Development of Inhibited Children's Coping with Unfamiliarity

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ASENDORPF, JENS B. *Development of Inhibited Children's Coping with Unfamiliarity.* CHILD DEVELOPMENT, 1991, **62**, 1460–1474. In a longitudinal study, 87 children were observed in dyadic free-play sessions with unfamiliar peers at 4, 6, and 8 years of age and were judged by their parents for inhibition. Correlational analyses showed that observed inhibited behavior as well as parental judgments of inhibition became increasingly associated with solitary-passive activity and lost an initial negative correlation with parallel play. Extreme group analyses of the time structure of the behavior of continuously inhibited and control children indicated that with increasing age, many inhibited children spend longer periods in solitary-passive activity, whereas many controls spend longer periods in social behavior. These findings suggest that dispositional inhibition toward strangers becomes increasingly associated with unsociable behavior, which makes it difficult to distinguish between the dispositions of inhibition and unsociability at the empirical level.

When children are confronted with strangers, they often become inhibited. In the presence of unfamiliar peers, for example, they tend to regress to less mature forms of play (Asendorpf, in press; Doyle, Connolly, & Rivest, 1980). More specific behavioral signs of inhibition are long latencies of responding, looking at peers from a distance, or staring into space (Asendorpf, 1990a).

From a motivational point of view, inhibited behavior arises from an approach-avoidance conflict (Asendorpf, 1990b, in press). A person is motivated to approach others, but this approach tendency is inhibited by a simultaneous avoidance tendency. This motivational state is different from disinterest in peers (state of unsociability; no approach and no avoidance) or from actively avoiding others (avoidance and no approach).

In the presence of unfamiliar peers, children can become trapped in the approach-avoidance conflict for a considerable amount of time. For example, in the present study we observed children who literally froze for 10 min; they hid in a corner of the playroom, seemingly unable to move, but nonetheless constantly watched the unfamiliar partner. Other children hesitate for only some seconds and then approach the partner and quickly become immersed in joint play. Most children need more time to move from an initial state of inhibition to social interaction. A frequent way of approaching familiar or unfamilir peers is to first engage in parallel play (playing near to the partners with similar toys without interacting; Parten, 1932), and then to swiftly join the activity of the partners (Bakeman & Brownlee, 1980; Dodge, Schlundt, Schocken, & Delugach, 1983). Other children solve the approach-avoidance conflict by retreating to quiet, solitary play; they "give up" their social interests and instead become object-focused (see Jennings, 1975, for the concept of "people-orientation" vs. "object-orientation").

These different ways of responding to unfamiliar peers represent different styles of coping with unfamiliarity. Children may fail to cope and show inhibited behavior for a long time. They may try to overcome their approach-avoidance conflict by approaching their partners, either by engaging in parallel play first and moving on to interaction later, or by jumping directly into interaction. Or

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they may retreat from the state of inhibition or parallel play to solitary activities. In different encounters with peer strangers, the same child may cope differently depending on the child's present internal states (e.g., motivation to approach peers vs. objects, attachment needs, wakefulness) and on the behavior of the partners (do they invite, accept, ignore, or reject social overtures?).

Despite this *intra*individual variability, children may develop characteristic styles of coping with unfamiliarity that show some consistency across different encounters with strangers. Among other factors, two sources of *inter*individual differences contribute to these coping styles: children's general experience with peers (and specific experience with peer strangers), and a temperamental disposition to react with inhibition toward the unfamiliar. The present study is concerned with this latter factor.

Kagan and his colleagues (Kagan & Moss, 1962; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984; Kagan, Reznick, Snidman, Gibbons, & Johnson, 1988) have intensively studied behavioral and physiological differences between extremely inhibited and uninhibited children in unfamiliar social and nonsocial situations. Their data can be interpreted to show a temperamental "inhibition toward the unfamiliar." Interindividual differences in this disposition show moderate degrees of temporal stability and consistency across social as well as nonsocial unfamiliar situations. Sometimes confusion is caused in the literature because the term "inhibition" can refer both to situationally variable behavior and to a disposition to react with inhibited behavior across many social situations. In order to avoid such confusion in the present study, I will use the terms "inhibition" and "inhibited children" only when I refer to the disposition of inhibition at the construct level; otherwise I will use the term "inhibited behavior."

Asendorpf (1990c) has found an even higher temporal stability of inhibition toward strangers in a German sample of children. Furthermore, he has extended Kagan et al.'s analysis in two respects. First, he showed that parental judgments of inhibition toward strangers were strongly predictive of inhibited behavior with unfamiliar peers but not significantly related to behavior with familiar classmates in comparable play sessions. Thus, inhibition toward the unfamiliar involves a lack of social performance in the presence of strangers but not a general lack of social competence.

Second, Asendorpf (1990c) found that over a 3-year period, children's inhibition during free play in their preschool class lost an initial correlation with their inhibition toward strangers and instead became more related to neglect and rejection by classmates. Thus, both unfamiliarity and low peer acceptance contribute to young children's inhibition in peer groups. Asendorpf (1990c) suggested that the increasing correlation between low peer acceptance and inhibition is mediated by social-evaluative concerns. Low acceptance by peers leads to the anticipation of negative social evaluation, which in turn triggers inhibited behavior during social interaction with these same peers.

However, inhibition toward strangers and inhibition because of social-evaluative concerns are highly correlated in adults, according to self-report data (Asendorpf, 1989a, 1989b; Crozier, 1979; Jones, Briggs, & Smith, 1986). This means that a two-factor view of inhibition seems appropriate for young children, whereas one factor may suffice for a description of adults' inhibition. If this is accurate, inhibition toward the unfamiliar and inhibition because of social-evaluative concerns must become increasingly associated during some period between kindergarten and young adulthood.

