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ORIGINAL ARTICLE

Prevalence of Aggressive Acts Among 1- to 5-Year-Olds in Norwegian Early Childhood Education and Care

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Abstract

This cross-sectional study explores the age-prevalence of teacher-rated aggressive acts among 1-to-5-year-old children ($N = 919$, 49.8% girls) enrolled in 20 Norwegian Early Childhood Education and Care (ECEC) centers. Perpetration of physical-, verbal-, relational-, and object-related aggressive acts towards peers was examined as well as victimization by using the same four types of acts. In the literature, such acts have been studied both using the concepts of aggression and bullying. The prevalence of all forms of aggressive acts was higher among the 2-year-olds than the 1-year-olds. In the second year of life, more than 50% of the children used physical aggression at least 2–3 times a month. In children aged 3 years and older, the age-prevalence of physical aggressive acts declined, whereas verbal and relational acts increased or stabilized. Destroying belongings of peers occurred at low rates in Norwegian ECEC centers. The age-prevalence curves and absolute percentage levels for victimization and perpetration were similar. Our results suggest a general picture of similarities between girls and boys rather than differences. Among the 1- and 2-year-olds, there were no significant gender differences in any of the four aggression types for perpetration and victimization. The prevalence rates for girls and boys in relational perpetration and victimization were similar across all age categories. A significant gender difference in the prevalence of physical aggression appeared in the 3-year-olds. More consensus in definitions and measurements is called for including more research on the relation between general aggression and bullying behavior.

Keywords Aggressive behavior · Prevalence · Age · Gender · ECEC, Early childhood

An important group of peer problems comprises behavior in which a child exposes other children to negative acts. These acts may be physical, such as kicking or pushing, or verbal, including mean words, name-calling, or threats. Other negative acts are, for example, behavior that excludes peers from play or attempts at damaging their relationships with others by telling lies or spreading rumors. Exposing others to negative acts is typically linked to the concepts of *aggression* and *bullying*.

The concept of *aggression* is usually understood as behavior intended to inflict injury or discomfort upon another individual (Berkowitz, 1993; Coie & Dodge, 1998). The term *bullying* is also defined as aggressive behavior, and the concept is mostly used if the negative acts are *intentional*, occur *repeatedly over time*, and there is a *power imbalance* between the perpetrator and the child being victimized (Olweus, 1993, 2013; Smith et al., 2002). Most researchers in the field regard bullying as a subcategory of aggressive behavior (Alsaker & Valkanover, 2001; Olweus, 1993; Salmivalli, 2010; Smith, 2014). In the literature, it has become common practice to distinguish studies of bullying behavior from studies based on the broader concept of aggression, often referred to as *general aggression*.

Peer-directed aggressive behaviors exist not only among school-age children, but can also be found in early childhood. Based on previous research, however, it is difficult to get a systematic overview of the *prevalence* of aggression including *all age categories* in early childhood, i.e., from 1 to about 6 years of age. While the prevalence of *physical* aggression in preschool children has been examined in large-scale population-based studies, in particular among 1- to 3-year-olds (Alink et al., 2006; Nærde et al., 2014;

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Tremblay et al., 2004), the sample sizes in studies examining *other* forms of aggressive behavior are usually smaller, and the children are older, i.e., within the age range of 4–6 years (Kupersmidt et al., 2000; Ladd & Profilet, 1996; Monks et al., 2021). Also, in studies examining the prevalence of children involved in peer bullying in early childhood, the youngest children are mainly 4 or 5 years of age (Alsaker & Valkanover, 2001; Ilola et al., 2016; Perren & Alsaker, 2006).

The aim of the present study is to investigate the prevalence of aggressive acts in children 1–5 years old enrolled in Norwegian ECEC centers including both perpetration of aggressive acts towards peers as well as being victimized by peers. The literary background for our study is broad and draws on findings based on the concept of aggression as well as the subcategory bullying. Being involved in aggressive interactions with peers represent a potential threat to children's health and wellbeing (Halpern et al., 2015; Perra et al., 2021). Aggression starting at an early age may persist over time and become stable aggressive behavior patterns including bullying (Coie & Dodge, 1998; Perra et al., 2021; Tremblay et al., 1999). Thus, detailed knowledge on the frequency of aggressive behavior among children in ECEC centers may increase our understanding of the phenomenon and inform future strategies for early prevention and intervention both for aggression and bullying.

