



PAPER

Infants' unprovoked acts of force toward others

Audun Dahl

Department of Psychology, University of California, Santa Cruz, USA

Abstract

Infants harm others at higher rates than older children and adults. A common explanation is that infants fail to regulate their frustration, becoming aggressive when they do not get what they want. The present research investigated whether infants also use force against others without provocation, for instance because they seek to explore the consequences of hitting or try to pet someone using too much force. Two studies with infants aged 11 to 24 months investigated infants' use of force against others in everyday life using maternal report (Study 1) and direct observation (Study 2). In both studies, a large proportion of infants' acts of force were unprovoked and occurred without signs of infant distress. Unlike provoked acts, unprovoked acts showed a decrease late in the second year and were positively associated with reports of infant pleasure-proneness. The presence of unprovoked acts of harm may reflect that infants' actions are not reliably guided by an aversion for harming others and may provide unique opportunities for early moral development.

Research highlights

- It is typically assumed that infants hit, bite, and kick others more often than older children because infants are unable to peacefully regulate their frustration.
- This research shows that a large proportion of infants' acts of force toward others occur without provocation and without signs of distress.
- Unprovoked acts of interpersonal force constitute a distinct category of interpersonal force in infancy, having different age trends and temperamental correlates from provoked acts of force.
- Experiences with unprovoked force may strengthen children's growing understanding of how their actions affect others.

Introduction

Why do infants hit, bite, and kick others at higher rates than older children and adults? (Côté, Vaillancourt, LeBlanc, Nagin & Tremblay, 2006; Hay, 2005) The most common explanation is that infants harm others because

they are poor at regulating their frustration (Berkowitz, 1989; Bloom, 2013; Hay, 2005; Loeber & Hay, 1997; Vitaro & Brendgen, 2005): When family members frustrate infants, for instance by taking away a desired object, infants sometimes (though not always) lash out in anger. In this view, children gradually stop resorting to force as they get better at regulating their frustration (Kopp, 1982). A key – yet uninvestigated – implication of this standard explanation is that infants do not hit, bite, or kick others without a provocation leading to frustration.

A contrasting hypothesis states that many of infants' forceful acts against family members are unprovoked and result from neither frustration nor provocation. If so, the standard frustration-based explanation would fit some forceful acts, but leave other forceful acts unexplained. The present research investigated this hypothesis.

In general, interpersonal force can serve motives other than frustration. When hitting another person, children could be exploring the social consequences of hitting ('Will she get mad?') or seeking the person's attention (Brownell & Hazen, 1999; Dunn & Munn, 1985). Indeed, older children sometimes harm others in order to dominate or get objects – actions called *proactive*, as

opposed to *reactive aggression*¹ (Feshbach, 1964; Vitaro & Brendgen, 2005; Vitaro, Gendreau, Tremblay & Oligny, 1998). Hence, the mere use of force is not by itself indicative of frustration – an examination of the circumstances of forceful acts is necessary.

Past research on infant interpersonal force has not addressed whether infants' forceful acts are usually provoked. One line of research has studied the development of forceful acts during conflicts (Caplan, Vespo, Pedersen & Hay, 1991; Hay, Waters, Perra, Swift, Kairis *et al.*, 2014; Hay, Hurst, Waters & Chadwick, 2011), which by definition excludes unprovoked acts. Other studies have used caregiver reports of instances of hitting or biting, but without asking about the circumstances (Côté *et al.*, 2006; Tremblay, Nagin, Séguin, Zoccolillo, Zelazo *et al.*, 2004). Hence, past research on infant forceful acts has not indicated whether infant acts of force are usually provoked and accompanied by distress or, alternatively, whether forceful acts also occur without provocation.

Indirect and anecdotal evidence suggests that infants do use force without provocation. For instance, although only 15% of mothers reported clear signs of anger at 6 months, about 70% of mothers in a British sample said that their child pulled people's hair (Hay, Perra, Hudson, Waters, Mundy *et al.*, 2010). With reference to 15-month-olds, Bridges (1933) wrote that 'attacks [against others] are indulged in at this stage for their own sake and are not out-grown till well after two years of age' (p. 48). In informal interviews preceding this research, the mother of an 18-month-old said: 'She tends to get very excited when she's playing with myself or my husband and then she'll suddenly get really excited and she'll give us a big whack in our face . . . then we'll take her hand and tell her nicely, "Jessica no, that hurts". She might go right back to doing it.' However, no past studies have systematically investigated infants' unprovoked use of force.

The second year is a transition period in the development of forceful acts. Infants' anger and force toward others during conflicts emerge in the second half of the first year (Caplan *et al.*, 1991; Eckerman, Whatley & Kutz, 1975; Hay *et al.*, 2011; Sternberg & Campos, 1990).

