

Inhibited and Aggressive Preschool Children at 23 Years of Age: Personality and Social Transitions into Adulthood

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In a 19-year longitudinal study, the 15% most inhibited and the 15% most aggressive children at ages 4–6 years were followed up until age 23 years and were compared with controls who were below average in preschool inhibition or aggressiveness. As adults, inhibited boys and girls were judged as inhibited by their parents and showed a delay in establishing a first stable partnership and finding a first full-time job. However, only the upper 8% in terms of inhibition tended to show internalizing problems, including self-rated inhibition. Aggressive boys showed an externalizing personality profile in the parental and self-judgments, were educational and occupational underachievers, and showed a higher adult delinquency rate than the controls, even after sex and socioeconomic status were controlled. The results suggest delayed social transitions without internalizing problems for most male and female inhibited children and a significant long-term risk of an externalizing profile for aggressive children.

Keywords: inhibition, shyness, aggressiveness, longitudinal study, social relationships

Is it possible to predict important developmental outcomes in adulthood from early childhood personality? Several studies have focused on the stability of individual differences in the same personality trait over time. According to the meta-analysis of Roberts and DelVecchio (2000), major personality traits show a moderate stability of approximately .45 over an average prediction interval of 7 years from early childhood on. Simple extrapolation from these results to the much longer predictions from early childhood into adulthood is not possible, however, because stability seems to decrease with increasing prediction interval until it approaches an asymptote of approximately .30 due to long-term stabilizing factors (Fraleigh & Roberts, 2005).

In addition, longitudinal studies of personality development provide much more evidence on long-term effects of early personality than just test–retest stability estimates. Most evidence for the predictive power of early personality into adulthood has been found for two personality traits that describe two main directions in which young children may deviate from the modal personality pattern of the well-adjusted, resilient child (Asendorpf & van Aken, 1999; Block & Block, 1980; Caspi, 2000): (a) undercontrolled temperament and aggressiveness and (b) social inhibition. It

is important to note that this evidence is largely based on comparisons of very high aggressiveness, or very high social inhibition, with the modal personality pattern of a well-adjusted child (e.g., Caspi, 2000; Huesmann, Eron, Lefkowitz, & Walder, 1984).

The aim of the present study was to relate assessments of high aggressiveness and high social inhibition at 4–6 years of age to personality and important life outcomes at 23 years of age. We intended to test hypotheses derived from earlier studies on long-term sequelae of childhood undercontrol or aggressiveness and social inhibition and to explore additional life outcomes in young adulthood.

Undercontrolled Temperament and Aggressiveness

Undercontrolled temperament in early and middle childhood (as evidenced by low control of emotional and motivational impulses, including restlessness, distractibility, and aggressive behavior) has consistently been shown to be predictive of externalizing problems (Achenbach & Edelbrock, 1981) throughout childhood and adolescence and to predict adult externalizing problems, particularly aggressive and antisocial behavior (Huesmann et al., 1984; Moffitt, 1993; Robins, 1966; Tremblay, 2000). In terms of the temperamental classification developed by Thomas and Chess (1977), undercontrolled children are of the *difficult* type. In terms of the taxonomy of antisocial behavior developed by Moffitt (1993), they are at risk for the *life-course-persistent* form of antisocial behavior. Undercontrolled and aggressive children tend to have a below-average IQ (Asendorpf & van Aken, 1999; Huesmann et al., 1984) and are one of the groups at risk for educational underachievement, that is, lower school and college achievement than expected given their IQ (Mandel, 1997).

Arguably the best evidence for the long-term stability of this undercontrolled pattern from early childhood into adulthood comes from the Dunedin Longitudinal Study, which followed a representative New Zealand birth cohort from the age of 3 years into adulthood (Caspi & Silva, 1995). On the basis of behavioral

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observations in various situations, 10% of the sample of 1,037 children were classified as undercontrolled and were followed up until age 26. Compared with a control group of well-adjusted children (40% of the sample), the undercontrolled children reported high negative emotionality at both ages 18 and 26, particularly feelings of being mistreated and betrayed by others, and at age 26 were described by knowledgeable informants as low in agreeableness, conscientiousness, and openness to experience and high in neuroticism (Caspi, Harrington, Milne, Amell, Theodore, & Moffitt, 2003). Psychiatric interviews and official crime records of participants at age 21 showed that undercontrolled children had a significantly increased risk for antisocial personality disorder, convictions for a violent offense, a high variety of self-reported offenses, and suicide attempts (Caspi, 2000; Caspi, Moffitt, Newman, & Silva, 1996a).

With regard to life-course sequelae of childhood undercontrol even further into adulthood, Caspi, Elder, and Bem (1987) reanalyzed data from the Berkeley Guidance Study (MacFarlane, Allen, & Honzik, 1954) for boys and girls born in 1928 with a history of temper tantrums at ages 8–10 years (33% of $N = 214$). Interviews at ages 30 and 40 years revealed that undercontrolled boys later experienced downward occupational mobility and erratic work lives and were likely to be divorced; undercontrolled girls later married men with lower occupational status, were likely to be divorced, and became ill-tempered mothers. It is interesting that the effect on men's erratic work lives was only partially mediated by their occupational status in midlife; thus, undercontrol in middle childhood directly contributed to erratic work lives later.

Inhibition

Inhibition is not the opposite of undercontrol (i.e., overcontrol of emotional and motivational impulses; see Block & Block, 1980, for the concept of the overcontrolled child), although it is related to this concept as well as to numerous others such as behavioral inhibition toward the unfamiliar, social anxiety, shyness, social withdrawal, and internalizing problems. As Rubin and Asendorpf (1993) pointed out in their review of research in this area, care should be exercised to avoid confusion between these related but nonidentical concepts.

Inhibition, as we use the term here, refers to an observable, uneasy reaction to unfamiliar or social–evaluative situations characterized by an inhibition of social approach tendencies, sometimes fearful reactions, and often reserved, reticent behavior. This definition is consistent with the definition used in earlier reports from the present longitudinal study (Asendorpf, 1990, 1993, 1994; Asendorpf & van Aken, 1994). Because this concept includes social–evaluative inhibition due to social-evaluative concerns that are based on experiences of being neglected or rejected by others, it is broader than the temperamental concept of *inhibition to the unfamiliar* introduced by Kagan and colleagues and defined as *observed inhibited responses to both social and nonsocial unfamiliar situations* (Garcia-Coll, Kagan, & Reznick, 1984; Kagan, Reznick, Clarke, Snidman, & Garcia-Coll, 1984). Individual differences in inhibition to the unfamiliar and social-evaluative inhibition can be clearly distinguished from one another in terms of their different concurrent correlates and developmental outcomes until late childhood (Asendorpf, 1990; Asendorpf & van Aken, 1994).

Inhibition in early childhood is related to the concept of the *slow-to-warm-up* child described by Thomas and Chess (1977) and can be considered a specific form of social anxiety. The importance of early inhibition for later adult personality first became evident in the Fels Longitudinal Study (Kagan & Moss, 1962), in which two measures of observed anxiety in unfamiliar social situations at ages 3–6 were both significantly correlated with social anxiety in adulthood. Much later, Kagan and colleagues took up this observation in their studies of the concurrent and predictive correlates of very high versus very low inhibition (often defined as the upper and lower 15% of the distribution of a normal sample). Concerning long-term outcomes in non-clinical samples, very high versus very low inhibition at ages 2–3 predicted social anxiety at age 13 (Schwartz, Snidman, & Kagan, 1999), and functional MRI (fMRI) recorded high versus low responsiveness to novel faces as compared with familiar faces at age 22 (Schwartz, Wright, Shin, Kagan, & Rauch, 2003).

Inhibition in unfamiliar situations was also studied in the Dunedin Longitudinal Study. On the basis of observations of the children in various testing situations at age 3, 8% of the sample was classified as inhibited. Compared with the control group of well-adjusted children, the inhibited children reported more harm avoidance and less social potency and positive emotionality at both ages 18 and 26, and at age 26 were described by informants as lower in extraversion but not higher in neuroticism (Caspi et al., 2003). The psychiatric interviews at age 21 showed that the inhibited children were not more likely to have anxiety disorders of various kinds but were more often depressed and had more often attempted suicide (Caspi et al., 1996a). Thus, the evidence for internalizing disorders in adulthood for formerly extremely inhibited children was mixed. It is important to note that social phobia was not related to early inhibition, contrary to clinical studies based on retrospective reports (e.g., Stemmerger, Turner, Beidel, & Calhoun, 1995).

