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The Discrepant Repressor: Differentiation Between Low Anxiety, High Anxiety, and Repression of Anxiety by Autonomic-Facial-Verbal Patterns of Behavior

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This study examined the notion that personality questionnaires can be used to predict different styles of coping with anxiety as expressed by individual differences in patterns of autonomic, verbal, and nonverbal reactions. In line with earlier modifications of the repression–sensitization concept, the Taylor Manifest Anxiety Scale (MAS) and the Marlowe-Crowne Social Desirability Scale (SDS) were used to select four groups of 12 subjects each from a pool of 206 male students in Germany: low-anxious subjects (low MAS, low SDS), repressors (low MAS, high SDS), high-anxious subjects (high MAS, low SDS), and defensive high-anxious subjects (high MAS, high SDS). Several measures of autonomic arousal, facial activity, and self-reported affect were obtained during a potentially anxiety-arousing free-association task and during a number of control conditions, including a funny film. Significant differences in baseline-corrected heart rate and self-reported anxiety as well as rated facial anxiety all indicated that repressors exhibited a discrepancy between low self-reported anxiety and high heart rate and facial anxiety; low-anxious subjects reported an intermediate level of anxiety, although they showed low heart rate and facial anxiety; high-anxious subjects had consistently high values on all three variables; and the defensive high-anxious group showed an intermediate level of anxious responding. These group differences were specific to the task of freely associating to phrases of mixed (sexual, aggressive, neutral) content (but not to other experimental situations) and to self-reported anxiety (but not to other self-rated emotions or task difficulty), indicating that they reflect individual differences in coping with anxiety.

A long-standing problem in emotion research in general and anxiety research in particular has been that different "indicators of emotion"—verbal report, nonverbal behavior, autonomic arousal—often do not intercorrelate in an emotion-laden situation. This lack of correlation led many researchers to believe that the concept of emotion—considered to be a theoretical construct defined by empirical indicators—is a fiction and has little predictive power. However, if one adopts a system-theoretic point of view (Powers, 1973; Schwartz, 1982), treating emotions as processes unfolding on different hierarchically organized levels of behavior with each level being regulated by a separate control system, one would expect many discrepancies between the different indicators of emotion because in most cases they are regulated by different control systems (cf. Asendorpf, 1981). From this perspective, discrepancies between different components of emotional behavior can serve as an important source of information about the control processes underlying the surface behavior patterns.

This study attempts to link interindividual differences in such discrepancies to a particular class of control processes: processes that are commonly called defense mechanisms or coping styles (Byrne, 1964; Freud, 1946; Haan,

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1977; Lazarus, 1968; Plutchik, Kellerman, & Conte, 1979). Usually, at least three different styles are distinguished: repression, that is, defensive avoidance of the experience of anxiety and other anxiety-linked cognitions; sensitization, that is, hypervigilance against these cognitions; and a "realistic" coping style, with no systematic distortion of experience.

Since the early 1960s, the Repression-Sensitization (R–S) Scale (Byrne, Barry, & Nelson, 1963) has been widely used to operationalize these three different styles of coping with anxiety despite the high correlation of this scale with other scales measuring anxiety or neuroticism, with correlation coefficients about as high as its own reliability coefficient. All of these scales, which basically represent the Factor I of the Minnesota Multiphasic Personality Inventory (MMPI; Millimet, 1970), seem to measure neither repression–sensitization nor anxiety but a mixture of both: They neither differentiate true low anxiety from repression of anxiety nor true high anxiety from sensitization against anxiety (cf. Weinberger, Schwartz, & Davidson, 1979).

The Social Desirability Scale (SDS; Crowne & Marlowe, 1964) seems to be a useful tool to help make this distinction. Although Crowne and Marlowe developed the SDS to assess the construct "need for social approval," which was expected to lead to conformity behavior or to tendencies to respond to questionnaires in a socially desirable direction, numerous studies have concluded that the SDS is actually unrelated to this construct (e.g., Wiesenthal, 1974). Instead, the scale seems to assess defensive avoidance of social disapproval (for a review, see Millham & Jacobson, 1978). This more recent interpretation of the SDS is still consistent with Crowne and Marlowe's conception of the high-social-desirability (SD) scorer as a person who tries hard to maintain an idealized self-concept, particularly by the defensive avoidance of negative affect such as anxiety or anger (Crowne & Marlowe, 1964, pp. 150, 190). Thus, the SDS seems to be appropriate for splitting low-trait-anxiety scorers into true low-anxious individuals with low SD scores and repressors with high SD scores.

Extending this idea to high-trait-anxiety scorers, we can distinguish four groups of individuals using the SDS and a trait anxiety scale such as the Taylor (1953) Manifest Anxiety Scale (MAS; cf. Weinberger et al., 1979): (a) repressors, defined by low manifest anxiety (MA) and high SD scores; (b) low-anxious subjects, defined by both low MA and low SD scores; (c) high-anxious subjects, defined by high MA and low SD scores; and (d) defensive high-anxious subjects, defined by both high MA and high SD scores.

