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The early childhood aggression curve: Development of physical aggression in 10- to 50-month-old children

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Abstract

This study examines the prevalence, stability, and development of physical aggression, as reported by mothers and fathers, in a sample of children initially recruited at 12, 24, and 36 months ($N = 2,253$), and in a subsample followed-up 1 year later ($n = 271$) in a cross-sequential design. Physical aggression occurred in 12-month-olds, but significantly more often in 24- and 36-month-olds. The rates of physically aggressive behaviors increased in the second year of life, and declined from the third birthday onward. Stabilities were moderate for 12-month-olds and high for 24- and 36-month-olds. At the ages of 24 and 36 months, boys were more aggressive than girls. The results confirm and extend Tremblay's (2004) hypothesis about the early development of physical aggression.

Introduction

Recent studies indicate that the frequency of children's physical aggression is highest during the preschool years (e.g., NICHD, 2004b; Tremblay et al., 2004). It has been suggested that physically aggressive behaviors, such as hitting, kicking, and biting, occur as early as around the 1st birthday, increase and peak during the second and third year of life, and decline in the fourth year of life (Cummings, Iannotti, & Zahn-Waxler, 1989; Gimenez & Blatier, 2004; Tremblay et al., 1999, 2004). However, the few studies that have investigated the development of aggression rates in early childhood did not include data regarding all relevant age groups (i.e., each of the first four years of life). In addition, sex differences in the rate of aggressive behavior in these age groups have been largely ignored. Thus far, it is unclear at what age the frequently reported sex differences in aggression (see Coie & Dodge, 1998) start to emerge. The present study addresses these issues in a general population sample of 1- to 4-year-old boys and girls, using a cross-sequential design.

In the past three decades, two main approaches to the study of aggression in children can be distinguished. Studies inspired by social learning theory emphasize the influence of the social environment on the onset and development of aggression (Bandura, 1973; Feshbach, 1974; Johannesson, 1974). According to Bandura (1973), "People are not born with preformed repertoires of aggressive behavior; they must learn them in one way or another" (p. 61). More specifically, Bandura's social learning theory states that children learn specific behaviors (e.g., aggression) through imitation and reinforcement. A theory that has been inspired by the social learning paradigm is Patterson's coercion model (Patterson, 1976, 1982), which describes child aggression as a result of family-based reinforcement processes. In contrast to classical social learning theory, Patterson's theory also describes the possibility that child aggressive behavior may be biologically determined and reinforcement processes may result in maintaining or increasing this behavior (Patterson, 1982). Several studies have confirmed the role of social learning processes in the development of child aggression, and in the treatment and prevention of the expression of antisocial behavior (e.g., Bandura, 1973; Johannesson, 1974; Reid, Eddy, Fetrow, & Stoolmiller, 1999; Snyder, Edwards, McGraw, Kilgore, & Holton, 1994; Webster-Stratton, Reid, & Hammond, 2004). Most of these studies based on social learning theory have focused on preschoolers and school-aged children (e.g., Bandura, 1973; Snyder et al., 1994).

Recently, based on the idea that aggression may be partly inborn, the focus has shifted toward investigating aggression in younger children. For example, Tremblay et al. (1999) asked mothers of 17-month-old children to report whether their children showed physically aggressive behavior at that time, such as kicking, biting, and hitting, and if they did, at what age the children had shown aggression for the first time. On the basis of these retrospective data, the authors concluded that physical aggression was already present in children as young as 12 months of age. In addition, they reported that by the time children were 17 months old, nearly 80% had shown one or more aggressive behaviors. Findings from the longitudinal study of children from 17 to 42 months of age by Tremblay et al. (2004) revealed that most children start to use physical aggression in the second year of life. Tremblay (2003) argued that, because it seems that most children start

to use physical aggression during infancy, it is unlikely that this behavior has been learned. Rather, physical aggression in infancy would be a natural way of expressing anger and most children learn to regulate this behavior as they grow older. Those children who do not will be at risk for becoming antisocial later in life. Tremblay therefore stated that we should focus on how children learn to *inhibit* physical aggression rather than on the process of learning how to act aggressively (Tremblay, 2002, 2003).

The research initiated by Tremblay and colleagues has been innovative because of its focus on the early development of aggression. However, there are some methodological shortcomings in these and other studies. First, the study by Tremblay et al. (1999) had a retrospective research design. Mothers were asked to recollect when their children had first shown physically aggressive behavior. Recall of earlier aggression in children may be biased by factors such as current levels of aggression, current family situation, and behavior of other children. As a result, it is not clear to what extent the findings reflect the actual age of onset of aggressive behavior. Furthermore, in their 2004 study, Tremblay and colleagues assessed physical aggression using a questionnaire that consisted of only three items. In addition, the mother was the only informant at ages 17 and 30 months. Information from fathers was obtained for children at 42 months of age, but for the main analyses only mother reports were used. This was the case for most studies (e.g., Dionne, Tremblay, Boivin, Laplante, & Pérouse, 2003; Tremblay et al., 1999; Vaillancourt, Brendgen, Boivin, & Tremblay, 2003).