With regard to life-course sequelae of childhood inhibition, two longitudinal studies reported delays in social transitions for children classified as inhibited in middle childhood. In their reanalysis of the Berkeley Guidance Study, Caspi, Bem, and Elder (1988) found such delays only for boys who were classified as inhibited at ages 8–10 years. These inhibited boys married 3 years later, became fathers 4 years later, and entered a stable occupational career 3 years later than the remaining boys. No such delays were found for the inhibited girls; instead, inhibited girls became women who spent less time in the labor force and who married men with higher occupational status. This finding should not be attributed to instability of female inhibition because Q-sort ratings of inhibition based on two clinical interviews conducted when the participants were ages 30 and 40 years correlated significantly with both boys' and girls' childhood inhibition scores. The strong sex difference in the outcomes can be attributed to the traditional gender roles for this 1928 U.S. birth cohort that required assertiveness in the initiation of social contacts, particularly from men. Kerr, Lambert, and Bem (1996) also found delays in marriage and parenthood for inhibited boys but not girls in a 1955–1958 Swedish cohort; unfortunately, the age at which the participants began a stable career was not recorded.

The Present Study

The aim of the present study was to examine the long-term outcome of inhibition and aggressiveness as assessed by teacher

Q-sort descriptions in the sample of the Munich Longitudinal Study on the Genesis of Individual Competencies (LOGIC) at ages 4, 5, and 6 years (Weinert & Schneider, 1999); this sample was recently reassessed at age 23. In earlier reports of teacher-assessed inhibition in the LOGIC study (Asendorpf, 1990; Asendorpf & van Aken, 1994), the intraindividual correlation between a child's Q-sort profile and the prototypic Q-sort profile of an inhibited child was used as a measure of the child's inhibition. Similarly, a Q-sort-related measure for aggressiveness was based on the correlation with a prototypic Q-sort profile of an aggressive child. However, the two prototypic teacher profiles for inhibition and aggressiveness correlated .58 because the teachers ranked items relating to low aggression in the prototypic profile for inhibition and items relating to low inhibition in the prototypic profile for aggressiveness. To avoid this problem in the present study, we developed new measures of inhibition and aggressiveness based only on items that the teachers placed high in either of the two prototypic Q sorts.

On the basis of these new Q-sort measures, we targeted inhibited and aggressive children by scores in the upper 15% of the distribution of inhibition or aggressiveness. A 15% criterion is used in many studies of behavioral inhibition (e.g., by Kagan and colleagues) and provided sufficient statistical power for analyses of sex differences in high inhibition. We were interested in high inhibition and high aggressiveness rather than low inhibition or low aggressiveness. Therefore, we did not rely on correlations within the full sample or extreme group comparisons between children with extremely high and extremely low scores because these symmetric procedures are equally sensitive to characteristics of extremely high scorers and extremely low scorers. Instead, we contrasted the upper 15% of the distribution of inhibition or aggressiveness with the lower half of the distribution. This asymmetric procedure is more sensitive to characteristics of high scorers (see Asendorpf & van Aken, 1994; Asendorpf & Wilpers, 1998, for earlier applications such as an asymmetric extreme group design). In an additional set of analyses, we excluded the lowest 15% of the distribution in order to exclude any effects of extremely low scorers.

Hypotheses

On the basis of the meta-analysis by Roberts and DelVecchio (2000), the model of the long-term stability of individual differences suggested by Fraley and Roberts (2005) and the more specific findings by Caspi and colleagues, we expected that the aggressive children would continue to be more aggressive into adulthood and that the inhibited children would continue to be more inhibited into adulthood, according to judgments by both themselves and others. Furthermore, on the basis of the results of the Berkeley Guidance Study and the Dunedin Longitudinal Study, we expected that inhibited children would be judged in adulthood as more introverted and would show delays in social transitions such as leaving the parental home, forming the first stable partnerships, and entering the labor force. Due to the erosion of traditional gender roles in the studied German birth cohort, we expected that these delays would apply to both boys and girls. In addition, we explored indicators for internalizing problems such as self-reported neuroticism and low general and social self-esteem (no measure of depression was available). For aggressive children,

we expected that they would be judged in adulthood by their parents and themselves as less agreeable, less conscientious, more neurotic, and less open to experience; achieve a somewhat lower IQ and a lower educational level; be less successfully integrated into the labor force (i.e., occupational underachievement) when educational level was controlled statistically; and show a higher rate of delinquency. We also expected from the literature on high-school underachievers (Mandel, 1997; McCall, Evahn, & Kratzer, 1992) that their impulsivity and undercontrol in early childhood would dispose them to school problems independent of their (somewhat lower) cognitive competence (i.e., educational underachievement).

Method

Participants

Participants were part of the Munich Longitudinal Study on the Genesis of Individual Competencies (LOGIC). The LOGIC sample originally consisted of 230 children (119 boys, 111 girls) born in 1980–1981 who were studied every year from their first or second year in preschool until age 12 (see Weinert & Schneider, 1999). The sample was fairly unbiased because the schools were selected from a broad spectrum of neighborhoods, and more than 90% of the parents who were asked for permission gave their consent for their child's participation. The original sample in the present study consisted of the 206 participants who were judged at ages 4–6 years by their teachers using a Q sort in at least two of three yearly assessments. This sample was followed up at age 23 years ($M = 22.75$, $SD = 0.45$). Sample attrition up to this point was 29%, resulting in 147 longitudinal participants at age 23.

Assessments and Measures

The present study refers to the following assessments conducted when participants were ages 4–6 years: teacher Q sorts, parental ratings, and observations of inhibition and aggressiveness in preschool; first laboratory observation of confrontation with a stranger; IQ tests; and socioeconomic status. At age 23 years, assessments included: parental and self-ratings of inhibition, aggressiveness, and the Big Five factors of personality; self-ratings of global and social self-esteem; IQ tests; social network questionnaire; and life history interview for the period back to the 18th birthday. The parental ratings and observations at ages 4–6 were obtained only for a subsample of 99 participants. The remaining assessments were scheduled for the full LOGIC sample at the corresponding measurement points.

Q-sort measures of inhibition and aggressiveness. The 54-item short version of the California Child Q Set (CCQ; Block & Block, 1980) was adapted to German (Göttert & Asendorpf, 1989). All LOGIC participants attended a preschool or kindergarten from ages 5–6, the large majority from ages 4–6. At the end of each school year, the child's main teacher provided a Q-sort description of the child according to a fixed, 9-point distribution, ranging from *extremely uncharacteristic* to *extremely characteristic*. The teacher (mostly the same person across the 3 school years) was instructed to sort exactly six items into each of the nine categories of increasing saliency for the child (forced equal distribution).

Teachers at different schools independently provided prototypic Q-sort assessments for a “shy–inhibited” and an “aggressive” child; their interobserver agreement was high ($\alpha > .90$ in both cases), resulting in internally consistent aggregated prototypic Q-sort profiles. From the highest-ranking Q-sort items on each such prototypic Q-profile, we constructed internally consistent eight-item scales. The item saliency for a child (ranging from 1 to 9) served as the child’s score for that item. Item scores were then averaged across the eight items of each scale, yielding one inhibition score and one aggressiveness score for each child.

The inhibition scale consisted of the following items (ordered by mean item-total correlations across ages 4–6 years; numbers from original CCQ given in parentheses): “inhibited and constricted” (35), “anxious in unpredictable environments” (60), “fearful and anxious” (23), “indecisive and vacillating” (53), “goes to pieces under stress” (46), “cries easily” (33), “tends to yield in conflict” (44), and “tends to brood and ruminate” (24). It showed a high internal consistency at all three assessments, $\alpha > .80$, and a 2-year stability of $r = .38$.

The aggressiveness scale consisted of the following items (ordered by mean item-total correlations across ages 4–6 years; numbers from original CCQ given in parentheses): “is aggressive” (85), “teases other children” (80), “attempts to transfer blame to others” (11), “pushes and tries to stretch limits” (13), “afraid of being deprived” (55), “unable to delay gratification” (65), “overreacts to minor frustrations” (95), and “dramatizes or exaggerates mishaps” (57). It showed a satisfactory internal consistency in all three assessments, $\alpha > .78$, and a 2-year stability of $r = .56$.

The inhibition scores were averaged over the three assessments, allowing for one missing score for each child. The same procedure was applied to the aggressiveness scores. It should be noted that these scales are optimized for the 54-item CCQ; they may be nonoptimal for the full 100-item CCQ.

