Psychophysiological Differences Between Subgroups of Social Phobia

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Individuals meeting criteria of the revised third edition of Diagnostic and Statistical Manual for Mental Disorders (American Psychiatric Association, 1987) for social phobia with a fear of speaking in front of people were subdivided into those with \( n = 16 \) and without \( n = 14 \) avoidant personality disorder (APD). These individuals and nonanxious controls \( n = 22 \) spoke in front of a small audience while speaking time, subjective anxiety, fearful thoughts, and electrocardiographic and respiratory measures were recorded. Controls spoke longer than either social phobia group. Those with social phobia and APD reported more subjective anxiety and more fear cognitions than the other two groups; phobic individuals without APD showed greater heart rates in the phobic situation than either social phobics with APD or controls. The latter two groups did not differ in heart rate. These results indicate incongruent subjective and heart rate responses to the feared situation. A similar pattern of results was found when participants were divided into generalized and specific social phobia groups.

With the publication of the third edition of Diagnostic and Statistical Manual for Mental Disorders (DSM-III; American Psychiatric Association, 1980), social phobia was officially recognized as a diagnostic entity. When the DSM-III was revised in 1987 (DSM-III-R; American Psychiatric Association, 1987), a diagnosis of social phobia was no longer ruled out if a person also met criteria for avoidant personality disorder (APD). Thus, it became possible to have both diagnoses concurrently. More recently, however, there has been some debate as to whether social phobia and APD are separate entities or whether they are the same entity at different points on a continuum (Herbert, Hope, & Bellack, 1992; Holt, Heimberg, & Hope, 1992; Turner, Beidel, & Townsley, 1992; Widiger, 1992).

Recent studies examining this issue (Herbert et al., 1992; Holt et al., 1992) compared subgroups of people with social phobias on measures of subjective and behavioral anxiety. Results showed significant differences between those with generalized social phobia with and without APD and those with discrete social phobia without APD. The authors interpreted these findings as indicating that both the diagnosis of APD and the generalized subtype of social phobia may apply to more severe cases of social phobia rather than to qualitatively different subgroups. These studies are limited because one of them (Holt et al., 1992) did not use a standardized experimental situation to assess social anxiety. In addition, neither study included a nonsymptomatic comparison group or used physiological measures that might provide an additional perspective on the intensity of distress.

Three studies of DSM-III-R social phobia involved the use of physiological measures. Heimberg, Hope, Dodge, and Becker (1990) compared people with public speaking anxiety to those with a generalized subtype of social phobia. Those with public speaking anxiety showed higher heart rate but reported less subjective anxiety to a behavioral challenge than those with generalized social phobia. However, in this study the behavioral challenge test was not uniform for all individuals. Whereas some had their heart rate recorded during social interaction, others were recorded during public speaking. Differences in amount of speaking required by the different tasks may have affected physiological measures, because a striking positive relationship has been found between talking and increased blood pressure and heart rate in a large number of studies (e.g., Lynch, 1985).

Turner et al. (1992) compared people with discrete social phobias, generalized social phobias without APD, and generalized social phobia with APD on heart rate recorded during an impromptu speech. Their findings indicated no differences in heart rate between these three groups. However, public speaking was not the main fear of all of their participants, and these authors failed to include a nonsymptomatic control group. Furthermore, heart rate was not assessed continuously but rather at 2-min intervals while blood pressure was being measured.
In a replication of Heimberg et al. (1990) that included a standard public speaking task, Levin et al. (1993) compared people with generalized and discrete social phobia to controls on heart rate, subjective, and biochemical measures (plasma epinephrine and norepinephrine). Consistent with Heimberg et al.'s (1990) finding, discrete social phobic people showed higher heart rate but reported less subjective anxiety during their speech than generalized social phobic people. This study also had several limitations. First, the individuals were standing while giving their talk, which may have affected their heart rate. Second, the groups were not age matched. Discrete social phobic individuals were an average of seven years older than those of the generalized subtype, which may have affected their heart rate response. Third, it is unclear whether public speaking was the main fear of the social phobic people tested. Fourth, controls were recruited from inside their medical center, which means that they were tested in a more familiar environment compared to the other groups. This may have reduced their anxiety response to speaking.