Numerous studies have addressed the level of agreement between parents on externalizing problem behaviors of their children (see the meta-analysis by Duhig, Renk, Epstein, & Phares, 2000). These studies have generally found that fathers report less problem behaviors than mothers, and that the level of disagreement is not influenced by the sex of the child. Only a small part of the difference between mother and father reports may be ascribed to rater bias (Hudziak et al., 2003; Ostrov, Crick, & Keating, 2005; Van der Valk, Van den Oord, Verhulst, & Boomsma, 2003). Hudziak et al. (2003) stated that the disagreement between mothers and fathers may be attributed to the fact that the parents have different experiences with their children. Mothers usually spend more time with their children than fathers and, as a result, have more exposure to any problem behavior of their children (Christensen, Margolin, & Sullaway, 1992). Consequently, parental disagreement may reflect actual differences in the observed behavior of the child. Therefore, the use of multiple raters in the study of child behavior is recommended.

In addition to using only one informant, most studies that focused on aggression in early childhood did not include data regarding all relevant age groups necessary to establish the suggested increase and decline in rates of physical aggression in early childhood (i.e., each of the first four years of life). For instance, Cummings et al. (1989) investigated aggression in children aged 2 and 5 years; children in the study of Keenan and Shaw (1994) were 18 and 24 months of age; and Tremblay et al. (2004) focused on children aged 17, 30, and 42 months. Consequently, no firm conclusions can be drawn about the development of physical aggression in the first four years of life.

Another caveat regarding research on physical aggression in early childhood is that many studies thus far focused exclusively on boys (e.g., Brame,

Nagin, & Tremblay, 2001; Patterson, DeGarmo, & Knutson, 2000; Patterson, Reid, & Dishion, 1992). The studies that included both sexes generally found that boys were more physically aggressive than girls (Hudziak et al., 2003; for a review, see Coie & Dodge, 1998), whereas girls showed more relational aggression than boys (Crick, Casas, & Mosher, 1997; Ostrov, Woods, Jansen, Casas, & Crick, 2004). The earliest sex differences in physical aggression thus far have been reported by Tremblay et al. (1999). In their study, 17-month-old boys were significantly more aggressive than girls when no siblings were present. In addition, Baillargeon, Tremblay, and Willms (2005) found a higher prevalence for boys than for girls on two of the three assessed physically aggressive behaviors in 2- and 3-year-olds: "fights" and the item "kicks, bites, and hits." Coie and Dodge (1998) suggested that biological differences are the basis of the early development of sex differences in aggression and that this biological effect is mediated by social experiences. They argued that sex differences in infant behavioral style precede sex differences in aggression and that these can be strengthened by parental and peer reactions. Therefore, it is to be expected that sex differences increase with age. Thus far however, little is known about the exact age at which sex differences emerge in aggressive behavior and how these differences develop over time.

Furthermore, whether or not sex differences are present in the stability of aggression in early childhood is unclear. Some researchers suggested that stability of aggressive behavior is comparable for boys and girls (see Coie & Dodge, 1998). Keenan and Shaw (1994) did not find different stability coefficients for boys and girls between 18 and 24 months. Cummings et al. (1989) reported higher stability in overall observed aggression for boys than for girls between the ages of 2 and 5 years. However, stability of *physical* aggression did not differ significantly for boys and girls.

In the present study we investigate the prevalence, stability, and development of physical aggression in 1- to 4-year-old boys and girls using mother and father reports. We focus on *physical* aggression because this is generally considered to be socially undesirable behavior that often has problematic consequences. There is less agreement about the undesirability of nonphysical aggression. Tremblay gives the example of being an aggressive (e.g., persistent, fanatic, etc.) debater, which is generally seen as desirable, as opposed to having a *physically* aggressive debating style (Tremblay et al., 1999). Furthermore, Broidy et al. (2003) concluded that persistent childhood physical aggression is a better predictor of both violent and nonviolent offending in adolescence than are nonphysically aggressive conduct problems, oppositional, and hyperactive behaviors. In addition, physical aggression is a concrete type of behavior, which makes it relatively easy to measure. Consequently, the reliability of parent reports concerning this concrete behavior is rather high. Finally, from a developmental view, physical aggression is relevant from an early age, whereas verbal and relational aggression are less applicable because of limitations in cognitive skills. Therefore, the focus of our study is on physical aggression and not on other subtypes (e.g., verbal or relational aggression).

Unfortunately, there is little consensus about the definition of physical aggression. Most studies on this topic do not provide a specific definition, and there has been some debate concerning the issue of "intent" in very young children's aggression. A number of studies that do provide a definition include

intent in this definition (e.g., Brook, Zheng, Whiteman, & Brook, 2001; Estrem, 2005; Ostrov et al., 2004). However, assessing intent is extremely difficult, if possible at all (Hartup, 2005). Most studies that included intent in their definition of aggression did not measure the intentionality of the behavior. Furthermore, for adults as well as children, many aggressive behaviors following intense frustration, or driven by anger and fear, cannot be considered intentional, but are more or less impulsive acts (Tremblay, 2000, 2003). Therefore, we agree with Tremblay (2000), who stated that the criterion of intent is not necessary for the definition of physical aggression. In young children, frustration, anger, or fear may be expressed physically, resulting in behaviors that are labeled as aggressive in older children regardless of intentionality. The question is whether these behaviors in young children are predictive of aggression in older children and may be considered as early expressions of aggression.

In addition, Tremblay (2000) stressed the need to define physical aggression clearly. We define physical aggression as behavior that may cause physical harm to people, objects, or animals. Examples of physical aggression are hitting, kicking, and fighting. Several studies only focused on aggression toward people (e.g., Ostrov et al., 2004). However, in line with Shaw (Shaw, Gilliom, & Giovannelli, 2000; Shaw, Keenan, & Vondra, 1994) we also consider behavior that may cause physical harm to *objects* or *animals* as aggressive.