IQ tests. Verbal intelligence was assessed with subscales of the German versions of the Wechsler scales for preschool children (ages 4 and 5 years: Hannover–Wechsler Intelligenztest für das Vorschulalter [HAWIVA]; Eggert, 1978), and adults (age 23: Hamburg–Wechsler Intelligenztest für Erwachsene [HAWIE]; Tewes, 1991). Nonverbal intelligence was assessed with the Columbia Mental Maturity Scale (Burgemeister, Blum, & Lorge, 1972) at ages 4 and 6 and with the German version of the Culture Fair Intelligence Test (CFT–20; Weiss, 1987) at age 23. Total IQ scores ($M = 100$, $SD = 15$) averaging across the verbal and nonverbal IQ scores were computed for ages 4–6 and 23 years for the full LOGIC sample. The reliabilities of these IQ variables were high ($\alpha > .82$).

Socioeconomic status (SES). When the participants were 5–6 years old, their SES was coded from parental reports of their professional status according to a widespread German coding procedure (Wegener, 1988). The distribution of SES in the sample was typical for the greater Munich area, with 28% low, 63% middle, and 9% high social status families (see Weinert & Schneider, 1999).

Preschool observations. Children’s contact initiation behavior during free play in class at ages 4–6 was coded by an observer sitting in the classroom for at least eight 10-min periods (see Asendorpf, 1990, for details). Inhibited behavior was defined as the percentage of wait-and-hover initiations among all initiations (see Asendorpf, 1990, for details). Aggressive behavior was de-

defined as the percentage of initiations involving verbal or physical aggression or taking objects from another child without asking. Interobserver agreement for the incidence of inhibited or aggressive behavior was checked each year (see Asendorpf, 1990, for details), with $\kappa > .90$ in each case. Because the distribution of aggressive behavior was highly skewed and contained zero scores, it was transformed with $y = \log(x + 1)$. The indices for inhibited and aggressive behavior were moderately stable across the 3 years in preschool and were averaged.

Laboratory observation. Children’s behavior at age 4 toward an adult stranger was videotaped immediately after the children had entered the laboratory together with their main caregiver for the first time in their lives (see Asendorpf, 1990, for details). The first and the second minutes of this situation were rated for inhibition on 7-point scales (from *not at all inhibited* to *extremely inhibited*) independently by four raters with high agreement ($\alpha = .97$).

Personality scales. When the children were ages 4, 5, and 6, the main caregiver (nearly always the mother) answered a questionnaire that contained an inhibition and an aggressiveness scale. When the children were age 23, both parents were asked to provide independent judgments of the Big Five, inhibition, and aggressiveness. The same items were also answered by the participants themselves during a laboratory visit at age 23.

The aggressiveness scale consisted of four items, and the inhibition scale consisted of eight items when the participants were ages 4–6 and four items when they were age 23. The items at ages 4–6 referred to aggressiveness with peers (“is aggressive to peers,” “starts arguing with peers,” “easily flies into a rage,” “makes peers angry”) and to inhibition with adult and peer strangers (“inhibited,” “shy,” “slow to warm up,” “easy approach” [reversed]; see Asendorpf, 1990, for more details). The inhibition items for age 23 referred to being inhibited in social interaction (“inhibited,” “shy,” “easy approach” [reversed], “easy to get in touch” [reversed]; see Asendorpf, 1987, for details). The aggressiveness items at age 23 were “I rarely react aggressively” (reversed), “I easily fly into a rage,” “I rarely quarrel with other people” (reversed), and “I am aggressive”; the items were adapted for the parental judgments (e.g., “S/he rarely reacts aggressively”). The items were answered on a 7-point Likert scale when participants were ages 4–6 and on a 5-point Likert scale when they were age 23 (because they were mixed with NEO Five-Factor Inventory [NEO FFI; Costa & McCrae, 1992] items). The internal consistency of the parental scales was satisfactory for all ages ($\alpha > .82$ for aggressiveness, $\alpha > .93$ for inhibition). For the self-ratings at age 23, the average internal consistency was slightly lower ($\alpha = .75$ for aggressiveness, $\alpha = .87$ for inhibition).

When the participants were age 23, the factors of the Five Factor Model of Personality (neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness) were assessed with the German version of the NEO FFI (Borkenau & Ostendorf, 1993). The items were mixed with the aggressiveness and inhibition items, and respondents answered on 5-point Likert scales. The internal consistencies were acceptable, $\alpha > .71$ in each case, except for openness ($\alpha > .64$), a well-known problem of the broad openness factor.

Because the parental scales showed a high correlation between mothers and fathers when the participants were age 23 (r s between .61 and .75), the scale scores were averaged, allowing for a

missing score of one parent. Because some parents did not cooperate in the ratings, only approximately 80% of the participants were judged by a parent at each age.

Self-esteem. When the participants were age 23, global and social self-esteem were assessed with the German short versions of the global self-esteem scale and two domain-specific scales of the Self-Description Questionnaire III developed by Marsh and O'Neill (1984): self-esteem toward same-sex peers and self-esteem toward opposite-sex peers. The items were randomly mixed and answered on a 5-point scale (see Asendorpf & van Aken, 2003, for details). All four scales showed sufficient internal consistencies, $\alpha > .72$.

Social network. Social relationships of the participants at age 23 were assessed with an ego-centered social network questionnaire (see Asendorpf & Wilpers, 1998). This instrument requires participants to list important people they have interacted with during the past month. A list of 14 relationship categories (e.g. mother, partner, peer [defined as anybody aged 18–28 who is neither a relative nor a partner], neighbor) was provided to guide the selection of contact persons. For each network partner, participants provided data about age, sex, duration of the relationship, and contact frequency (1 = *once per month or less* to 5 = *daily*). Also, they rated each relationship on five Likert scales (response scale, 1–5): personal closeness, exchange of personal thoughts and feelings, felt acceptance, conflict, and emotional support.

Life History Calendar. To capture demographic transitions in a retrospective yet accurate way, we used the Life History Calendar (Caspi et al., 1996b). During a 45-min interview conducted when the participants were age 23, various aspects of the participants' lives since their 18th birthday were documented on a month-by-month horizontal timeline. By proceeding serially from one life domain to another, interviewer and interviewee worked together to "anchor" additional life history information to key biographical events (e.g., "Did you get your new job before or after you broke up with your girlfriend?"), which has been shown to lead to more accurate responses (Caspi et al., 1996b).

Our version of this interview covered the following life domains: living situation, romantic relationships, education, work, and delinquency. From this information, the following variables were generated for the present study: latency to leaving one's family of origin, latency to first romantic relationship with a duration of at least 1 month, latency to first part-time job, and latency to first full-time job; percentage of time spent in various living arrangements (e.g., in family of origin, alone, with partner, with peers), in education, and in part-time and full-time jobs; highest educational level reached; and criminal charges for delinquency). Latency to an event was set to 0 if the event had occurred before the 18th birthday.

Results

Inhibited, Aggressive, and Control Participants at Ages 4–6 Years

The teacher Q-sort scales of inhibition and aggressiveness at ages 4–6 years correlated at .07, *ns*, and a scatter plot did not show any evidence for statistical dependence (see Fig. 1). When inhibited or aggressive children are defined as scoring in the top

15% of the distributions of the inhibition or aggressiveness Q-sort scales, 2.25% of the 206 children (4.6 children) can be expected to be both inhibited and aggressive, given the statistical independence of inhibition and aggressiveness. Indeed, 5 children were classified as both inhibited and aggressive (see Fig. 1). Because of the statistical independence of high inhibition and high aggressiveness, we analyzed these two constructs independently by contrasting the top 15% of the distribution with the lower half of the distribution.

As expected, the aggressive group consisted mainly of boys (28 boys, 4 girls), whereas the control group consisted mainly of girls (69 girls, 34 boys), $\chi^2(1, n = 135) = 29.2, p < .001$, for the Sex \times Group interaction). Because of this interaction, we additionally controlled for sex in all analyses for aggressiveness. The inhibited group and its control group consisted of equal numbers of boys and girls (15 inhibited and 50 control boys, 15 inhibited and 51 control girls, no Sex \times Group interaction, $\chi^2 < 1$).

The aggressive group had a lower IQ at ages 4–6 than the control group, $M = 90$ versus $M = 104$, $t(114) = 5.10, p < .001$, $d = 1.08$, and grew up in families of marginally lower SES, $t(127) = 1.64, p < .06, d = 0.31$. Therefore, all analyses for aggressiveness were also controlled for SES. After we controlled for SES, the IQ effect for the aggressive group remained large, $M = 91$ versus $M = 104$, $F(1, 107) = 17.02, p < .001, d = 1.02$. The inhibited group was not different from the control group in terms of IQ or SES ($t < 1$ in both cases).