The present study was inspired by the idea that the tendency for social withdrawal in the face of social difficulty may be an important moderator variable for the relation between the two factors of inhibition. Rubin and his colleagues (Rubin, 1985a; Rubin, Hymel, & Mills, 1989; Rubin, LeMare, & Lollis, 1990; Rubin & Mills, 1988) have studied the concomitants and long-term consequences of dispositional social withdrawal from peers. They found that a preference for solitary activity observed in kindergarten and in grade 2 predicted internalizing difficulties (negative social self-esteem and self-reports of loneliness and depression) in grades 4 and 5. More recently, Rubin has even found significant positive relations between observed withdrawal in grade 2 and internalizing difficulties in grade 9 (personal communication, June 1990). If the temperamental disposition of inhibition toward the unfamiliar becomes increasingly associated with a coping style of social withdrawal during middle and late childhood, inhibited children may develop internalizing difficulties.

The present study investigated the first part of this hypothesis, that is, that the association between the dispositions of inhibition and social withdrawal increases over development. Three distinct subtypes of solitude were investigated: solitary-passive, solitary-active, and inhibited behavior. Furthermore, the frequency and the quality of parallel play and social-interactional activity were analyzed as alternative ways of coping with unfamiliarity.

According to Rubin et al. (1988, 1989), socially withdrawn behavior is best described as solitary-passive behavior. Solitary-passive behavior includes solitary exploration and solitary constructive play; it is the preference for this type of solitude that is related to internalizing problems (Rubin et al., 1989). In contrast, solitary-active play includes solitary-functional and solitary-dramatic play. A preference for this type of solitude is not related to internalizing problems; instead, positive correlations with teacher ratings of externalizing problems (particularly aggressiveness) have been established (Rubin & Mills, 1988). It was expected that if inhibited children retreated to solitude as a response to unfamiliarity, they would show passive rather than active solitary behavior.

In addition to solitary-passive and solitary-active behavior, two other kinds of solitary activity were targeted in the present study: prolonged looking at the partner without accompanying play, and being unoccupied. Both of these behaviors were found in a previous study to be correlated with parental judgments of inhibition when the partner was unfamiliar, but not when the partner was a familiar classmate (Asendorpf, 1990c). This correlational pattern suggested that these two behaviors could be used as indicators of inhibition.

The five types of social behavior (solitary-passive, solitary-active, inhibited behavior, parallel play, social-interactional behavior) were observed longitudinally in a sample of 87 children who participated in dyadic free-play sessions with unfamiliar peers at 4, 6, and 8 years of age. Additionally, parental judgments of dispositional inhibition to strangers were concurrently assessed. This sample is part of a somewhat larger sample of 99 children for whom longitudinal inhibition data from 4 to 7 years were reported in Asendorpf (1990c). In the present study, the time frame is extended to include a new play session in grade 2. Additionally, analyses of passive and active solitary behavior, parallel play, and their relations to inhibited behavior as well as dispositional inhibition are provided for the full longitudinal data set.

Method

Subjects.—A sample of 87 children (46 boys, 41 girls) served as subjects in the present study. This sample was recruited from the sample of the Munich Longitudinal Study on the Genesis of Individual Competencies (LOGIC; Weinert & Schneider, 1986). The original LOGIC sample (N = 194) consisted of children born between August 1980 and July 1981 who started to attend 20 preschools in the Munich area in the fall of 1984 and whose first language was German. This is a rather unbiased sample because the schools were selected from a broad range of neighborhoods, and more than 90% of the parents gave their consent for their child's participation.

To make the sample more homogeneous, it was reduced to the 126 children who attended preschool in the mornings when groups are larger than in the afternoon. Over the next 5 years, 12 children dropped out because they moved away from the Munich area, and three parents withdrew permission after children had entered grade school. These 15 children (attrition rate 12%) were not significantly different from the remaining 111 children in the three measures of inhibition toward strangers that were assessed in the first year of the study ($t < 1$ for parental scale, teacher Q-sort measure, and the latency to approach an adult stranger).

Of the remaining 111 children, 87 had participated in all three dyadic play sessions with an unfamiliar peer at 4, 6, and 8 years of age; these children constituted the sample of the present study. Of the 87 children, 76 entered grade school 1–3 months before the dyadic play session at age 6; the remaining 11 children entered grade school 1 year later. These 11 children did not differ significantly from the main group in terms of the major variables of the present study (measures of dispositional inhibition, inhibited behavior, solitary-passive activity, and parallel play) in any of the three years of assessment. Therefore, this subgroup was not treated separately in the analyses.

Parental inhibition scale.—Concurrently with the play sessions, the child's main caregiver (nearly always the mother)

answered a questionnaire that contained eight questions rated on a 7-point scale ("never"–"always") that referred to dispositional inhibition toward strangers (e.g., "My child is shy toward unknown children"). These eight items were randomly distributed among 40 other items with the same response format. The internal consistency of the scale was high for all three assessments (Cronbach's alpha .84–.95). Validity data for the scale were available from other studies of the LOGIC project. The parental scale at age 4 correlated with the latency of children's first spontaneous utterance directed toward an adult stranger at age 3.9 (r = .66) as well as at age 5.9 (r = .55); this latter latency correlated r = .47 with the inhibition scale at age 6 (see Asendorpf, 1990c, Table 2). Furthermore, the inhibition scale at age 6 correlated r = .39 (n = 58, $p < .003$) with an inhibition rating that children's grade 1 teacher provided at age 7.4 at the end of grade 1 on one 9-point scale.

Play sessions.—The play sessions took place in an observation room at the Max Planck Institute; children were randomly paired with a same-gender child whom they had never met before. There were three play sessions; children's mean age at the sessions was 4.9, 6.9, and 8.1 years. Children were videotaped during free play with a set of age-appropriate toys that were similar but not identical in different assessments. In the first play session at age 4, the parent of each child sat quietly in the room and was instructed to answer a long questionnaire. In the other two play sessions, a female experimenter well known to the children sat in the room pretending to read a book. Adults were instructed to ignore the children as much as possible and to explain to them, if necessary, that they were working. Dyadic play sessions lasted 15 min (age 4), 10 min (age 6), or 12 min (age 8).