Specifically, our study aimed to answer the following questions:

- (1) What is the prevalence of physical aggression in 12-, 24-, and 36-month old children according to their mothers and fathers?
- (2) Are there differences between aggression rates reported by mothers and fathers?
- (3) Is the stability of aggressive behavior the same for 12-, 24-, and 36-month-olds?
- (4) How does physical aggression develop over time in early childhood from the age of 10 to approximately 50 months?
- (5) Are there sex differences in level, development, and stability of physical aggression in early childhood? At what age do these differences emerge?

On the basis of the literature discussed above, it is hypothesized that physically aggressive behavior occurs in children as young as 12 months of age. In addition, we expect to find that the prevalence of physical aggression is higher in 24- and 36-month-olds than in 12-month-olds. It is hypothesized that mothers report higher rates of aggression than fathers. Because of the important behavioral and emotional transitions that take place early in life (e.g., developing feelings of autonomy, becoming more physically and emotionally independent, growing understanding of others, language development), stability of physical aggression is hypothesized to be lower for younger than for older children. Concerning the development of physical aggression, an increase in the rate of aggressive behavior during the second year of life is expected, followed by a decline from the age of 3 years onward. On the basis of the results by Tremblay et al. (1999), it is hypothesized that sex differences in the rates of physical aggression (boys being more aggressive than girls) will emerge in the second year of life. Finally, we do not expect to find differences between boys and girls in the stability of physically aggressive behavior (see Coie & Dodge, 1998).

Method

The SCRIPT study

Participants were recruited for the Dutch SCRIPT study (Screening and Intervention of Problem behavior in Toddlerhood). The study investigates the effectiveness of an early intervention program aimed at reducing externalizing problems in 1- to 3-year-old children by enhancing parental sensitivity and adequate discipline strategies. It consists of a screening phase in a large general population sample, and a randomized case-control intervention phase in a selected subsample of children with high levels of externalizing problems. Approximately 1 year after the screening, a follow-up took place. This paper focuses on data obtained in the general population screening and the 1-year follow-up of the SCRIPT study.

Participants and procedure

During the screening phase (Time 1), the names and addresses of children aged 10-15 (12-month-olds), 22-27 (24-month-olds), and 33-40 months (36-month-olds) were drawn from municipal registers (in which all Dutch citizens are listed) of several cities and towns in the western region of the Netherlands. Because the screening phase of the SCRIPT study was designed to provide participants for an intervention study, sample homogeneity regarding cultural background (Dutch) was important. Therefore, children with both a non-Dutch surname and a non-Dutch first name were not included in the target sample. Parents of 4,615 eligible children received two booklets with questionnaires, one for each parent. Usable data were obtained from the primary parents of 2,408 children (response rate 52%). For 2,106 of these children, data were also obtained from the second caregiver (response rate 45%). For the present paper, only those children were included for whom the primary parent was the mother (biological or otherwise) and the second caregiver (if present) was the father (biological or otherwise). In addition, those children were selected for whom complete demographic information was available.

Time 1 samples: mother and father reports

The selection for the current paper resulted in a sample of 2,253 children for whom mother reports were obtained ("mother sample"): 789 children aged 12 months ($M = 11.72$, $SD = 1.02$, range = 10-15, 399 boys), 720 children aged 24 months ($M = 23.80$, $SD = 0.99$, range = 22-27, 373 boys), and 744 children aged 36 months ($M = 35.77$, $SD = 1.09$, range = 33-40, 390 boys). Sample characteristics are shown in Table 2.1. We estimate that the large majority of the sample is of Caucasian ethnicity. Although we did not directly ask parents about the child's ethnicity, 99% of the children's last names were Dutch, and in roughly 90% of the families both parents were born in the Netherlands.

Of the total sample for which mother reports were available, 1,968 fathers also returned the questionnaires ("father sample": 686 12-month-olds,

635 24-month-olds, and 647 36-month-olds). Because of the large sample size, we used a critical p value of $p < .01$ throughout this paper in order to prevent capitalization on chance and too small effect sizes. We examined whether there were demographic differences between families with father reports and families without father reports. The results are shown in Table 2.1. Compared with the sample without father reports, children in the sample with father reports were more likely to live with both biological parents, and their parents were more likely to have been born in the Netherlands and to have a higher educational level. In addition, we tested for differences in mother-reported aggression scores between children in the Time 1 father sample and children for whom father reports at Time 1 were not available. Aggression scores were significantly lower for children in the Time 1 father sample than for children without father reports, $F = 7.47$, $p < .01$, partial $\eta^2 = .003$.

Table 2.1

Sample characteristics (%) and sample differences (χ^2/F) on demographic variables

	Sample characteristics			Difference from remaining children in Time 1 mother sample (χ^2/F)	
	Time 1 mother sample	Time 1 father sample	Longitudinal sample	Time 1 father sample	Longitudinal sample
<i>n</i>	2,253	1,968	271		
Boys	52	51	52	-	-
Both biological parents present	95	99	100	433.90*	15.21*
Siblings present	60	61	58	-	-
Firstborn	52	52	55	-	-
Child born in the Netherlands	99	99	100	-	-
Both parents born in the Netherlands	89	90	88	15.60*	-
Educational level parents ^a	3.93 (1.05)	3.98 (1.03)	4.26 (0.93)	36.48*	30.40*

Note. F -test for comparison samples on educational level parents. χ^2 for all other variables.