The goal of the present study was to elucidate psychophysiological differences between social phobic individuals with and without APD during a speech task. Although the presence of APD was not assessed in either of the two studies that found physiological differences between specific and generalized social phobic persons (Heimberg et al., 1990; Levin et al., 1993), we suspected that those with APD would react physiologically like generalized social phobic individuals because these two groups overlap diagnostically. We attempted to improve on previous research in the following ways: Participants were recruited from outside our medical center, and each group had the same mean age. All participants shared the same main social fear (public speaking anxiety), and the behavioral challenge test was uniform. Participants were seated as psychophysiological measures were taken, and measures included T-wave amplitude and respiratory sinus arrhythmia in order to separate sympathetic and parasympathetic influences on heart rate. In addition, a non-symptomatic control group was included.

Method

Participants

Sixteen social phobic individuals with APD, 14 social phobic individuals without APD, and 24 controls who lacked public speaking anxiety were recruited by advertisements in the classified sections of local newspapers. For those with social phobia, the advertisement read as follows: "AFRAID OF SPEAKING IN FRONT OF OTHER PEOPLE? Stanford University and Palo Alto VA are offering free evaluations to people who have a fear of speaking in some or all situations. For further information, call . . . " For controls, the advertisement read: "SPEECH STUDY. Stanford University and Palo Alto VA will pay $50 for participation in study of attitudes and reactions to speaking. We are looking for healthy adults between 18 and 65 who generally are not afraid of speaking. For further information, call . . . ".

About half \((n = 16)\) of the public speaking anxious group met criteria for APD. Controls and social phobic individuals with and without APD did not differ in terms of age (mean years = 47.1, 48.7, and 44.3, respectively), sex distribution (percentage of females = 41%, 44%, and 40%, respectively), or years of education \((M = 16.2, 15.0, \) and \(16.3, \) respectively). Furthermore, there were no group differences in employment, marital status, use of medications, treatment for anxiety problems in the past, or frequency of exercise (which could affect cardiac psychophysiological measures).

Assignment of Diagnoses

Those who responded to advertisements were screened briefly over the telephone to determine whether they were likely to meet participant selection criteria. People who passed the initial screening were scheduled for two structured interviews conducted on one day by an experienced clinician. The first took up to 2 hr, and its results are reported elsewhere (Hofmann, 1993). The second included the Structured Clinical Interview for DSM-III-R (Spitzer, Williams, Gibbon, & First, 1989) and an unstructured interview using DSM-III-R (American Psychiatric Association, 1987) criteria for APD. These interviews gathered sufficient information for making DSM-III-R diagnoses of anxiety disorders, APD, psychoactive substance-use disorder, schizophrenia, and mood disorders. As part of this interview, participants were asked to rate their fear of numerous social situations (e.g., eating in public, writing in public, being introduced, talking on the phone) on a scale from 0 (not at all) to 10 (very much) and were asked which social situation they most feared. Those who rated their fear of public speaking as 7 or higher, who indicated that public speaking was their worst fear, and who met criteria for social phobia were assigned to the public speaking anxious group. Respondents who rated their fear of public speaking as 3 or less and who did not meet criteria for social phobia or APD were assigned to the control group.

Diagnostic interviews were audiotaped and a blind independent rater listened to a random selection of half of the tapes (14 presumed social phobic individuals and 11 presumed controls). Agreement between the blind rater and the interviewer was 100% for the diagnosis of social phobic and 93% for the diagnosis of APD. Subtypes of social phobia were also determined by the two raters with 100% agreement. Criteria for generalized social phobia were similar to those of Turner et al. (1992). Judgments were based on fear ratings of specific social situations elicited in the structured interview. Phobic individuals were assigned a generalized subtype diagnosis if they rated a minimum of four commonly occurring social situations (being introduced, speaking on the phone, going on a first date) as at least moderately fear provoking (4 or more on a 10-point Likert scale).

Procedure

After the interviews, participants were scheduled to return for a second day of testing within a 2-week period. They also learned that during their second day of testing they would be asked to give a talk before a small audience, but no details were given.

At the end of the interview day participants took home a battery of questionnaires to be filled out, which included a sociodemographic questionnaire, a medical history questionnaire, the Fear of Negative Evaluation Scale (FNE; Watson & Friend, 1969), the Social Avoidance and Distress Scale (SADS; Watson & Friend, 1969), the Social Phobia and Anxiety Inventory (SPAI; Turner, Beidel, Danuc, & Stanley, 1989), the Social Interaction and Self-Statement Test (SISST; Glass, Muruzzi, Biever, & Larsen, 1982), the Test Anxiety Scale (TAS; Sarason, 1978), and the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961).