Behavioral coding.—Videotapes of children's behavior were coded with Rubin's (1985b) Play Observation Scale. Ten-second intervals were coded for social participation, as defined by Parten (1932) (unoccupied, solitary play, onlooking, parallel play, conversation, group play). In addition, adult orientation of any of the play partners, aggressive exchanges, and transitional behavior between these categories were coded. Because of a low frequency of occurrence, aggressive exchanges and transitional behavior are ignored in the present analyses. Because unoccupied and onlooking behavior showed similar effects in all analyses, particularly in their relations to the parental inhibition judgments, they were aggregated, yielding a code for inhibited behavior. Also, in line with Rubin et al. (1988, 1989), conversation and group play were aggregated to an index of social-interactional activity.

Code frequencies were corrected for the time when the child's partner was oriented toward an adult. Furthermore, play was coded for its cognitive quality *sensu* Piaget (1962) (functional, exploratory, constructive, dramatic, games with rules). By combining codes of social and cognitive play, codes for (non)solitary-passive and (non)solitary-active behavior were generated according to the definitions given by Rubin et al. (1988, 1989). Solitary-passive behavior was defined as solitary exploration or solitary-constructive play, and solitary-active behavior was defined as solitary-functional or solitary-dramatic play; similarly, in nonsolitary play (i.e., parallel and group play), nonsolitary-passive play was distinguished from other forms of nonsolitary play. In addition, the latency to children's first request directed toward their play partner was coded because this latency appears to be a good measure of inhibited behavior.

Results

Intercoder agreement.—The Play Observation Scale was used by two coders. Each coder scored half of the dyads of each play session. In addition, each coder scored 20% of the other coder's tapes for determining the intercoder agreement for each play session; the coders did not know which of their tapes would be selected for this reliability check. Intercoder agreement was determined for the five categories of social play and the two categories of cognitive play that were used in the analyses (see Table 1).

Overall agreement was satisfactory in both cases for all three play sessions (for social play in sessions 1–3, kappa .80, .76, .80; for cognitive play, kappa .80, .74, .79). The percentages of agreement for the individual categories were also satisfactory (see Table 1). The latencies correlated between coders above .82 for all play sessions.

Age-related differences in children's social behavior.—Table 2 contains descriptive indices of children's social behavior in the three play sessions. Because the measures of latency were strongly skewed and showed considerable ceiling effects (about 30% of the children in each year of observation did not produce any requests and thus were

TABLE 1

INTERCODER AGREEMENT FOR THREE PLAY SESSIONS

CODING DECISIONS FOR:	AGREEMENT FOR PLAY SESSION (%)		
	4 Years	6 Years	8 Years
Inhibited behavior[a]	86	76	79
Solitary play	80	83	90
Parallel play	80	74	87
Interactional behavior[b]	87	89	80
Adult orientation	77	92	79
Passive play[c]	96	95	98
Active play[d]	84	78	81

NOTE.—Percentage of agreement was computed as no. agreement/mean no. disagreements.

[a] Onlooking or being unoccupied.

[b] Group play or conversation.

[c] Exploratory or constructive play.

[d] Functional or dramatic play.

scored at ceiling), median latencies are reported.

For all variables except latencies, age effects were tested by a linear and a quadratic trend within a multivariate analysis of variance that took the uneven spacing of the play sessions into account. These tests indicated that inhibited behavior, $F(1,86) = 22.03$, $p < .0001$, and adult orientation, $F(1,86) = 15.01$, $p < .0002$, decreased linearly with increasing age, and that social-interactional behavior increased linearly with increasing age, $F(1,86) = 27.36$, $p < .0001$. No other trends were significant.

The medians of the latencies suggest a decrease with age. However, these medians cannot be easily compared between sessions because there were ceiling effects, and the ceiling (duration of the session) varied between sessions. Survival analysis (see Kalbfleisch & Prentice, 1980; Tuma & Hannan, 1984) provides a nonparametric method of comparing ceilinged time variables across groups; ceilings are allowed to vary across subjects. This approach provides only conservative tests for cross-session differences in the present case because it assumes that subjects are different between sessions.

A survival analysis between the three sessions (SAS program LIFETEST; SAS Institute, Inc., 1985) showed marginal differences between sessions (for the Wilcoxon test, $\chi^2(2) = 4.75$, $p < .10$), and subsequent comparisons between single sessions showed no difference between the first and the second session ($\chi^2(1) < 1$), and a marginal difference between the second and the third session, $\chi^2(1) = 3.39$, $p < .07$. Because of the conservative between-subjects ap-

TABLE 2

DESCRIPTIVE INDICES OF CHILDREN'S SOCIAL BEHAVIOR IN THE PLAY SESSIONS

BEHAVIOR	MEANS (Standard deviations)[a]		
	4 Years	6 Years	8 Years
Solitary-passive (SPAS)	28.9 (24.7)	29.2 (27.0)	22.2 (24.2)
Solitary-active (SACT)	7.2 (9.8)	6.1 (10.4)	7.2 (14.5)
Inhibited (INH)	15.6 (16.8)	7.6 (11.4)	6.1 (9.6)
Parallel play (PAR)	20.9 (15.7)	25.9 (19.7)	21.4 (20.9)
Social-interactional (SOC)	20.5 (20.5)	27.9 (28.7)	40.8 (35.6)
Adult orientation (ADU)	5.1 (9.4)	1.8 (3.0)	1.1 (2.1)
Latency to request (LAT)	201.0	186.0	85.0

NOTE.—$N = 87$.