¹ This article does not describe infants' use of force as 'aggression'. 'Aggression' is typically defined as acts done with *intent to harm*, which is difficult or impossible to assess in infants (Hay, 2005; Parke & Slaby, 1983; Tremblay, 2000). Correspondingly, this article uses the dichotomy of 'provoked force' and 'unprovoked force' rather than common dichotomies of aggression, such as reactive versus proactive aggression or hostile versus instrumental aggression (see Gendreau & Archer, 2005). Proactive or instrumental aggression are attempts to achieve goals such as dominance or possession by causing harm. Insofar as infants in the present research use unprovoked force, it would not be possible to ascertain that they are intending to harm nor that they are seeking dominance, property, or some other reward by causing harm.

Most 1-year-olds, but few 6-month-olds, react with anger and physical force when a peer takes an object away from them (Caplan *et al.*, 1991; Hay *et al.*, 2010; Hay, Nash & Pedersen, 1983). During the first half of the second year, the average rate of physical force roughly doubles (Dunn & Munn, 1985; Hay, 2005). In the remainder of the second year, some report a continued increase (Dunn & Munn, 1985; Tremblay *et al.*, 2004), while others report a temporary decrease (Hay, 2005). One possible explanation for differences in reported age-trends is that forceful actions in the second year are a heterogeneous category, comprising both provoked and unprovoked acts.

The main goal of the two present studies was to investigate whether a substantial proportion of everyday infant acts of force are unprovoked and not accompanied by distress. Study 1 used maternal descriptions of forceful acts. Study 2 used direct observation of naturally occurring interactions in the home, thereby overcoming the potential reporting biases present in Study 1. This research focused on interactions in the home, where most infants spend a large amount of their waking time. Possible contextual variability will be further discussed in the General Discussion.

Study 1: Maternal reports

Methods

Participants

Mothers of 74 infants (33 female, 11.1–24.0 months, $M_{\text{age}} = 16.6$ months) were recruited from a participant database in a large metropolitan area in the western United States. Sixty-four percent were non-Hispanic Caucasian, 6% were Asian American, and the remaining participants were of another ethnicity or mixed. Families were mostly upper middle-class families living in a large metropolitan area in the western United States.

Procedures

Participants returned consent forms and a demographics questionnaire by mail. Mothers participated in a structured phone interview about various aspects of their infants' lives. As part of the interview, mothers were asked to describe a recent situation in which their child harmed someone else.

Data coding

A coder coded the maternal descriptions from the audio recordings and a second coder coded 20% of the data to

assess interrater agreement. (Cohen's Kappas are listed in parentheses after each code.) The following aspects were used (see Table 1): presence of force to another person's body ($\kappa = 1.00$), type of act ($\kappa = .78$), purposefulness of force ($\kappa = 1.00$), provocation ($\kappa = .61$), presence of child distress ($\kappa = .81$), and target of the child's forceful action ($\kappa = .86$).

Results

Situations described by six of the mothers did not mention the infant applying force to another person's body (e.g. because the mother intervened before the infant was able to apply force). These situations were not analyzed further.

Among the remaining 68 situations, infants' use of force was described as unprovoked in 76% of situations, provoked in 21% of situations, and accidental in 3% of situations. As shown in Figure 1, infant distress was significantly more likely in provoked (64%) than unprovoked situations (4%), Fischer's exact test: $p < .001$.

For completeness, the target and nature of the forceful acts are also reported: The most common target of the forceful actions were parents (69% of situations), followed by siblings (15%), other (12%), and pets (4%). Infant force was coded as biting (28%), hitting with hand (26%), hitting with object (9%), shoving (3%), and 'other' (32%).

Table 1 Coding categories

| Aspect | Definition | Codes | Examples of each code |
|--------------------------|---|--|---|
| Studies 1 and 2 | | | |
| Force | Event involved the application of abrupt force to another person's body | <i>Forceful</i> | C. hits mother C. bites sibling |
| Type of act | The motoric nature of the forceful act | <i>Non-forceful</i> <i>Biting</i> <i>Hitting w/ hand</i> <i>Hitting w/ object</i> <i>Shoving</i> <i>Other</i> | C. flails arms but does not hit – – – – – |
| Purposeful | Application of force was not accidental | <i>Purposeful</i> <i>Accidental</i> | C. looks at victim before hitting C. kisses parent's arm then bites C. knocks object off table onto pet C. runs into sibling without looking |
| Provocation | Application of force was preceded by a frustration of the C.'s desire | <i>Provoked</i> <i>Unprovoked</i> | C. is kept from toy, then hits C. hits sibling after sibling takes toy C. suddenly hits sibling |
| Distress | C. shows facial or vocal sign of distress | <i>Distress</i> <i>No distress</i> | C. walks over to parent and bites C. cries before hitting C. screams angrily while pulling hair C. shows no distress before hitting |
| Target | Who was the target (victim) of C.'s act of force? | <i>Parent</i> <i>Sibling</i> <i>Pet</i> <i>Other</i> | – – – – |
| Study 2 only | | | |
| Type of provocation | What type of provocation preceded the act of force? | <i>Physical obstruction</i> <i>Property conflict</i> <i>Other</i> | C. is picked up and carried away Mother blocks C.'s access to room Sibling pushes C. from computer C. tries to take sibling's toy Parent says C. can't have snacks Parent refuses to let C. watch TV |
| Type of unprovoked force | What kind of unprovoked use of force did the infant engage in? | <i>Exploration</i> <i>Miscalibration</i> <i>Other</i> | C. looks to parent after hitting C. simply picks up truck and hits sibling with it C. pets cat, but too forcefully C. hands object to parent so hard it hurts parent C. uses force as part of a game |
| Reaction to force | How did victim and others react verbally to forceful act? | <i>Pain (victim)</i> <i>Prohibition</i> <i>Gentle</i> | 'Ow! That hurts mommy' 'No, we don't hit!' 'Gentle touch!' |

Note C. = Child.