As expected, the inhibited participants scored significantly higher than the control group in the parental judgments of inhibition, $t(64) = 2.68, p < .01, d = 0.79$; in observed inhibition in preschool, $t(61) = 3.01, p < .01, d = 1.00$; and in observed inhibition in the laboratory, $t(48) = 2.75, p < .01, d = 0.92$. Aggressive participants scored significantly higher than the control group in the parental judgments of aggressiveness, $t(67) = 2.79, p < .01, d = 0.72$, and in observed aggressiveness in preschool, $t(74) = 5.39, p < .001, d = 1.23$; there was no laboratory situation designed to induce aggressiveness.

Both differences remained significant when they were controlled for sex and SES: for observed aggressiveness, $F(1, 68) = 14.83, p < .001, d = 0.96$, and for parental judgments, $F(1, 63) = 2.84, p < .05, d = 0.50$. The large effect sizes for the preschool and laboratory observations that were independently obtained from the teacher judgments strongly supported the validity of the extreme groups. The parental judgments differentiated less strongly between the groups but still significantly.

Selective Attrition

We studied selective attrition for the sample of 206 children by comparing the 59 dropouts with the 147 children who participated in the study until age 23. The dropouts had significantly higher childhood inhibition scores, $t(204) = 2.70, p < .01, d = 0.38$, and marginally significantly higher childhood aggressiveness scores, $t(204) = 1.85, p < .07, d = 0.26$, than the longitudinal participants. In line with this selective attrition effect, inhibited participants tended to be more likely to drop out more than controls, 37% versus 22%, $\chi^2(1, n = 131) = 2.72, p < .10$, odds ratio (OR) = 2.08, as well as aggressive participants, 38% versus 22%, $\chi^2(1, n = 135) = 2.93, p < .10, OR = 2.09$. Thus, attrition limited the statistical power to revealed significant long-term effects of high

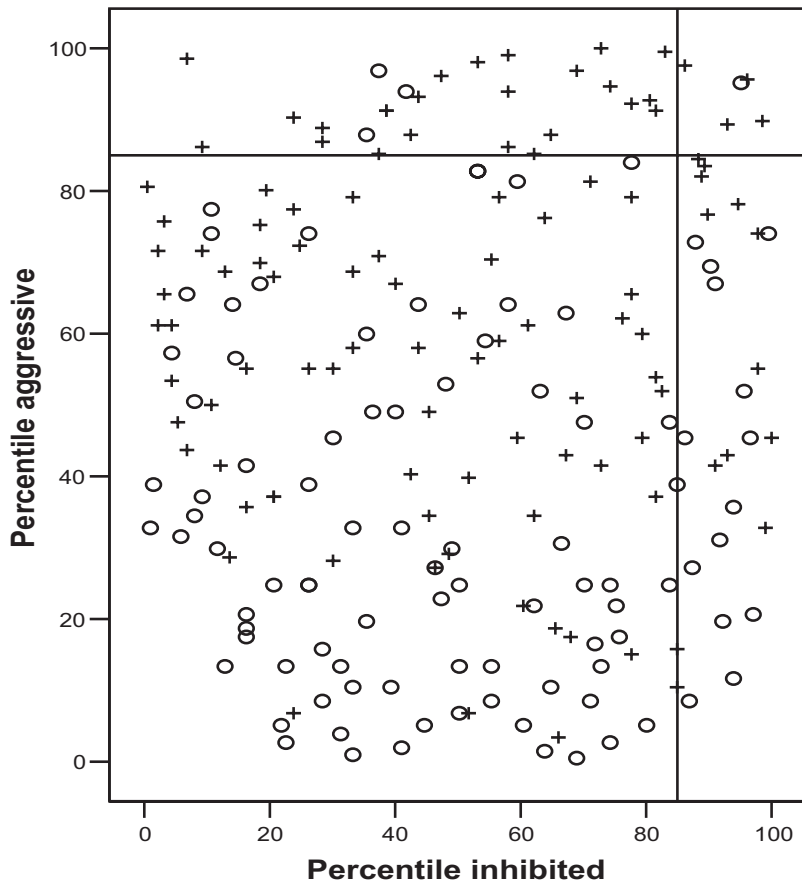


Figure 1. Bivariate distribution by sex of the teacher Q-sort indices of inhibition and aggressiveness of children at ages 4–6 years and definition of the inhibited and aggressive participants. The Q-sort indices are scaled in terms of percentiles of the distribution. Cross = male; circle = female.

inhibition and high aggressiveness because of the decrease in group sizes, particularly in the extreme groups. No attrition was observed for sex ($\chi^2 < 1$).

Outcome of Inhibited Children at 23 Years

At age 23, 19 inhibited participants (10 males, 9 females) were contrasted with 79 controls. The main group differences are presented in Table 1.

Personality and self-esteem. Data were analyzed with 2×2 analyses of variance (ANOVAs) for sex and inhibition. Because the Sex \times Inhibition interaction never reached even marginal significance, the remaining section reports *t* tests between the inhibited group and the control group (one-tailed *t* tests for expected differences). For the parental judgments, a significant inhibition main effect was found only for the inhibition scale; boys and girls judged as inhibited by their preschool teachers were

Table 1
Outcome of Inhibited Children at Age 23

Outcome at 23 years	Inhibited (<i>n</i> = 19)		Control (<i>n</i> = 77)		Difference	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i> ^a	<i>p</i> ^a
Parental judgment of inhibition ^b	3.46	1.20	2.75	0.77	0.81	.01
Currently has romantic partner (yes/no)	0.32	0.48	0.64	0.48	0.64	.01
Latency to first partnership (years) ^c	1.42	1.44	0.74	1.13	0.51	.02
Latency to first full-time job (years) ^c	3.43	1.92	2.57	1.61	0.51	.02
Contact frequency with same-sex peers	4.32	0.89	3.83	0.91	0.54	.04
Contact frequency with opposite-sex peers	3.37	0.92	2.70	1.08	0.63	.04
Age of opposite-sex peers (years)	20.63	1.55	23.04	2.18	1.02	.001
Age at testing (years)	23.09	0.44	22.67	0.41	0.91	.001

^a The *t* test for group difference is one-tailed for first four rows. ^b Data available for 14 inhibited and 64 control participants. ^c After participants' 18th birthday.

judged as inhibited by their parents at age 23 (see Table 1). No other inhibition effects on personality and self-esteem reached significance, either for the parental judgments or for the self judgments ($F < 1.6, p > .10$, in all cases). In particular, self-reported (adult) levels of inhibition, neuroticism, and extraversion of inhibited children did not differ from those of the control group, nor did their reported levels of general or social self-esteem (see Figure 2). Thus, they showed no signs of internalizing problems.

To test whether internalizing difficulties might be restricted to extremely inhibited children, we repeated the analyses for a stricter criterion for preschool inhibition (upper 8% of the distribution, i.e., the proportion of inhibited children in the Dunedin Longitudinal Study; see Caspi & Silva, 1995). Six males and 4 females tested at age 23 met this criterion. Again, only the parental inhibition judgment significantly differentiated this extremely inhibited group from the control group. However, as Figure 2 indicates, the extremely inhibited group tended to show a z-score pattern of temperament and self-esteem at age 23 that is characteristic for slight internalizing tendencies, although t tests failed to significantly confirm this pattern for the individual variables because of the small number of extremely inhibited children; only the effect for social self-esteem was significant, $t(84) = 1.84, p < .05, d = 0.60$. It should be noted that the average z score for the five

indicators of internalizing problems (inhibition, neuroticism, introversion, low global and low social self-esteem) was .42, which is similar to the average z score of .38 reported by Caspi et al. (2003) for the Multidimensional Personality Questionnaire scales of Harm Avoidance and (low) Social Potency that characterized inhibited children in the Dunedin Longitudinal Study at both ages 18 and 26. Thus, the inhibited group tended to show a pattern of internalizing difficulties only when it was restricted to extremely inhibited children, although the small sample size prevented a clear confirmation.

Social network. Significant differences between inhibited children and controls at age 23 were found only for relationships with a romantic partner and with same and opposite-sex peers (excluding a partner); see Table 1. Formerly inhibited children reported a romantic partner in their network in 32% of the cases, whereas controls reported a partnership in 64% of the cases, thus twice as often. The duration and rated quality of the partnership did not even marginally differ between the inhibited and the control groups.

