Journal of Personality and Social Psychology
1993, Vol. 64, No. 6, 1072-1083

0022-3514/93/$3.00

Personality Effects on Children's Speech in Everyday Life: Sociability-Mediated Exposure and Shyness-Mediated Reactivity to Social Situations

Jens B. Asendorpf and Gerd H. Meier

Speech and heart rate were continuously monitored during 7 days from morning to evening in 41 Grade 2 children selected for high or low parental judgments of sociability and shyness. Children attended school in the mornings and were free in the afternoons; the child's social situations in the afternoon were reconstructed with the child and a caretaker. During the afternoons sociable children spent more time in conversations than unsociable children, but the groups did not differ in their verbal participation within conversations. Shy children spent as much time in conversations and spoke as much in familiar situations as nonshy children but spoke less in moderately unfamiliar situations. Neither sociability nor shyness had an effect on heart rate reactivity. The results show that sociability affects the exposure, and shyness the reactivity, to situations and that these traits are clearly distinct despite some similarity in lay judgments of personality.

Over the past decade, personality psychologists have become increasingly interested in measuring personality characteristics in everyday life as opposed to assessment by questionnaire or observations in laboratory situations (see particularly the special issue of the *Journal of Personality*, 1991, on personality and daily experience). The great advantage of studies of personality in everyday life is that the situations in which behavior occurs can be sampled representatively, thus providing a broader range of situations and greater ecological validity than more traditional approaches.

Most studies of personality in everyday life have relied on self-report behavior or experience (see Hormuth, 1986, for an overview). An inherent problem with this method is that self-reports can be affected by biased self-perception and self-presentation tendencies. Only a few studies have directly monitored the behavior of people in their everyday life environment. Child psychologists frequently observe young children in fairly unstructured school settings, such as free play in class or on playgrounds. As children get older, however, these settings become more structured and less representative of everyday life. Psychophysiologists increasingly monitor physiological variables, such as heart rate or blood pressure, in the everyday life environment and occasionally relate them to self-reports of experience or situations (e.g., Fahrenberg, Heger, Foerster, & Müller, 1991; Johnston & Anastasiades, 1990; Langewitz, Rüddel, & von Eiff, 1987), but apparently no systematic study has tried to monitor overt, socially relevant behavior in everyday life from morning to evening and to relate it to personality differences. The present study is a first attempt to do this through continuous monitoring of children's speech.

A major advantage of studies of personality in everyday life is that they can distinguish between two aspects of the person–situation relationship: personality-mediated exposure and reactivity to situations. Most of personality research has exclusively focused on people's reactivity to situations that are described in questionnaires or arranged in the laboratory. The impact of personality on exposure to situations, particularly on the active selection of situations, has rarely been empirically studied (but see Bolger & Schilling, 1991), although the need for such studies has been pointed out repeatedly over the past 15 years (see, e.g., D. M. Buss, 1987; Mischel, 1977; Snyder, 1981).

It is important to distinguish clearly exposure and reactivity aspects of the person–situation relationship because interindividual differences in exposure and reactivity can vary independently, and their covariation provides important information about the mechanisms underlying personality functioning. If exposure and reactivity aspects are confounded in the assessment of personality, this covariation is only implicit in the data, and results can be easily misinterpreted.

For example, the most frequently studied personality factor, Extraversion (H. J. Eysenck & Eysenck, 1969) or, in the Big Five terminology, Surgency (Goldberg, 1990), confounds exposure and reactivity to social situations. One subfactor is sociability, a tendency to prefer being with others to being alone; another subfactor is shyness, the tendency to react with tension and discomfort to strangers and social-evaluative situations (see Cheek & Buss, 1981). *Sociability* refers to the selection of social situations, *shyness* to the reaction within particular social situations. Questionnaire items such as "is talkative," overall scores on Extraversion scales, or the observed rate of social interaction in an unavoidable social situation, such as a cocktail party at one's boss's home, confound sociability and shyness. Correlates

Jens B. Asendorpf and Gerd H. Meier, Max-Planck-Institut für Psychologische Forschung, Munich, Federal Republic of Germany.

This study was supported by grants from the Thyssen Foundation and the Max Planck Society. We thank Franz E. Weinert and Marcel van Aken for their support; Hans-Peter Krüger, Arnim Rausche, and Uwe Rimkus for providing software for the analysis of the LOGOPORT data and technical assistance; the children and caretakers involved in the study for their cooperation; three anonymous reviewers for their comments on an earlier version; and Merry Bullock for brushing up our English.

Correspondence concerning this article should be addressed to Jens B. Asendorpf, Max-Planck-Institut für Psychologische Forschung, Leopoldstrasse 24, D-8000 Munich 40, Federal Republic of Germany.

of such ambiguous measures of extraversion cannot be clearly interpreted (see Briggs, 1988). For example, a correlation of .41 between the Extraversion scale of the Eysenck Personality Inventory (H. J. Eysenck & Eysenck, 1968) and the percentage of recreation time spent in social situations found for university students (Diener, Larsen, & Emmons, 1984) may be due to the sociability component of extraversion (people sought out these situations), the shyness component of introversion (people had problems to get involved in social interaction), or both.

Sociability and shyness can be distinguished perhaps most easily from a motivational point of view. *Sociability* refers to a high social approach motive, whereas *shyness* refers to a high social passive avoidance motive (Asendorpf, 1989). Shy people are inhibited by situation-specific cues to approach others (particularly unfamiliarity of the interaction partners and expectations of negative or insufficiently positive social evaluation; Asendorpf, 1989, 1990b), but they do not necessarily have a low social approach motive, nor do they necessarily avoid social situations actively (Asendorpf, 1989). Approach motivation appears to be due to different psychophysiological mechanisms than passive avoidance motivation, and the same seems to apply to individual differences in approach versus passive avoidance motivation (see Fowles, 1987; Gray, 1982, 1987). From this theoretical perspective, shyness and sociability are clearly distinct traits at the construct level, and it remains an empirical question to what extent and why self-rated shyness and sociability are correlated at the empirical level.

To explore this latter question, Cheek and Buss (1981) constructed short shyness and sociability scales with as little overlap in item content as possible; these scales correlated −.30 in a sample of 912 undergraduates. They observed shy–sociable, shy–unsociable, unshy–sociable, and unshy–unsociable female students with an unfamiliar female partner matched for both traits in a short laboratory interaction. Shy sociables tended to act more shy than the other groups.

This Shyness × Sociability interaction could not be replicated, however, for opposite-sex dyads in a similar situation where the two partners were not matched for personality type; instead, shyness was the most consistent predictor of behavioral, physiological, and cognitive measures of anxiety (Bruch, Gorsky, Collins, & Berger, 1989). Furthermore, these authors found a higher negative correlation of −.47 between shyness and sociability in a sample of 679 undergraduates, although confirmatory factor analyses did support the separability of shyness and sociability factors. Furthermore, many studies have shown that self-rated shyness is associated with shy–inhibited behavior in the presence of strangers or in social–evaluative situations (see, e.g., Asendorpf, 1987; Pilkonis, 1977), but apparently no study has found an effect of self-rated sociability on behavior in these situations.