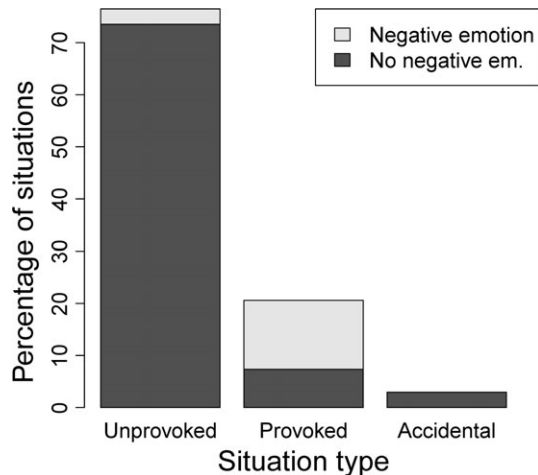


Figure 1 Study 1: Distribution of infant interpersonal force situations. Bars show percent of total number of situations involving unprovoked, provoked, and non-purposeful harm in which infants showed distress (dark gray) or no distress (light gray). For instance, the leftmost bar indicates that 73% of situations were unprovoked with no distress and 3% of situations were unprovoked with distress.

Discussion

In Study 1, maternal reports indicated that when infants purposefully use force against others, they often do so without visible provocation. This finding challenges the standard view that most or all of infants' acts of force are elicited by external provocation. Supporting the distinction between provoked and unprovoked use of force, distress was reported to accompany most provoked acts of force, but almost no unprovoked acts.

Study 2 used direct observations of everyday home interactions to corroborate and expand on the findings from Study 1. Direct observations overcome some of the limitations of maternal report. It is possible, for instance, that mothers in Study 1 sometimes forgot, or failed to notice, what provoked the infants' act of force. In addition, direct observations allowed for distinctions among categories of unprovoked force. Specifically, to better understand why infants use unprovoked force it is important to distinguish between when infants were exploring the social consequences of their forceful actions (explorative force) and events when infants tried to pet someone but used too much force (miscalibrated force).

Study 2 also included additional ways of validating the distinction between provoked and unprovoked force. First, provoked and unprovoked force were hypothesized to have different temperamental correlates. Since many unprovoked acts of force presumably reflect a pursuit of pleasant experiences (e.g. exploration), the frequency of unprovoked acts was hypothesized to correlate with

parental reports of pleasure-proneness but not of anger-proneness (Goldsmith, 1996). In contrast, the provoked acts of force were expected to be associated with anger-proneness but not pleasure-proneness. To investigate this, parents participating in Study 2 were asked to fill out a temperament questionnaire.

Second, provoked and unprovoked force were expected to show different developmental trajectories. During the second year, infants' empathic capabilities grow more robust and infants increasingly try to relieve others' distress (Hoffman, 2001; Zahn-Waxler, Radke-Yarrow, Wagner & Chapman, 1992). In unprovoked situations, when infants' inclinations to use force may be weak, merely noticing that force causes pain and being empathically concerned with preventing others' may be sufficient to stop. Therefore, it was hypothesized that the frequency of unprovoked acts of harm would decrease toward the end of the second year. In contrast, in provoked situations, infants are likely highly motivated to use force. Thus, infants' provoked force may not decrease until they acquire the additional linguistic, cognitive, and emotional skills to peacefully regulate their frustration (Calkins, 2007; Kopp, 1982). Moreover, infants' increasing demands for autonomy may increase the rate of conflicts, and hence provocations, over the course of the second year (Forman, 2007; Rijt-Plooi & Plooi, 1993). Hence, provoked acts of force were expected to increase throughout the second year.

Finally, direct observations allowed for assessment of others' reactions to infants' use of force. Anecdotal evidence from Study 1 indicated that family members reacted strongly when infants used force against others, providing infants with potentially valuable information about how their actions affected others. In Study 2, assessment of reactions to force allowed for verification that the coded forceful actions were serious enough to warrant negative reactions from others.

Study 2: Naturalistic observations

Methods

Participants

Twenty-six families with an infant aged 14 months (11 female) were recruited to participate in a naturalistic home observation study. All infants had at least one older sibling. Sixty-three percent of parents were non-Hispanic Caucasian, 19% were Asian American, and 19% were of African-American, Hispanic, other, or mixed ethnicity. Seventy-seven percent of caregivers had a college degree and 29% had a graduate degree. Most

families were middle-class families living in a metropolitan area in the western United States.