In a number of studies using these distinctions, it has been found that repressors had significantly higher recognition thresholds for sexual pictures than low-anxious subjects (Holroyd, 1972) and reacted less affectively than low-anxious subjects in projective tests, particularly when they were described as mental-illness tests (Lefcourt, 1966, 1969; Orlofsky, 1976). Most support for the validity of the distinction between repressors, low-anxious subjects, and high-anxious subjects comes from the study of Weinberger et al. (1979). They compared the behavior of repressors, low-anxious subjects, and moderately high-anxious subjects in a situation that was designed to induce anxiety in a relatively subtle way: Subjects had to free associate to sentences with neutral, aggressive, and sexual content. As predicted, repressors reacted significantly more strongly than low-anxious subjects in three physiological measures (heart rate, spontaneous skin resistance responses, and forehead muscle tension) and three behavioral measures (reaction time, content avoidance, and verbal interference) despite their low scores on the MAS, whereas the moderately high-anxious subjects showed an intermediate level of anxious responding (except for particularly low forehead muscle tension).

These results clearly show that the R–S Scale or other measures of self-reported trait anxiety are not sufficient to distinguish between the very different styles of low-anxious versus repressive coping with anxiety. More generally, the study of Weinberger et al. (1979) indicates that interindividual differences in verbal as well as nonverbal anxious behavior, particularly in autonomic activity, can be reliably predicted by personality questionnaires. Although these authors did not use verbal state measures of anxiety, it seems very likely that the group differences found in self-reported trait anxiety can be expected for self-reported state anxiety as well.

This assumption is supported by a recent study of Weinberger and Schwartz (Note 1). They constructed an Emotional Situations Questionnaire containing items that primarily elicit one of six emotions (positive and negative ones) in one of three intensities. A comparison of the intensities of the emotions reported by the four groups showed that for negative affect, repressors reported the lowest intensities; low-anxious subjects, an intermediate intensity level; and defensive high-anxious and high-anxious subjects, the highest intensities. Apart from this general tendency of the repressors to report the least intensive negative affect of all four groups, an interesting effect concerning nondominant emotions emerged: Repressors reported particularly low intensities for negative emotions that were not primarily characteristic for the given situation (e.g., anger in a primarily anxiety-arousing situation). This result indicates that repressors' responses are strongly affected by social stereotypes about "how to feel" when asked to describe their feelings in situations that elicit negative emotions.

If we extrapolate from these results to the phrase-association task used by Weinberger et al. (1979), which seems to arouse anxiety in a subtle way (not conforming to established stereotypes), we would expect that repressors would report a particularly low, low-anxious subjects an intermediate, and high-anxious subjects a high level of state anxiety during or immediately after this task. This, in turn, would provide direct evidence that it is possible to predict systematic interindividual differences in discrepancies between verbal and physiological measures of anxious behavior: Repressors should report less anxiety than their physiological scores indicate; low-anxious subjects should report somewhat more anxiety than their autonomic arousal predicts; and high-anxious subjects should consistently respond in a high-anxious manner on both variables. Thus, specific predictions can be derived for individual differences in the patterning of anxious behavior.

This study attempts to extend this approach by including other levels of (nonverbal) behavior, particularly visible facial activity. We were motivated to this extension by an interesting inconsistency in the Weinberger et al. (1979) data: In contrast to the moderately high-anxious subjects' high level of anxiety, as measured by their autonomic responses, these subjects had the lowest frontalis electromyograph (EMG) scores of all groups, both for baseline values and for change scores between baseline and phrase association. Thus, the moderately high-anxious subjects seemed to exhibit a discrepancy between low forehead muscle tension and relatively high autonomic activity, whereas both low-anxious subjects and repressors showed consistent levels of autonomic response and facial activity. If we hypothetically infer the visible facial activity of the groups from these EMG data, an interesting link to the internalizer–externalizer concept (Buck, 1976; Jones, 1950) emerges: We would expect the repressors to be "generalizers," that is, to react strongly on all nonverbal behavioral levels; the low-anxious subjects to respond consistently low in both autonomic arousal and facial activity; and the high-anxious subjects to be "internalizers," that is, to react more strongly autonomically than facially. The personality differences between internalizers and externalizers reported by Buck, Miller, and Caul (1974) are consistent with this interpretation: Internalizers had significantly higher scores in general trait anxiety as measured by the R–S Scale and significantly lower scores in self-esteem and extraversion.

A final aim of this study was to investigate the coping styles corresponding to all four quadrants in the two-dimensional MAS/SDS space by studying, in addition to repressors anxious and defensive high-anxious subjects (rather than just one group of moderately high-anxious subjects as in the experiment of Weinberger et al., 1979). Although the high-anxious subjects were predicted to respond somewhat more strongly than the moderately anxious group in all measures of anxiety except facial expressiveness, no hypotheses could be derived for the defensive high-anxious subjects apart from the high self-rated anxiety that can be predicted from the data of Weinberger and Schwartz (Note 1).

Table 1 summarizes our hypotheses for the anxious behavior of the four groups during the phrase-association task as used by Weinberger et al. (1979). To test these hypotheses we conducted an experiment modeled after the design of Weinberger et al. (1979) with the extensions discussed so far: comparison of four

Table 1
Summary of the Patterns of Group Means Predicted for the Phrase-Association Task

Variable	Groups			
	REP	LA	HA	DHA
Self-rated anxiety	low	medium	high	high
Autonomic response	high	low	high	—
Facial response	high	low	low	—

Note. REP = repressors, LA = low-anxious, HA = high-anxious, and DHA = defensive high-anxious subjects.

groups instead of three, recording of the subjects' visible facial activity, and administration of a rating scale for state anxiety.

Because we were interested in an unobtrusive measurement of facial expression, we did not record the frontalis EMG. Instead, we recorded pulse-volume amplitude as a third measure of the autonomic arousal accompanying anxiety because this variable seems to respond to anxiety-arousing situations about as strongly as the other two measures used (heart rate and frequency of spontaneous skin-resistance responses; cf. Bloom, Houston, & Burish, 1976).