This lack of validity information for self-rated sociability is not surprising if one expects sociability to affect exposure rather than reactivity to social situations. Arkin and Grove (1990) reported one of the rare studies on the relationship between self- or peer-rated sociability and the exposure to social situations (see also Gormley, 1983). Arkin and Grove (1990) related students' scores on the Cheek and Buss (1981) shyness and sociability scales to their selection of lunchtime partners. High-sociable students reported that they had eaten less often in the past with the current mealtime partner than had low-sociable students (suggesting a higher variety of lunchtime partners for sociable individuals); shyness had no effect on the selection of partners. Thus, there is some evidence for convergent and discriminant validity of sociability scales, but it is weak.

Although sociability and shyness are considered by many as two fundamental and distinct temperamental traits in childhood (e.g., A. H. Buss & Plomin, 1984), little is known about the sociability of children and its relation to shyness. There are many studies on children's social participation in peer groups (operationalized by the percentage of time spent in social interaction), particularly on children characterized by a very low rate of interaction (see Rubin & Asendorpf, 1993), but the rate of interaction approach confounds shyness and unsociability (see Asendorpf, 1990a). Apparently, no study has tried to investigate the effect of children's sociability on their selection of social situations. Again, much more attention has been devoted to shyness in children.

Kagan and his colleagues found that shyness in unfamiliar laboratory situations showed relatively high stability between 2 and 6 years of age for extreme groups of very shy or very unshy children (Kagan, Reznick, Snidman, Gibbons, & Johnson, 1988) and a higher and more stable heart rate for very shy children than for unshy children in these situations (Kagan, Reznick, & Snidman, 1987). In an unselected sample of 99 children, Asendorpf (1990b) found a stability of .64 between 4 and 7 years of age for shyness with strangers, a high consistency of shyness across encounters with adult and peer strangers and shyness in class during the first year of preschool, but no consistency between shyness in unfamiliar situations and shyness in dyadic play with familiar classmates or shyness in class after 2 years of group socialization. Furthermore, Asendorpf (1991) showed that between 4 and 8 years of age, children increasingly retreated to passive solitude in the presence of unfamiliar peers, making it difficult to distinguish between shyness and unsociability at the behavioral level in these situations.

In the present study we attempted to use parental judgments to measure sociability and shyness in children and to relate these judgments to the children's exposure and reactivity to social situations in everyday life. We selected children as subjects because German children attend school only during the morning and are relatively free to arrange the afternoon as they wish, which makes it easy to study the personality-mediated exposure to social situations. We chose second graders because these children are old enough to carry the small microcomputer that was used for the assessment of their speech and heart rate, and they are young enough not to be highly familiar with the school setting outside of their classroom. Thus, we could use situations where children from different classrooms mix (entry to school, recess, and exit from school) for a study of shyness in moderately unfamiliar situations. We relied on parental judgments as criteria for shyness and sociability because recent studies have found correlations in the range of .40 to .67 between parental judgments of shyness and behavioral obser-

vations of shyness with strangers in laboratory situations (Asendorpf, 1990b) and meaningful patterns of behavior with unfamiliar peers for children judged to be very shy by their parents (Asendorpf, 1991); also, we wanted to make the study as comparable as possible to the approach used by Cheek and Buss (1981) and Bruch et al. (1989).

We selected extreme groups of children high or low in shyness and sociability similar to Cheek and Buss (1981), and we investigated the separability of sociability and shyness scales by confirmatory factor analysis similar to Bruch et al. (1989). The social situations children encountered in the afternoons were reconstructed every evening with the children and their caretakers, and this information was validated by cross-reference to the objective speech data. Heart rate was measured to test the hypothesis derived from laboratory research by Kagan et al. (1987) that shy children have a higher heart rate in unfamiliar situations.

On the basis of Asendorpf's (1990b) findings for the situational specificity of shyness we expected that shy children would speak less and have a higher heart rate than unshy children in situations of moderate to high unfamiliarity but that shy and unshy children would not differ in their verbal participation and heart rate in familiar social situations, particularly at home (a situation-specific reactivity effect for shyness). Furthermore, we hypothesized that sociable children would spend more time than unsociable children with peers in the afternoon (a situation exposure effect for sociability) but that sociability would not have an effect on the verbal participation rate within these situations; no heart rate differences between sociable and unsociable children were expected.

Method

Subjects

The parents of 1,553 second graders in 65 different classes in Munich, Germany, were asked by letter to participate with their child in a study on children's behavior in everyday life. Parents were informed that their child's speech and heart rate would be continuously monitored during 7 school days from morning to evening and that the child would receive a present worth approximately $30 for participation. A total of 197 parents and their children (12.7%) agreed to participate in the study.

The child's primary caretaker (nearly always the mother) was interviewed by phone. The caretaker was asked to draw a 7-point response scale (frequency format, *never–always*) on a sheet of paper and to answer 12 items on this scale. Four items referred to shyness with strangers (e.g., "Your child is shy with strangers"), 4 referred to sociability (e.g., "Your child prefers to play with other children rather than alone"), and 4 referred to aggressiveness toward peers (e.g., "Your child is aggressive toward other children"); the items of these three scales were presented in a random order. Eight caretakers indicated that they had difficulties with this procedure; their data were excluded from further analysis.

All items had been used before in a different, fairly representative longitudinal sample of 126 children in Munich, particularly when these children attended Grade 2 (see Asendorpf, 1991, for details about this sample). The means and variances of the three scales were compared between this Grade 2 assessment and the present sample of 189 children by t and F tests. The results indicated that the present sample was judged as significantly less aggressive but not significantly different in any other means or variances. Thus, the present sample was fairly representative with regard to children's shyness and sociability despite the strong self-selection of the subjects.

Because the reliability of the four-item sociability scale was unsatisfactory in the first phone interview (α = .65), 184 of the caretakers answered the original 12 items and 1 additional sociability item 2 to 4 months later by phone. Six months after the first phone interview, 140 of the caretakers answered a questionnaire that contained the 13 items from the second phone interview. In both cases, the reliability of the five-item sociability scale was acceptable ($\alpha > .77$ in each case). To further increase reliability, the scores of all three assessments were averaged. These aggregated scores (n = 140) were highly reliable for all scales (shyness, $\alpha = .97$; sociability, $\alpha = .90$; and aggressiveness, $\alpha = .91$). The aggregated scores showed low correlations (shyness–sociability, $r = -.35$; shyness–aggressiveness, $r = -.22$; and sociability–aggressiveness, $r = .15$).

From this sample of 140 children, extreme groups for shyness and sociability were selected. First, children with aggressiveness scores in the upper quartile of the distribution were excluded because there were many aggressive children in the group low in shyness, and we wanted to separate the shyness effect from effects of aggressiveness as much as possible. Second, four extreme groups of children high or low in shyness and sociability were selected. Because we were particularly interested in children high in shyness or low in sociability, we chose more extreme cut-off points for high shyness–low sociability than for low shyness–high sociability. The families were not informed about the selection criteria. On the first day of assessment, one child within each extreme group refused to participate further in the study; for the other 41 children and their caretakers, assessments were completed for 7 days. The size and cut-off points for each extreme group in the final sample of 41 children are presented in Figure 1.

An analysis of sex differences showed that there were significantly more girls than boys in the final sample (27 vs. 14), $\chi^2(1, N = 41) = 4.12$, $p < .05$, which appears to be due to the exclusion of highly aggressive children (predominantly boys) from the sample. The proportion of boys and girls was not even marginally different across the groups high or low in shyness, $\chi^2(1, N = 41) < 1$, *ns*, but there was a marginal Sex × Sociability interaction, $\chi^2(1, N = 41) = 2.15$, $p = .14$, due to a disproportionally higher rate of girls in the sociable group. Therefore, shyness and sociability effects on behavior were controlled for sex differences by analysis of covariance (ANCOVA).