With regard to peer relationships, formerly inhibited children had as many relationships with same and opposite-sex peers as the controls ($t < 1$ in both cases) but reported a higher contact frequency with both same-sex peers and opposite-sex peers. In addition, the inhibited group reported relationships with opposite-sex peers who were 2.4 years younger on average than the opposite-sex peers of the controls, a large effect (see Table 1). In contrast, the age of the same-sex peers was not even marginally different between the two groups, $t < 1$.

Analyses of Sex \times Group interactions did not reveal any significant Sex \times Inhibition interactions; thus, the inhibition effects applied to both males and females. Restriction to the 8% most inhibited children did not change the pattern of characteristic deviations.

Life history and IQ. Unexpectedly, the inhibited group was 5 months older than the control group when tested (see Table 1), resulting in a 5-month-longer interview period after the 18th birthday. The higher age at testing was particularly surprising because the participants were invited to the tests according to their month of birth to minimize age variance, and the inhibited participants were born 3 months earlier than the control group, $t(93) = 2.88, p < .01, d = 0.91$. Their average month of birth was January 1981, whereas that of the control group was April 1981. Thus, the inhibited group should have been tested 3 months earlier than the control group but was in fact tested 5 months later than the control group, resulting in an 8-month delay in testing. Because of this effect, care was taken to control all interview data for the duration of the life history period covered in the interview, which was 5 months longer for the inhibited group.

With regard to romantic partnerships, the Life History Calendar data made it possible to study these relationships in more detail because all such relationships between the 18th birthday and the time of the interview were recorded on a monthly basis (minimum-required partnership duration was 1 month). As expected from the social network questionnaire, formerly inhibited children were less often together with a partner after their 18th birthday than were controls, 45.5% versus 64.4% of the interview period, $t(93) = 2.65, p < .01, d = 0.60$. Furthermore, the latency to first partnership during the interview period could be determined (0 if participants had a partner at their 18th birthday). All participants of both

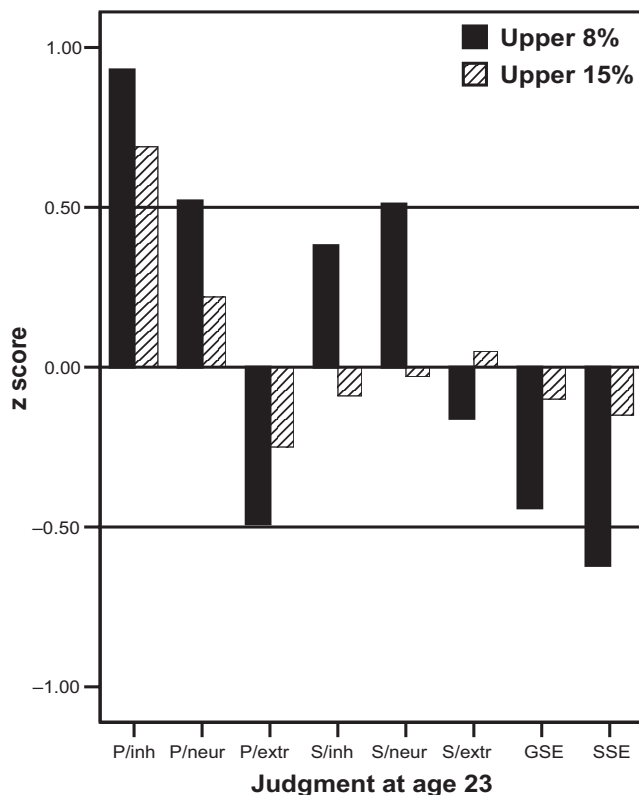


Figure 2. Standardized group means in parental and self-rated personality and self-esteem at age 23 for inhibited children defined by the upper 15% or the upper 8% of the distribution in teacher-judged inhibition in preschool. P = parental judgment; S = self-judgment; inh = inhibition; neur = neuroticism; extr = extraversion; GSE = global self-esteem; SSE = social self-esteem.

groups reported at least one partnership; thus, these latencies were not constrained by the length of the interview period. The inhibited group became involved in their first romantic partnership 1.42 years after their 18th birthday on average, whereas the control group became involved significantly earlier: 0.74 years after turning 18 (a delay of 8 months, which again runs counter to the slightly older age of the inhibited group; see Table 1).

With regard to work, education, and IQ, only one variable distinguished between the inhibited and the control groups: a 10-month-longer latency after the 18th birthday to first participation in full-time work for the inhibited participants (see Table 1). Not even marginal effects were found for latency to part-time work, time spent in education during the interview period, educational level at age 23, and IQ at age 23 ($F < 1$ in each case). Thus, the longer latency of inhibited participants to full-time work seemed to be independent of possible delays in higher education.

In order to test this hypothesis more stringently, we analyzed the latencies to full-time work by survival analysis, which takes into account the fact that a few members of each group did not report any full-time job at the time of the interview ("censored cases"). A Cox regression procedure with group and educational level as covariates confirmed a higher latency for the inhibited group after we controlled for educational level, $F(1, 92) = 4.50, p < .02$. Figure 3 shows the estimated probability of engaging in a full-time job for the first time for the two groups as estimated with this regression procedure. Inhibited participants tended to start full-time work later than the controls, even after we controlled for education, but caught up at the end of the studied period.

All significant effects for the Life History Calendar were independent of sex ($F < 1$ for the Sex \times Inhibition interactions), and restriction to the 8% most inhibited children did not change the

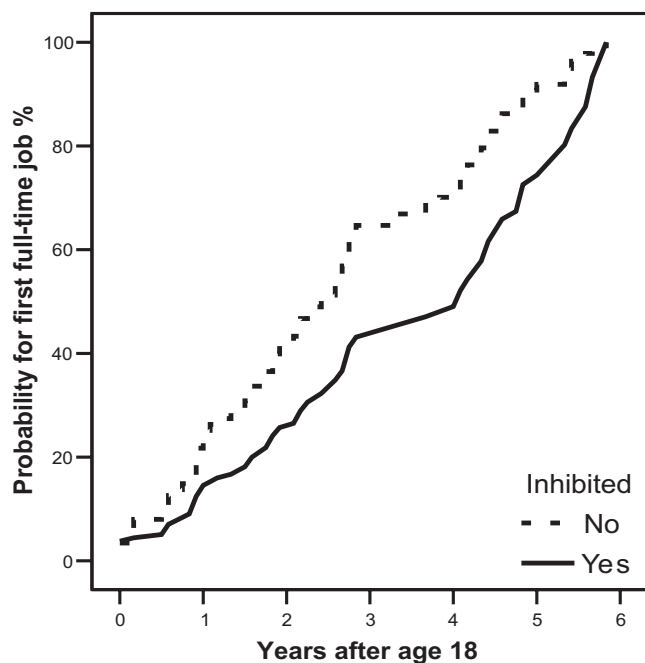


Figure 3. Probability of participants' engaging in a first full-time job after the 18th birthday by inhibition, controlling for educational level, as estimated with survival analysis.

pattern of characteristic deviations. More specifically, even extremely inhibited children did not show a delay in leaving their family home ($t < 1$).

Outcome of Aggressive Children at 23 Years

We contrasted 20 formerly aggressive participants (17 males, 3 females) with 80 controls when they were 23. The small number of aggressive girls precluded an analysis of sex differences. Instead, t tests (one-tailed for expected differences) that contrasted formerly aggressive children with controls were used, followed by analyses of covariance in which sex and SES were additionally controlled. The main group differences are presented in Table 2.

Personality and self-esteem. As expected, parents judged the formerly aggressive children at age 23 as more aggressive, less agreeable, less conscientious, and less open to experience (see Table 2), that is, as showing an externalizing profile. Three of the four significant effects were replicated by self-judgments; compared with the controls, formerly aggressive children judged themselves as more aggressive, less agreeable, and less open to experience (see Table 2). It is interesting to note that they judged themselves to be just as conscientious as the controls judged themselves to be, $t < 1$. Not even marginal aggressiveness effects were found with regard to the inhibition and self-esteem scales ($p > .10$ in all cases).

As suggested by one reviewer, the control for sex and SES via analysis of covariance may be somewhat weak. Therefore, we additionally tested the effect of early aggressiveness on the parental aggressiveness judgments made when the participants were age 23 only for boys and controlled SES directly. Each aggressive boy was matched with a low-aggression boy of the most similar SES. A matched samples t test showed that the aggressive boys were judged as 1 SD higher in aggressiveness at age 23 than the matched controls, $t(10) = 2.48, p < .02, d = 1.06$. We note that this matched control procedure should be considered with caution because the small sample of aggressive boys prevented matching in terms of identical SES. Inspection of the single cases revealed that the majority of the aggressive boys were rated by their parents as at least 0.75 SD above the mean aggressiveness in the full LOGIC sample at age 23.