Three further extensions were made to obtain a more powerful test of the hypothesis that the predicted group differences are specifically related to coping with anxiety instead of reflecting more general attitudes toward emotion, general styles of emotional expressiveness, or general autonomic arousability: (a) In the present study the phrase-association procedure began with three baseline phrases of neutral content; thus, a comparison of baseline and mixed phrases allows one to eliminate the general effect of the task requirement to free associate to phrases of any content. (b) In addition to the phrase-association task, subjects watched three films—a neutral, a funny, and another neutral film—to control for differences in emotional reactions unrelated to anxiety. (c) Subjects rated not only their level of anxiety but also their level of other emotions as well as perceived task difficulty to control for general attitudes toward emotionality and for cognitive involvement. We expected that the group differences predicted in Table 1 would be specifically related to the anxiety induction (associating to mixed phrases) and would not occur during the neutral baseline phrases or during the films.

Method

Subjects

Pretest. About 6 weeks before the experiment, 206 male students enrolled in different fields of study at the University of Giessen (excluding psychology students) were pretested with the German versions of the MAS and the Marlowe-Crowne SDS (cf. Lück & Timaeus, 1969). Subjects received DM 5 ($2) for filling out the questionnaires in which the items from the two scales were randomly intermingled. They were told that some of them would be selected to participate in a more extensive study that was described as "a new kind of personality assessment procedure based not only on paper-and-pencil tests but also on real behavior in different situations"; they were informed that they would receive DM 20 ($8) for their participation.

Final sample. From the pretested subjects we selected four extreme groups of repressors (REP; low MAS, high SDS), low-anxious (LA; low MAS, low SDS), high-anxious (HA; high MAS, low SDS), and defensive high-anxious (DHA; high MAS, high SDS) subjects. We decided to keep group size constant ($n = 12$) to obtain a reasonable sample size for each group. Because the MAS and the SDS correlated negatively in the pretest sample ($r = -.30$), different cutoff points on the MAS and the SDS had to be selected to equalize the n for the four groups. To make repressors comparable with those of Weinberger et al. (1979), they were selected from the upper quartile of the SDS; all other groups were selected from the upper/lower tercile of the SDS. In all four groups the 12 subjects with the most extreme MAS scores in the respective directions were chosen. This selection procedure led to the following MAS and SDS ranges (percentage range scores with respect to the pretest distribution): REP, MAS < 33%, SDS > 83%; LA, MAS < 41%, SDS < 32%; HA, MAS > 74%, SDS < 32%; DHA, MAS > 62%, SDS > 69%. The HA group differed considerably from the corresponding moderately anxious group of Weinberger et al. (1979) in having more extreme MA and SD scores. Mean age of the final sample was 24.6 years (somewhat higher than in the sample used by Weinberger et al., 1979).

Design

Overall procedure. The design included three major experimental procedures: (a) induction of anxiety by having to free associate to affective phrases, (b) induction of happiness by having to watch a funny film, and (c) induction of anger by being frustrated in a modified Prisoner's Dilemma Game. These major experimental conditions were embedded into several control conditions:

1. During an initial 15-minute period, subjects filled out a number of personality questionnaires; part of this time also served as an adaptation period for the physiological recording (see below).

2. Following this period, two 1-minute resting baselines were obtained for the physiological measures (Baseline 1).

3. Then, 17 phrase associations were administered in the following order for all subjects: two practice phrases with neutral content, three baseline phrases with neutral content, and 12 mixed phrases divided into blocks of three phrases, each block containing a sexual, an aggressive, and a neutral item; the order of sexual and aggressive items was counterbalanced, whereas the last item of each block was a neutral phrase.

4. After completing the phrase-association task, subjects watched three 3-minute films: Neutral Film 1, a funny film, and Neutral Film 2. The funny film was selected from a well-known German TV series ("Loriot"), and the two neutral films consisted of two comparable excerpts from an educational film on changes in typical German landscapes brought about by civilization and industrialization. Before seeing the films the subjects were informed that after each film they would be asked to rate their feelings.

5. After viewing the films, subjects played a modified Prisoner's Dilemma Game with a confederate. This game was designed to induce anger in the subjects; however, because the anger induction was not entirely successful, data from this part of the experiment are not presented here.

6. Finally, another two 1-minute resting baselines were obtained for the physiological measures (Baseline 2).

The three major experimental procedures were not counterbalanced within groups to keep within-group variance smaller, which seemed to be necessary because of the small group sizes.

Phrase-association procedure. The 17 phrases were direct German translations of the items used by Weinberger et al. (1979) or had similar content. Again, they were spaced at 75-sec intervals following a short tone. The procedure differed from that adopted by Weinberger et al. in three respects: (a) The order of phrase blocks was not balanced to keep within-group variance smaller. (b) The task began with three baseline phrases with neutral content to control for general effects of the task of associating to phrases of any type. (c) The instruction and the phrases were presented via videotape. Subjects saw the face of a female assistant who read the instructions and the phrases in a uniform manner. At the beginning and at the end of each phrase, she looked straight into the camera, producing the impression of eye contact with the viewer. A still picture of this position served to fill the approximately 65-sec pauses between the phrases. This procedure was designed to intensify both level of anxiety and defense against anxiety through a high level of "objective self-awareness" (Duval & Wicklund, 1972). Also, this setting forced the subjects to look straight into the (hidden) camera by directly facing the monitor in front of them.