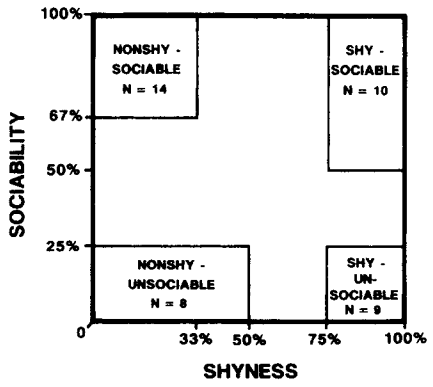

Figure 1. Final sample for field assessment.

The LOGOPORT

Children's vocalizations and heart rate were continuously monitored by the LOGOPORT (Krüger, 1989), described to them as "a kind of walkman." It is a small, portable microcomputer (size 16 cm × 11 cm × 3 cm, weight = 800g), which was carried by two straps on the right side of the body. A condenser microphone was attached to the throat with adhesive tape and connected with the LOGOPORT. This procedure made sure that sounds outside children's throat (particularly speech of interaction partners) are not recorded. The on–off pattern of vocalizations was recorded every 8 ms and stored as a digitized signal. Heart rate was recorded by three electrodes in standard thoracic positions and stored as beat-to-beat heart rate.

Procedure

The 41 families were visited by a research assistant on each of the 7 days in the morning before children left for school and in the evening after 6 p.m.; each family was served by one assistant. For the period of the study, no child participated in regular sport activities. In the morning, the assistant applied the LOGOPORT to the child and tested vocalization and heart rate recordings. Then the child was asked to pronounce the vowel *a* for 5 s without pause and to say nothing for the next 5 s. This control procedure was used to check the quality of the speech recording. Before leaving, the assistant reminded the child not to take off the LOGOPORT and not to do sports; children were otherwise free to move (including riding bikes).

In the evening, the assistant checked the afternoon protocol of the caretaker, interviewed the caretaker about the afternoon, and asked the child about deviations from the normal school schedule and times when the caretaker was not present. The child was instructed to sit quietly during the interview for approximately 5 min, a time period that was used as a baseline period for heart rate. Then the control procedure for speech was repeated and the LOGOPORT was taken off. On the last day the child was asked whether he or she would participate again in a similar study and received the present.

Assessment of Situations

Children's situations in the mornings were classified according to the school schedule as follows: school entry (the 10 min before the start of the first lesson), early lessons (lessons before the first recess, usually three 45-min lessons interrupted by short pauses), school recess (one or two periods of a total of 15–30 min), late lessons (after the first recess, usually two or three 45-min lessons interrupted by short pauses), school exit (the 10 min following the last lesson when children left school). For obvious reasons, children vocalized much more during music lessons than during other lessons; therefore, these lessons were treated as missing data. Because the beginning and end of the school lessons and the recess periods were signaled by a preprogrammed clock in each school and because German teachers closely follow this schedule, the timing of the morning situations was reliable. Deviations from the normal schedule (e.g., earlier end of school because of a teacher's illness) were noted during the assistant's evening visit.

The child's caretaker (nearly always the mother, although sometimes a grandmother or a nanny) was asked to protocol the afternoon situations for the child continuously from 2 p.m. (all children were home from school and most children had finished lunch by this time) to 6 p.m. (before dinner). Among other things, they were asked to note the beginning of each situation as well as the number and type of people present (siblings, familiar peers, familiar adults, and unfamiliar people) and the location (own house, other house, outside, or other).

After inspection of the frequencies of occurrence of the various types of situations, the situations were classified according to the familiarity of the location and the partners into three levels of familiarity. Situations were defined as *high in familiarity* if the child was at home and no unfamiliar persons were present and as *low in familiarity* if unfamiliar persons were present or if the child was together with at least three other partners outside the home (in most cases playing outside with many children from the neighborhood); the other situations (being outside the home with up to two familiar people) were defined as *medium in familiarity.* The inclusion of situations other than meeting strangers into the low-familiarity category was necessary because on average children spent only 3% of the afternoons with unfamiliar people, and only 22 of the 41 children met such a situation at all during the seven afternoons. Inclusion of larger groups outside home made sense because of the location and the fact that, other things being equal, the familiarity of the partners decreases with increasing group size.

To increase the validity of the caretaker's protocol, she was given a watch that was programmed to beep about every 30 min for 20 s as a reminder (the alarm could be stopped but not suppressed). Periods when the caretaker could not observe the child's activity (e.g., when the child visited a friend or played outside) were reconstructed with the child during the evening visit of the assistant.

According to the assistants' impressions, the caretakers sometimes filled out the protocol with some delay despite the instruction to do so immediately. However, 98% of the automatically detected conversations of the child (discussed further in the Assessment of Speech and Conversations section) fell into a time period that appeared as a social situation in the afternoon protocol. Thus, errors of omission were apparently rare, but estimations of situational durations must be considered with caution.

Assessment of Speech and Conversations

The on–off pattern of vocalizations was converted into a 200-ms interval code by dropping each vocalization interval smaller than 200 ms and filling each pause shorter than 200 ms with vocalization by an iterative procedure. This procedure makes sure that only audible speech and pauses are analyzed and conforms to current standards in speech research (see Beebe et al., 1989; Krüger, 1989). These data were then converted into interval codes of speech–nonspeech for successive 5-s intervals. An interval was defined as *speech* if it contained at least 20% vocalization time; all other intervals were defined as nonspeech. The cutoff point for speech was set so low because each speech phase contains short phases of silence (see Goldman-Eisler, 1968).

Conversations were targeted on the basis of these interval codes according to an algorithm that was developed and successfully tested with adults by Heidenfelder (1985). First, the whole day was divided into 5-min phases, P_1, P_2, . . . , and the number, s_i, of speech intervals within each phase, P_i, was computed. Second, the intraindividual mean (M) and standard deviation (S) for the s_is were computed over all p_is of the day. Third, a p_i marked the beginning of a conversation if (a) $s_i > M$, and (b) $s_i - s_{i-1} > S$ (that is, each phase was compared with the preceding phase in terms of the intraindividual standard deviation of speech). A symmetric definition was used to define the end of a conversation.

The validity of this detection procedure for conversations was supported by the fact that every school recess was classified as a conversation for every child (low error of omission) and that, according to the caretakers' and children's protocols, 98% of the classified conversations during the afternoon took place within social situations (low error of commission). The remaining 2% of conversations were ex-

cluded from further analysis; they were due either to phases of long and intense private speech or singing or to errors of omission in the afternoon protocols.

For each school situation or afternoon conversation, the *verbal participation* was defined as the percentage of speech in the situation (i.e., the number of 200-ms speech intervals divided by the number of all 200-ms intervals in the situation).

Assessment of Heart Rate

The LOGOPORT continuously measured the difference between successive *R* spikes with an accuracy of ±1 ms and stored each value as beats per minute (bpm). The raw data were automatically corrected for artifacts (too short or too long beat-to-beat intervals) minute by minute; in case of too many artifacts per minute the whole minute was set to missing (see Rausche, 1991, for details). Each nonmissing minute was divided into 5-s intervals that corresponded to the 5-s intervals for speech, and the mean heart rate within each interval was computed. According to Elliott (1969) and Elliott, Bankert, and Light (1970), phasic heart rate changes (that are difficult to interpret in field data) are canceled out in this kind of data; the remaining changes reflect tonic changes such as gross motor activity, speech, or emotional processes. Because speech has a strong impact on heart rate, the mean heart rate in a situation was evaluated separately for the speech and nonspeech intervals within the situation.