Social network. Significant differences between aggressive children and controls at age 23 were found only for ratings of conflict in close relationships. As expected, the aggressive group reported more conflict than the control group in the relationship with the mother and the romantic partner if they currently had one (see Table 2). Conflict ratings for relationships with the father, siblings, and peers did not show significant differences between the two groups ($t < 1$ in all cases).

Life history and IQ. With respect to time of testing and birth, the aggressive group was tested 3 months later than the control group (see Table 2) and were born 2 months earlier than the control group, $t(96) = 1.44, ns$. Thus, similar to the inhibited group, the aggressive group was tested 5 months later than expected, which may be attributed to their lower (parent-rated) conscientiousness.

In addition, a significant difference was found for educational level, whereas the IQ effect was only marginally significant. As compared with the controls, the aggressive participants had a slightly lower IQ at age 23 and, although they had spent as much

Table 2
Outcome of Aggressive Children at Age 23

Outcome at 23 years	Aggressive (<i>n</i> = 19)		Control (<i>n</i> = 77)		Difference			
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i> ^a	<i>p</i> ^a	<i>d</i> ^b	<i>p</i> ^b
Parental judgment ^c								
Aggressiveness	3.23	0.88	2.71	0.74	0.63	.01	0.51	.06
Agreeableness	3.42	0.54	3.81	0.37	0.86	.001	0.69	.01
Conscientiousness	3.55	0.80	4.00	0.61	0.68	.01	0.55	.05
Openness to experience	2.98	0.54	3.42	0.37	1.00	.001	1.25	.001
Self-judgment ^c								
Aggressiveness	3.02	0.87	2.56	0.79	0.56	.02	0.60	.01
Agreeableness	3.48	0.34	3.78	0.46	0.68	.01	0.38	.10
Conscientiousness	3.79	0.70	3.80	0.56	—	<i>ns</i>	—	<i>ns</i>
Openness to experience	3.16	0.57	3.52	0.48	0.68	.01	0.84	.01
Conflict with mother	2.89	1.08	2.29	0.90	0.65	.01	0.59	.02
Conflict with partner ^d	3.20	1.03	2.50	0.89	0.69	.02	0.90	.01
Adult criminal charges	0.50	1.20	0.04	0.20	0.73	.001	0.50	.05
IQ	94.40	18.30	100.40	14.90	0.40	.07	0.58	.03
Educational level	3.22	1.59	4.38	1.72	0.67	.01	0.46	.06
High school finished (yes/no)	0.33	0.49	0.66	0.48	0.67	.01	0.50	.05
Full-time work ^e	0.09	0.46	0.24	0.20	0.77	.01	0.62	.05
Age at testing (years)	22.92	0.33	22.68	0.44	0.52	.02	0.75	.01

^a The *t* test for group difference was one-tailed, except for age at testing. ^b Analysis of covariance controlling for sex and socioeconomic status (SES); *df* reduced by 6 missing values for SES. ^c Available for 14 aggressive and 67 control participants. ^d Available for 10 aggressive and 46 control participants. ^e Percentage of time after 18th birthday spent in full-time work after educational level was controlled.

time in education (*t* < 1) as controls, had reached a lower educational level by age 23 (see Table 2). More detailed analyses showed that only 33% of the aggressive participants finished high school, whereas twice as many in the control group did so (see Table 2).

To test the hypothesis that the formerly aggressive children became educational underachievers, we computed analyses of covariance of aggressiveness for educational level and high-school certificate, with IQ at ages 4–6 years as a covariate. Although early IQ significantly predicted both educational level and acquisition of a high-school certificate, early aggressiveness showed a significant incremental predictive validity over early IQ for both educational level, *F*(1, 67) = 5.42, *p* < .02, *d* = 0.68, and high-school certificate, *F*(1, 67) = 7.28, *p* < .01, *d* = 0.79. Thus, the aggressive participants were indeed underachievers who did not reach the educational level that one would expect on the basis of their IQ.

Inspection of earlier LOGIC data on the deviation of school grade (school grade attended in a school year minus expected school grade for the birth cohort, assessed at ages 7–12 and 17) showed that the aggressive children were underachievers in every school year (*t* > 3.32, *p* < .001), from Grade 1 to Grade 11. Therefore, we controlled educational level at age 23 for both early IQ and deviation of school grade separately for each assessed school grade between Grade 1 (corresponding to age 7) and Grade 11 (corresponding to age 17); no school grades were available for Grades 7–10. A significant aggressiveness effect remained for all grades up to Grade 6 (*F* > 5.8, *p* < .01) but disappeared for Grade 11 (*F* = 1.3, *p* > .10). Thus, the effect of early aggressiveness on educational underachievement at age 23 was only partially explained by the participants' lagging behind in school grade up to Grade 6; however, it was fully explained by the accumulated delay in school grade by the end of the participants' secondary educa-

tion. In other words, somewhere between Grade 6 and Grade 11, the delay in school grade fully accounted for the effect of early aggressiveness on adult educational underachievement. In contrast, time spent in education was not related to aggressiveness. Thus, the aggressiveness effect on educational underachievement was not mediated by an early dropout from the educational system but rather by cumulated delays in school grade before age 17 (in the German school system, children with poor grades have to repeat school grade for another year).

A further significant effect of aggressiveness on the timing of the transitions encoded by the Life History Calendar concerned work. Obviously, young adults' engagement in part-time work and in full-time work is related to their educational level. In early adulthood, full-time work is more typical for those with lower educational achievement, whereas many German university students work part time. Indeed, educational level correlated negatively (*r* = -.42, *p* < .001) with the latency to the first part-time work after the 18th birthday but positively (*r* = .25, *p* < .002) with the latency to the first full-time work. Because early aggressiveness was related to educational level, it was necessary to control for this effect in all analyses of work.

After educational level was controlled as a covariate, early aggressiveness did not have even marginal effects on the latency to part-time work, the percentage of time spent with part-time work, or the latency to full-time work. However, after controlling for educational level, we found that the aggressive group spent less time in full-time work after their 18th birthday than the controls (9% vs. 24%; see Table 2, in which the corrected group means refer to the expected means for a person of average educational level). Thus, the aggressive children were occupational underachievers who were less integrated into the labor force at age 23 than one would expect on the basis of their low educational level.

Last but not least, a significant effect of aggressiveness concerned the participants' self-reported number of criminal charges after the 18th birthday, standardized in terms of charges within 5 years. As expected, aggressive children reported more such charges than controls (see Table 2). Although the rate of charges was 12 times higher in the aggressive group than in the control group, this was mainly due to the very low rate of charges in the control group (0.04 charges over 5 years on average). Most charges were related to drug trafficking, traffic violations, and physical assault. In the two most delinquent cases, 1 participant was incarcerated for dealing in drugs; another was ordered by a judge to undergo therapy after five different charges had been laid for theft and drug usage. Both were members of the aggressive group.

Because differences between the aggressive group and the control group were confounded with sex and SES, all analyses reported earlier were also run with sex and SES as covariates. As Table 2 indicates, these controls did not have much impact on the results. Of the 14 significant effects, 11 remained significant, and the other 3 effects remained marginally significant. In terms of effect sizes, a rough estimate is the average size of all effects of early aggressiveness reported in Table 2. Without correction, the average effect was $d = 0.68$; after correction for sex and SES, the average effect was only slightly reduced to $d = 0.65$.

All other significant long-term effects of aggressiveness not reported in Table 2 remained at least marginally significant ($p < .10$) after we controlled for sex and SES, particularly the effects of early aggressiveness on educational underachievement ($p < .06$) and occupational underachievement ($p < .03$).

Exclusion of Extremely Low Scorers

In a last set of analyses, we excluded the lowest 15% of the distribution from the control groups and performed all analyses again. These analyses were done to make sure the effects could not be contributed to the groups with extremely low scores. This procedure somewhat reduced the power for finding significant differences, resulting in slightly higher p values. However, the effect sizes were only minimally affected and sometimes even increased. For example, after exclusion of the lowest 15% in inhibition at ages 4–6 years, the parental inhibition judgment made when participants were age 23 continued to show a large significant difference between the inhibited group and the control group, $t(57) = 2.68$, $p < .01$, $d = 0.83$, and after exclusion of the lowest 15% in aggressiveness at ages 4–6 years, the parental aggressiveness judgment made when participants were age 23 continued to show a medium-sized significant difference between the aggressive group and the control group, $t(61) = 2.34$, $p < .02$, $d = 0.66$.