^a Educational level parents defined by the level of the parent with the highest education on a scale ranging from 1 to 5.

Means and SD s (in parentheses) are given.

* $p < .01$.

Longitudinal sample

Approximately 1 to 3 years after the screening phase, a follow-up took place. Questionnaires were sent to all Time 1 respondents. From these families 1,353 mothers (60%) returned the questionnaires. The age range at Time 2 was quite large (20-60 months). To be able to compute 1-year stabilities and to investigate the longitudinal development of aggression in different age groups, we selected a subsample of children who were within the following restricted age ranges at Time 2: ages 22-26, 34-38, and 46-50 months. In addition, we selected only those children for whom data were available from both parents at both times of assessment to avoid informant-effects. This resulted in a sample ($n = 271$) consisting of 99 12-month-olds, 83 24-month-olds, and 89 36-month-olds. None of these children received the intervention between Time 1 and Time 2.

Table 2.1 shows sample characteristics and differences between the longitudinal sample and the remaining children from the Time 1 mother sample.

Children in the longitudinal sample were more likely to be living with both biological parents and their parents had higher educational levels than those from families who were not selected for the longitudinal sample.

In addition, we examined differences in physical aggression scores between children in the longitudinal sample and children in the sample for whom follow-up data were not available for the specified age ranges at Time 2. No significant differences on mother- and father-rated aggression were found.

Measures

Physical Aggression Scale for Early Childhood (PASEC)

The questionnaire consisted of 11 items concerning physical aggression. These items have been selected because they correspond to our definition of physical aggression (behaviors that are potentially physically harmful to persons or objects). Eight of these originated from the 11 items used by Tremblay et al. (1999). Because two of the remaining items used by Tremblay ("Pushes to get what he/she wants" and "Cruel") led to misunderstandings in the translation, and Tremblay's item "Bullies" could not unequivocally be considered physical aggression, we decided to exclude these items. In addition, the questionnaire was extended with 2 items concerning physical aggression directed at objects and with an item regarding cruelty to animals. These items were adapted from the Dutch version of the Child Behavior Checklist for ages 1½ to 5 years (Achenbach & Rescorla, 2000; Koot, Van den Oord, Verhulst, & Boomsma, 1997). The other items were translated from English to Dutch by an expert and independently translated back to English by another expert to check for potential differences. Parents were asked whether their children had shown these behaviors during the past 2 months. The items were scored on a 3-point Likert scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). A physical aggression score was computed by summing the item scores (potential score range = 0-22). Both parents were asked to fill out this questionnaire at Time 1 and Time 2. Internal consistencies of the physical aggression score were computed (Cronbach's alpha) for mothers and fathers, respectively, in 12-month-olds (Time 1: .67, .67; Time 2: .74, .77), in 24-month-olds (Time 1: .81, .80; Time 2: .81, .78), and in 36-month-olds (Time 1: .83, .82; Time 2: .78, .81).

Results

First, preliminary analyses are performed to control for potential confounding effects on age differences in the rate of physical aggression. Second, cross-sectional age differences on physical aggression are presented. Third, we focus on differences between mother and father reports. In addition, sex differences in physical aggression are addressed. Furthermore, we describe the stability of aggression for the different age and sex groups. Finally, the development of aggressive behavior is reported. For the analyses concerning stability and development, the averaged scores of mother and father reports were used. For all analyses we used critical p values of $p < .01$.

Preliminary analyses

We tested for differences between the three age groups regarding demographic variables in the Time 1 mother and father samples and in the longitudinal sample. The only differences between age groups were found for presence of siblings and parental educational level (Table 2.2). In the Time 1 mother sample and the Time 1 father sample, older children had siblings more often than younger children. In addition, 12-month-olds in the Time 1 mother sample had parents with a higher educational level than 36-month-olds. No differences between age groups on demographic variables existed in the longitudinal sample.

Because age groups in the Time 1 mother sample differed on presence of siblings and parental educational level, analyses concerning age differences in this sample were controlled for the effects of these two variables. To facilitate comparison across mother and father reports of aggression, the same control variables were used in analyses concerning age effects in the Time 1 father sample.

Some univariate outliers were found, but additional analyses showed that the outliers had no effects on the results. No multivariate outliers were identified.

Table 2.2

Differences between age groups on demographic variables in the different samples

	Time 1 mother sample	Time 1 father sample	Longitudinal sample
<i>n</i>	2,253	1,968	271
	χ^2/F	χ^2/F	χ^2/F
Boys	0.55	0.42	4.29
Both biological parents present	1.85	0.43	0.00
Siblings present	122.07 ^a	120.87 ^b	5.75
Firstborn	7.74	5.60	0.54
Child born in the Netherlands	1.37	0.55	0.00
Both parents born in the Netherlands	1.06	0.87	1.29
Educational level parents	5.74 ^c	4.32	0.27

Note. *F*-test for comparison of age groups on educational level parents as defined by the level of the parent with the highest education. χ^2 for comparison of age groups on all other variables.

^a $p < .01$, less often in 12-month-olds than in 24- and 36-month-olds.

^b $p < .01$, less often in 12- than in 24-month-olds, less often in 24- than in 36-month-olds.

^c $p < .01$, higher for parents of 12-month-olds than for parents of 36-month-olds.