On the second day of testing individuals participated in a laboratory experiment with a same-sex experimenter (to minimize any effects of opposite sex interaction on anxiety). They were taken to a laboratory where electrodes and equipment for ambulatory recording were attached, which took about 30 min. Testing consisted of two parts. During the first part, which took about 1 hr, they were asked to read text passages. Results of this part of the experiment are not relevant for the present investigation and will be reported elsewhere. The second part
was a modified version of the procedure used by Beidel, Turner, Jacob, and Cooley (1989). During this procedure, they completed 5 tasks, the average duration of which is indicated: (a) sitting quietly with the experimenter outside the room (baseline—3 min); (b) conversing with the experimenter about what the participant had done the day before (small talk—3 min); (c) preparing a talk with the experimenter outside the room (preparation—3 min); (d) sitting in front of an audience of two people (3 min); and (e) speaking in front of this audience (speaking—10 min). The audience was the male experimenter and a female member of the Veterans Affairs research staff whom the participant had never met before. Participants sat in a chair during all tasks to avoid postural effects on physiological measures.

Right before the second task, the experimenter turned on a video camera (placed between the audience members) and a tape recorder. For the third task, participants were given a list of five topics (nuclear power, corporal punishment in schools, mandatory seat belt laws, abortion, and the American health-care system) and were told to choose up to 3 topics for their 10-min speech. They were informed they could jot down notes during their 3-min preparation period but that these notes would be taken from them after the preparation period was over. They were also told that it was unimportant how many of the topics they addressed or how long they spent on one topic. They were to try to speak for 10 min but could end their speech at any time if they experienced significant distress. They were instructed that they could end the speech by holding up an index card on which the word STOP was written. The length of time the participant spoke was recorded. After each task, they were asked to fill out the State-Trait Anxiety Inventory, state form (STAI-state; Spielberger, Gorsuch, & Lushene, 1970). To measure anxiety-related cognitions that had occurred during their speech, they completed the experimenter-developed Cognitions During the Talk Questionnaire (CT; Hofmann, 1993) after their speech. They also completed the Personal Report of Confidence as a Speaker (PRCS; Paul, 1966) to measure their public speaking confidence during their talk.

The CT is an adaptation of the SISST modified to represent cognitions prior to, during, and following public speaking. Items are rated on a scale of 0 (do not agree at all) to 5 (strongly agree). Nineteen of the 30 items are keyed true, and 11 are keyed false, yielding a maximum summed score of 150 and a minimum score of 0. A high score on this questionnaire indicates more negative thoughts. This scale has good face validity with items such as: “What I say will probably sound stupid” and “it would crush me if the audience didn’t respond to me” as well as “I’m beginning to feel more at ease.” In a previous study, the reliability estimation (Cronbach alpha) showed high coefficients for the patient group (.88) and the control group (.83). Criterion validity of this questionnaire was demonstrated by high correlations with the PRCS, r = .51, and the SISST (negative cognitions; Glass et al., 1982), r = .48, and low correlations with the Agoraphobic Cognitions Questionnaire (Chambless, Caputo, Bright, & Gallagher, 1984), r = .15, the Body Symptoms Questionnaire (Chambless et al., 1984), r = .10, and the BDI (Beck et al., 1961), r = .10. Known groups validity was demonstrated by discriminating public speaking phobic individuals from controls, p < .05 (Hofmann, 1993).

Physiological data were recorded during the entire experiment but were only analyzed for periods when the tasks were actually being performed. An electrocardiogram was derived from electrodes placed over the sixth intercostal spaces at the left and right midclavicular line (modified Lead I) with a ground electrode below the right intercostal electrode and above the iliac crest. Respiratory activity was recorded from two elastic belts around the abdomen and the chest. The ambulatory cassette tape recorder (Medilog 4-24, Oxford Medical Systems) was worn on a belt that also carried the respiratory oscillator. Events could be marked on the tape by pressing a button attached to the recorder. Cassette tapes of the ambulatory data were played back into an analog-to-digital converter that sampled the data channels. Mean values of each variable for the duration of each task were calculated in an off-line computerized analysis. Heart rate was based on R–R intervals. T-wave amplitude was calculated for each cardiac cycle. The amplitude was the difference between the maximum and a reference point before the R-wave set for each individual, typically 60 ms before. The smaller the T-wave amplitude, the greater the beta-adrenergic (sympathetic) cardiac activity (e.g., Contrada et al., 1991). For the respiratory minute volume, differences between peaks and valleys were estimates of tidal volume, which was multiplied by respiration rate. Respiratory sinus arrhythmia was quantified by a version of a method suggested by Grossman and Wientjes (1986), by which mean difference in R-R interval between inspiratory and expiratory windows of the breathing cycle was calculated. Respiratory sinus arrhythmia is an indicator of cardiac vagal tone.