The Concepts of Aggression and Bullying in Early Childhood

At the conceptual level, there seems to be a good deal of agreement among scholars on how aggression and bullying are defined. When it comes to applying these constructs in young children, however, scholars' agreement seems less clear. According to Bandura's social learning theory, children learn to use specific types of behavior by modelling significant persons in the home environment and by experiencing rewards for previous negative behavior (Bandura, 1973). Tremblay et al. (1999) challenge the common view that human aggression needs to be learnt and argue that physical aggression in very young children is a natural and partly inborn way of expressing negative feelings and solving conflicts. Children do not need to see models of physical aggression to start using this kind of behavior. Moreover, according to Tremblay and Nagin (2005), physical aggression in infants and toddlers should not be considered *intentional behavior* since these acts are more or less impulsive and driven by frustration, anger, or fear. Hence, the theoretical definition of physical aggression in their research refers to observable behavior such as pushing, kicking, and biting and *not* to the intentions of the person committing the aggressive acts. This view finds support in more recent studies of physical aggression (Alink et al., 2006; Nærde et al., 2014; Ribeiro & Zachrisson, 2019).

Others suggest, however, that intentions *may be* present in toddlers' aggressive behavior. Observational studies of children's conflicts with peers indicate that children under 2 years of age may use physical force in a proactive manner when, for example, defending toys, hitting, kicking, or grabbing objects from peers (Hay, 2017; Hay et al., 2011). In addition, studies suggest that proactive or goal-directed aggression can be observed in 3- to 4-year-olds (Murray-Close & Ostrov, 2009; Ostrov et al., 2019) and 3- to 6-year-olds (Evans et al., 2019). Also, a recent study, using video observations and interviews of 3- to 5-year-olds, indicates that intentions are present in children's interpretation of their *own* aggressive acts directed toward peers (Swit et al., 2024).

Although the concept of bullying has mainly been used in empirical studies of school aged children, there are studies of bullying behavior in ECEC centers indicating that this is also a useful concept in children 4 years and older (Alsaker, 2016; Alsaker & Valkanover, 2001; Camodeca et al., 2015; Ilola et al., 2016; Kirves & Sajaniemi, 2012; Perren & Alsaker, 2006). Using the term bullying in early childhood has been challenged, however. Because the victim role at this age seems less stable than in middle childhood and adolescence, Monks and colleagues (2002) argue against the use of the definition of bullying in early childhood. In a study of children aged 4 to 6 years, they have proposed to use the term "unjustified aggression" and not bullying for situations in which "a child or a group of children insult, hit, socially exclude, or threatens others without a motive" in this age group (Monks et al., 2002, p. 459). There are also others who prefer using other terms than bullying in early childhood, e.g., peer victimization (Lee et al., 2016). Moreover, some parents and teachers are hesitant to label very young children as bullies (Kovač & Cameron, 2024; Swit, 2018).

In the current study, due to the young age of the children, we decided to take a broad approach and study children's aggressive behavior in general. As explained, at the present state of knowledge, there are different views on the issue of intentionality in young children's aggressive behavior. Moreover, it is not clearly described yet to what extent some form of power imbalance may exist in infants' and toddlers' aggressive interactions with peers (Hawley & Geldhof, 2012; Ostrov et al., 2019). Therefore, we did not attempt to distinguish bullying behavior from *other types* of peer aggression in this study. Accordingly, the term bullying was not used in our measurement procedure.

Forms of Perpetration and Victimization in Early Childhood

Aggressive behavior between peers takes many different forms. In early childhood, most aggressive acts towards peers are overt or direct. These acts tend to occur in face-to-face situations involving open attacks on the target such as pushing, hitting, or verbal insults. Indirect aggression, on the other hand, requires a certain level of cognitive and social skills and is characterized by behavior that do not directly confront the target, such as gossiping or telling stories of others (Björkqvist et al., 1992; Lagerspetz et al., 1988).

Previous studies of infants and toddlers indicate that *physical aggression* is present in children as young as 1 year of age (Alink et al., 2006; Baillargeon et al., 2007a, 2007b; Nærde et al., 2014; Tremblay et al., 1999). Observations also suggest that individual differences in anger and physical aggression are present as early as in 6-month-old children (Hay et al., 2014). Before school entry, however, most children display alternative behavior to physical aggression (Tremblay, 2002). With increasing language skills, preschoolers may use *verbal aggression* to hurt their peers by making fun of them and by employing mean names or derogative words (Alsaker & Valkanover, 2001; Monks et al., 2021).