Procedures

Families participated in a 2.5-hour videotaped home visit when the target child was 14 months ($N = 26$), 19 months ($N = 24$), and 24 months ($N = 22$). To keep the context of the observations somewhat similar, the mother and one sibling were required to be present for the visit. At the first visit, mothers completed a demographics questionnaire. At the third visit, mothers completed the Toddler Behavior Assessment Questionnaire (TBAQ), which asks mothers to rate their infants on 120 items assessing 11 scales (Goldsmith, 1996). Only the anger and pleasure subscales were analyzed (see above).

Families were told that the study was about infants' everyday experiences and that they should do whatever they would normally be doing during the time of observation. The observer videotaped the child's activities. If the child applied force to another person's body, the observer electronically logged the event using an iPod Touch (Apple Inc.). When in doubt, observers were instructed to log the event so that a final decision could be made from the videotapes. Observers were trained, using videotapes from pilot observations, until they logged at least 80% of situations logged by the author.

Data coding and analysis

Coders coded the logged situations from the video tapes in the lab. Coders identified actual force in 84% of situations logged. Reliability for the coding of the videotapes was assessed by having a second coder code 20% of the data. (Cohen's Kappas are listed in parentheses after each code.)

Study 2 used the coding categories used in Study 1: presence of force ($\kappa = .71$), type of forceful act ($\kappa = .80$), whether act was purposeful ($\kappa = .83$), whether act was provoked ($\kappa = .70$), presence of child distress ($\kappa = 1.00$), and identity of victim ($\kappa = 1.00$). In addition, the following three additional aspects were coded (see Table 1): nature of the provocation (if provoked, $\kappa = 1.00$), type of unprovoked force (if unprovoked, $\kappa = .73$), and response elicited by others ($\kappa = .79$).

To analyze the frequency of interpersonal force events as a function of child age and temperament scores, Generalized Linear Mixed Models (GLMMs) with Poisson error distribution and logarithmic link function were fitted with random intercepts for children. To analyze the presence of particular aspects (e.g. child distress), GLMMs with binomial error distribution and logistic link function were fitted. Hypotheses were tested

using likelihood ratio tests (Hox, 2010). Preliminary analyses revealed no significant effects of child gender, so this variable was not included in the final model.

Results

Distribution of interpersonal force events

Coders noted 171 instances of a child using interpersonal force (mean rate: 0.95 situations/hour, inter-quartile range [IQR]: 0.40–1.20 situations/hour). All infants who participated in three visits used force at least once.

Forty-nine percent of situations were unprovoked, 43% were provoked, and 8% were accidental (Figure 2). Among infants who participated in three visits, 82% had at least one unprovoked force event. Mean Spearman correlations between per-visit frequencies was .14 for unprovoked acts and .20 for provoked acts. Mean correlation between provoked and unprovoked acts was .08.

Also as in Study 1, the presence of infant distress was far less common in unprovoked situations (1%) than in provoked situations (36%), binomial GLMM: $D(1) = 31.63$, $p < .001$. Study 2 corroborated evidence from Study 1 that a large proportion of infants' forceful actions are unprovoked and not accompanied by signs of frustration.

A main purpose of Study 2 was to assess the specific contexts of infants' acts of force. The most common type of unprovoked situation was explorative force (e.g. seeking attention, 49% of unprovoked situations), while

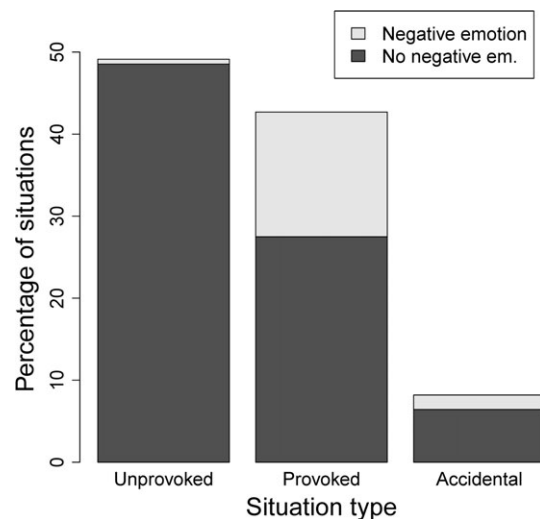


Figure 2 Study 2: Distribution of infant interpersonal force situations. Bars show percent of situations involving unprovoked, provoked, and non-purposeful harm in which infants showed distress (dark gray) or no distress (light gray).

37% of unprovoked situations were classified as miscalibrated force (e.g. petting dog too hard), and the remaining 14% were coded as other. Fifty-one percent of provoked events pertained to physical obstruction (e.g. holding child back), 29% pertained to property conflicts, and 20% pertained to other provocations (e.g. refusing to give child what child wants).

For completeness, the target and nature of the forceful acts are also reported: Siblings were the most common victims of infants' interpersonal force (56%), followed by parents (31%), pets (11%), and other (2%). The most common force types were hitting with hand (31%) and hitting with object (25%), followed by kicking (12%), shoving (9%), and biting (8%). Fifteen percent of situations were classified as other (e.g. pulling hair).