Dependent Measures

Self-ratings. Several times during the experiment subjects were asked to estimate their level of anxiety, happiness, anger, and sadness on a 5-point scale ranging from "very low" to "very high." The judgments were obtained at the following points: immediately after (a) Baseline 1, (b) the phrase-association task, (c) Neutral Film 1, (d) the funny film, and (e) Neutral Film 2. After the phrase-association task they also rated task difficulty on a 5-point scale.

Physiological measures. A Narco Bio Systems DMP-BD polygraph was used to record (a) finger pulse volume (PV) and (b) skin resistance (SR). A new impulse technique was employed to prevent polarization between SR electrodes during the relatively long measurement period. After the experiment was conducted, the polygraph record of the SR impulses was found not to be sensitive enough for a reliable detection of SR responses of usual magnitude, that is, about above 100 Ω or .1% of SR level. Consequently, the rate of reliably detectable SR responses was too low. Therefore, SR data are not reported here.[1] PV was recorded by a mechanical plethysmograph (Narco Bio Systems Crystal Pulse Pickup) placed on the first phalanx of the small finger of the subject's nondominant hand, which was fixated at the arm of the physiological chair to minimize movement artifacts. The PV signal was recorded with a 3 Hz filter and a time constant of .3 sec; sensitivity was adjusted individually for each subject to between 5 and 100 μV/cm and was corrected at fixed points between measurement periods to maximize the quality of the written record. PV was measured (a) during each of the four resting 1-min baselines, (b) for 1 minute following the tone preceding each of the 15 phrase associations (baseline and mixed phrases), and (c) for 2 minutes during each of the three films starting about 30 sec after the beginning of the film.

For each of the 22 measurement periods described above all segments containing artifacts were determined. Then, heart rate (HR) and finger pulse volume amplitude (PVA), that is, amplitude of the PV spikes, were scored by hand in the artifact-free intervals and were transformed into scores per minute.

Facial measures. Without their prior knowledge, the faces of the subjects were filmed with a hidden video camera placed in front of them. Recordings were made during the last two baseline phrases, the first two and the last two affective (sexual, aggressive) phrases, and the funny film. A video timer was used to insert a time code into the video signal such that the measurement periods for the physiological and the facial measures were synchronized.

For the facial ratings to be made, new rating tapes were edited. To keep raters blind as to phrase type or sequence and to avoid confounding order effects during rating with phrase type or sequence, in these rating tapes the order of presentation of the video segments for the six association records of each subject was varied systematically within each of the four experimental groups.

Only the first 30 sec of the association records were used for the ratings; to obtain funny-film records of comparable length, each 2-minute funny-film record was split into four 30-sec segments. Four groups of eight naive raters each rated all video segments of 12 subjects (three out of each experimental group). Within each of the four rater groups, four raters first judged the association records of all 12 subjects and then the funny-film records; the reverse order was presented to the other four raters. All video segments were displayed without sound, using a 64-cm TV monitor, with groups of four raters each placed at a distance of about 4 m. They rated each 30-sec segment

[1] Despite their low frequency, the SR responses differentiated the groups in the predicted direction, but these group differences did not reach significance (the complete SR data are available from the authors upon request).

on five unipolar scales with intensity levels numbered from 1–9: expressive, happy, anxious, angry, and surprised (in that order). To reduce interrater variability, raters were shown examples of expressions with low, medium, or high scores on these scales (as previously determined by a group of independent judges) that were taken from tapes that the raters did not rate later on.

Debriefing

After the subjects had finished the experiment, they were debriefed about the audio and video recordings made and were asked to give their consent for a scientific evaluation of the tapes. To prevent subjects from informing future subjects about all intentions of the experiment, the debriefing about group selection, significance of the experimental situations, and hypotheses was delayed until all subjects were run; then, each subject received a letter containing the complete debriefing.

Statistical Analyses

A priori hypotheses about differences between REP, LA, and HA groups were tested by planned contrasts (one-tailed tests) within analyses of variance (ANOVA); similarly, a priori hypotheses about differences between two groups only were tested by one-tailed t tests. In all other cases, group differences were tested by ANOVA followed by the Newman-Keuls procedure or two-tailed t tests. To correct physiological measures for baseline values or to correct scores obtained during the mixed phrases for scores obtained during the baseline phrases, individual change scores were computed following the procedure proposed by Myrtek, Foerster, and Wittmann (1977): If simple difference scores $y - x$ proved to be linearly independent from baseline values x, that is, if there was no significant correlation between x and $y - x$, these simple difference scores served as change scores; if there was a significant positive or negative correlation between x and $y - x$, autonomic lability scores (AL scores; cf. Lacey, 1956) were computed and served as change scores. This procedure always results in (a) change scores being linearly independent of baseline scores and (b) the simplest change scores possible with regard to (a).

Results

Self-Ratings

Validation of emotion induction. Among all experimental situations, that is, baseline, phrase association, and the three films, subjects reported the most anxiety after the phrase-association task and the most happiness following the funny film; t tests between each pair of these experimental situations showed that these results were highly significant. Thus, both the anxiety and the happiness inductions were successful.