Results

Overall Group Differences

Diagnoses. Fourteen of the 16 phobic individuals with APD received at least one additional DSM-III-R diagnosis, whereas only 7 of the 14 social phobic individuals without APD received an additional diagnosis. The most common additional diagnoses of phobic people with APD were psychoactive substance use disorder (25%), simple phobia (25%), generalized anxiety disorder (19%), and agoraphobia without history of panic disorder (19%). This difference, however, did not reach statistical significance, \( \chi^2(1, N = 30) = 3.37, p = .066 \). For people with social phobia without APD, simple phobia was the most frequently reported additional diagnosis (21% of cases).

Social phobia individuals with APD were much more likely to meet the criteria for the generalized subtype of social phobia, \( \chi^2(1, N = 30) = 10.72, p = .001 \), than those without APD. Fourteen out of 16 phobic individuals with APD (88%) met the criteria for the generalized subtype of social phobia; only 3 out of 14 social phobic individuals without APD (21%) did. We therefore lacked a sufficient number of participants with generalized social phobia without APD to include this group as a separate comparison. The diagnosis of APD was also more common among social phobic individuals with the generalized subtype of social phobia (82%) than those without this subtype (15%).

Severity of social phobia. Separate analyses of variance (ANOVA) were conducted on ratings of feared social situations. Results showed that “giving a speech” was the only situation that significantly differentiated both social phobic participants with APD \((M = 9.3)\) and those without APD \((M = 8.2)\) from controls \((M = 3.2)\), \(F(2, 51) = 60.81, p < .0001\). However, social phobic participants with APD showed significantly greater anxiety than those without APD and controls in the following situations: being introduced \((M = 6.8, 2.9,\) and 2.6, respectively), \(F(2, 51) = 15.44, p < .0001\); being under observation by others \((M = 8.3, 3.7,\) and 3.5, respectively), \(F(2, 51) = 26.48, p < .0001\); being teased \((M = 6.4, 3.6,\) and 3.2, respectively), \(F(2, 51) = 9.12, p < .0004\); using a telephone \((M = 4.1, 1.0,\) and 1.1, respectively), \(F(2, 51) = 11.66, p < .0001\); eating in public \((M = 3.7, 0.3,\) and 1.2, respectively), \(F(2, 51) = 9.51, p < .0003\); and writing in public \((M = 4.9, 0.5,\) and 0.8, respectively), \(F(2, 51) = 25.38, p < .0001\). For two social fears, social phobic participants with APD reported greater anxiety than those without APD, but controls were not different from either
group. These fears were: having a first date (M = 7.4, 4.1, and 5.5, respectively), F(2, 51) = 6.07, p < .005, and urinating in a public lavatory (M = 2.8, 0.7, and 1.7, respectively), F(2, 51) = 3.34, p < .04. Social phobic participants with APD reported greater fear of meeting people in authority (M = 6.6) than controls (M = 2.9), whereas social phobic participants without APD (M = 4.4) were not different from the other two groups, F(2, 51) = 11.72, p < .0001.

ANOVA of the questionnaires are summarized in Table 1. Due to missing data, only 15 social phobic participants with APD, 9 social phobic participants without APD, and 22 controls were included in the questionnaire analyses. Of these, 13 social phobic participants with APD (8%) and 2 without APD (22%) met criteria for generalized social phobia. To determine whether results would be similar when participants were divided into generalized and specific social phobic groups, similar analyses were conducted with this division.

There were significant group differences for the FNE, SADS, the agoraphobia subscale of the SPAI, the Social Phobia subscale of the SPAI, the total SPAI score, the SISST (negative self-statements), and the Test Anxiety Scale. Post hoc Fisher tests revealed that social phobic participants without APD were more similar to controls than to social phobic participants with APD (p < .05) on all scales but the TAS, the total SPAI, and the SPAI Social Phobia subscales. On the TAS, phobic participants with APD scored higher than controls, but phobic participants without APD were not different from either group. On the two SPAI scales, social phobic participants with APD scored higher than those without APD, who in turn scored higher than controls. No group differences were found on the SISST (positive self-statements) or the BDI. The same pattern of results was found when participants were divided into generalized and specific social phobic groups.