Prevalence

We investigated the prevalence of physical aggression based on reports from both mothers and fathers. First, we were interested in the proportion of children showing any aggressive behavior. Of the 12-month-olds, 52% according to their mothers and 46% according to their fathers showed at least some form of physically aggressive behavior, sometimes or often. In 24- and 36-month-olds these percentages were higher (80% according to mothers and 74% according to fathers for 24-month-olds, and 78% and 68%, respectively, for 36-month-olds).

In Table 2.3, the physical aggression scores derived from mother and father reports are presented for the different age and sex groups. To examine effects of age on physical aggression, two analyses of covariance (ANCOVAs) were performed with scores obtained from mothers and fathers as dependent variables and age as factor. Parental educational level and presence of siblings were used as covariates. For both mother- and father-rated aggression, there was a significant age effect. Children aged 12 months scored significantly lower than 24- and 36-month-olds (Table 2.3).

We also tested whether results were the same when we performed the analysis on the smaller sample that was used for our longitudinal analyses. Results from the same analysis on the longitudinal sample ($n = 271$) were largely similar.

Mother and father reports

Results of a repeated measures analysis of variance (ANOVA) showed that the physical aggression score was significantly lower for father reports ($M = 2.00$, $SD = 2.49$) than for mother reports ($M = 2.36$, $SD = 2.71$), $F(1, 1962) = 47.13$, $p < .01$, partial $\eta^2 = .023$. The interaction effect of informant by age group was also significant, $F(2, 1962) = 5.70$, $p < .01$, partial $\eta^2 = .006$. Differences between parent reports were larger for 24- and 36-month-olds than for 12-month-olds. The interaction effects of informant by sex and informant by age by sex were not significant, $F(1, 1962) = 5.31$, $p = .02$, and $F(2, 1962) = 0.12$, $p = .89$, respectively (note that for all analyses we used critical p values of $p < .01$). Overall sex differences and sex differences per age group on physical aggression score were not significantly different for mother and father reports. Finally, the correlation between physical aggression scores derived from mother reports and scores from father reports was substantial, $r(1968) = .58$, $p < .01$.

When the smaller longitudinal sample ($n = 271$) was used for these analyses, no significant main or interaction effects were found.

Sex differences

ANCOVAs (covariates were presence of siblings and parental educational level) were performed to test for sex and age by sex effects on physical aggression rated by mothers and fathers. The main effect of sex was significant for both mother- and father-rated aggression, $F(1, 2245) = 59.16$, $p < .01$, partial $\eta^2 = .026$; $F(1, 1960) = 32.34$, $p < .01$, partial $\eta^2 = .016$, respectively. Overall, boys received significantly higher scores than girls. For mother-rated aggression the age by sex interaction effect was significant, $F(2, 2245) = 5.34$, $p < .01$, partial $\eta^2 = .005$. Sex differences for 24- and 36-month-olds were significantly larger than sex differences for 12-month-olds. The interaction-effect of age by sex was not significant for father-rated aggression, $F(2, 1960) = 3.85$, $p = .02$.

Sex differences for the separate age groups are reported in Table 2.3. Results of ANOVAs revealed that the mean physical aggression score was significantly higher for boys than for girls in 24-month-olds ($p < .01$, $d = .36$ for mother reports and $p < .01$, $d = .30$ for father reports) and 36-month-olds ($p < .01$, $d = .37$ and

Table 2.3
Means, sex, and age differences for physical aggression score obtained from mothers and fathers

Informant	Age 12 months				Age 24 months				Age 36 months				Age difference ^a
	Total	Boys	Girls	Sex diff.	Total	Boys	Girls	Sex diff.	Total	Boys	Girls	Sex diff.	
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>	<i>F</i>
Mother	1.19 (1.71)	1.34 (1.76)	1.03 (1.65)	6.41	3.20 (3.06)	3.72 (3.35)	2.63 (2.59)	23.80*	2.99 (3.07)	3.51 (3.24)	2.41 (2.77)	24.86*	106.10*
	<i>n</i> 789	399	390		720	373	347		744	390	354		
Father	1.04 (1.55)	1.11 (1.54)	0.97 (1.57)	1.33	2.60 (2.68)	3.00 (2.88)	2.19 (2.39)	14.70*	2.42 (2.79)	2.81 (3.02)	1.99 (2.46)	14.26*	68.38*
	<i>n</i> 686	343	343		635	323	312		647	335	312		

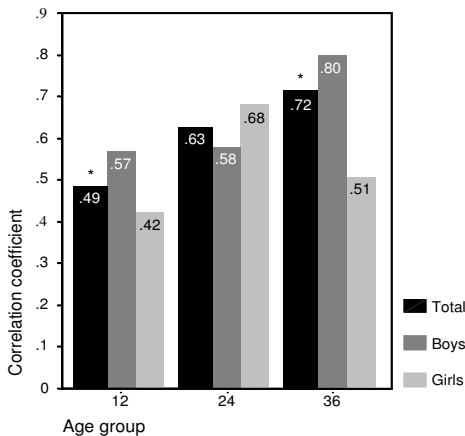
^a Parental educational level and presence of siblings were used as covariates. Means and standard deviations based on raw scores are given.
* $p < .01$.

$p < .01$, $d = .30$, respectively). The difference between 12-month-old boys and girls was not significant ($p = .01$, $d = .18$ for mother reports and $p = .25$, $d = .09$ for father reports). Boys aged 24 and 36 months scored significantly higher than girls in these age groups. Scores for 12-month-olds were similar for both sexes.