[a] Because of the skewed and ceilinged distributions of the latency measures, median latencies are reported.

proach, the marginal differences can be interpreted with some confidence. Thus, the latency of children's first request to their play partner decreased between the second and the third sessions.

Age-related changes in the correlates of inhibited behavior.—Two methodological problems had to be considered in the analyses of correlations within play sessions. First, most variables were skewed; therefore Spearman rank-order correlations were applied. Because the latency measures showed a ceiling effect, Spearman correlations with these latencies somewhat underestimate the real ordinal relations.

Second, percentages of different behaviors that refer to the same observation interval are intrinsically negatively correlated. For example, if only two behaviors were distinguished, the correlation between these two behaviors must be −1. If more than two behaviors are distinguished, correlations between any two behaviors are still negatively biased; this bias increases as the mean percentage of the remaining behaviors decreases. Thus, decreasing means of two behaviors lead to more positive correlations between these behaviors.

Table 3 presents the correlations of the two measures of inhibited behavior with the other measures of social behavior within each play session. Table 3 suggests various age-related changes of correlations in terms of systematic increases or decreases. These changes were evaluated by testing differences between correlations for significance. Because the correlations always referred to the same sample, *t* tests for differences between correlations in dependent samples were applied (Z^* statistic; see Steiger, 1980).

The increase in the correlation between inhibited behavior and solitary-passive activity (−.12 at age 4 to .34 at age 8) was significant ($Z^* = 3.14$, $p < .002$) as well as the change in the correlation between inhibited behavior and parallel play (−.34 at age 4 to .02 at age 8; $Z^* = 2.48$, $p < .02$) and in the correlation between inhibited behavior and adult orientation (−.20 at age 4 to .13 at age 8; $Z^* = 2.75$, $p < .01$). However, these changes in the correlations might be due partly to a decrease in the overall rate of the compared behaviors (see Table 2) that may have alleviated the negative bias (see above); on the other hand, the changes in overall rates were not so great as to suggest that this effect fully accounts for the age-related changes in the correlational patterns.

Because the latency measures are independent of the percentages of coded behaviors, their correlations are not affected by a negative bias problem. The increase in the correlation between the latency measure and solitary-passive behavior (.40 at age 4 to .61 at age 8) was marginally significant ($Z^* = 1.89$, $p < .07$), and the change in the correlation between latency and parallel play (−.40 at age 4 to .16 at age 8) was significant ($Z^* = 3.83$, $p < .001$). Thus, the latency data replicated the findings for the relations between inhibited behavior and passive solitude and parallel play if marginal levels of significance are included. Together, these data suggest that inhibited behavior became increasingly associated with solitary-passive behavior, and that it lost its negative relation to parallel play.

Age-related changes in the correlations between parental inhibition judgments and social behavior.—Because the parental inhibition judgments were assessed independently of children's behavior in the play sessions, they provide a good test of the

TABLE 3

CORRELATIONS BETWEEN MEASURES OF INHIBITED BEHAVIOR AND OTHER SOCIAL BEHAVIOR WITHIN PLAY SESSIONS

	INH			LAT		
BEHAVIOR	4 Years	6 Years	8 Years	4 Years	6 Years	8 Years
LAT	.29	.38	.27	. . .	. . .	. . .
SPAS	−.12	.10	.34	.40	.51	.61
SACT	−.13	−.02	.02	.04	−.05	.28
PAR	−.34	−.06	.02	−.40	−.08	.16
SOC	−.19	−.28	−.31	−.72	−.75	−.67
ADU	−.20	−.01	.13	.02	−.14	.02

NOTE.—$N = 87$. Reported are Spearman correlations; correlations above .21 or below −.21 are significant. See Table 2 for abbreviations of behavioral measures.

developmental findings reported above. Table 4 contains the concurrent and the predictive correlations between the three parental inhibition judgments and children's behavior in the three play sessions.

Because of high correlations between the three parental judgments (age 4–6, .68; 4–8, .72; 6–8, .81), they were aggregated to produce a mean parental judgment that appears to be a good measure of children's dispositional inhibition.

Both the concurrent and the predictive correlations and the correlations with the aggregated parental judgment confirmed the major findings of the correlational analyses within play sessions. The three parental inhibition measures showed similar positive concurrent correlations with the two measures of inhibited behavior for all three play sessions, an increasingly positive concurrent correlation with solitary-passive activity, and a decreasingly negative concurrent correlation with parallel play.

The increasingly positive correlations with solitary-passive activity and the decreasingly negative correlations with parallel play were tested with the aggregated parental judgment because this variable appeared to be the most robust measure of children's dispositional inhibition. The increase in the correlation with solitary-passive behavior (.08 at age 4 to .37 at age 8) was significant ($Z^* = 2.23$, $p < .05$), whereas the change in the correlation with parallel play was marginally significant ($-.12$ at age 4 to .13 at age 8; $Z^* = 1.79$, $p < .08$).

Overall, especially if marginally significant findings are included, the correlations with the parental inhibition scales fully confirmed the major findings for the measures of inhibited behavior, that inhibition becomes increasingly predictive of solitary-passive behavior and decreasingly predictive of parallel play.

Comparison of continuously inhibited children with a control group in terms of the time structure of their behavior.—Two major problems exist in the above analyses of the relation between dispositional inhibition and children's behavior during free play. First, these analyses confound effects of high and low inhibition. For example, both the conclusion that highly inhibited children engage in increasingly more solitary-passive activity and the conclusion that strongly uninhibited children engage in increasingly less passive solitude are compatible with the correlational findings.

Because the focus of this study is on high dispositional inhibition, an extreme group analysis was performed. A small group of children continuously high in dispositional inhibition was contrasted with a large control group of children with continuously below-average dispositional inhibition. This asymmetry in the definition of the two comparison groups makes it possible to interpret differences between these groups in terms of high inhibition.