Distinct predictors of provoked and unprovoked force

Another purpose of Study 2 was to investigate whether provoked and unprovoked acts were differentially associated with child age and temperament. As predicted, the frequency of unprovoked acts showed a curvilinear relation to child age, Poisson GLMM: $D(1) = 8.30$, $p = .004$ (Figure 3). The mean per visit frequency of unprovoked acts of force was 0.85 at Visit 1, 1.42 at Visit 2, and 1.27 at Visit 3. Also as predicted, the same model showed a significant, positive relation between TBAQ pleasure score and frequency of unprovoked acts, $D(1) = 8.77$, $p = .003$,

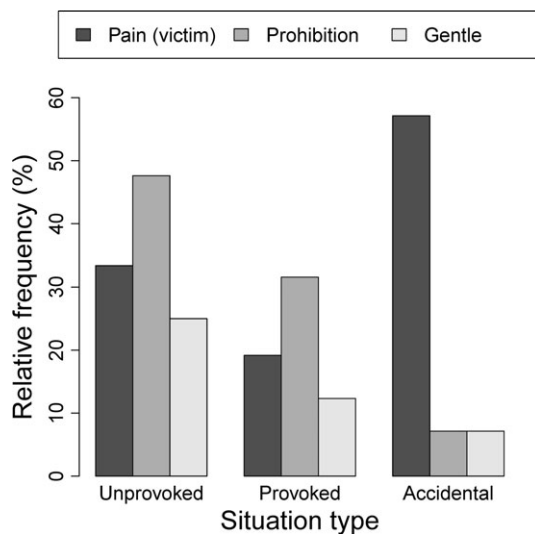


Figure 3 Study 2: Relation between child age and frequency of unprovoked and provoked acts of force per visit. Dashed lines show predicted values from a local polynomial regression fitting (Loess, span = 1). Solid lines show fitted values from Poisson GLMMs with random intercept for child and fixed linear and (unprovoked only) curvilinear effects of age.

but no significant relation between TBAQ anger score and unprovoked acts, $D(1) = 0.90$, $p = .34$.

In contrast, there was a positive relation between infant age and provoked acts of force, $D(1) = 9.34$, $p = .002$. The mean per visit frequency of provoked acts of force was 0.65 at Visit 1, 1.13 at Visit 2, and 1.32 at Visit 3. There was no significant relation between provoked acts and TBAQ pleasure score, $D(1) = 0.005$, $p = .95$, or TBAQ anger score, $D(1) = 0.05$, $p = .82$. (There was a near-significant interaction between TBAQ anger score and child age in predicting the frequency of provoked force, as the relation between anger score and provoked force was more positive for older infants, $D[1] = 3.76$, $p = .05$.)

Reactions to forceful actions

A final purpose of Study 2 was to assess whether family members signaled disapproval of infants' forceful action. In 67% of situations, infants' forceful acts elicited negative verbal reactions from others: expression of pain by victim (29% of situations), prohibition (37%), or instruction to be gentle (18%). The probability of eliciting at least one such verbal reaction depended significantly on the type of situation, $D(2) = 10.00$, $p = .007$, being higher in the unprovoked force situations (79%) than in the accidental force situations (64%) and the provoked force situations (53%). As shown in Figure 4, all types of verbal reactions were more common in unprovoked than in provoked situations. However, references to pain were by far the most likely in the accidental force situations, whereas the other two types of verbal reactions were rare in such situations. (Situation by verbal reaction type interaction: $D(4) = 14.08$, $p = .007$.)

Discussion

Study 2 supported the general findings from Study 1: A substantial proportion of infants' acts of force against others were unprovoked and not accompanied by signs of frustration. As in Study 1, infant distress accompanied provoked force more often than unprovoked force, further supporting the distinction between the two categories of purposeful acts of force against others.

Study 2 also provided novel forms of evidence for the validity of the distinction between unprovoked and provoked force. Unprovoked force situations were more likely than provoked force situations to elicit expressions of pain from the victim, verbal prohibitions, and instructions to be gentle. The frequency of unprovoked situations showed a curvilinear relation with infant age, whereas the frequency of provoked situations generally increased throughout the second year. Finally, the

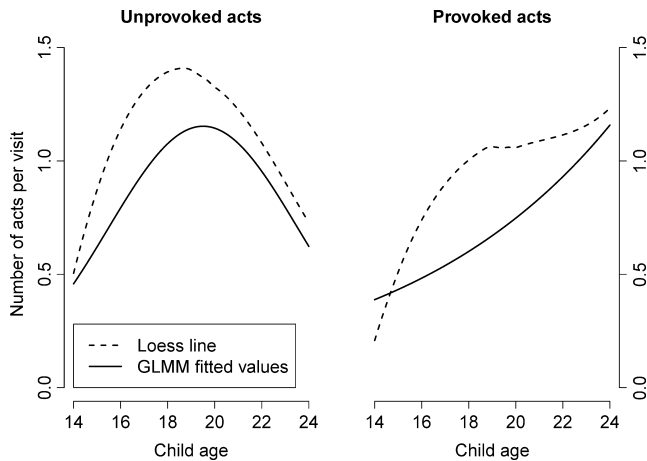


Figure 4 Study 2: Relative frequency of reactions as a function of situation type. Bars show the relative frequency of the three verbal reaction types (victim expression of pain, prohibition, instruction to be gentle) as a function of situation type (unprovoked, provoked, and accidental force). For instance, the leftmost bar indicates that 33% of unprovoked force situations elicited an expression of pain from the victim.

frequency of unprovoked situations, but not that of provoked situations, was positively associated with parental reports of children's pleasure-proneness. While rates of provoked acts were not significantly associated with anger-proneness, this hypothesized association seemed to emerge toward the end of the second year.