We also performed these analyses on the longitudinal sample ($n = 271$). The main effect of sex and the interaction effect of age by sex were not significant for this subsample.

Stability

The longitudinal sample ($n = 271$) was used for analyses concerning stability of physical aggression (see Method section, page 26). To explore the 1-year stability of aggressive behavior (averaged score of mother and father reports), we computed correlations between scores at Time 1 and Time 2. Stability coefficients for 12-, 24-, and 36-month-olds were .49 ($n = 99$, 95% confidence interval [CI]: .31 - .66), .63 ($n = 83$, 95% CI: .45 - .80), and .72 ($n = 89$, 95% CI: .57 - .87), respectively (Figure 2.1). The difference between the stability coefficient for 36-month-olds and the coefficient for 12-month-olds was significant, $Z_{\text{diff}} = -2.60$, $p < .01$. Stability coefficients for 24-month-olds did not differ significantly from that for 12-month-olds and 36-month-olds, $Z_{\text{diff}} = 1.36$, $p = .17$ and $Z_{\text{diff}} = -1.11$, $p = .27$, respectively. We also computed the stability of aggressive behavior for boys and girls separately (Figure 2.1). Stability coefficients for boys and girls did not differ significantly for 12-, 24-, and 36-month-olds, $Z_{\text{diff}} = 0.94$, $p = .35$, $Z_{\text{diff}} = -0.76$, $p = .45$; $Z_{\text{diff}} = 2.40$, $p = .02$, respectively (using a critical p value of $p < .01$). Together, these results indicate that aggressive behavior was more stable for 36-month-olds than for 12-month-olds and that stability for boys and girls was comparable for all age groups.



* Significant difference between 12- and 36-month-olds, $p < .01$.

Figure 2.1

Correlation coefficients for aggression scores at Time 1 and Time 2 for the different age and sex groups

Longitudinal development

To investigate the longitudinal development of physical aggression, we performed a repeated measures ANOVA (between subjects factors: age and sex of the child; within subjects factor: time). The interaction effect for time by age was significant, $F(2, 265) = 15.80, p < .01$, partial $\eta^2 = .107$. No significant interaction effect was found for time by age by sex, $F(2, 265) = .22, p = .80$, indicating that the slopes for the different age groups were comparable for boys and girls. In Figure 2.2, mean aggression scores for each age group at Time 1 and Time 2 are shown. Additional repeated measures ANOVAs for the separate age groups showed that for 12-month-olds scores were significantly higher at Time 2 than at Time 1, $F(1, 98) = 31.36, p < .01$, partial $\eta^2 = .242$ (Time 1: $M = 1.13, SD = 1.57$; Time 2: $M = 2.20, SD = 2.07$). No difference between the two times of assessment was found for 24-month-olds, $F(1, 82) = 1.03, p = .31$. For 36-month-olds, Time 2 scores were significantly lower than scores at Time 1, $F(1, 88) = 7.03, p < .01$, partial $\eta^2 = .074$ (Time 1: $M = 2.43, SD = 2.00$; Time 2: $M = 1.98, SD = 2.22$). These findings demonstrate a rise in rates of aggression from 12 to 24 months of age and a decline from approximately 36 months onward. The development of physical aggression was comparable for boys and girls.

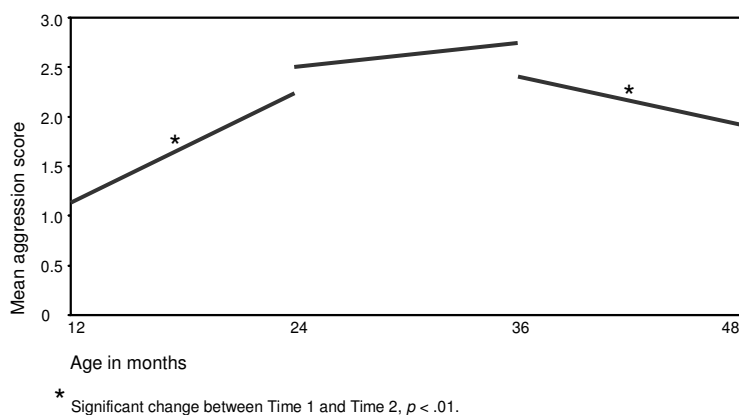


Figure 2.2

Repeated measures for mean aggression score by age group

Discussion

The aim of the present study was to investigate the prevalence, development, and stability of physical aggression in 1- to 4-year-old children. In addition, we examined sex differences in level, development, and stability of physical aggression in early childhood. Finally, differences between mother and father reports were investigated.

Prevalence and development of physical aggression in early childhood

Our study showed that physical aggression occurs in children as young as 12 months of age. As reported by their parents, half of the children in this age group showed at least some form of physically aggressive behavior, sometimes or often. As we expected, children aged 24- and 36-months showed significantly more physically aggressive behavior than younger children. Consistent with previous studies (e.g., Gimenez & Blatier, 2004; Tremblay et al., 1999, 2004), we found a rise in rate of aggression in the second year of life and a decline from the fourth year onward. Previous studies often suggested such a pattern of development based on data regarding small age ranges. The current study focused on all relevant age groups, that is, children with ages ranging from 10 to 50 months. The lowest aggression rates were found in 12-month-old children. Some of the items of our questionnaire may be less appropriate for this age group than for older children, and may require abilities that typical 12-month-olds have not yet developed. However, from the wide range of physically aggressive behaviors that we measured, most did occur in all age groups.