Group differences. Analysis of variance separately performed for each of the five self-ratings and each of the five experimental situations revealed significant main effects for self-rated anxiety only; for all other ratings the overall F did not even approach significance for each situation (in all cases, $p > .10$). For anxiety, we found a significant effect for the phrase-association task, $F(3, 44) = 5.3$, $p < .003$, for the funny film, $F(3, 44) = 3.1$, $p < .04$, and a marginal effect for the baseline rating, $F(3, 44) = 2.6$, $p < .07$.

Figure 1 shows that in all these three instances the REP group reported the least anxiety, followed by the LA, DHA, and HA groups, in that order. This pattern of group means was identical with the corresponding pattern of the MAS scores of the groups, in-

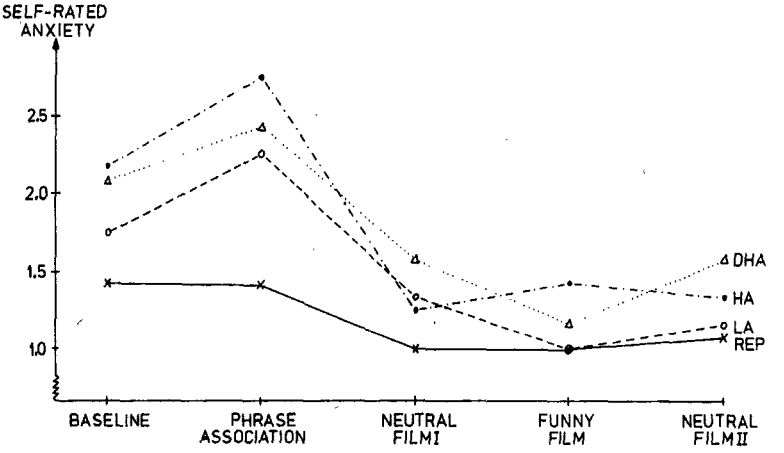

Figure 1. Group differences in self-rated anxiety (REP = repressors, LA = low-anxious, HA = high-anxious, DHA = defensive high-anxious subjects).

dicating a stable hierarchy of the groups in terms of the relative level of anxiety reported in both trait and state measures.

Apart from this general tendency, the data support the more important hypothesis that the REP group, compared to the other groups, reported particularly low anxiety after phrase association. Figure 1 shows that after the phrase-association task, the REP group reported exactly as much anxiety as before, whereas the other groups reported more anxiety than before. To test this hypothesis, change scores between baseline rating and phrase-association rating were analyzed. Because simple difference scores between these two ratings correlated significantly negatively with raw scores in the baseline condition ($r = -.33$), AL scores were computed (cf. section on Statistical Analyses). The contrast REP < LA < DHA, HA in an ANOVA of these AL scores proved to be highly significant, $t(44) = 2.4$, $p < .01$, confirming the specific relation of these group differences to the phrase-association task.

Physiological Measures

Individual baselines. A procedure similar to the one described in Weinberger et al. (1979) was used whereby an individual resting baseline for HR and PVA was obtained for each subject by selecting the 1-minute baseline period with the lowest average HR as the individual HR baseline and the 1-minute baseline period with the highest average PVA as the individual PVA baseline. Groups did not differ significantly in their HR and PVA individual baseline scores according to two-tailed t tests (in all cases, $p > .10$).

Group differences: HR. For HR, simple differences between experimental situations and individual baseline did not correlate significantly with individual baseline for all experimental situations (median $r = .05$). Thus, simple difference scores were chosen to test for differences between the groups.

Figure 2 indicates that, as predicted, both REP and HA groups had higher HR change scores than the LA group during all phrases of the phrase-association task, particularly during the mixed phrases. To test this hypothesis, baseline phrases and mixed phrases were separately pooled and contrasts LA < REP, HA were computed within an ANOVA of HR change scores for both phrase types. For a better check of the specificity of results for the phrase-association task compared with other experimental situations, these contrasts were also computed for the other four situations.

As Table 2 shows, contrasts reached significance only for the mixed phrases and the first neutral film; for all other situations, contrasts were not significant. Thus, these results indicate that group differences in HR change are specifically related to the mixed phrases; the persistence of group differences during the first neutral film seems to be mainly due to an aftereffect of the preceding phrase-association task, because groups did not differ significantly during the second neutral film.

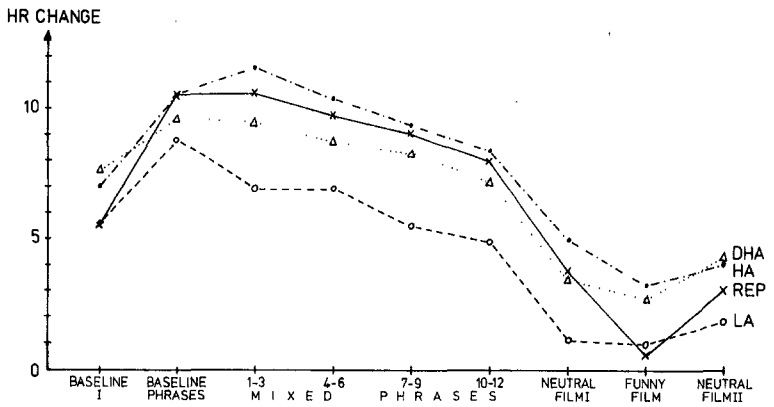

Figure 2. Group differences in heart rate (HR) change (difference scores with respect to individual baseline; REP = repressors, LA = low-anxious, HA = high-anxious, DHA = defensive high-anxious subjects).