Continuously inhibited children were targeted by parental inhibition scores that were in the upper quartile of the distribution in all three assessments; the control group was defined by parental inhibition scores below the median in all three assessments. Of the 87 children in the sample, 13 were classified as continuously inhibited, and 30 as controls.

The second problem of the correlational analyses is that they refer to behavioral data that are aggregated over each play session for each child. Thus, the time structure of children's behavior is lost. The same problem applies to extreme group comparisons of such aggregated data. However, the interpretation of children's behavior in terms of coping styles refers to this time structure rather than to averages within sessions. First, if continuously inhibited children spend more time in passive solitude at an older age, this could be due to an increase in the duration of periods of uninterrupted solitary-passive behavior, or to more frequent short periods of this behavior. Only an increase in the duration of solitary-passive behavior would be consistent with the conclusion that inhibited children learned to cope with social situations by retreating to passive solitude. Second, a coping hypothesis would be supported by developmental changes in preferences for particular behavioral transitions, for example, if inhibited children become more likely, relative to controls, to switch from inhibited behavior to passive solitude.

Therefore, continuously inhibited children were compared with control children in terms of two types of variables: mean state lengths and the probability for state transitions ("state" meaning an uninterrupted period spent with a particular behavior, e.g., solitary-passive activity). Following the approach to sequential analysis advocated by Bakeman and Gottman (1986), the 10-sec interval codes for each child were transformed into state sequences. Each state consisted of a sequence of identical interval codes (e.g.,

TABLE 4

CORRELATIONS BETWEEN PARENTAL JUDGMENTS OF INHIBITION AND SOCIAL BEHAVIORS

PARENTAL JUDGMENT	BEHAVIOR IN PLAY SESSIONS[a]											
	INH1	INH2	INH3	LAT1	LAT2	LAT3	SPAS1	SPAS2	SPAS3	PAR1	PAR2	PAR3
Age 4	.25	.35	.24	.52	.41	.45	.17	.23	.40	−.21	−.03	.13
Age 6	.27	.28	.17	.23	.32	.31	.04	.11	.26	−.01	−.09	.14
Age 8	.33	.37	.24	.31	.37	.39	.01	.23	.36	−.08	−.24	.00
Mean[b]	.32	.37	.24	.41	.40	.41	.08	.20	.37	−.12	−.12	.13

NOTE.—N = 87. Correlations are Spearman correlations; correlations above .21 or below −.21 are significant. Concurrent correlations between judgments and behavior are underscored. See Table 2 for abbreviations of behavioral measures.

[a] 1 = age 4, 2 = age 6, 3 = age 8.

[b] Mean of the three parental judgments at age 4–8.

the code sequence 1,1,2,2,2,1,2,2 would be transformed into the state sequence 1-2-1-2). The length of each state was also computed (e.g., the state lengths of the above sequence are 20, 30, 10, and 20 sec), and the mean state length was determined for each child, type of state, and play session.

Table 5 presents the means and standard deviations of these mean state lengths for the two groups of children across the three years of observation. The overall group and age differences and the age × group interactions of the state lengths were evaluated for each type of state by mixed analyses of variance with group as a between-subjects factor and age as a within-subjects factor. The age effect was split into a linear and a quadratic trend in age; these contrasts took the uneven spacing of the play sessions into account. Thus, five statistically independent effects were tested within each ANOVA that exhausted all degrees of freedom: group main effect, linear age effect, quadratic age effect, linear age × group interaction, and quadratic age × group interaction.

These analyses revealed that, compared to controls, continuously inhibited children showed longer periods of inhibited behavior, $F(1,41) = 13.54$, $p < .001$, as well as solitary-passive activity, $F(1,41) = 10.59$, $p < .003$, and shorter phases of social-interactional behavior, $F(1,41) = 15.41$, $p < .001$; for parallel or solitary-active play, no significant group differences were found. Significant linear age effects were revealed for solitary-passive behavior, $F(1,41) = 6.38$, $p < .02$, parallel play, $F(1,41) = 4.93$, $p < .04$, and social-interactional behavior, $F(1,41) = 6.24$, $p < .02$. Table 5 indicates that periods of this behavior became longer with increasing age. No other linear age effects nor any of the five quadratic age effects were significant.

More interesting than these overall effects are the age × group interactions. A significant linear age × group effect for solitary-passive behavior, $F(1,41) = 4.23$, $p < .05$, indicated that the length of solitary-passive activity increased more for inhibited children than for controls. In fact, Table 5 shows that periods of passive solitude increased with increasing age only for inhibited children and not for controls. In addition, the variance of solitary-passive activity within the inhibited group was also much higher at age 8 than before; thus, some inhibited children retreated to passive solitude for long periods, whereas others did not do so.

For parallel play, a quadratic age × group effect, $F(1,41) = 4.42$, $p < .05$, was revealed. Table 5 suggests that inhibited children showed a delayed peak in the length of parallel play. Whereas controls reached this peak at age 6 (when the amount of parallel play peaks in general; see Table 2), inhibited children spent particularly long times with parallel play at age 8.