From a developmental perspective, the onset of physical aggression can be linked to the emergence of anger that takes place in the first year of life (Sroufe, 1995). Anger and frustration are likely to elicit aggressive behaviors (Berkowitz, 1989). However, this does not mean that we know exactly what causes the onset of physical aggression. Further research is needed to explore the interaction between social and biological processes taking place before birth and in the first year of life that can lead to the onset and persistence of physical aggression.

The normative increase in rate of aggression in toddlerhood may be partly explained by the developing feelings of autonomy in children of this age (Campbell, 2002). Because of their emerging capacities and their growing self-awareness, toddlers start to perform new behaviors that are sometimes unacceptable to their parents, resulting in parental limit-setting. This conflict between the child's exploration of emerging capacities and parental limit-setting may result in an increase in physically aggressive behaviors.

The demonstrated decline in prevalence of aggressive behavior from the age of 3 years onward is consistent with theories regarding moral development and socialization (e.g., Kochanska, Coy, & Murray, 2001). In early childhood, most children start to internalize rules and values, learn to control their behavior and to regulate their anger, develop a theory of mind, and become more empathic (e.g., Hoffman, 2000; Sroufe, 1995; Wellman, 1992). As a result, they learn to respond in a socially acceptable way instead of acting aggressively. In addition, the exponential growth in language skills that takes place in early childhood may contribute to the decline in prevalence of physical aggression. The ability to verbally communicate needs and desires may reduce frustration associated with not being understood. This, in combination with using improved negotiation and persuasive skills, may result in less physically aggressive behavior. It is important to note that the finding of a decline in physical aggression after the first years of life does not necessarily imply that aggression cannot be learned later in life, or early in life for that matter. The mechanisms proposed by Bandura (1973) and Patterson (1976, 1982) may still be responsible for late childhood or adolescent

increase in aggressive behavior and for a persistence of aggression after early childhood.

In the current study we focused on the development of *physical* aggression and showed that this form of aggression decreases between the ages of 3 and 4 years. However, physical aggression may be replaced by other forms of aggression, such as verbal or relational aggression. Several studies indeed revealed an increase in new forms of aggression from the age of 3 years onward (see Coie & Dodge, 1998). The development of language skills may contribute to the increase of other types of aggression, such as relational aggression, although research findings are mixed (Bonica, Arnold, Fisher, Zeljo, & Yershova, 2003; Estrem, 2005). Additional research is needed to address qualitative changes in aggression throughout childhood.

The effect sizes of our findings concerning age differences were generally small to moderate. Only part of the variance of physical aggression could be explained by age effects. Therefore, other (genetic, biological, social) variables that are potentially related to the development of physical aggression should be investigated as well.

Stability of early childhood physical aggression

The present study shows that physical aggression is already relatively stable in early childhood. One-year stability coefficients were moderate for 12-month-olds and high for children aged 24 and 36 months. By using the averaged score of mother and father reports to establish stability, informant effects were minimized. The high stability coefficients for 24- and 36-month-olds are in line with other studies investigating stability of aggression at this age (e.g., Cummings et al., 1989; Van Beijsterveldt, Bartels, Hudziak, & Boomsma, 2003). Stability in children as young as 12 months of age has not been previously investigated. The somewhat lower stability in this age group may be due to the many emotional and cognitive transitions that take place in the second year of life (Sroufe, 1995). However, significant 1-year stability was found for this age group. The fact that these behaviors measured at age 1 were related to the same behaviors 1 year later suggests that the PASEC does measure early expressions of aggression in 12-month-olds.

Sex differences

Consistent with our hypothesis, boys were found to show more physical aggression than girls at the ages of 24 and 36 months. Effect sizes were small to medium (d s ranging from .30 to .37). For 12-month-olds, no differences between boys and girls were found. The effect sizes for this age group were small ($d = .18$ and $d = .09$, for mother and father reports, respectively). Several authors concluded that sex differences in the rate of aggression do not emerge before the age of 4 years (e.g., Cummings et al., 1989; Keenan & Shaw, 1994). The current study indicates that sex differences are already present in toddlerhood (see also Tremblay et al., 1999). Keenan and Shaw (1997) suggested a number of biological mechanisms (maturation, functional asymmetry, and stress reactivity) that may explain the emergence of sex differences at this young age.

Differences between boys and girls in the prevalence of physical aggression in early childhood may be partly explained by sex differences in language skills. Language skills of girls are often more advanced than those of boys (Galsworthy, Dionne, Dale, & Plomin, 2000; Roulston, Loader, Northstone, & Beveridge, 2002). As was stated before, advanced communication skills may result in less physical aggression, because there is less frustration arising from misunderstanding others or not being understood. In addition, when children have good language skills, they can use verbal communication instead of physical aggression to express what they want. In line with this reasoning, Estrem (2005) found that lower levels of physical aggression were associated with better receptive language abilities. Superior receptive language skills may enhance the child's social skills so that acting aggressively is not a necessary alternative behavior.

Girls may also be more inclined to use other types of aggression instead of physical aggression. For example, Ostrov and Keating (2004) have shown that preschool-aged girls were more relationally aggressive than boys, whereas boys showed more physical aggression. Comparable findings were presented by Crick et al. (1997) and Bonica et al. (2003). The differences in type of aggression used by boys and girls may partly be due to sex differences in language skills and social competence.