Results

Separability of Shyness and Sociability

Similar to Bruch et al. (1989) the separability of shyness and sociability was studied by confirmatory factor analysis, using the LISREL VI program (Jöreskog & Sörbom, 1985; see Byrne, 1989, for applications to confirmatory factor analysis). For each of the three assessments (two phone interviews and one questionnaire), two models were compared: a three-factor model that treated shyness, sociability, and aggressiveness as correlated factors and a two-factor model that treated aggressiveness and shyness–sociability as correlated factors. In these models, each item was allowed to load on only one factor. Goodness-of-fit indices for these two models for each assessment are presented in Table 1.

Table 1 indicates that only the three-factor model showed an acceptable fit. For each assessment, this fit was significantly superior to the fit of the two-factor model (for the first interview, $\chi^2[2, N = 189] = 54.3$, $p < .001$; for the second interview, $\chi^2[2, N = 184] = 159.4$, $p < .001$; for the questionnaire, $\chi^2[2, N = 140] = 222.5$, $p < .001$). Thus, lumping together the shyness and sociability items clearly violated the data. Table 2 presents the factor loadings for the 13 items in the three-factor model when the two assessments, including 5 sociability items were aggregated (second interview and questionnaire; chi-square divided by degree of freedom = 1.6, goodness of fit index [GFI] = .90, root-mean-squared residual [RMSR] = .079).

Subject Compliance and Treatment of Missing Data

One child within each originally targeted extreme group refused to participate further on the first day of assessment; these data were not analyzed. The other children and their caretakers participated on 7 days. On the evening of the 7th day, 73% of the children said they would participate once more in a similar study. Apparently, most children had no problems in carrying the LOGOPORT; they told the assistants that they forgot about it after a short time.

To exclude artifactual data as much as possible, a strict procedure was used. On each morning and afternoon, the child was asked to produce a particular speech pattern (described earlier) that could be easily identified in a regular LOGOPORT signal. If the morning pattern could not be detected, the whole day was treated as missing; if the pattern could not be detected in the evening and a visual inspection of the data showed irregularities up to 6 p.m., the full day was set to missing. Thus, only full-day protocols were analyzed. This procedure resulted in an average of 29% missing days per subject (on the average, 5.0 days were nonmissing). There were no significant differences among the missing rates of any of the days of assessment. Thus, the missing rate was unsystematic but fairly high, mostly due to a loosened microphone or to the battery on a LOGOPORT running out.

Exposure to Situations

Because of the fixed school schedule, all children were exposed to the same school situations in the morning. Personality effects on the exposure to situations could be studied during the afternoons from 2 p.m. to 6 p.m. The percentage of time spent by each of the four extreme groups in various types of afternoon situations as assessed by the caretakers' protocols, and the percentage of time spent by the groups in conversations with people of varying familiarity, are presented in Table 3.

Differences between the four extreme groups in the percentage of time spent in particular situations were tested by three separate 2 × 2 multivariate analyses of variance (MANOVAs) for number of partners, type of partners (friends, siblings, etc.), and location, with sociability and shyness as grouping factors. A significant sociability effect was found only for type of partners, $F(4, 34) = 4.49$, $p < .01$. Subsequent t tests for each of the four types of partners showed that sociable children spent more time with friends, $t(39) = 2.41$, $p < .03$, and less time with siblings, $t(39) = 2.68$, $p < .02$, than did unsociable children. These two effects remained significant when sex was partialed out by an ANCOVA. No other univariate or multivariate effects were significant.

To explore the possibility that the preference of sociable children for friends was due to a lower availability of siblings as play partners, the time spent with friends was analyzed by an ANCOVA, with the number of siblings with whom a child interacted during the 7 days of observation as a covariate. The effect of this covariate on time spent with friends was not significant ($F < 1$), and the sociability effect remained significant, $F(1, 38) = 6.18$, $p < .02$, also when sex was controlled by an ANCOVA, $F(1, 37) = 5.70$, $p < .03$.

Differences between the four groups in the time spent in conversations during the afternoon were tested by a mixed analysis of variance (ANOVA), treating sociability and shyness as between-subjects factors and the familiarity of the situation as a

Table 1
Goodness of Fit for Two- and Three-Factor Models for the Shyness, Sociability, and Aggressiveness Items in Three Assessments

Assessment and model	χ^2	*df*	*Q*	GFI	RMSR
First phone interview[a]					
Three factors	91.8	51	1.8	.925	.081
Two factors	153.1	53	2.9	.880	.088
Second phone interview[b]					
Three factors	85.0	62	1.4	.934	.062
Two factors	244.4	64	3.8	.794	.117
Questionnaire[b]					
Three factors	105.6	62	1.7	.896	.072
Two factors	328.1	64	5.1	.678	.158

Note. *Q* = chi-square divided by degree of freedom; GFI = goodness-of-fit index; RMSR = root-mean-squared residual.
[a] 12 items. [b] 13 items.

within-subject factor. A significant sociability main effect was found, $F(1, 30) = 7.92$, $p < .01$; no other effect was significant (in each case $F < 1$). Subsequent t tests for each level of familiarity showed that sociable children spent more time than unsociable children with conversations in situations of medium familiarity, $t(37) = 2.57$, $p < .02$, but did not spend more time than unsociable children in conversational situations high or low in familiarity (in both cases, $t < 1$). When the number of siblings was partialed out from the time spent in conversations, a significant effect remained for situations of medium familiar-

Table 2
Factor Loadings for the Three-Factor Oblique Structure of Ratings of Shyness, Sociability, and Aggressiveness Items

	Factor loadings[a]		
Item assignment	Shyness	Sociability	Aggressiveness
Shyness			
1. If your child meets unknown people, she or he needs a long time to warm up	.91		
2. Your child is shy with strangers	.94		
3. Your child easily approaches unfamiliar people (−)	.91		
4. Your child is somewhat inhibited with strangers	.96		
Sociability			
1. Your child seeks contact with other children		.72	
2. Your child prefers to play alone rather than with other children (−)		.85	
3. Your child is more interested in toys than in other children (−)		.69	
4. Your child prefers to play with other children rather than alone		.73	
5. Your child likes to be with other children[b]		.80	
Aggressiveness			
1. Your child is aggressive toward other children			.80
2. Your child starts arguing with other children			.84
3. If your child plays with other children, she or he easily becomes enraged			.75
4. Your child makes other children angry			.83

[a] Loadings refer to the standardized solution. Empty cells indicate that the given factor loading was set equal to 0. [b] This item was not used in the first phone interview.
Note. − = reverse scored.