Differences During Laboratory Testing

Speaking time. An ANOVA indicated group differences in duration of speaking, F(2, 41) = 9.07, p < .0005. Controls spoke longer (M = 9.2 min) than phobic participants without APD (M = 6.2 min) and than those with APD (M = 6.9 min), as indicated by significant post hoc Fisher tests (p < .05). Phobic participants with and without APD showed no differences in speaking time. The same pattern of results was found when participants were classified into generalized and specific social phobic groups.

Subjective anxiety. Figure 1 shows subjective anxiety as measured by the STAI (state) during the baseline and 5 tasks for the 3 groups. Groups already differed at baseline (p < .0002). A 5 (task) × 3 (group) repeated measures ANOVA for 22 controls, 9 social phobic participants without APD, and 14 social phobic participants with APD showed highly significant group differences, F(2, 42) = 22.42, p < .0001. Post hoc group comparisons confirmed (p < .05) the pattern that those with social phobia with APD scored higher than those with social phobia without APD, who in turn scored higher than controls. Similarly, when participants were redivided, STAI scores showed that those with generalized social phobia scored higher than those with specific social phobia, who in turn scored higher than controls. For social phobic participants with and without APD, the task effect and the Task × Group interaction were also highly significant, F(4, 42) = 39.86, p < .0001, and F(8, 42) = 6.45, p < .0001, respectively. A significant linear trend of task indicated that tasks became successively more difficult for the participants.

Note. Different subscripts indicate significant post hoc group differences (Fisher test, p < .05). APD = avoidant personality disorder; FNE = Fear of Negative Evaluation Scale; SADS = Social Avoidance and Distress Scale; SPAI = Social Phobia and Anxiety Inventory (Social Phobia subscale); SISST = Social Interaction Self-Statement Test; TAS = Test Anxiety Scale; BDI = Beck Depression Inventory. 1In the SISSL control group, n = 21.

*p < .005. **p < .0001.

Table 1
Comparison Between Controls and Social Phobic Individuals With and Without APD on Self-Report Inventories

<table>
<thead>
<tr>
<th>Measure</th>
<th>Controls (N = 22)</th>
<th>Without APD (n = 9)</th>
<th>With APD (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>FNE</td>
<td>8.6</td>
<td>6.9</td>
<td>11.7</td>
</tr>
<tr>
<td>SADS</td>
<td>5.0</td>
<td>5.9</td>
<td>7.0</td>
</tr>
<tr>
<td>SPAI</td>
<td>42.2</td>
<td>28.1</td>
<td>74.5</td>
</tr>
<tr>
<td>Total</td>
<td>29.3</td>
<td>23.8</td>
<td>62.3</td>
</tr>
<tr>
<td>SISST†</td>
<td>Negative 29.1</td>
<td>11.1</td>
<td>29.6</td>
</tr>
<tr>
<td>Positive 48.2</td>
<td>12.4</td>
<td>42.8</td>
<td>8.6</td>
</tr>
<tr>
<td>TAS</td>
<td>11.1</td>
<td>8.2</td>
<td>14.2</td>
</tr>
<tr>
<td>BDI</td>
<td>3.9</td>
<td>4.7</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Figure 1. Means and standard errors of the State—Trait Anxiety Inventory (STAI; state form) during a speech test for social phobic individuals with avoidant personality disorder (APD; n = 15; closed circles), social phobic individuals without APD (n = 9; open circles), and nonanxious controls (n = 22; closed squares).
The Task × Group interaction reflected differences between social phobic participants with APD and the other two groups that increased during the course of the experiment. A similar pattern of results was found when participants were classified into generalized and specific social phobic groups.

Because there were baseline STAI differences, \( F(2, 42) = 10.06, p < .0003 \), an analysis of covariance was calculated with baseline scores as the covariate as a way of comparing the anxiety response (increases from baseline to speaking) in the three groups. Results showed a significant group effect, \( F(2, 39) = 4.30, p < .03 \). Post hoc Fisher tests of the least square means showed that after correction for baseline differences, social phobic participants with APD scored higher on the STAI than those without APD, who scored higher than controls. When participants were divided into generalized and specific social phobic groups, the analysis of covariance group effect just missed significance (\( p = .059 \)). Post hoc tests showed that both groups had higher scores than controls, but the difference between the two types of social phobia was only a trend (\( p < .07 \)).

Analyses of the CT, \( F(2, 42) = 35.77, p < .0001 \), and the PRCS, \( F(2, 42) = 72.46, p < .0001 \), also revealed a significant group effect. Similar to STAI results, Fisher tests (\( p < .05 \)) documented that social phobic participants with APD scored higher on the CT and PRCS than those without APD, who scored higher than controls (see Table 2). A similar pattern of results was found with participants who had generalized and specific social phobia.