Table 2
Significance Tests for the Predicted Group Differences in Heart Rate (HR) and Pulse Volume Amplitude (PVA)

Physiological measure	t[a] HR	PVA
Baseline phrases[b]	<1	<1
Mixed phrases[b]	2.0**	<1
AL scores for change; baseline − mixed phrases	2.7***	<1
Neutral Film 1[3]	1.7*	1.0
Funny film[3]	<1	2.1**
Neutral Film 2[3]	1.1	1.9**

Note. AL = autonomic lability.
[a] $t(33)$ of the contrast testing the hypothesis LA < HA, REP (for HR) and LA > HA, REP (for PVA).
[b] Scores are corrected for individual baseline.
* $p = .05$. ** $p < .05$. *** $p < .01$.

A more powerful test of the hypothesis that group differences in HR are specific to the mixed phrases was performed by an analysis of HR change between baseline phrases and mixed phrases. Because simple differences between HR scores in these two situations showed a highly significant negative correlation ($r = -.49$) with HR scores in the baseline phrases, HR change was analyzed by means of AL scores. Table 2 shows that the a priori hypothesis LA < REP, HA was highly significantly confirmed.

Taken together, these analyses of the HR data clearly support the hypothesis that both REP and HA subjects show a higher HR compared to LA subjects. In addition, this difference can be shown to be specific to the task requiring free association to phrases with mixed content.

Figure 2 indicates that the DHA subjects had intermediate HR change scores compared with the other groups. In fact, t tests did not reveal any significant differences between DHA and any other group for any of the six experimental situations (in all cases, $p > .10$, two-tailed).

Group differences: PVA. For PVA, simple differences between experimental situations and individual baseline had highly significant negative correlations for all experimental situations (median $r = -.51$). Thus, we analyzed group differences for AL scores between individual baseline and experimental situations.

Contrary to expectation, there were no group differences in AL scores for any phrase type in the phrase-association task. As Table 2 indicates, groups differed only during the last two films, showing the pattern that had been predicted for the mixed phrases: The LA group had significantly higher PVA change scores than both the REP and the HA groups (for PVA, higher scores indicate less arousal than lower scores). Thus, the expected group differences for the phrase-association task occurred "with delay." One possible explanation of this unexpected result is that the PVA measure showed a ceiling effect during phrase association that obscured group differences. Only when subjects began to relax did group differences appear.

Facial Ratings

We restrict our discussion of the results for the facial ratings to the central variable for the phrase-association task: the facial anxiety rating (see Asendorpf, 1981, for a detailed discussion of the results for all facial ratings).

Reliabilities. Interrater agreement scores for the lay judges were computed using an ANOVA approach (cf. Winer, 1971, chapter 4.5, Equation 12). This formula is identical with Cronbach's alpha if one considers raters as test items.

For the phrase-association task the reliability of the anxiety rating, .83, can be considered to be sufficiently high. For the funny film the anxiety rating showed less agreement, .75, which is probably because the funny film induced only very little anxiety.

Group differences. As in the case of HR data, we analyzed the group differences in facial anxiety both by means of raw scores (separately pooled for the two baseline and the four affective phrases) and by means of change scores between the baseline and the affective phrases. Again, the data indicated the need to compute AL scores to measure this change.

Table 3 provides the means and standard deviations of the facial anxiety scores of the four groups obtained during the baseline and the affective phrases. They indicate that, as predicted, the REP group responded to the affective phrases with more facial anxiety than the LA group, whereas contrary to expectation, the HA group also showed relatively much

facial anxiety. Therefore, it was not justified to test the a priori hypothesis LA, HA < REP by the corresponding contrast. Instead, we tested the a priori subhypothesis LA < REP by one-tailed t tests and the a posteriori subhypothesis LA = HA by two-tailed t tests.

Table 3 shows that REP subjects looked significantly more anxious than LA subjects during the affective phrases but did not differ from LA subjects during the baseline phrases, indicating that the higher facial anxiety of the repressors was caused by the anxiety induction. This was confirmed by a comparison of the corresponding AL scores: REP subjects had significantly higher AL scores than LA subjects, that is, their facial anxiety increased significantly more between the baseline and the affective phrases than the facial anxiety of the LA subjects. Thus, our prediction for these two groups are fully confirmed.

Compared to this clear difference between REP and LA subjects, the HA subjects behaved somewhat ambiguously. Their facial anxiety increased marginally less than the repressors' facial anxiety between the baseline phrases and the affective phrases (cf. Table 3), which is consistent with our original conception that HA subjects are internalizers. On the other hand, HA subjects looked marginally more anxious than LA subjects during the affective phrases, which is inconsistent with the internalizer hypothesis. Thus, HA subjects did not show the expected low facial anxiety; instead, both their raw and change scores of facial anxiety fell in between those of LA and REP subjects.

The DHA subjects also had intermediate facial anxiety scores that did not significantly differ from any of the three other groups' scores (in all cases, $p > .10$, two-tailed t tests).

All four groups had nearly identical facial anxiety scores during the funny film (varying between 1.6 and 1.3); an ANOVA revealed no group difference ($p > .20$).

Group Differences in the Patterning of Anxious Behavior

In the preceding sections we reported results on differences between the four experimental groups separately for each dependent variable. In this section we analyze group differences in the patterning of anxiety responses. Table 1 contains hypotheses for both types of analysis: Its rows represent hypotheses about group differences in single variables; its columns represent hypotheses about within-group discrepancies between variables, that is, about the specific reaction pattern of each group.