Most acts of force – especially unprovoked ones – elicited negative reactions from family members. These signals provide information to infants about how their actions affect, and are perceived by, others (Hoffman, 2001) and may contribute to the decline of unprovoked acts of force observed toward the end of the second year.

General discussion

Two studies, using different methods, showed that a large proportion of infants' forceful actions were unprovoked and not accompanied by distress. Most infants used unprovoked force at home. These unprovoked acts do not fit the standard, frustration-based explanation of infant acts of force (Berkowitz, 1989; Bloom, 2013; Hay, 2005; Loeber & Hay, 1997; Vitaro & Brendgen, 2005).

The distinction between provoked and unprovoked use of force was supported by several pieces of evidence. The basic distinction was made by deciding whether a purposeful use of force was preceded by a frustration of the infant's desire. This distinction was validated by evidence that infant distress was more common in provoked situations (both studies), unprovoked situa-

tions more often elicited reactions from others, and the frequency of the two types of situations showed different relations to infant age and parent-reported pleasure-proneness (Study 2).

Direct observations suggested that some unprovoked acts of force were forms of social exploration (seeking a reaction or attention), while other acts represented excessive force during otherwise acceptable actions (e.g. petting a pet too hard) (Brownell & Hazen, 1999). A lack of regulatory abilities likely contributes to high rates of provoked harm in infancy (Hay, 2005; Kopp, 1982), but this lack does not readily explain why infants use unprovoked force. Unprovoked situations contain no obvious motive for using force, and almost never included infant distress, minimizing the need for regulation of distress or forceful impulses.

The frequency of unprovoked force decreased in the second half of the second year. What makes infants stop using unprovoked force? There are at least two possible scenarios. One possibility is that infants initially do not care if they harm others. Although infants show growing sensitivity to others' distress, this sensitivity remains limited around the first birthday (Roth-Hanania, Davidov & Zahn-Waxler, 2011; Zahn-Waxler *et al.*, 1992). Mothers reported that 13- to 15-month-olds showed positive affect more often than empathic concern after causing distress to someone (Zahn-Waxler *et al.*, 1992). The decrease in unprovoked force late in the second year may result from an increasing sensitivity to distress (Svetlova, Nichols & Brownell, 2010; Zahn-Waxler *et al.*, 1992).

The second possibility is that infants want to avoid causing pain to others, but fail to realize that their biting, kicking, or hitting others causes pain. If so, the decline in unprovoked use of force may result from infants' gradually realizing how force affects others. Negative reactions to infants' acts of force, documented in Study 2, may help infants understand this causal relation. While this scenario remains a possibility, it is difficult to imagine how infants could be concerned with not harming others, yet be unaware that harm results from the application of force to another person's body.

To explain decreases in forceful acts it will be necessary to study infants' use of others' reactions to force. Unprovoked acts of force may engender particularly valuable learning experiences. Some of these acts may be attempts to seek reactions from others, representing a form of limit-testing (Dunn & Munn, 1985; Lamb, 1991). Moreover, unprovoked acts of force typically occurred without infant distress, making it easier to attend to signals of distress and prohibition from others. It might be harder for infants to learn from episodes when they are focused on their own frustration (provoked situations) or when the force was unintended (accidental situations).

This study did not investigate contextual variability in infants' use of force. Such variability is expected, both within and between individuals. For instance, infants may show different rates of unprovoked and provoked force during interactions with peers than during interactions with family members. Same-age peers could be more prone to provoke force in each other by snatching toys or using force (Caplan *et al.*, 1991). There may also be differences in rates of provoked and unprovoked force between communities, for instance due to different ways of reacting to infants' use of force. While some communities appear to ignore many of infants' forceful acts (Briggs, 1971; Rogoff, 2003), other communities encourage young children to respond forcefully to provocation (Miller & Sperry, 1987). Additional research using larger and more diverse samples is needed to investigate variability in the nature of and reactions to interpersonal force.

A number of studies have reported that infants' use of force is related to subsequent externalizing problems (e.g. Cummings, Iannotti & Zahn-Waxler, 1989; Keenan, Shaw, Delliquadri, Giovannelli & Walsh, 1998; Shaw, Owens, Giovannelli & Winslow, 2001). Since unprovoked force is shown by most infants, and may reflect neither anger nor intent to harm, it could be unrelated to subsequent aggressive tendencies. It will thus be important to distinguish between provoked and unprovoked force in future research on antecedents and predictors of childhood aggression.