Discussion

This 19-year longitudinal study of a 1980 birth cohort tested hypotheses regarding the long-term outcome of inhibited and aggressive children, defined as the upper 15% of the distribution of teacher-judged inhibition, or aggressiveness, in preschool. As expected, inhibited boys and girls were judged as inhibited by their parents when the participants were 23 years of age. They showed a delayed transition into major social roles such as romantic

partnership and full-time job; contrary to expectation, they did not leave their family home later than other participants. It is interesting that their testing at age 23 was delayed although they were born somewhat earlier than the controls. Only the 8% most inhibited children tended to show an internalizing pattern of self-reported inhibition, neuroticism, introversion, and low self-esteem at age 23. The effect size for the internalizing pattern was similar to the effect size for adult personality outcomes of the similarly extremely inhibited group in the Dunedin Longitudinal Study (Caspi et al., 2003). However, due to the small size of the extremely inhibited group, the pattern was not significant except for social self-esteem.

Aggressive children, as expected, were rarely girls and grew up in families of marginally lower SES; showed an externalizing personality pattern in both the parental and the self judgments; reported more conflictual relationships with their mother and, if present, their partner; were underachievers with regard to educational level right from the beginning of primary school until age 23; were occupational underachievers in regards to full-time work; and reported a higher delinquency rate than children below average in aggressiveness. These effects remained even when sex composition and SES were controlled. Similar to the inhibited group, the participants in the aggressive group were born somewhat earlier but tested later than the controls. Because inhibition and aggressiveness were statistically independent, we discuss these results separately for inhibition and aggressiveness.

Inhibited Children: Delayed Social Transitions During Emerging Adulthood

Inhibited participants reported as many peer relationships as controls and interacted with both same- and opposite-sex peers more frequently, had nonromantic relationships with opposite-sex peers who were 2.4 years younger on average, had a stable romantic partner half as often as controls at the time of testing, and got involved in such a relationship 8 months later than controls. This overall pattern suggests that inhibited participants avoided age-appropriate contact with potential romantic partners of their age (Connolly & Furman, 1999) and instead invested in nonromantic relationships with same-sex and relatively immature opposite-sex peers (a kind of downward orientation to the opposite sex). Thus, regarding the age-appropriate transition to a stable romantic partnership, it seems that inhibited participants spent more time in the preceding phase of nonromantic peer relationships and unstable dating relationships. The delay in forming stable romantic relationships squares nicely with the finding of delayed marriage in inhibited boys in earlier studies (Caspi et al., 1988; Kerr et al., 1996).

Inhibited participants also showed a delay of 10 months in the transition to first full-time job. Because this transition is delayed by higher education, particularly a university education, it was important to control for educational level. However, inhibition was unrelated to educational level, and therefore the delay in the transition to the first full-time job remained unaffected by educational level. This finding may foreshadow a delayed transition into a stable career with resulting occupational underachievement, as found by Caspi et al. (1988) for shy boys at midlife. Our data for participants up to age 23 show only a transient delay (see particularly Fig. 3, where the curves converge again before age 24).

Curiously, inhibited participants showed another, unexpected delay. They visited the laboratory for the age-23 testing 8 months later than expected on the basis of their birthday. According to the staff responsible for invitation and testing, they had difficulties in persuading some participants to undergo follow-up testing and in making sure they kept their promises. Indeed, testing took more than 6 months longer than originally expected because of such problematic cases. It seems that inhibited participants were over-represented among them. Their hesitations concerning testing may be just another example of a general tendency of inhibited adults to avoid unfamiliar and evaluative situations (Asendorpf, 1989).

One exception to this conclusion was that even the extremely inhibited group left their family home as early as the control group. This unexpected finding can be explained post hoc by two different factors specific to local socioeconomic conditions. First, many participants who wanted to study at university had to leave home and move to another city because they likely failed the notoriously selective admission criteria of the local Munich universities. Second, accommodation costs are very high in Munich; whether participants were able to leave the family home if they stayed in the greater Munich area was therefore strongly dependent on their financial situation. The impact of these socioeconomic factors seems to have overridden the impact of inhibition.

One of the most important findings of the present study is that delayed transitions were shown not only by inhibited males, as in earlier studies, but also by inhibited females. We expected this lack of sex differentiation in developmental transitions because of the erosion of traditional sex roles in Germany after the 1950s (Germany ranked second in the cross-cultural study of egalitarian gender roles carried out by Williams & Best, 1990). In the present 1980 birth cohort, no Sex \times Inhibition interactions with regard to delayed transitions were found, nor were Sex \times Inhibition interactions found in any other respect (although it should be noted that the statistical power was not sufficient to detect small interactions). It seems that the longitudinal paths for inhibited children have lost their earlier sex-specific bias in current German culture (and perhaps in other Western countries as well).

Inhibited Children: Weak Evidence for Internalizing Difficulties

Sometimes zero findings are as important as significant differences. Our result that the formerly inhibited children did not consider themselves as inhibited and did not show any internalizing difficulties in adulthood is an important zero finding of this kind. It is important because self-perceived shyness and social anxiety in older children, adolescents, and adults are regularly accompanied by lower social self-esteem (Cheek & Melchior, 1990; Crozier, 1995; Leary, 1986). The present study found no exception: Self-rated inhibition at age 23 correlated $-.70$ with social self-esteem with opposite-sex peers and $-.50$ with global self-worth.

The lack of internalizing problems at age 23 in the early inhibited group seems to be contradicted by the fact that the parents judged this group as significantly more inhibited than the control group. However, it should be noted that parents likely acquired a view that their child was inhibited when he or she was in early childhood and may have continued to hold this view when the child reached adulthood even if the child's inhibition showed

marked changes. In addition, the parents may have given more weight to observable behavior in adulthood, such as the delayed development of stable romantic relationships, than the participants themselves, who may have based their self-judgment of inhibition more on private experiences of internalizing problems such as low social self-esteem. The relatively low correlation of $.33$ between the parental and the self-judgments of inhibition is consistent with both interpretations.

Other studies have found mixed evidence for internalizing problems of formerly inhibited children in adulthood. In the Dunedin Longitudinal Study, the inhibited group had a higher risk for depression at age 21 but not for anxiety, including social phobia, and were not judged as more neurotic by knowledgeable informants. Their self-perceptions of personality drew a picture of a reserved, cautious attitude to social life, as evidenced by higher harm avoidance and lower social potency; only somewhat lower scores in positive emotionality pointed in the direction of internalizing problems. The effect size of these differences was small but significant due to the large sample (Caspi et al., 1996a, 2003). Other studies have followed up inhibited children only to adolescence (e.g., Prior, Smart, Sanson, & Oberklaid, 2000; Schwartz et al., 1999).

When we defined a subgroup of extremely inhibited children (using the same criteria as applied to the inhibited group in the Dunedin Longitudinal Study), we did in fact find a tendency for these children to show internalizing difficulties (see Fig. 2), with effect sizes similar to those found in the Dunedin Longitudinal Study. However, due to the much smaller number of extremely inhibited children in our sample, these deviations from the control group were not significant except for a low social self-esteem. Together, these findings suggest that early inhibition (even when observed in the familiar peer group where children face the risk of becoming excluded from the group) is not a serious risk for internalizing problems in adulthood, except for an extremely inhibited subgroup.

Together with the observed delays in social transitions, these results suggest that inhibited children develop into cautious, reserved adults with few signs of internalizing problems. Such problems may develop only if additional factors such as continuous peer exclusion (Gazelle & Ladd, 2003), maternal overprotection (Bruch & Heimberg, 1994; Rubin, Burgess, & Hastings, 2002), or serious problems with love relationships develop (all inhibited children of the LOGIC study observed at age 23 reported at least one stable romantic relationship). It should be noted that our results may underestimate the effects of early inhibition because formerly inhibited children with more problematic outcomes in adulthood, particularly concerning problems in love relationships and depression, may have been not able or may have refused to cooperate in the assessment at age 23.

Regarding different facets of inhibition, particularly the distinction between inhibition to the familiar and social-evaluative inhibition occurring in familiar settings, our study did not allow us to test differences between subgroups of inhibited children because the more detailed behavioral observation data in unfamiliar situations and in the preschool peer group were restricted to a small subsample. The findings by Asendorpf and van Aken (1994) on the effects of stable inhibition to the unfamiliar versus stable social-evaluative inhibition in the familiar peer group on social self-esteem up to age 12 showed effects only for inhibition in the

familiar peer group. Because the teacher measure of inhibition in the present study reflected mainly inhibition in the familiar peer group, our results suggest that early social–evaluative inhibition is only a long-term risk factor for extremely socially inhibited children (the upper 8% of the distribution did show a lower social self-esteem at age 23). Concerning high inhibition to the unfamiliar, the results of the present study are rather silent about long-term sequelae; better evidence for this temperamental trait comes from the Dunedin Longitudinal study, in which the inhibited group was defined on the basis of observations in unfamiliar situations.