**Physiological response.** Although physiological recording was performed for all participants, a substantial amount of data were missing due to sporadic equipment failure. Therefore, physiological analyses were based on 8 phobic participants with APD and 7 persons without APD. However, a subanalysis determined that each subgroup whose data were included in the physiological analyses (i.e., social phobic participants with and without APD) did not significantly differ on questionnaire scores from the comparable subgroup of participants not included in the analyses. Of those included in the analyses, all 8 social phobic participants with APD (100%) but only 1 without APD (14%) met criteria for the generalized subtype of social phobia.

There were no significant differences between baseline measures of physiological variables. Responses to tasks were analyzed with separate 5 × 3 repeated measures ANOVAs. Significant results appeared for heart rate and T-wave amplitude but not for respiratory minute volume or respiratory sinus arrhythmia. Figure 2 shows heart rate for groups during baseline and tasks. Heart rate results showed a significant overall task effect, \( F(4, 29) = 12.76, p < .0001 \) and a significant Task × Group interaction, \( F(8, 29) = 3.38, p < .006 \), without a main group effect. The task effect was associated with a significant linear trend, \( F(1, 29) = 35.26, p < .0001 \). Quadratic and the cubic trends did not reach statistical significance. The significant Task × Group interaction reflects group differences that were greater at the end of the experiment during the more frightening tasks than at the beginning. This same result was found when participants were divided into generalized and specific social phobic groups. Post hoc Fisher tests showed that during the speech, social phobic participants without APD had significantly higher heart rates than those with APD (\( p < .05 \)) and than controls (\( p < .004 \)). However, social phobic participants with APD were not significantly different from controls. Similarly, when participants were divided into generalized and specific social phobic groups, those with specific social phobias had higher heart rates than those with generalized social phobias and controls. However, those with generalized social phobias were not significantly different from controls. Only 17 controls were included in this analysis due to missing data.

Results for T-wave amplitude showed a highly significant task effect, \( F(4, 30) = 13.76, p < .0001 \), and a significant Task × Group interaction, \( F(8, 30) = 2.59, p < .04 \). The task effect was
associated with a significant upward linear trend, $F(1, 30) = 26.38, p < .0001$. Social phobic participants with APD showed a relatively greater T-wave amplitude than the other two groups. This group difference was greater at the end than at the beginning of the experiment. Post hoc tests for T-wave amplitude during the speech did not reach statistical significance. Results were similar when participants were divided into generalized and specific social phobic groups, with one difference: post hoc tests during the speech showed that those with generalized social phobias had higher T-wave amplitude than the other two groups. There were no effects for the respiratory minute volume or respiratory sinus arrhythmia. These analyses were based on 18 controls.

Discussion

Results of this study showed that social phobic participants with and without APD differed in their subjective anxiety, fearful thoughts, number of feared situations, and heart rate responses to the feared situation. With respect to subjective anxiety, those with APD reported higher scores on the total SPAI, SPAI Social Phobia subscale, SPAI Agoraphobia subscale, FNE, and SADS than did social phobic participants without APD or controls. Moreover, when giving a talk in front of a small audience, phobic individuals with APD scored higher on the STAIE-state and PRCS. They also reported more fearful thoughts as measured by the SISST and CT than social phobic individuals without APD or controls. The same relationship between the three groups was found for subjective anxiety during minor fearful situations of the experiment and for scores on questionnaire assessing severity of social phobia. Physiological measures, however, showed a different pattern. Social phobic participants without APD had higher heart rates in response to public speaking than those with APD, who did not differ from controls. Thus, whereas social phobic participants with APD reported more severe subjective anxiety, more feared situations, and fearful thoughts during the feared situations, social phobic participants without APD had higher heart rates. The same pattern of results was found when participants were divided into generalized and specific social phobic groups and compared to controls (i.e., those with generalized social phobias reported greater subjective anxiety, whereas those with specific social phobias had higher heart rates).

Some of our results replicated previous findings (Herbert et al., 1992; Holt et al., 1992; Turner, Beidel, Dansu, & Keys, 1986; Turner et al., 1992). In all of these studies, phobic participants with APD reported more social anxiety, supporting the hypothesis that the diagnosis of APD identifies a more severe form of social phobia. Also consistent with previous studies was our finding that social phobic individuals without APD differed from controls on fewer measures than social phobic individuals with APD. On the basis of this hypothesis, one would also expect higher physiological arousal in social phobic individuals with APD when exposed to the phobic situation. Yet for heart rate, a standard indicator of arousal, we found the opposite, just as Levin et al. (1993) and Heimberg et al. (1990) had found lower heart rates to phobic situations in generalized social phobic individuals than in those with specific social phobias.