The two present studies show that infants' use of force against others is more diverse than typically assumed. The findings supported the view that a large proportion of infants' acts of hitting, biting, and kicking others is not a result of poor regulation of frustration, but may reflect a desire for social exploration or a failure to realize when their actions cause pain to others. These acts were particularly common in the middle of the second year and may provide unique opportunities for the development of a basic aversion to harming others. Contextual variability in unprovoked force and in others' reactions to such acts are important topics for future work. Across such variability, children in most or all communities come to see it as categorically wrong to harm others without justification (Astor, 1994; Jambon & Smetana, 2014; Smetana, 2006; Smetana & Braeges, 1990). Explaining this development is a major task for research on early moral development.

Acknowledgements

This research was supported by a grant from NICHD (1R03HD077155-01) and the Amini Foundation for the Study of Affect, and fellowships from the Norway-

America Association, the UC Berkeley Institute of Human Development, and the Greater Good Science Center. I thank Celia Brownell and Nameera Akhtar for comments on previous versions of this manuscript.

References

- Astor, R.A. (1994). Children's moral reasoning about family and peer violence: the role of provocation and retribution. *Child Development*, **65** (4), 1054–1067. <http://doi.org/10.2307/1131304>
- Berkowitz, L. (1989). Frustration-aggression hypothesis: examination and reformulation. *Psychological Bulletin*, **106** (1), 59–73.
- Bloom, P. (2013). *Just babies: The origins of good and evil*. New York: Crown.
- Bridges, K.M.B. (1933). A study of social development in early infancy. *Child Development*, **4** (1), 36–49. doi.org/10.2307/1125836
- Briggs, J.L. (1971). *Never in anger: Portrait of an Eskimo family*. Cambridge, MA: Harvard University Press.
- Brownell, C.A., & Hazen, N. (1999). Early peer interaction: a research agenda. *Early Education & Development*, **10** (3), 403–413. doi.org/10.1207/s15566935eed1003_9
- Calkins, S.D. (2007). The emergence of self-regulation: biological and behavioral control mechanisms supporting toddler competencies. In C.A. Brownell & C.B. Kopp (Eds.), *Socioemotional development in the toddler years: Transitions and transformations* (pp. 261–284). New York: Guilford Press.
- Caplan, M., Vespo, J., Pedersen, J., & Hay, D.F. (1991). Conflict and its resolution in small groups of one- and two-year-olds. *Child Development*, **62** (6), 1513–1524. doi.org/10.2307/1130823
- Côté, S., Vaillancourt, T., LeBlanc, J.C., Nagin, D.S., & Tremblay, R.E. (2006). The development of physical aggression from toddlerhood to pre-adolescence: a nation wide longitudinal study of Canadian children. *Journal of Abnormal Child Psychology*, **34** (1), 68–82. doi.org/10.1007/s10802-005-9001-z
- Cummings, E.M., Iannotti, R.J., & Zahn-Waxler, C. (1989). Aggression between peers in early childhood: individual continuity and developmental change. *Child Development*, **60** (4), 887–895. doi.org/10.2307/1131030
- Dunn, J., & Munn, P. (1985). Becoming a family member: family conflict and the development of social understanding in the second year. *Child Development*, **56** (2), 480–492. doi.org/10.2307/1129735
- Eckerman, C.O., Whatley, J.L., & Kutz, S.L. (1975). Growth of social play with peers during the second year of life. *Developmental Psychology*, **11** (1), 42–49.
- Feshbach, S. (1964). The function of aggression and the regulation of aggressive drive. *Psychological Review*, **71** (4), 257–272.
- Forman, D.R. (2007). Autonomy, compliance, and internalization. In C.A. Brownell & C.B. Kopp (Eds.), *Socioemotional development in the toddler years: Transitions and transformations* (pp. 285–319). New York: Guilford Press.