Aggressive Children: Externalizing Profile

In contrast to the lack of internalizing problems in the inhibited group, the aggressive children showed a clear externalizing profile in adulthood. They were judged as more aggressive, less agreeable, less conscientious, lower in openness to experience, and more neurotic (particularly on items referring to impulsiveness). It is interesting that these parental assessments were corroborated by self-ratings except for conscientiousness, for which aggressive participants' self-ratings did not differ from those of the control group. Perhaps they used different criteria for this self-evaluation; for example, the parents may have based their conscientiousness judgment mainly on observations of conscientiousness behavior in the school domain and in family relationships, whereas the aggressive participants may have used conscientiousness in relationships with friends as the main criterion. Indeed, the aggressive group reported normal peer relationships at age 23; higher interpersonal conflict was perceived by themselves only in their relationship with the mother and, if available, their current romantic partner. It seems that in young adulthood, aggressiveness affects mainly close relationships that are not easily dissolved; later on, one might expect additional problems in close relationships at work (see Caspi et al., 1987).

Concerning the most serious outcome of externalizing problems, delinquency in adulthood, the formerly aggressive children were at a higher risk for criminal charges after their 18th birthday than the controls, and the two most delinquent participants of the sample were judged as highly aggressive at ages 4–6. These results should be considered with caution because the delinquency rate was extremely low for the control children, and only a minority of the aggressive group reported criminal charges. When these rates are compared with the often higher rates in other longitudinal studies (e.g. Caspi et al., 1996a; Huesmann et al., 1984), one should note that the LOGIC sample consisted of children growing up in Bavaria, a prosperous part of Germany that provided a benign social-cultural environment. This may also be the reason that the effect of SES on aggressiveness was only small. It is interesting that childhood aggression was a risk factor for delinquency even in this benign environment where the overall delinquency rate is among the lowest in Germany (Bundesministerium des Inneren, 2005).

One reason for the successful prediction of delinquency from early childhood in the relatively small sample of the LOGIC study seems to be that delinquency was restricted to charges after the 18th birthday, which is a watershed in the German legal system. Delinquency after 18 is considered as much more serious, and the response is much harsher. This distinction between adolescent and adult delinquency squares nicely with the distinction between adolescence-limited and life-course persistent antisocial behavior

(Moffitt, 1993). Our measure captured predominantly life-course-persistent, serious antisocial behavior, which is expected to be more predictable from early childhood aggressiveness than antisocial behavior during adolescence.

Aggressive Children: Educational and Occupational Underachievers

The aggressive children had reached a lower educational level by age 23. Their probability of finishing high school (German Abitur) was only 33%, half of the probability for the control group (the overall rate of finishing high school is lower in Germany than in many other countries because of higher demands). This figure is particularly important because a high-school final certificate is the main requirement in Germany for higher education, particularly at a university, and most well-paid jobs require a high-school certificate. The low educational achievement can be partly attributed to a somewhat lower IQ. Statistical control for lower IQ at ages 4–6 did not change the low educational level of the formerly aggressive children; after this correction, the estimates for finishing high school were 23% for the aggressive children but 62% for the controls. Thus, aggressive children were educational underachievers (Mandel, 1997; McCall et al., 1992).

Their underachievement was present right from the beginning of primary school because many of the aggressive children started primary school a year later than expected for their birth cohort, although late schooling alone did not fully explain later underachievement. Instead, the effects of aggressiveness on delays in school grade accumulated over childhood; after age 12, these effects fully accounted for adult educational underachievement. Thus, the late schooling and poorer educational outcome of the early aggressive group can be attributed to externalizing tendencies from early on rather than to low intelligence.

The aggressive children also turned into occupational underachievers who did not become as much involved in full-time work as one would expect from their educational level. It is interesting that this effect of early aggressiveness was found only for the percentage of time in full-time employment, not for the latency to the first full-time job. The discrepancy suggests that the aggressive group had problems with pursuing a continuous career after they had entered the job market. This result squares nicely with their more erratic work pattern found in the Berkeley Guidance Study (Caspi et al., 1987). It is notable that such an effect was already found early on in their working lives.

Delay in Preschool Entry and Testing in Adulthood

Both the inhibited and the aggressive groups were a few months older than the control group. Before indulging in speculation about seasonal effects, one should consider the more obvious interpretation that parents and heads of preschools might have preferred these problematic children to enter preschool somewhat later. Because the LOGIC sample consisted of children who began preschool in the fall (the regular beginning of a preschool year), such delays may very well have led to the selection of slightly older problem children.

Despite their somewhat older age, participants in both problem groups were tested in adulthood a few months later than average. These delays were particularly informative because testing was

scheduled according to age in order to decrease age variance at testing. Thus, the inhibited and the aggressive groups should have been tested somewhat earlier than the control group but in fact were tested later. The delay in testing can be considered as an unplanned, real-life validation of the continuity of characteristic behaviors in the two groups but for different reasons. Consistent with their assumed sensitivity to unfamiliar and social–evaluative situations, the inhibited group hesitated more when invited for testing. And consistent with their low conscientiousness, the aggressive group may not have cared much about the study, which might explain why they had to be contacted repeatedly.

Limitations of the Present Study

The results of the present study are limited by their reliance on teacher Q sorts. It would have been desirable to base the predictions on behavioral observations as well, but because these observations were available for less than half of the sample, power limitations prevented their use. Second, the sample size was much smaller than in the main comparison study, the Dunedin Longitudinal Study, which prevented the detection of small effects, particularly concerning internalizing difficulties and Sex \times Inhibition interactions. Detection was additionally hampered by selective attrition in terms of a disproportionate loss of formerly inhibited and aggressive children over the course of the longitudinal study. It may well be that formerly inhibited children with more problematic outcomes in adulthood, particularly problems with love relationships and depression, dropped out of the study by age 23. Third, delinquency was only self-reported, depressive tendencies were not assessed, and peer perceptions and measures of their parents' childrearing behavior were not available. Finally, the results are of course limited, in varying measure, to a particular culture at a particular time in history. For the inhibited group, for example, the delay in the transition to stable romantic relationships may be more robust against cultural variation than the delay in the transition to full-time work, which may depend more on the societal distribution of working opportunities.

Conclusions and Future Prospects

Three main conclusions can be drawn from this 19-year longitudinal study. First, it is possible to predict important developmental outcomes in adulthood for inhibited and aggressive preschool children from preschool teacher judgments. The findings replicated similar results for North American, New Zealand, and Swedish children (Caspi et al., 1987, 1988, 1996a, 2003; Kerr et al., 1996) based on parental judgments or behavioral observations. Our findings lend further support to the view that early childhood temperament foreshadows later adult personality to some extent, even when it is assessed in emerging adulthood, a period of life for which some authors such as Arnett (2000) and Cohen, Kasen, and Chen (2003) have claimed that individual life trajectories are particularly difficult to predict.

Second, the results for the aggressive children fully confirmed expectations based on earlier findings regarding long-term effects of childhood aggressiveness (Caspi et al., 1996a, 2003; Huesmann et al., 1984; Moffitt, 1993).

Third, the delayed development of the inhibited children during important life transitions replicated earlier findings for North

American boys born in 1928 (Caspi et al., 1988) and Swedish boys born in 1955 (Kerr et al., 1996) but, contrary to these earlier studies, applied also to the inhibited girls in our 1980 birth cohort. This diminishing of a former sex difference was not unexpected because our participants grew up in a culture characterized by more egalitarian gender roles than one or two generations earlier. It would be interesting to replicate this cultural dependence of sex differentiation in the life course of inhibited children in other cultures that can be characterized as very high or very low in traditional gender roles.

Future analyses of the LOGIC data should reconstruct the individual pathways of the two extreme groups between early childhood and adulthood in as much detail as possible, using all available assessments in the LOGIC study (see Denissen, Asendorpf & van Aken, 2008, for a first step). In addition, a reassessment at later ages with regard to the life history of love, children, work, health, and delinquency could shed more light on the long-term outcome of early inhibition and aggressiveness. Other studies could combine the power of repeated teacher judgments with the power of repeated concurrent assessments of behavior, measures of peer exclusion, and parenting. These data in combination with molecular genetic data could be used for even better predictions of adult outcomes. What will remain despite all these attempts at prediction will be a large variance left unexplained because of the immense complexities of human development.

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