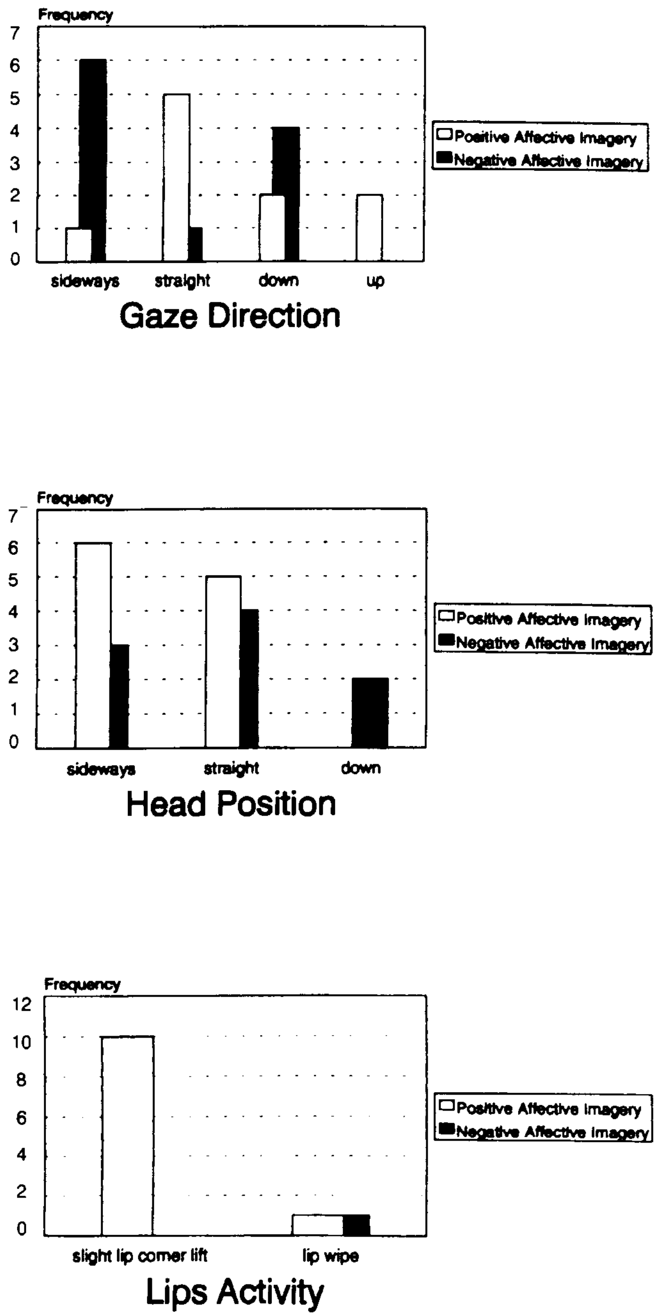

Figure 2

Frequency of behavioral cues detectable on the video clips of the stimulus persons while engaging in positive and negative affective imagery.

Nonverbal Cues

convey information about affect and not single behavioral elements in themselves. The relative change in the cues becomes apparent through immediate comparison of the configuration of the cues resulting thus in correct identification. Head orientation and gaze direction do not inherently carry differential information about affective state in the manner facial expression may. A tilted head or a gaze shift become meaningful cues only when compared to an upright head or to fixed gaze respectively (Otta, Lira, Delevati, Cesar, & Pires, 1994). This information can only be obtained when comparing the relative change across different affective states for a specific individual (Ellgring, 1986). It is believed that in the real course of time these minor changes in cue configuration occur gradually and are, thus, very difficult, if not impossible, to identify except in condition of immediate comparison of cues that enables the perception of relative change.

These findings fit in the theoretical framework of face recognition proposed by Bruce and Young (1986) that discriminates between types of information derived from faces. In this study the focus was set on the processes involved in deriving information about the affective expression of faces based on the perception of subtle changes in facial cues. According to Buck (1983) accurate decoding of nonverbal cues also depends on the attention to specific patterns of nonverbal cues and on the degree of familiarity with the sender. In the present study, it seems that subjects attended to specific patterns of noverbal cues such as head orientation and eye movements or gaze direction, in the absence of facial expression. Also, in the paired presentation condition they may have gained knowledge about the differential use of these cues by the sender in different affective states.

It should be noted that subjects in the decoding study were asked to decide which of the two clips corresponded to the positive or negative condition for the stimulus persons. This does not, however, mean that subjects would have spontaneously made an inference about affective expression if they were not instructed to do so. The nonverbal cues perceived on the video clips might have been interpreted as signs of reflection, puzzlement, or meditation, rather than as indicators of positive or negative affect. Nevertheless, sensitizing the subjects on the affective aspects of these cues, led them to discriminate between positive and negative affect conditions. This suggests that these nonverbal cues are adequate indicators of affect when there is a situational demand for recognizing affect.

The small number of subjects and their relatively wide age range may be considered as a shortcoming of this study. The reported effects of the immediate comparison procedure on the perception of subtle changes in nonverbal cues need to be investigated with a larger sample in a future replication study. Furthermore the potential effect of gender of subjects on accurate identification of affect has not been looked at in this study because of the small sample size. Dimberg and Lundquist (1990) reported findings that indicate that females are more facially reactive than males. It is of interest to expand the goals of a future study into investigating gender differences with respect to sensitivity to subtle changes in nonverbal cues of affect.

In summary, the present study suggests that the accurate identification of affective state during imagery is possible in the absence of codable facial activity. The configuration of cues such as head position, gaze direction or a slight-lip-corner-lift seem to provide adequate information for affect recognition even for exposures of very short duration. Accurate recognition is facilitated by juxtaposition and immediate comparison of two distant behavioral events during which relative changes in behavior become apparent and allow the detection of otherwise non-codable actions such as the slight-lip-corner-lift. In this way, an indication is gained about the differential use of noverbal cues across affective states. The relevance of such comparative information for the clinical practice has been pointed out by research on the expressive patterns of patients with affective disorders (Ellgring, 1989; Vanger et al., 1990, 1991, 1992).

Further research is required in order to expand on Waxer's (1981) observations and investigate the relative importance of head and gaze cues in the recognition of affect when varying degrees of facial activity are also present. It seems that these nonverbal cues are attended to only when information from the face is minimal or not readily available.

The immediate comparison procedure seems to have enabled perception of subtle, otherwise non-codable changes in facial activity and particularly of a slight-lip-corner-lift. Ekman (1983) has suggested that electromyography (EMG) may be the only method for measuring changes in muscular tension which are barely visible. Such changes usually do not involve a movement but rather a bulging of the skin. The present findings, however, indicate that the contrasting technique employed in this study may be an alternative method for the detection of such subtle muscular changes in the face.

Configurations of head and eyes cues were shown to be adequate indicators of negative and positive affect. It is of interest to investigate as to what extent these cues provide differential information about specific emotions such as anger, surprise, fear, etc. The immediate comparison technique applied in the present study seems to be a promising research tool for revealing subtle changes in nonverbal behavior. A goal for future research may be to employ this technique in order to investigate the information provided about affective states by other nonverbal cues in other areas of the body.

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