Table 3
Percentages of Afternoon Time Spent in Various Types of Situations for the Four Groups of Children

	Sociable				Unsociable			
	Unshy		Shy		Unshy		Shy	
Type of situation	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Location								
Own apartment	58.4	22.4	52.3	17.7	66.8	21.3	55.8	11.1
Other apartment	10.9	12.4	10.7	9.9	9.5	13.0	11.2	11.6
Play outside	19.0	16.9	27.7	15.3	9.8	8.0	18.4	15.9
Other[a]	11.7	14.2	9.2	7.5	14.0	12.8	14.7	12.5
No. of partners								
Alone	18.8	18.2	13.0	9.0	21.5	12.3	15.5	15.5
One partner	37.6	16.8	40.9	10.9	27.9	16.9	32.6	15.3
Two partners	21.8	11.3	18.8	6.9	19.4	9.8	24.5	18.5
More partners	21.9	16.2	27.3	13.9	31.1	24.0	27.4	16.5
Type of partners[b]								
Siblings	21.4	23.4	16.9	17.2	42.2	25.0	37.5	31.3
Familiar peers	35.1	21.1	56.8	19.7	23.0	17.9	32.3	19.1
Familiar adults	19.0	20.7	11.4	9.7	24.6	17.5	21.9	21.2
Strangers	2.7	5.7	6.1	8.0	3.3	6.7	0.7	1.4
Conversations								
High familiarity	16.0	11.4	14.9	8.6	15.8	11.6	14.1	10.1
Medium familiarity	16.3	11.0	20.1	10.8	7.5	5.9	12.5	4.5
Low familiarity	16.0	11.4	12.5	8.5	13.0	13.9	9.7	9.6

[a] For example, riding in cars or attending special school courses. [b] Percentages do not sum up to 100% because of times when children were alone and because of multiple types of partners in a situation.

ity, $F(1, 36) = 7.00$, $p < .02$, also when sex was partialed out in addition, $F(1, 35) = 6.98$, $p < .02$.

To summarize, (a) sociable children spent more time than unsociable children with friends and conversed more in situations of moderate unfamiliarity (usually playing with a few friends outside or in a friend's house) and spent less time with siblings, even though siblings were as available for them as for unsociable children and (b) no situation exposure effect was found for shyness (in particular, shy children were as much exposed to unfamiliar situations as were unshy children).

Verbal Participation in Situations

The reliability of individual and group differences in children's verbal participation in the various situations over a day was estimated on the basis of the day-to-day correlations of verbal participation within situations (because of skewed distributions, Spearman correlations were computed). The reliability of the individual scores was estimated by the Spearman-Brown formula on the basis of 5 days per child (the average number of nonmissing days per child). More important than the reliability of individual scores is the reliability of the group means for a study of extreme group differences. This reliability was conservatively estimated by the Spearman-Brown formula on the basis of 8 children per group (the minimum group size); see Starkweather (1956) for a similar approach. These reliability data are shown in Table 4.

Table 4 indicates that the day-to-day stabilities were low, even after aggregation across different types of situations. The reliability for individual differences was also unsatisfactory, whereas the reliability for group means was high. Thus, aggregation of everyday speech behavior across only 5 days is not sufficient for studying individual differences, but it is sufficient for studying group differences. The reliabilities for the social situations in the morning (approximately 45 min) and for the conversations in the afternoon (approximately 90 min) were (accidentally exactly) identical, indicating that the afternoon

Table 4
Day-to-Day Stabilities and Reliabilities of Individual and Group Differences in Verbal Participation Within Situations

Situation	Day-to-day stability[a]	Reliability for	
		Individual[b]	Group[c]
School entry	.21	.57	.91
Early lessons	.36	.74	.96
School recess	.16	.49	.88
Late lessons	.27	.69	.95
School exit	.18	.52	.90
Social school situations[d]	.23	.60	.92
Afternoon conversations	.23	.60	.92

[a] Mean Spearman rho across days. [b] Estimated by Spearman-Brown formula for 5 days. [c] Estimated by Spearman-Brown formula for 8 children per group. [d] Aggregate of school entry, school recess, and school exit.

situations were more heterogeneous with regard to children's speech behavior.

The percentage of verbal participation of the four groups in particular types of situations are presented in Table 5.

Differences between the groups in the mornings were analyzed by mixed 2 × 2 ANOVAs, treating sociability and shyness as between-subjects factors and the aggregated social school situations (entry, recess, and exit) and the aggregated two types of lessons as two levels of a within-subject factor. A significant shyness main effect, $F(1, 37) = 10.53$, $p < .005$, and a significant Shyness × Situation effect, $F(1, 37) = 4.79$, $p < .04$, were found. Subsequent t tests for each of the three social situations and the early and late lessons showed that shy children spoke less than unshy children in school situations, $t(39) = 3.20$, $p < .005$, for school entry; $t(39) = 2.03$, $p < .05$, for school recess; $t(39) = 2.56$, $p < .02$, for school exit; $t(39) = 1.91$, $p < .07$, for early lessons; and $t(39) = 2.26$, $p < .03$, for late lessons, and that the shyness effect was more marked during the social situations. All other effects were nonsignificant.

Differences between the four groups in the afternoons were analyzed by mixed ANOVAs with the between-subjects factors sociability and shyness and the within-subject factor of familiarity of the conversation situation. A significant main effect was found for shyness, $F(1, 30) = 9.20$, $p < .005$. Subsequent t tests for each level of familiarity showed that shy children spoke less than unshy children in unfamiliar situations, $t(34) = 3.38$, $p < .002$, and in situations of medium familiarity, $t(37) = 2.25$, $p < .04$, but not less in familiar situations, $t(39) = 1.14$, $p = .26$. All other effects were nonsignificant.

The a priori hypothesis of a Familiarity × Shyness interaction was tested more directly by one-tailed t tests between shy and unshy children for (a) the difference scores for verbal participation in conversations in familiar and unfamiliar situations and (b) the difference scores for verbal participation in conversations in familiar situations and the three social school situations (thus, conversations in familiar situations were treated as baseline situations for the two types of unfamiliar situations). Shy children had significantly more positive difference scores than did unshy children in both cases (for conversations in unfamiliar situations, $t(34) = 1.92$, $p < .04$; for the social school situations, $t(39) = 2.08$, $p < .03$). When sex differences were partialed out by an ANCOVA, these effects became even slightly stronger (for conversations in unfamiliar situations, $t[33] = 2.06$, $p < .03$; for the social school situations, $t[38] = 2.25$, $p < .02$). These Familiarity × Shyness interactions are shown in Figure 2.

To summarize, the hypothesis that shy children speak less than unshy children in conversations in unfamiliar situations, but not in familiar situations, was fully confirmed. The shyness effect was most strong for school entry and for unfamiliar situations in the afternoon and was not even marginally significant for conversations with familiar people at home.

Although no significant overall sociability effect was found for the mornings and the afternoons, a closer inspection of Table 5 revealed an unexpected, very systematic effect of sociability on verbal participation. For both levels of shyness, sociable children participated verbally less than unsociable children in all morning situations and more in both types of afternoon conversations. This Time of Day × Sociability interaction is shown in Figure 3.

The Time of Day × Sociability interaction was tested by a mixed 2 × 2 ANOVA, with sociability as a between-subjects factor and the aggregated morning situations and all afternoon conversations as the two levels of a within-subject factor. The interaction was significant, $F(1, 39) = 13.49$, $p < .001$, also when sex was partialed out by an ANCOVA, $F(1, 39) = 10.49$, $p < .003$. Although unexpected interactions should be generally considered with caution, the systematic pattern and the size of the effect suggest that this interaction merits attention.