Previous studies also indicate that preschool children are capable of exposing peers to *relational aggression* (Crick et al., 1997) as well as relational bullying (Alsaker, 2016). According to Crick and Grotpeter (1995, 1996), relational aggression and victimization can be defined as behavior that damage social relationships, such as spreading secrets or lies, excluding peers from play, as well as threatening to end social relationships (Crick & Grotpeter, 1995; Grotpeter & Crick, 1996). Thus, these terms are used about relational aggressive acts occurring in both indirect and direct ways. Aggressive behavior in early childhood may also include *destruction of peers' property* (Alsaker & Valkanover, 2001). This type of behavior is far less studied than physical, verbal, and relational aggression. Most studies examining destructions of others' property usually regard them as instances of direct physical aggression (Achenbach & Rescorla, 2000; Alink et al., 2006). Although such acts can be regarded as a subcategory of general physical aggression, the consequences of using physical force to destroy peers' belongings are generally viewed as less serious compared to physical attacks on peers' bodies.

Prevalence of Children Involved in Aggressive Behavior in Early Childhood

Studies measuring the prevalence of perpetration and victimization in early childhood typically ask respondents to rate *how often* the negative acts have occurred. The response categories to these questions vary in both number and exact wording. The response format in studies of aggression/victimization in early childhood typically comprises three descriptive categories like "never," "sometimes," and "often" (Baillargeon et al., 2007a, 2007b; Tremblay et al., 2004) or 5-point Likert items (Crick et al., 1999). Prevalence studies of peer bullying on the other hand tend to use specific time-based response categories like "once a month" or "once a week" (Alsaker & Nagele, 2008; Ilola et al., 2016). Also, the criteria for classifying a child a victim/non-victim or a perpetrator/non-perpetrator varies, with some studies using strict cut-offs and others using more lenient ones. These differences represent important challenges for comparisons of prevalence rates across studies.

Types of Perpetration Across Age in Early Childhood

Both aggression studies and bullying studies report prevalence estimates based on various types of compound measures which divide children into different roles or types of involvement (Alsaker & Valkanover, 2001; Camodeca et al., 2015; Ilola et al., 2016). Nevertheless, prevalence data on the various *forms* of aggressive behavior in early childhood are mainly found within the general aggression literature.

Previous research on physical aggression in 1- and 2-year-olds is mainly based on parental reports. Thus, the main context for these observations is the family or other private settings in which children interact with family members, friends, or playmates. Studies of 1- and 2-year-olds' aggressive behavior in ECEC centers are very few. Reports from both parents (Alink et al., 2006; Nærde et al., 2014; Tremblay et al., 2004) and teachers (Ribeiro & Zachrisson, 2019) conclude that the frequency of physically aggressive behavior is at its highest during the second year of life. After 2 years of age, the prevalence of physical aggression declines with increasing age (Alink et al., 2006; Ribeiro & Zachrisson, 2019; Tremblay, 2002; Tremblay et al., 2004). This is most likely linked to increases in cognitive development and language skills, awareness of social expectations and norms, and greater ability to regulate oneself (Roberts et al., 2018). Only a small proportion of children (about 3–5%) maintain high levels of physical aggression from preschool years to adolescence (Tremblay, 2002). In a study from Canada, parents reported that almost 80% of 17-month-old children had used one or more forms of physically aggressive behavior sometimes or often (Tremblay et al., 1999). The prevalence varied with type of physical aggression, however. Taking away toys from others (70%) and pushing (46%) were considerably more prevalent than kicking (24%) and hitting (15%), for example (Tremblay et al., 1999). Also, a large-scale study of infants and toddlers in the Netherlands,

estimated that about half of all 1-year-olds and 80% of the 2-year-olds used some form of *physically* aggressive behavior, sometimes or often (Alink et al., 2006). Later studies in Canada, however, reported much lower prevalence estimates at 17 months of age (5% in boys and 1% in girls) using a scale of three low-prevalent physical acts (kicking, biting, and hitting) and the stricter cutoff point, *often* (Baillargeon et al., 2007a, 2007b).

Very few studies tend to report data on the frequency of *verbal* negative behavior separately. Rather, verbal and physical aggression have been combined into scales measuring direct aggression, and hence, little is known on age variations in verbal aggression in early childhood (Card et al., 2008). Based on teacher ratings, Kupersmidt and colleagues estimated that 29% of the 4-year-olds called names or teased other children (Kupersmidt et al., 2000). In a sample of 4- to 6-year-olds, using peer reports, Monks et al. (2005) found that verbal aggression comprised 22.4% of all aggressive nominations.