For social-interactional behavior, both a linear age × group effect, $F(1,41) = 4.58$, $p < .04$, and a quadratic age × group effect, $F(1,41) = 4.52$, $p < .04$, were found. Table 5 indicates that periods of social interaction became longer for controls, but not for inhibited children, and that inhibited children tended to show shorter periods of social interaction at age 8 than at age 6, whereas the opposite was true for controls. It seems that controls increasingly learned how to continue social interaction, whereas inhibited

TABLE 5

DIFFERENCES BETWEEN CONTINUOUSLY INHIBITED AND CONTROL CHILDREN IN THE MEAN LENGTH OF BEHAVIORAL STATES

	Age 4				Age 6				Age 8			
	Inhibited		Control		Inhibited		Control		Inhibited		Control	
Behavior	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
INH	28.0	28.4	12.0	6.9	17.1	11.6	8.1	6.8	16.7	19.0	10.8	13.6
SPAS	41.9	44.6	25.9	16.2	49.1	46.4	35.0	36.5	94.7	113.2	30.8	35.9
SACT	16.1	16.0	15.5	9.9	4.6	8.0	13.9	15.0	13.0	13.6	12.5	15.9
PAR	24.2	25.6	24.3	10.9	23.2	13.5	33.7	30.1	45.6	32.6	30.8	35.0
SOC	9.8	13.0	22.1	13.1	18.7	17.0	25.2	22.6	11.2	16.5	56.1	50.6

NOTE.—Mean state lengths are expressed in seconds. $N = 13$ for inhibited group and $N = 30$ for control group. See Table 2 for abbreviations of behaviors.

children did not. No other age × group interaction was significant.

In summary, the analyses of state length revealed that many inhibited children showed a developmental shift toward longer periods of solitary-passive activity, whereas control children shifted toward longer periods of social-interactional behavior.

The second type of analysis of the time structure of children's behavior focused on the probability of transitions between states. These probabilities are independent of state length and can be treated independently of the probabilities of the states. To simplify the analysis, it was limited to the three most important types of state: inhibited behavior, solitary-passive activity, and social activity (including parallel play).

The transitional probabilities between these three states were analyzed by sequential and by log-linear analyses (see Bakeman & Gottman, 1986). For each year of assessment, the state sequences of all inhibited children and all control children were pooled separately (there were not enough states per child to allow analyses on a child-by-child basis). From these two "super-sequences" for each year of assessment, the frequencies of the 3 (initial state) × 2 (next state) = 6 possible transitions between states were computed. Since there were only two alternative transitions from a given state, these data can be fully described by the number of all initial states n per year and group, and the probability for the transition from one of the three states into one of the two alternative next states. These n's and transitional probabilities are presented in Table 6.

Table 6 was analyzed in two ways. First, each observed transitional probability was compared with the expected probability under the assumption of random transitions between states. Table 6 presents these expected probabilities as well as the results of z tests for significant deviations of the observed probabilities from the expected probabilities (Allison-Liker tests; see Allison & Liker, 1982; Bakeman & Gottman, 1986, p. 155). Each of these tests met the requirement of a sufficiently large number of observed state transitions (see Bakeman & Gottman, 1986, p. 138). However, different tests were based on a different number of state transitions (the n's in Table 6). The n's decreased with increasing age because the mean state lengths increased (see Table 5), and inhibited children had lower n's because this group was smaller than the control group. Because the significance of the z tests strongly depends on the number of transitions, this variation of the n's must be taken into account when significances are compared across age or groups.

TABLE 6

DIFFERENCES BETWEEN CONTINUOUSLY INHIBITED AND CONTROL CHILDREN IN THE PROBABILITIES FOR TRANSITIONS BETWEEN BEHAVIORAL STATES

	Type of Transition					
	INH → PAR/SOC		SPAS → PAR/SOC		PAR/SOC → INH	
Age	Inhibited	Control	Inhibited	Control	Inhibited	Control
4 years:						
n	74	112	49	111	51	142
p	56.8	70.5*	36.7	70.3*	70.6*	52.1
p_e	56.1	60.9	47.2	59.5	58.8	51.4
6 years:						
n	43	53	43	88	51	106
p	60.5	69.8*	65.1	81.8*	60.8	31.1
p_e	59.3	55.1	54.0	69.0	55.4	35.5
8 years:						
n	45	40	31	45	44	52
p	66.7	70.0	51.6	68.9	63.6	46.2
p_e	59.7	59.6	51.7	60.8	58.1	48.7

NOTE.—See Table 2 for abbreviations of behaviors. n indicates the number of initial states per age and group; p indicates the observed transitional probabilities; p_e indicates the expected transitional probabilities under the assumption of random transitions.

* Observed probability significantly exceeds expected probability according to Allison-Liker z test.

Table 6 indicates that five of the 18 transitional probabilities significantly exceeded those expected under the assumption of random transitions. In each year of assessment, control children had about 10% more transitions to social behavior than to be expected by chance. In the first 2 years of assessment, these above-chance probabilities were significant; at age 8, they failed to reach significance despite similar deviations from chance because of the smaller number of state transitions. Thus, control children at all ages, but not inhibited children, were particularly likely to move from solitary states (inhibited or solitary-passive behavior) to social states (parallel play or social-interactional behavior). This above-chance probability reflects the direction of change toward social interaction during the process of becoming acquainted with an unfamiliar peer.

Inhibited children deviated from this normal pattern. Their transitions were compatible with the assumption of randomness except for the transition from social states to inhibited behavior at age 4 that exceeded chance expectation: Young inhibited children were particularly likely to show inhibited behavior even after entering the route to social interaction.

The second approach to transitional frequencies focuses on group and age effects in the transitional probabilities between states. Log-linear models appear to be most appropriate here (see Bakeman & Gottman,1986, chap. 9; Bishop, Fienberg, & Holland, 1975). The observed transitional probabilities are estimated by the most parsimonious model, that is, by a model that ignores as many interactions between factors as possible but that nevertheless generates expected probabilities that do not significantly deviate from the observed ones.

Because there were three states, evaluation of the full 2 (group) × 3 (age) × 3 (initial state) × 3 (consequent state) model includes many effects with more than 1 degree of freedom that do not allow straightforward interpretation. Because of the focus of this analysis on particular state transitions, the data were analyzed separately for each initial state by 2 (group) × 3 (age) × 2 (consequent state) models (for each initial state there exist only two consequent states because transitions from a state to itself cannot occur). Furthermore, because the three age categories were ordered and unevenly spaced, age was treated as a continuous variable (SAS procedure CATMOD with option "direct" for age; SAS Institute Inc., 1985); this approach allows one to fit linear and quadratic age functions. The resulting models involve only effects with 1 degree of freedom and are easy to interpret.