Heart Rate

Baseline heart rate scores were obtained each evening for each child. Only those days when heart rate could be measured for 30 s without accompanying speech were included. Because gross motor movements could not be completely prevented during these periods, and to minimize the effect of the experimenter's unfamiliarity during the beginning of the study, the

Table 5
Verbal Participation Within Situations for the Four Groups

	Sociable				Unsociable			
	Unshy		Shy		Unshy		Shy	
Situation	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
School entry	32.1	7.9	24.8	11.2	35.4	7.5	25.5	4.8
Early lessons	12.8	4.3	9.1	3.7	15.7	5.1	12.7	6.3
School recess	36.2	12.0	29.1	9.0	42.3	6.9	35.3	12.4
Late lessons	16.9	3.6	12.7	6.0	19.7	8.3	14.6	7.6
School exit	33.9	10.0	25.7	8.5	36.3	10.3	29.1	8.3
Afternoon conversations								
High familiarity	27.4	6.9	27.0	7.3	26.6	3.8	22.6	5.0
Medium familiarity	30.8	9.7	26.2	4.7	34.2	13.4	24.9	7.5
Low familiarity	31.5	8.0	24.1	4.7	30.0	9.4	21.7	5.3

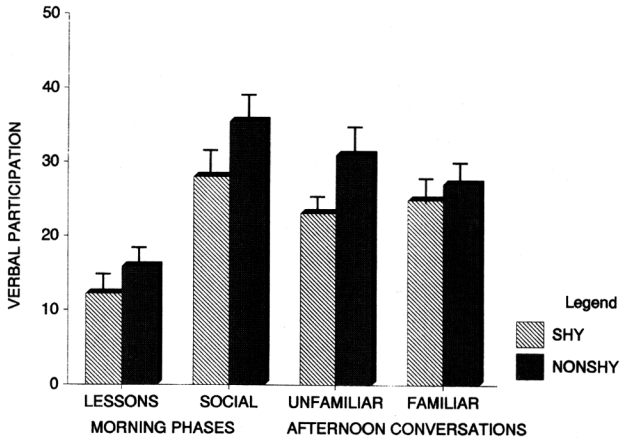

Figure 2. Familiarity × Shyness interaction for verbal participation.

child's minimum of these heart rate scores was defined as the child's baseline score. The average baseline heart rate across all children was 88.8 bpm, which is nearly identical with the norm for resting heart rate for normal German agemates (88 bpm; Fresenius, 1980). A 2 × 2 ANOVA with sociability and shyness as factors did not show significant group differences for baseline heart rate (in all cases, $F < 1$); girls had a higher baseline heart rate than boys, $t(43) = 2.53$, $p < .02$. Heart rate reactivity measures were obtained by subtracting the child's baseline heart rate from each child's mean heart rate in a particular situation.

These reactivity scores showed a day-to-day stability of .55 for both speech and nonspeech phases, an individual reliability of .86, and a group reliability of .98 (stabilities and reliabilities were computed exactly as for verbal participation). Mean heart rate was 98.1 during nonspeech and 106.7 during speech (for the difference, $t[40] = 2.84$, $p < .0001$). Despite the high reliability of individual differences in heart rate reactivity and the control for speech effects, analyses of group differences by ANOVAs for the situations in Table 5 that were exactly parallel to the tests for verbal participation, separately conducted for speech phases, nonspeech phases, and overall, did not reveal any significant effects; also, sex differences in heart rate reactivity were not significant (in each case, $t < 1$). Moreover, a closer inspection of the data did not reveal any systematic group differences. Shy children's heart rate reactivity tended to be lower in most situations, but this tendency was not even marginally significant; Familiarity × Shyness effects were also not even marginally significant. When sex was partialed out in these analyses by an ANCOVA, this pattern of negative findings remained the same.

Discussion

This study shows that sociability and shyness are separate dimensions in parental perceptions of their children and that they mediate children's social behavior in everyday life. Sociability mediated the exposure to social situations, particularly to small group play with friends outside home, whereas shyness mediated children's verbal participation in situations of moderate to high unfamiliarity. Contrary to expectation, shyness was unrelated to heart rate reactivity. An unexpected Time of Day × Sociability interaction indicated that sociable children talked less during the morning and more during the afternoon than unsociable children.

Short parental shyness and sociability scales were developed with a sufficient reliability and a correlation of −.35. Confirmatory factor analyses showed that the two scales represented correlated but separable factors. The parental judgments of children's shyness were not related to children's exposure to social situations; in particular, shy children did not avoid unfamiliar situations in the afternoon. As expected, shy children talked less during moderately unfamiliar situations in school and in the afternoon (meeting strangers and being outside home with many people) but talked as much as unshy children in the company of familiar people at home. This situational specificity of shyness supports Asendorpf's (1990b) findings that shyness with strangers is related to social behavior with unfamiliar peers but not with highly familiar classmates. The additional class of shyness-arousing situations postulated by Asendorpf (1989, 1990b)—social–evaluative situations—was ignored in the present study and appears to be difficult to assess in everyday life. However, social–evaluative situations may have contributed to the shyness effect for moderately unfamiliar situations.

Kagan et al.'s (1987) finding that shy children have a higher heart rate than unshy children in unfamiliar laboratory situations could not be confirmed in the present study. It is important to note that heart rate in everyday life when people can move freely is strongly influenced by motor activity (see Obrist, Howard, et al., 1974). In a recent study on university students' heart rate in everyday life, Fahrenberg et al. (1991) found a correlation of .50 between heart rate and motor activity for 30-min intervals. Yet there surely exist situations where heart rate increases due to sympathetic activation despite stable or

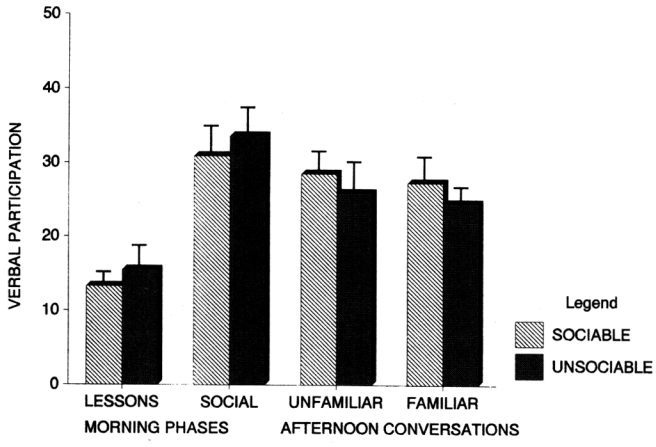

Figure 3. Time of Day × Sociability interaction for verbal participation.

even decreasing motor activity (see, e.g., Obrist, Lawler, et al., 1974). The finding that shy children tended to have a lower heart rate than unshy children in moderately unfamiliar situations may be due to an inhibition of motor activity in shy children that had a stronger effect on their heart rate than their sympathetic arousal due to unfamiliarity.

It should be noted that this study compared high, medium, and low familiarity situations and that low familiarity included not only meeting strangers but also interacting with many people outside home (usually playing with many children from the neighborhood). These situations are moderately unfamiliar because of the place and the number of interaction partners, but they are clearly more familiar than confrontations with strangers in psychological laboratories—the favorite setting in research on shyness. One interesting finding from the present study is that interacting with strangers is rare in everyday life—only half of the children interacted with any stranger during the afternoons, and the average percentage of afternoon time spent with strangers was only 3%. This low rate appears to be quite normal; Csikszentmihalyi and Larson (1984) found an average of 1.3% of waking time spent with strangers in public places for a group of 75 adolescents who were assessed with the experience-sampling method for many days. Thus, laboratory assessments of shyness tap situations that are clear exceptions in the lives of most children and adolescents.