- Gendreau, P.L., & Archer, J. (2005). The beginnings of aggression in infancy. In R.E. Tremblay, W.W. Hartup, & J. Archer (Eds.), *Subtypes of aggression in humans and animals* (pp. 25–46). New York: Guilford Press.
- Goldsmith, H.H. (1996). Studying temperament via construction of the Toddler Behavior Assessment Questionnaire. *Child Development*, **67** (1), 218–235. <http://doi.org/10.2307/1131697>
- Hay, D.F. (2005). The beginnings of aggression in infancy. In R.E. Tremblay, W.W. Hartup, & J. Archer (Eds.), *Developmental origins of aggression* (pp. 107–132). New York: Guilford Press.
- Hay, D.F., Hurst, S.-L., Waters, C.S., & Chadwick, A. (2011). Infants' use of force to defend toys: the origins of instrumental aggression. *Infancy*, **16** (5), 471–489. doi.org/10.1111/j.1532-7078.2011.00069.x
- Hay, D.F., Nash, A., & Pedersen, J. (1983). Interaction between six-month-old peers. *Child Development*, **54** (3), 557–562. doi.org/10.2307/1130042
- Hay, D.F., Perra, O., Hudson, K., Waters, C.S., Mundy, L. *et al.* (2010). Identifying early signs of aggression: psychometric properties of the Cardiff Infant Contentiousness Scale. *Aggressive Behavior*, **36** (6), 351–357. doi.org/10.1002/ab.20363
- Hay, D.F., Waters, C.S., Perra, O., Swift, N., Kairis, V. *et al.* (2014). Precursors to aggression are evident by 6 months of age. *Developmental Science*, **17** (3), 471–480. doi.org/10.1111/desc.12133
- Hoffman, M.L. (2001). *Empathy and moral development: Implications for caring and justice*. Cambridge: Cambridge University Press.
- Hox, J. (2010). *Multilevel analysis: Techniques and applications* (2nd edn.). New York: Routledge.
- Jambon, M., & Smetana, J.G. (2014). Moral complexity in middle childhood: children's evaluations of necessary harm. *Developmental Psychology*, **50** (1), 22–33. doi.org/10.1037/a0032992
- Keenan, K., Shaw, D., Delliquadri, E., Giovannelli, J., & Walsh, B. (1998). Evidence for the continuity of early problem behaviors: application of a developmental model. *Journal of Abnormal Child Psychology*, **26** (6), 441–452.
- Kopp, C.B. (1982). Antecedents of self-regulation: a developmental perspective. *Developmental Psychology*, **18** (2), 199–214.
- Lamb, S. (1991). First moral sense: aspects of and contributors to a beginning morality in the second year of life. In W.M. Kurtines & J.L. Gewirtz (Eds.), *Handbook of moral behavior and development. Vol. 2: Research* (pp. 171–190). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Loeber, R., & Hay, D. (1997). Key issues in the development of aggression and violence from childhood to early adulthood. *Annual Review of Psychology*, **48** (1), 371–410.
- Miller, P., & Sperry, L.L. (1987). The socialization of anger and aggression. *Merrill-Palmer Quarterly*, **33** (1), 1–31.
- Parke, R.D., & Slaby, R.G. (1983). The development of aggression. In P. Mussen (Series Ed.) & E.M. Hetherington (Ed.), *Handbook of child psychology, Vol. 4, Socialization, Personality and Social Development* (4th edn., pp. 547–641). New York: Wiley.
- Rijt-Plooij, H.H.C., & Plooij, F.X. (1993). Distinct periods of mother-infant conflict in normal development: sources of progress and germs of pathology. *Journal of Child Psychology and Psychiatry*, **34** (2), 229–245.
- Rogoff, B. (2003). *The cultural nature of human development* (reprint edn.). Oxford: Oxford University Press.
- Roth-Hanania, R., Davidov, M., & Zahn-Waxler, C. (2011). Empathy development from 8 to 16 months: early signs of concern for others. *Infant Behavior and Development*, **34** (3), 447–458. doi.org/10.1016/j.infbeh.2011.04.007
- Shaw, D.S., Owens, E.B., Giovannelli, J., & Winslow, E.B. (2001). Infant and toddler pathways leading to early externalizing disorders. *Journal of the American Academy of Child & Adolescent Psychiatry*, **40** (1), 36–43.
- Smetana, J.G. (2006). Social-cognitive domain theory: consistencies and variations in children's moral and social judgments. In M. Killen & J.G. Smetana (Eds.), *Handbook of moral development* (pp. 119–153). Mahwah, NJ: Lawrence Erlbaum Associates.
- Smetana, J.G., & Braeges, J.L. (1990). The development of toddlers' moral and conventional judgments. *Merrill-Palmer Quarterly*, **36**, 329–346.
- Sternberg, C.R., & Campos, J.J. (1990). The development of anger expressions in infancy. In N.L. Stein, B. Leventhal, & T. Trabasso (Eds.), *Psychological and biological approaches to emotion* (pp. 247–282). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Svetlova, M., Nichols, S.R., & Brownell, C.A. (2010). Toddlers' prosocial behavior: from instrumental to empathic to altruistic helping. *Child Development*, **81** (6), 1814–1827.
- Tremblay, R.E. (2000). The development of aggressive behaviour during childhood: what have we learned in the past century? *International Journal of Behavioral Development*, **24** (2), 129–141.
- Tremblay, R.E., Nagin, D.S., Séguin, J.R., Zoccolillo, M., Zelazo, P.D. *et al.* (2004). Physical aggression during early childhood: trajectories and predictors. *Pediatrics*, **114** (1), e43–e50. doi.org/10.1542/peds.114.1.e43
- Vitaro, F., & Brendgen, M. (2005). Proactive and reactive aggression: a developmental perspective. In R.E. Tremblay, W.W. Hartup, & J. Archer (Eds.), *Developmental origins of aggression* (pp. 178–201). New York: Guilford Press.
- Vitaro, F., Gendreau, P.L., Tremblay, R.E., & Oligny, P. (1998). Reactive and proactive aggression differentially predict later conduct problems. *Journal of Child Psychology and Psychiatry*, **39** (3), 377–385.
- Zahn-Waxler, C., Radke-Yarrow, M., Wagner, E., & Chapman, M. (1992). Development of concern for others. *Developmental Psychology*, **28** (1), 126–136.

Received: 20 January 2015

Accepted: 9 June 2015