Furthermore, the different beliefs young children and their parents have about the relation between sex of the child and aggression may account for the perpetuation of sex differences in physical aggression. Giles and Heyman (2005) found that preschoolers believed that boys are more physically aggressive than girls. According to these authors, this may result in self-regulative behavior, reflected in adapting one's behavior in line with aggressive scripts appropriate for one's gender. In addition, differential reactions from parents or other caregivers to child aggression for boys and girls may account for the reinforcement of sex differences (Fagot, 1984). Parents themselves may also be biased with respect to the behavior of their children. They may be more likely to interpret certain behaviors of their sons as aggressive than similar behaviors of their daughters and react accordingly. Observational studies are needed to clarify this issue of parental bias regarding sex differences.

Concerning stability of physically aggressive behavior over time, we found that stability for boys and girls was comparable in all age groups. This is consistent with the results reported by Keenan and Shaw (1994) on children aged 18 to 24 months, and by Cummings et al. (1989) on 2- to 5-year-olds.

Mother and father reports

Overall, mothers reported more physical aggression than fathers. Parents of 12-month-olds agreed more on the occurrence of physical aggression than parents of 24- and 36-month-olds. Levels of parental disagreement were not different for boys and girls. Most research on parental agreement has focused on children aged 2 years or older (e.g., Christensen et al., 1992; Stanger & Lewis, 1993) and our results about corresponding age groups (mothers reporting more aggression than fathers) are consistent with findings of previous research. The disagreement between mothers and fathers regarding children's physical aggression may be because the relationships mothers and fathers have with their children are

different, and as a result mothers and fathers are commenting on different behaviors of their children (Hudziak et al., 2003). Additionally, as all mothers in our sample were primary caregivers, they are likely to be more involved in taking care of their children. They may thus be more aware of the problem behaviors of their children and report these behaviors more than fathers do (Christensen et al., 1992). Several studies have provided evidence for the notion that only a small part of the disagreement between mothers and fathers can be attributed to rater bias (Hudziak et al., 2003; Ostrov et al., 2005). To our knowledge, agreement between parents concerning the behavior of children as young as 12 months of age has never been investigated. The higher level of agreement in this age group may be due to the lower prevalence rates of aggressive behavior at this early age. Further research is needed to address this issue. Additional studies using observational data as a possibly more valid and objective measure are needed to further clarify the level and nature of parental agreement on child aggressive behavior.

Limitations and recommendations

Although the results of our study are clear, some limitations should be taken into account. First, although the PASEC contains clear-cut behavioral descriptions of aggressive acts, it is difficult to have parents reliably rate the behavior of their children. Some behaviors, such as rough-and-tumble play, may mistakenly have been interpreted as aggressive and may be merely developmental precursors of aggression. Observation of physical aggression using a clear operationalization of the behavior that also includes behavior that can be distinguished from motor immaturity, play, and exploration may be a more valid method to assess physical aggression in children. However, a large-scale study such as the current one will be more difficult to set up using observational methods.

The Time 1 response rate of our study was 52%. Although almost half of the families did not return the questionnaire, this percentage falls well within the normal range of response rates in survey studies (Baruch, 1999). The educational level of the parents in our study was relatively high. This may be because the questionnaire booklets we sent to the families were rather time-consuming. Nagin and Tremblay (2001) found that low parental educational level is a risk factor for the occurrence of physical aggression in children. As a result, the rates of aggression reported in our study are possibly an underestimation of prevalence rates in the general population. This, in combination with the fact that our sample was very homogeneous (due to exclusion of non-Caucasian families and families where the primary caregiver was not the mother), restricts the generalizability of the study.

Moreover, there were some differences between the families in our subsamples and the remaining Time 1 sample, with the latter generally consisting of lower educated parents, less families with two biological parents, less parents born in the Netherlands, and children with somewhat higher mother-rated aggression scores. These differences did not have an effect on differences between age groups, because results regarding this issue were comparable for the different samples. However, contrary to our results from the Time 1 samples, no informant and sex differences in the rate of physical aggression were found in the longitudinal sample. This may be because the longitudinal sample was

comparatively small. The effect sizes reported for the Time 1 samples concerning the results on informant and sex differences may be too small to be statistically significant in small samples. In addition, the differences between families in the longitudinal sample and families for whom follow-up data were not available for the selected age ranges of the child at Time 2 (higher parental educational level and both biological parents more often present in the longitudinal sample) may account for the different results. Nevertheless, the longitudinal development that we described is in line with the cross-sectional results regarding age differences. Replication of our findings is however necessary before firm conclusions can be drawn.

The alpha coefficients for the physical aggression questionnaire were moderate for the 12-month-olds (.67 for both parent reports). Apparently, the questionnaire is not as reliable for this age group as it is for the other age groups. Rating physically aggressive behaviors of 12-month-old children may be more challenging than rating these in older children. However, the stability of aggression in 12-month-olds was significant and our findings regarding the development of physical aggression were in line with previous research (e.g., Tremblay et al., 1999, 2004).

Conclusion

The current study showed that physical aggression occurs in children as young as 12 months of age. In addition, sex differences in physical aggression are clearly present in 24- and 36-month-olds. Our study provides more insight in the normative development of physically aggressive behavior in young children, which shows a peak around the age of 3. At that age, parents and other caregivers may consider low to moderate occurrence rates of physical aggression in their children to be normative. Between the ages of 3 and 4 years, the rate of physical aggression declines. The results of this study may contribute to the decision-making process regarding the timing of interventions aimed at preventing chronic development of aggression.