Recognizing that interactions with strangers are rare in the everyday life of children helps to prevent precocious generalizations from laboratory-based findings on children's shyness to real life. Children who react with a higher heart rate to strangers when they are not allowed to move in the laboratory do not necessarily show a higher heart rate in everyday life when they are allowed to move, and children who have problems in confronting strangers are not necessarily at risk for the development of social–emotional problems such as low social self-esteem; in a recent study, Asendorpf and van Aken (1993) did not find a lower social self-esteem even for extreme groups of children who were characterized by chronically high shyness with strangers during preschool or early elementary school. That shyness in adults is negatively related to various domains of self-esteem (see Cheek & Melchior, 1990, for a review) may, among other factors, be due to a higher incidence and a higher emotional significance of stranger confrontations after children have left home.

We do not claim that laboratory assessments of shyness in children produce only artifactual results. In addition to their frequency, the emotional significance of such situations is important for the developmental outcome of individual differences in these situations, and situations of a "low ecological validity" can help detect fundamental psychological mechanisms. Our point is rather to caution researchers that individual differences in rarely occurring everyday life situations could be less important for real life outcomes than would be expected, given their visibility, replicability, and stability in laboratory settings.

According to the caretakers' protocols, the children in our study spent an average of half an hour with homework and another half an hour with other duties such as going shopping or attending a special afternoon course at school. Thus, these second graders could freely arrange about three quarters of their afternoon time. According to the caretakers' protocols, sociable children spent less time with siblings and more time with friends than unsociable children, although there was no difference between sociable and unsociable children in the availability of siblings. Also, according to the speech recordings that were matched with the caretakers' protocols, sociable children spent more time in conversations with friends outside home than unsociable children. We had expected that sociable children would spend more time with peers than unsociable children, but we had not expected that the difference between siblings and friends was so important.

A plausible post hoc explanation of this difference is that sociable children not only prefer being with people to being alone but also prefer a greater variety of people than unsociable children (see also Arkin & Grove's, 1990, comparable finding for sociability in students). It seems that unsociable children can satisfy their social needs by interaction with very few, easily available persons such as siblings. Sociable children seek out more interaction partners and often find them outside the home. They may have more extensive than intensive social relationships (see Waldrop & Halverson, 1975). Future studies are needed that compare sociable and unsociable children and adults in the size of their social network as well as in their exposure time to social interaction.

As expected, sociable children did not differ from unsociable children in verbal participation within social situations. However, a systematic, unexpected Time of Day × Sociability interaction was found. Sociable children talked less than unsociable children in all situations in school and talked more in both familiar and unfamiliar situations in the afternoon. Because time of day and school attendance were confounded in the present study, one possible interpretation is that unsociable children found the school environment more stimulating than sociable children, and vice versa for the afternoon. However, the sociability effect did not disappear during the social morning situations.

Another interpretation of the Time of Day × Sociability effect is that unsociable people are "morning types" who wake up earlier, reach their temperature and activity maxima earlier, and fall asleep earlier than sociable people; consequently, they should be more talkative in the morning than during the afternoon. Although a literature search did not find any study on the relationship between sociability and diurnal rhythms in children, there is rather strong empirical evidence for such a relationship in adults. Blake (1967), Colquhoun (1960), and M. W. Eysenck and Folkard (1980) found that introverts are morning types. Larsen (1985) showed that many of these time-of-day effects are due to sociability rather than to impulsivity. Revelle, Humphreys, Simon, and Gilliland (1980) found the opposite, but their data are less strong than Larsen's (1985). Future studies are needed to explore to what extent sociability in children and adults is related to time of day and to what extent culturally regulated social opportunities to meet people interact with interindividual differences in diurnal rhythms. An intriguing hy-

pothesis is that individual differences in sociability could be explained to some extent by such an interaction.

No interaction between sociability and shyness was found in the present study. Instead, these two subfactors of Extraversion, or Surgency, appeared to have independent, different effects on behavior. This finding questions the assessment of personality by broad traits such as Extraversion or the Big Five alone. Although such a high level of abstraction is useful for classifications of trait judgments, it may not be useful, and may even be counterproductive, for the study of the real behavior of real people in real situations. It may well be that broad individual-differences factors provide only umbrella terms for the study of personality that lump together traits that arise from completely different mechanisms of person–situation interaction. If this is true, the frequent reliance of personality psychology on broad factors may be one of the reasons why the relations between personality judgments and real behavior in real situations are often so depressingly weak. The present findings suggest that stronger and more systematic relations may be found if the relations between more narrowly defined traits and behavior are studied (see Briggs, 1989, for a similar argument).

More generally, the present study has shown that traits differ in how they affect the exposure and the reactivity aspect of the person–situation relationship. Finally, the present study demonstrates how socially relevant overt behavior can be continuously monitored in everyday life situations, how such a continuous behavioral assessment can be used to study reactivity to situations, and to validate the assessment of exposure to situations by the self and others.

References

Arkin, R. M., & Grove, T. (1990). Shyness, sociability and patterns of everyday affiliation. *Journal of Social and Personal Relationships, 7,* 273–281.

Asendorpf, J. B. (1987). Videotape reconstruction of emotions and cognitions related with shyness. *Journal of Personality and Social Psychology, 53,* 542–549.

Asendorpf, J. B. (1989). Shyness as a final common pathway for two different kinds of inhibition. *Journal of Personality and Social Psychology, 57,* 542–549.

Asendorpf, J. B. (1990a). Beyond social withdrawal: Shyness, unsociability, and peer avoidance. *Human Development, 33,* 250–259.

Asendorpf, J. B. (1990b). Development of inhibition during childhood: Evidence for situational specificity and a two-factor model. *Developmental Psychology, 26,* 721–730.

Asendorpf, J. B. (1991). Development of inhibited children's coping with unfamiliarity. *Child Development, 62,* 1460–1472.

Asendorpf, J. B., & van Aken, M. A. G. (1993). *Traits and relationship status: Temperamental inhibition and test intelligence versus peer group inhibition and peer group competence as early predictors of self-esteem.* Manuscript submitted for publication.

Beebe, B., Jaffe, J., Crown, C., Feldstein, S., Jasnow, M., & Gordon, S. (1989, April). *Mother–infant and stranger–infant vocal dialogue at 12 months: Home/lab replication.* Paper Presented at the Meetings of the Society for Research in Child Development, Kansas City, Missouri.

Blake, M. J. F. (1967). Relationship between circadian rhythms of body temperature and introversion–extraversion. *Nature, 215,* 896–897.

Bolger, N., & Schilling, E. A. (1991). Personality and the problems of everyday life: The role of neuroticism in exposure and reactivity to daily stressors. *Journal of Personality, 59,* 355–386.

Briggs, S. R. (1988). Shyness: Introversion or neuroticism? *Journal of Research in Personality, 22,* 290–307.

Briggs, S. R. (1989). The optimal level of measurement for personality constructs. In D. M. Buss & N. Cantor (Eds.), *Personality psychology: Recent trends and emerging directions* (pp. 246–260). New York: Springer-Verlag.

Bruch, M. A., Gorsky, J. M., Collins, T. M., & Berger, P. A. (1989). Shyness and sociability reexamined: A multi-component analysis. *Journal of Personality and Social Psychology, 57,* 904–915.

Buss, A. H., & Plomin, R. (1984). *Temperament: Early developing personality traits.* Hillsdale, NJ: Erlbaum.

Buss, D. M. (1987). Selection, evocation, and manipulation. *Journal of Personality and Social Psychology, 53,* 1214–1221.