For the transitions from inhibited behavior, a main effects model (i.e., without age × group interaction) with liner age fitted the data well (for the residual effect, $\chi^2(3) = 0.72$, $p = .87$). Thus, the likelihood that inhibited children moved from inhibited behavior to passive solitude with increasing age did not increase relative to controls, as one might have concluded from the aggregated behavioral data in Table 5. Indeed, as Table 6 indicates, they even tended to show the opposite change. Removing the group effect from this model resulted in a significantly poorer fit ($\chi^2(1) = 4.04$, $p < .05$, for the change in the goodness of fit). Table 6 indicates that inhibited children were more likely than controls to move from inhibition to solitary-passive activity. Removing the age effect did not significantly affect the fit of the model ($\chi^2(1) = 0.45$, $p = .50$, for the change in fit).

For the transitions from solitary-passive behavior, the above model significantly violated the data; a main effects model with a quadratic age effect showed a better fit (residual effect, $\chi^2(1) = 0.27$, $p = .61$). Thus, again no significant group × age interaction was found. Removal of either the quadratic age effect ($\chi^2(1) = 9.38$, $p < .002$) or the group effect ($\chi^2(1) = 20.19$, $p < .001$) led to a significantly poorer fit. Table 6 indicates that transitions from solitary-passive activity to social behavior were more likely at age 6 than before or after, and that inhibited children showed these transitions less often than controls.

For the transitions from social behavior, again a main effects model with a quadratic age effect fit the data (residual effect, $\chi^2(1) = 1.44$, $p = .23$). Thus, again no significant group × age effect was revealed. And again, removal of the age effect ($\chi^2(1) = 9.70$, $p < .002$) or of the group effect ($\chi^2(1) = 17.85$, $p < .001$) led to a poorer fit. Table 6 shows that transitions from social behavior to inhibited behavior were less likely at age 6 than before or after, and that inhibited children made these transitions more often than controls.

To summarize, these analyses did not reveal age × group interactions in the transitional probabilities of moving from one state to another, contrary to the results for mean

state lengths. Inhibited children were not increasingly more likely to move to passive solitude from the state of inhibition, nor were they increasingly more likely to retreat from social behavior to passive solitude, relative to controls. Thus, the finding of an increasing correlation between dispositional inhibition and solitary-passive activity with increasing age that was reported above was not due to a differential change in inhibited children's transitional probabilities. Instead, the analysis of mean state lengths suggests that it was due to a differential change in the duration of states: With increasing age, inhibited children played alone for longer periods, whereas control children showed longer phases of social-interactional behavior.

Relation between dispositional inhibition and the quality of children's nonsolitary play.—The analyses reported so far provide a picture of the changing relations among different types of solitary behavior over development, as well as between dispositional inhibition and solitary behavior. But many children, even those in the continuously inhibited group, also engaged in nonsolitary play (parallel play or group play) for a considerable amount of time. A final question I asked was whether dispositional inhibition also showed an increasing effect on the *proportion* of passive activity (i.e., exploration and constructive play) within parallel and group play. This proportion is independent of the amount of nonsolitary activity as well as the amount and quality of solitary activity.

Spearman correlations between the aggregated parental inhibition scale and the percentage of exploratory and constructive play among children's parallel and group play were not significant at age 4 ($r = .13$), but were significant at older ages (for age 6, $r = .36$, $p < .001$; for age 8, $r = .28$, $p < .02$); however, differences between these correlations were not significant. Similarly, continuously inhibited children had only a slightly higher rate of passive nonsolitary play than controls at age 4 ($M = .74$ vs. $M = .67$, $t < 1$), but significantly higher rates at older ages (for age 6, $M = .92$ vs. $M = .73$, $t(39) = 2.27$, $p < .03$; for age 8, $M = .91$ vs. $M = .67$, $t(38) = 2.39$, $p < .03$); however, no significant age × group interaction was found ($F < 1$). Thus, when older inhibited children engaged in nonsolitary play, their play was more passive than control children's play.

Discussion

Children were observed longitudinally during free play with unfamiliar peers at 4, 6, and 8 years of age and were judged by their parents for dispositional inhibition. Correlational analyses showed that observed inhibited behavior as well as parental judgments of dispositional inhibition became increasingly associated with passive solitude (solitary exploration and solitary-constructive play) and lost an initial negative correlation with parallel play; both inhibited behavior and dispositional inhibition were unrelated to active solitude (solitary functional and dramatic play).

Extreme group analyses of children high and low in dispositional inhibition indicated that inhibited children failed to show the normal preference for moving from solitary to social behavior during free play with an initially unfamiliar peer; they were less likely than noninhibited children to move from inhibited behavior or solitary-passive activity to social behavior and more likely to retreat from social behavior back to inhibited behavior. In addition, inhibited children showed a differential-developmental shift in their persistence in behavioral states. With increasing age, they spent longer periods of time with solitary-passive activity, whereas noninhibited children showed longer phases of social interaction. Also, older inhibited children showed a high proportion of passive activity within parallel and group play.

The interpretation of these data must be tempered by two methodological problems. First, group means are used to infer individual tendencies of group members. This is particularly problematic for the analyses of transitional probabilities because these analyses rested upon state sequences that were pooled over all children per group in order to provide a sufficient number of transitions. Furthermore, Table 5 suggests that there was a high interindividual variance within groups for many variables. The relatively short observation periods for each child do not allow solving this problem by a reliable classification of individual children.