In the present study, dividing the phobic participants into those with and without APD also tended to divide them into those with and without generalized social phobia. In fact, the same pattern of results was found when participants were divided into generalized and specific social phobic groups. Therefore, our results may be, in effect, a confirmation of the results of Levin et al. (1993) and Heimberg et al. (1990). Unfortunately, we did not recruit enough generalized social phobic participants without APD to include this group in a separate comparison and therefore lack evidence to test whether the psychophysiological differences we observed are more a reflection of the presence or absence of APD or of generalized social phobia. Of course, this formulation of alternatives assumes the validity of the distinctness of these two categorizations, which in fact overlap conceptually and may simply represent different severities on the same continuum.

As an explanation for their results, Levin et al. (1993) suggested a central defect in anxiety regulation for generalized social phobic individuals, contrasted with peripheral autonomic hyperactivity in those with discrete social phobias. This hypothesis was based in part on the observation that those with discrete social phobias tended to show higher levels of plasma catecholamines throughout testing as compared to individuals with generalized social phobias. However, because plasma catecholamine levels did differ by group in their study and heart rate did not significantly correlate with plasma catecholamine levels, Levin et al. suggested that future research include additional measures such as heart rate variability to look for vagal effects. We did that and found that respiratory sinus arrhythmia, the prime variability measure, did not show the expected decrease during speaking in phobic participants with increased heart rates. Neither did we observe an increase in sympathetic tone indexed by decreased T-wave amplitude. Evidently, these measures were not sensitive enough to detect the changes in autonomic tone that eventuated in heart rate increases.

Why then do individuals with generalized social phobias as well as those with social phobias and APD differ from those without APD (i.e., those with discrete social phobia) in their anxiety response pattern (cf. Hodgson & Rachman, 1974; Lang, 1968; Rachman & Hodgson, 1974)? Discordance between physiological and subjective anxiety response systems may indicate a less coherent mnemonic language organization, sympathetic arousal, and avoidance components, as suggested by Cook, Melamed, Cuthbert, McNiel, and Lang (1988). These authors compared individuals with simple phobia, social phobia, and agoraphobia on their psychophysiological response to phobic imagery. Results showed greater concordance between affective ratings, heart rate, and skin conductance responses for individuals with simple phobia than for the other two groups. Furthermore, the study showed group differences: those with simple phobia showed the greatest, and those with agoraphobia the least, psychophysiological response to phobic imagery. Perhaps individuals with social phobias with APD have a less coherent cognitive fear structure than phobic individuals without APD.

Another reason for the discordance between physiological and subjective anxiety response systems may lie in the results of the study by Borkovec and Hu (1990), who examined the effect of worry on cardiovascular response to phobic imagery. Speech-anxious participants had to visualize a phobic scene as subjective anxiety and heart rate response were recorded. Before the visualization, one group engaged in relaxed thinking, another
group engaged in worried thinking, and a third in neutral thinking. Those in the worry group reported the greatest subjective anxiety but had lower physiological reactivity than those in the neutral condition, who had lower reactivity than those in the relaxed condition. The authors interpreted these results as indicating that worry may inhibit the processing of phobic material and thus preserve cognitive-affective fear structures. In their discussion, Borkovec and Hu refer to Gray’s theory of anxiety as a possible mechanism. According to Gray (1982), the behavioral inhibition system is activated when incoming information from the environment does not match the information expected. The greater the mismatch, the stronger the behavioral inhibition system activation and the greater the cardiovascular response. Borkovec and Hu suggested that because worriers constantly expect feared events, they evince little mismatch when these events actually occur. Because the feared event provides no new information, little further processing occurs and no cardiovascular reaction is elicited. Thus, the anxiety of worriers may be predominantly derived from tonically present fear-related thoughts rather than from phasic reactions to fearful stimuli.