To test these specific reaction patterns we selected one dependent variable out of each class of anxiety measures (i.e., verbal, autonomic, and facial measures): baseline-corrected verbal report of anxiety, baseline-cor-

Table 3
Means, Standard Deviations, and Significance Tests for Group Differences in Rated Facial Anxiety

	Means								t		
	REP		LA		HA		DHA				
Facial anxiety measures	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	LA < REP[a]	HA < REP[a]	LA ≠ HA[b]
Raw scores											
Baseline phrases	1.86	.51	1.69	.48	1.94	.68	2.08	.88	<1	<1	1.0
Affective phrases	2.04	.92	1.56	.22	1.88	.61	2.02	.92	1.8**	<1	1.7*
AL scores for change: baseline − affective phrases	.45	1.23	−.33	.73	−.10	.69	−.08	1.17	1.9**	1.4*	<1

Note. REP = repressors, LA = low-anxious, HA = high-anxious, and DHA = defensive high-anxious subjects. AL = autonomic lability.
[a] One-tailed tests because of an a priori hypothesis.
[b] Two-tailed tests because of an a posteriori hypothesis.
* $p < .10$. ** $p < .05$.

rected heart rate, and the facial anxiety rating. Because our hypotheses for group differences address the association to mixed phrases, we compared the following scores: baseline-corrected verbal anxiety report after completion of the phrase-association task, baseline-corrected heart rate average during the mixed phrases, and the average of the facial anxiety ratings obtained during all four affective phrases that had been rated. This seems to be the best possible choice of representatives of verbal, autonomic, and facial measures of anxiety for comparisons among measures.

Each of these three variables was z transformed over all 48 subjects to make them directly comparable. Although this approach allows only statements about the patterning of each group's reactions relative to the behavior of all four groups, these "relative" statements may be generalized with some caution to the total subject sample because the four experimental groups represent all four quadrants of the MAS/SDS space.

Table 4 shows the group means of the z-transformed scores (Table 4 may be directly compared with Table 1). Analyses of the variance–covariance matrices for each of the four groups clearly showed that it was not appropriate to analyze the groups' reaction patterns within a repeated measures approach: Not one of the 12 within-group correlations between the three anxiety measures reached significance. Therefore, we regarded each cell of Table 4 as an independent group, that is, we tested each column of Table 1 by a corresponding contrast between the verbal, autonomic, and facial scores.

Table 4 shows that these contrasts significantly confirmed the hypothesis verbal < autonomic, facial for REP subjects as well as the hypothesis verbal > autonomic, facial for LA subjects, whereas the contrast testing the hypothesis verbal, autonomic > facial for HA subjects proved not to be significant. No significant differences for the two subhypotheses verbal > facial and autonomic > facial for HA subjects were revealed by t tests (in both cases, $p > .10$). Thus, the predictions for both REP and LA groups were significantly confirmed, whereas the HA group did not show the expected autonomic–facial and verbal–facial discrepancies; instead, this group reacted with consistent high anxiety in all three measures of anxiety. An ANOVA for DHA also revealed no sizable discrepancies between these measures, $F(2, 33) < 1$, indicating that this group reacted with consistent intermediate anxiety.

Discussion

If we consider heart rate as an adequate measure of autonomic activity, the predicted pattern of group differences for the phrase-association task was fully confirmed except for the facial reaction of the high-anxious group, which was more intense than expected. The low-anxious group reported an intermediate level of anxiety after completion of the phrase-association task, although showing low heart rate and facial anxiety during its anxiety-in-

Table 4
Group Means of Standardized Measures of Anxiety for the Phrase-Association Task and Significance Tests for the Predictions of Table 1

Anxiety measure	REP	LA	HA	DHA	p[a]
Self-rated anxiety[b]	−.62	.13	.41	.08	<.01
Heart rate[c]	.19	−.48	.30	−.01	<.03
Facial anxiety[d]	.23	−.44	.00	.19	>.10
p[e]	<.03	<.02	>.10		

Note. All three measures are z transformed over all 48 subjects. REP = repressors, LA = low-anxious, HA = high-anxious, and DHA = defensive high-anxious subjects.
[a] Significance of contrasts testing the predicted group differences for each measure (cf. Table 1).
[b] Corrected for baseline rating.
[c] Average during all mixed phrases, corrected for individual baseline.
[d] Average during all rated affective phrases.
[e] Significance of contrasts testing the predicted within-group discrepancies for each group (cf. Table 1).

ducing part; the repressors exhibited a reverse discrepancy between low self-reported anxiety and high heart rate and facial anxiety; and the high-anxious subjects reacted with consistent high anxiety on all three variables.

Unfortunately, the skin resistance response data could not be fully evaluated because of technical problems, although the partial results were consistent with the heart rate data (see Footnote 1). The hypothesis for group differences in pulse volume amplitude during the phrase-association task could not be confirmed. Instead, the expected differences occurred with delay in the film periods following this task. As we pointed out above, this might have been caused by a ceiling effect for group differences during phrase association.

The facial data did fully confirm our hypothesis of a particularly high facial anxiety on the part of the repressors during the anxiety-inducing part of the phrase-association task. The hypothesis that the high-anxious subjects were internalizers, that is, that they show less anxiety facially than autonomically, was not significantly confirmed, although there was a tendency in that direction (cf. Table 4). All in all, the facial data point more to a consistently high-anxious behavior pattern of this group.