Second, the behavior of children in each dyad was not independent. Whether a child becomes engaged in social interaction, and how long this interaction lasts, depends not only on the child's personality but also on the personality of the child's partner. Because inhibited and noninhibited children were classified a posteriori and the two part-

ners of a dyad were matched randomly within each sex, the data could not be properly analyzed at a dyadic level (see Kraemer & Jacklin, 1979, for the analysis of dyadic interaction data when the partners of a dyad are systematically matched). This lack of control may be one of the reasons why the interindividual within-group variances were so high.

Two minor additional points should be mentioned. In the first session, children's main caregiver was present, whereas in the later sessions a familiar adult was in the room. Thus, some of the cross-session differences may be due to this situational variation. However, most effects were linear over age, and the differences between the second and the last session were somewhat greater for most variables than the differences between the first and second sessions despite the fact that the age difference between the last two sessions was smaller than the age difference between the first two sessions. The higher rate of adult orientation in the first session may be explained in part by the presence of a parent, but it seems very unlikely that the age-related changes in the other variables were strongly affected by this factor.

Second, children were repeatedly exposed to similar play sessions. One might argue that the age-related changes may reflect different adaptation by inhibited and noninhibited children to this type of situation rather than a developmental shift. However, the large time intervals between the sessions (2.0 and 1.2 years) make this interpretation unlikely. Cross-sectional studies could settle this point.

The findings of the present study can be interpreted in terms of a developmental shift in inhibited children's style of coping with unfamiliarity. Noninhibited children coped increasingly successfully with unfamiliarity by engaging in longer periods of social interaction. Inhibited children did not become more sociable; instead, many of them retreated to longer periods of passive solitude (whereas some of them did not; cf. the high variance of the inhibited group at age 8 in Table 6). This increasing association between dispositional inhibition and solitary-passive behavior also extended to nonsolitary activity: When inhibited children became engaged in parallel or interactive play, they preferred an exploratory or constructive type of play.

The increasing association between dispositional inhibition toward strangers and solitary-passive behavior is also interesting from a theoretical point of view. Children who do not often interact with their peers are frequently described as socially withdrawn. However, social withdrawal, or social isolation, is quite a fuzzy concept (Rubin & Mills, 1988; Wanlass & Prinz, 1982). Taking a motivational point of view on social withdrawal, I have recently suggested distinguishing between at least three types of dispositional social withdrawal: dispositionally inhibited (or shy) children who are characterized by a conflict between high social approach and high social avoidance motives, unsociable children who have a low social approach motive, and avoidant children who have a high social avoidance motive (Asendorpf, 1989a, 1990b).

In my original conception of these three types of social withdrawal, I have assumed a simple one-to-one correspondence between motives (at the construct level) and behavior. Thus I have operationalized dispositional inhibition by a high rate of inhibited behavior in social situations, such as the percent of time spent being unoccupied or watching the partner from a distance in dyadic peer play (as opposed to the percent of solitary-passive behavior, which can also reflect unsociability), or the rate of wait-and-hover among all contact initiation attempts in a group of peers (as opposed to the number of these initiations, which can also reflect unsociability).

The data from the present study suggest that assuming a one-to-one correspondence between the construct of dispositional inhibition and overt behavior, and between the construct of unsociability and overt behavior, can be misleading for older children when dispositional inhibition and unsociability are difficult to distinguish at the behavioral level. In the present study, inhibited children showed shorter phases of overt-inhibited behavior with increasing age, and longer periods of solitary-passive behavior (see Table 5). Thus, with increasing age it becomes more and more difficult to distinguish between dispositional inhibition and unsociability by molar measures of behavior. Perhaps this is one of the reasons why lay persons as well as some psychologists do not clearly distinguish between inhibition and unsociability at the construct level.

These findings do not question the importance of this distinction, but they high-

light the difficulties in operationalizing dispositional inhibition and unsociability for older children. Detailed behavioral analyses of initial reactions to strangers or to social-evaluative situations, or physiological measures of temperamental inhibition that are less affected by children's coping styles, may prove helpful here. Furthermore, in controlled situations, the role of unsociability can be minimized by motivating children to approach their interaction partners. In the LOGIC study this strategy was applied when children were confronted with adult strangers. The attractiveness of approaching the stranger was increased by the fact that children were bored before the stranger appeared, and then had a chance to get interesting toys from the stranger (see Asendorpf, 1990c, for details). This strategy is difficult to apply to peer interaction, however.

The findings of the present study are limited by the fact that they refer only to interactions with unfamiliar peers. It is important to know whether inhibited children also show a similar relative increase in solitary-passive activity in the presence of familiar peers. If not, their tendency toward solitude would be specific to encounters with strangers which may not be very problematic because children spend most of their time with familiar peers. However, if older inhibited children do show a generalized preference for solitude, this must be regarded to be a risk factor for the development of internalizing problems in light of the findings of Rubin et al. (1988, 1989). A third alternative is that some inhibited children show this generalized preference for solitude and others not; in this case, the former subgroup may be more prone to internalizing problems.

In the LOGIC study, most children were also observed in two dyadic free-play sessions with familiar classmates (see Asendorpf, 1990c), but these sessions were scheduled fairly closely together at ages 5.4 and 6.4 and hence do not provide sufficient data for an analysis of developmental change. Future studies may identify children high and low in the temperamental disposition of inhibition toward the unfamiliar and may further divide this group into "sociable" and "unsociable" ones on the basis of observations of their behavior in play sessions with unfamiliar and familiar peers. From the theoretical perspective of the present study, the prediction would be that inhibited children who retreat to solitary-passive behavior both in the presence of unfamiliar and of familiar peers are at risk for later internalizing problems, but that inhibited children who try to become immersed in social interactions do not face this risk. Stated in more general terms, the hypothesis is that what is important for later developmental outcome is not a temperamental disposition per se but how children cope with this temperamental disposition.

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