McNeil, Yrana, Melamed, Cuthbert, and Lang (1993) also used phobic visual imagery to investigate phobias. They divided dental and social (speech) phobic individuals into “high fearful” or “high anxious” categories on the basis of their standardized scores on the Fear Survey Schedule (Geer, 1965) and the SADS. Whereas fearful individuals showed positive correlations between heart rate and subjective fear reports, correlations were low in the anxious group. Interestingly, social phobic individuals tended to fall more frequently into the anxious category than the fearful category. McNeil et al. suggested that a source of variability of heart rate increase in anxious individuals might be emotional blends. These authors point out that definitions of social phobia and APD include associated emotions of shame and embarrassment and cite research demonstrating that cardiac rate decreases significantly during experimentally induced embarrassment (Buck & Parke, 1972; Buck, Parke, & Buck, 1970). They propose that a competing parasympathetic shame response in anxious social phobic individuals can summate with fearful sympathetic activation to attenuate heart rate increase.

It is likely that social phobic individuals with APD show more of a tonically present worried thinking style and are closer to the profile of the anxious phobic individual than those without APD. The group differences in questionnaires assessing fearful thoughts in the phobic situation (CT, SISST, negative cognitions, PRCS) are in line with this assumption. The relatively high scores of phobic individuals with APD on the FNE, SADS, and SPAI (Social Phobia subscale, Agoraphobia subscale, and total), may reflect not only more shame and embarrassment in social situations but also a tonic worried thinking style. This hypothesis may explain findings of the studies by Heimberg et al. (1990) and Levin et al. (1993) and is compatible with the findings of Borkovec and Hu (1990) as well as McNeil et al. (1993).

A possible objection to explaining cardiac fear responses in terms of the behavioral inhibition system is raised by the review of Fowles (1980), who concluded that heart rate reflects the central activity of the behavioral activation system rather than the behavioral inhibition system. The behavioral activation system responds to incentive and is correlated with somatic activity, including active avoidance and escape behavior. Electrodermal activity, on the other hand, rises in response to informational mismatch and threats of punishment, and thus is a more proper index of the behavioral inhibition system. An explanation by McNeil et al. (1993), however, may resolve this objection. These authors suggest that whereas the behavioral reluctance and passive avoidance of anxious individuals (possibly seen at an extreme in ADP individuals) fit Gray’s (1982) description of anxiety resulting from an overactive (behavioral) inhibition system, the physiology of fearful individuals (closer to those with more circumscribed social phobia) indicates a dominant activation system characterized by active approach and avoidance.

Studies conducted by Kagan and colleagues on inhibited children may also be of some relevance to our results (Kagan, Reznick, & Gibbons, 1989; Kagan, Reznick, & Snidman, 1987; Rosenbaum et al., 1992; Rosenbaum et al., 1991). Kagan suggests a relationship between childhood behavioral inhibition and adult anxiety disorders, and it is plausible phenomenologically that APD is an adult form of behavioral inhibition. Kagan et al. (1987) postulate that the threshold of responsivity in limbic and hypothalamic structures to unfamiliarity or challenge is tonically lower for inhibited than for uninhibited children, resulting in a lower threshold for sympathetic activation. If phobic individuals with APD have a lower threshold for sympathetic activation, we would expect them to have reduced T-wave amplitudes when making a speech. However, group differences were not statistically significant, and phobic individuals with APD tended to show even greater T-wave amplitude than those without APD.

The present study has several limitations. First, 82% of our participants with generalized social phobia met criteria for APD, which is higher than reported in all published studies except one (Schneier, Spitzer, Gibbon, Fyer, & Biebowitz, 1991, 89%). This suggests our sample was severely disturbed. In contrast, the self-report scores reported in Table 1 are among the least severe (Heimberg et al., 1990; Herbert et al., 1992; Holt et al., 1992; Turner et al., 1992). It is possible that our unstructured interview led to looser criteria for the diagnosis of APD than in other studies. Second, participants were told during the first session that they would be required to give a speech during the second session. It is possible that this led to higher baseline fear in the second session. Third, as stated earlier, we did not recruit enough participants with generalized social phobias without APD to be able to compare this group separately, so APD and the generalized subtype of social phobia are confounded. Thus, we cannot determine whether the observed discordance between subjective and psychophysiological measures is more a reflection of APD or of generalized social phobia.

In summary, the present study showed group differences in anxiety response patterns between social phobic participants with and without APD and controls. Despite the small number of participants and some missing data, phobic participants with APD showed a smaller heart rate response but greater subjective anxiety in the phobic situation than those without APD. The reason for this puzzling finding—whether incoherence in the cognitive fear structure, reduced reactivity when fearful cognitions are tonically present, or emotional blending—remains un-
clear. Future comparisons with other kinds of chronically worried patients, such as those with a diagnosis of generalized anxiety disorder, could shed light on this matter.

References


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