Byrne, B. M. (1989). *A primer of LISREL: Basic applications and programming for confirmatory factor analytic models.* New York: Springer-Verlag.

Cheek, J. M., & Buss, A. H. (1981). Shyness and sociability. *Journal of Personality and Social Psychology, 41,* 330–339.

Cheek, J. M., & Melchior, L. A. (1990). Shyness, self-esteem, and self-consciousness. In H. Leitenberg (Ed.), *Handbook of social and evaluation anxiety* (pp. 47–82). New York: Plenum Press.

Colquhoun, W. P. (1960). Temperament, inspection efficiency and time of day. *Ergonomics, 3,* 377–378.

Csikszentmihalyi, M., & Larson, R. (1984). *Being adolescent.* New York: Basic Books.

Diener, E., Larsen, R. J., & Emmons, R. A. (1984). Person × Situation interactions: Choice of situations and congruence response models. *Journal of Personality and Social Psychology, 47,* 580–592.

Elliott, R. (1969). Tonic heart rate: Experiments on the effects of collative variables lead to a hypothesis about its motivational significance. *Journal of Personality and Social Psychology, 12,* 211–228.

Elliott, R., Bankert, B., & Light, T. (1970). Differences in the motivational significance of heart rate and palmar conductance: Two tests of a hypothesis. *Journal of Personality and Social Psychology, 14,* 166–172.

Eysenck, H. J., & Eysenck, S. B. G. (1968). *Manual for the Eysenck Personality Inventory.* San Diego, CA: Educational and Industrial Testing Service.

Eysenck, H. J., & Eysenck, S. B. G. (1969). *Personality structure and measurement.* New York: Routledge, Chapman & Hall.

Eysenck, M. W., & Folkard, S. (1980). Personality, time of day, and caffeine: Some theoretical and conceptual problems in Revelle et al. *Journal of Experimental Psychology: General, 109,* 32–40.

Fahrenberg, J., Heger, R., Foerster, F., & Müller, W. (1991). Differentielle Psychophysiologie von Befinden, Blutdruck und Herzfrequenz im Labor–Feld-Vergleich [Differential psychophysiology of subjective state, blood pressure and heart rate: Laboratory–field comparison]. *Zeitschrift für Differentielle und Diagnostische Psychologie, 12,* 1–25.

Fowles, D. C. (1987). Application of a behavioral theory of motivation to the concepts of anxiety and impulsivity. *Journal of Research in Personality, 21,* 417–435.

Fresenius. (1980). *Normalwerte im Kindesalter* [Normal scores in childhood] (8th ed.). Bad Homburg von der Höhe, Federal Republic of Germany: Carl Bindernagel.

Goldberg, L. R. (1990). An alternative "description of personality": The Big Five factor structure. *Journal of Personality and Social Psychology, 59,* 1216–1229.

Goldman-Eisler, F. (1968). *Psycholinguistics—Experiments in spontaneous speech.* San Diego, CA: Academic Press.

Gormley, J. (1983). Predicting behavior from personality trait scores. *Personality and Social Psychology Bulletin, 9,* 267–270.

Gray, J. A. (1982). *The neuropsychology of anxiety: An investigation into the functions of the septo-hippocampal system.* Oxford, England: Oxford University Press.

Gray, J. A. (1987). Perspectives on anxiety and impulsivity: A commentary. *Journal of Research in Personality, 21,* 493–509.

Heidenfelder, K. H. (1985). *Objektive Registrierung von Sprechverhalten: Allgemeinpsychologische und differentielle Sensibilitäten des Logoport* [Objective assessment of speech: General-psychological and differential sensitivity of the logoport]. Unpublished doctoral dissertation, University of Würzburg, Federal Republic of Germany.

Hormuth, S. E. (1986). The sampling of experiences *in situ. Journal of Personality, 54,* 262–293.

Johnston, D. W., & Anastasiades, P. (1990). The relationship between heart rate and mood in real life. *Journal of Psychosomatic Research, 34,* 21–27.

Jöreskog, K. G., & Sörbom, D. (1985). *Lisrel VI: Analysis of linear structural relationships by the method of maximum likelihood.* Mooresville, IN: Scientific Software Inc.

Kagan, J., Reznick, J. S., & Snidman, N. (1987). The physiology and psychology of behavioral inhibition in children. *Child Development, 58,* 1459–1473.

Kagan, J., Reznick, J. S., Snidman, N., Gibbons, J., & Johnson, M. O. (1988). Childhood derivatives of inhibition and lack of inhibition to the unfamiliar. *Child Development, 59,* 1580–1589.

Krüger, H. P. (1989). Speech chronemics—a hidden dimension of speech. Theoretical background, measurement and clinical validity. *Pharmacopsychiatry, 22,* 5–12.

Langewitz, W., Rüddel, H., & von Eiff, A. W. (1987). Influence of perceived level of stress upon ambulatory blood pressure, heart rate, and respiratory frequency. *Journal of Clinical Hypertension, 3,* 743–748.

Larsen, R. J. (1985). Individual differences in circadian activity rhythm and personality. *Personality and Individual Differences, 6,* 305–311.

Mischel, W. (1977). The interaction of person and situation. In D. Magnusson & N. S. Endler (Eds.), *Personality at the crossroads: Current issues in interactional psychology* (pp. 333–352). Hillsdale, NJ: Erlbaum.

Obrist, P. A., Howard, J. L., Lawler, J. E., Galosy, R. A., Meyers, K. A., & Gaebelein, C. J. (1974). The cardiac–somatic interaction. In P. A. Obrist, A. H. Black, J. Brener & L. V. DiCara (Eds.), *Cardiovascular psychophysiology: Current issues in response mechanisms, biofeedback, and methodology* (pp. 136–162). Chicago: Aldine.

Obrist, P. A., Lawler, J. E., Howard, J. L., Smithson, K. W., Martin, P. L., & Manning, J. (1974). Sympathetic influence on cardiac rate and contractility during acute stress in humans. *Psychophysiology, 11,* 405–427.

Pilkonis, P. A. (1977). The behavioral consequences of shyness. *Journal of Personality, 45,* 595–611.

Rausche, A. (1991). Data evaluation with the program LOGEVAL. In H. P. Krüger (Ed.), *The LOGOPORT: Handbook* (Tech. Rep. No. 1–49). Würzburg, Federal Republic of Germany: University of Würzburg, Department of Psychology.

Revelle, W., Humphreys, M. S., Simon, L., & Gilliland, K. (1980). The interactive effects of personality, time of day and caffeine: A test of the arousal model. *Journal of Experimental Psychology: General, 109,* 1–31.

Rubin, K. H., & Asendorpf, J. B. (Eds.). (1993). *Social withdrawal, inhibition, and shyness in childhood.* Hillsdale, NJ: Erlbaum.

Snyder, M. (1981). On the influence of individuals on situations. In N. Cantor & J. F. Kihlstrom (Eds.), *Personality, cognition, and social interaction* (pp. 309–329). Hillsdale, NJ: Erlbaum.

Starkweather, J. A. (1956). Content-free speech as a source of information about the speaker. *Journal of Abnormal and Social Psychology, 52,* 394–402.

Waldrop, M. F., & Halverson, C. F., Jr. (1975). Intensive and extensive peer behavior: Longitudinal and cross-sectional analyses. *Child Development, 46,* 19–26.

Received March 3, 1992
Revision received December 31, 1992
Accepted January 13, 1993 ■