Whereas the low-anxious, the high-anxious, and the repressor groups had extreme scores in several measures of anxiety, the defensive high-anxious group showed consistently intermediate anxious behavior. This may be explained by their less extreme manifest anxiety and social desirability scores that were due to the difficulty of finding enough subjects with high scores on both the MAS and the SDS.

If we compare the results of our experiment with those of Weinberger et al. (1979), our experiment can be considered a replication, a refinement, and an extension of the Weinberger et al. study:

1. Our data replicated the pattern of group means found by Weinberger et al. for heart rate change and self-reported anxiety change.

2. We could further substantiate that the group differences found during the phrase-association task were due to its anxiety-inducing nature because (a) group differences in heart rate change and facial anxiety change were restricted to its anxiety-inducing part (i.e., associating to phrases with sexual and aggressive content), (b) group differences in self-reported anxiety after completion of the phrase-association task were specifically related to this task independent of similar differences in other experimental situations, and (c) no group differences were found for any other self-rated emotion or task difficulty in any experimental condition.

3. The predicted differential patterning of anxious behavior between the low-anxious and the repressor groups could be directly confirmed by an analysis of within-group discrepancy scores.

4. The results for autonomic–verbal discrepancies during the phrase-association task were extended to facial–verbal discrepancies as well: All four groups showed consistent autonomic–facial reactions, suggesting that both measures of anxiety reflected spontaneous anxious behavior in this experiment and that the autonomic/facial–verbal discrepancies within the groups reflect discrepancies between spontaneously and voluntarily controlled anxious behavior.

Taken together, the data of Weinberger et al. (1979) and of our study provide substantial empirical evidence that the low-anxious, the high-anxious, and the repressor groups utilize quite different styles of coping with anxiety that justify our labeling of the low-MAS, low-SDS subjects as low anxious and our labeling of the high-MAS, low-SDS subjects as high anxious. It should be noted, however, that in both the Weinberger et al. and our study only male subjects participated; whether our results generalize to female subjects needs further investigation.

The nature of the anxious behavior of the repressors needs to be discussed in more detail. Are the repressors really repressive, that is, are they self-deceptive, or are they "other deceptive"? Millham and Kellogg (1980) recently showed that high SD scores are significantly related to both self-deception and other deception, that is, the repressors' high SD scores alone do not permit a clear-cut decision. The facial data from this study provide some support for the notion that repressors are self-deceptive. Other deceptors should have monitored their face closely during the affective phrases (particularly because we increased objective self-awareness during the long intervals

between phrases by a still picture of the female experimenter apparently looking straight into the subject's face). Nevertheless, the repressors showed the opposite behavior: Their facial expression of anxiety increased more than that of any other group between the baseline phrases and the affective phrases. This seems to indicate that repressors do not control their facial expression; this, in turn, seems to be inconsistent with other deception.

On the other hand, our subjects did not know that they were videotaped; therefore, even highly other-deceptive subjects might not have been motivated to monitor their faces closely. Thus, the present study does not allow a clear-cut decision as to whether repressors are self- or other deceptive. Further research is needed to answer this important question. One way to do this is to vary experimentally the degree to which subjects feel observed.

The important clinical implications of the successful differentiation of low anxiety, high anxiety, and repression of anxiety were discussed by Weinberger et al. (1979). Here, we stress two further implications, one concerning the psychology of personality and one concerning the psychology of emotion.

In recent years the use of personality questionnaires has been increasingly criticized (cf. Endler & Magnusson, 1976; Mischel, 1968). The central argument is the claim that paper-and-pencil tests fail to explain a large proportion of the variance in "real behavior" in many situations. The present study shows that this is not necessarily the case. We have shown that interindividual differences in autonomic as well as in nonverbal behavior in a particular situation can be reliably predicted by paper-and-pencil tests if (a) defensive tendencies of subjects are taken into account and (b) item content and experimental situation closely correspond to each other. We do not expect that repressors differ considerably from low-anxious subjects in a situation that elicits a fairly stereotyped anxiety response that has little relevance to the repressors' idealized self-concept—threatening subjects by the announcement of an impending electric shock, for example. Only if the experimental situation closely corresponds to the questionnaire content will the subjects' self-description predict a significant portion of their nonverbal behavior. If this is taken into account, the use of personality questionnaires may not be as useless as is often claimed.

The main implication for the psychology of emotion is, in our view, that it seems to be possible to predict differences in the consistency of emotional behavior in different behavioral modalities without becoming entangled in the pitfalls of ex post facto explanations. The discrepancies between the classic indicators of emotion that have worried many scholars in the field seem to be an important source of information about the covert mechanisms involved in the processing and regulation of emotion. From this perspective, the study of discrepancies in emotional behavior could prove to be helpful for testing system-theoretic models of coping and control in the processing of emotion (cf. Asendorpf, 1981).

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New Journal on Aging: Call for Nominations

By action of APA's Publications and Communications Board and Council of Representatives, the APA is publishing a quarterly journal called *Psychology and Aging,* the first issue of which will appear in 1985. *Psychology and Aging* will contain original articles on adult development and aging. The articles may be reports of research or applications of research, and they may be biobehavioral, psychosocial, educational, methodological, clinical, applied, or experimental (laboratory, field, or naturalistic) studies. For more information about the new journal, see the November issue of the APA *Monitor.*

Nominations for the editor of *Psychology and Aging* are now open. Candidates must be members of APA and should be available to start receiving manuscripts in mid-1984 to prepare for issues published in 1985. To nominate candidates, prepare a statement of one page or less in support of each nomination. Submit nominations no later than April 2, 1984, to:

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