For *relational* aggression, there are several studies on pre-school children, but data on the frequency of aggressive acts are often reported for collapsed age groups (e.g., Crick et al., 1999). Longitudinal findings from Canada indicate that 4-year-olds use *indirect* aggression less than 6- to 10-year-olds (Vaillancourt et al., 2007). Potential age differences in relational aggression may be related to the acquisition of more sophisticated use of language and social cognitive skills replacing physical acts with relational aggressive acts (Björkqvist et al., 1992; Brittain & Vaillancourt, 2024). According to a systematic review, however, it is very difficult to draw meaningful conclusions about potential age variations in the prevalence of relational aggression due to the large differences in scales employed (Swit & Slater, 2021).

Types of Victimization Across Age in Early Childhood

There is little empirical data available on different forms of victimization in 1- to 3-year-olds, and studies of preschool children covering two or more age categories tend to report prevalence rates for all age groups combined. Thus, using cross-study comparisons to summarize age variations in the prevalence of victims is not possible. Both aggression researchers and bullying researchers report prevalence data by combining the various forms of victimization into compound measures or overall categories of victims. Nevertheless, there is more data available on *types* of victimization in the aggression literature than in the bullying literature.

An early study of peer victimization, using *self-report*, indicated that 16% of the 5- to 6-year-olds experienced physical victimization in kindergarten. Corresponding figures for direct and indirect verbal victimization were 21% and 15%, respectively (Kochenderfer & Ladd, 1996). In a study of 4- to 6-year-olds, using peer reports, the largest proportion of nominations for being victimized was received for physical victimization, 34,4%. Verbal victimization constituted 27.7% of all victimization nominations and social exclusion 21.3% (Monks et al., 2005). Using a teacher rating measure of peer victimization in preschool children (3–5 years old), Crick and colleagues reported that 29% were victimized relationally and 31% physically (Crick et al., 1999). It should be noted that the percentage base in these figures were all children involved in aggression and/or victimization and not the total sample of children. A study on bullying behavior in Finland estimated that 77.4% of the 4-year-olds were bullied physically by peers according to their parents. In comparison, 48.9% and 30.1% of the children experienced verbal and relational bullying, respectively (Ilola et al., 2016).

Gender Differences and Similarities in Type of Perpetration and Victimization in Early Childhood

Also, for gender differences and similarities across age in early childhood, most findings stem from the literature on general aggression. While there are several studies reporting significant gender differences in *physical aggression* towards peers in early childhood, there are inconsistencies regarding the age at which these differences emerge. On the one hand, there are large-scale studies in Canada reporting significant gender differences in the prevalence of mother-reported physical aggression toward peers as early as 17 months of age (Baillargeon et al., 2007a, 2007b). On the other hand, there are studies reporting *no* gender difference in 1-year-old children. The large-scale longitudinal study of 1- to 3-year-old children in the Netherlands found no gender difference in parent-reported physical aggression in 1-year-olds, but a difference occurred at 2 years of age (Alink et al., 2006). Also, an observational study of children's use of physical force during conflicts with peers reported no gender differences among children less than 2 years, whereas in children 2 to 3 years, the rate of using physical force was significantly larger in boys than in girls (Hay et al., 2011). In children 4 years and older, however, the findings are much more consistent, and several studies report that boys' use of physical aggression is significantly larger than for girls (Crick et al., 2006; Kupersmidt et al., 2000; Monks et al., 2021; Ostrov et al., 2004; Swit, 2019). A similar result pattern is found in verbal aggression towards peers (Monks et al., 2005).

For *relational aggressive behavior*, findings on gender differences in pre-school children are inconclusive. While there are studies concluding that girls use more relational aggression than boys (Crick et al., 2006; Krygsman & Vaillancourt, 2019; Ostrov et al., 2004; Swit, 2019), there are

also studies reporting no gender difference in relational aggression (Kupersmidt et al., 2000; Monks et al., 2021). Gender differences were not addressed in the recent systematic review of relational aggression in early childhood comprising 106 studies with a mean age of participants ranging from 34 to 95 months (Swit & Slater, 2021). These differences were addressed, however, in a meta-analytic systematic review of direct and indirect aggression in children under 18 years of age, concluding that girls enact significantly more indirect aggression than boys (Card et al., 2008). The magnitude of the gender difference, however, was described as "negligible." Notably, studies of early childhood were not well represented in this review.

A study of bullying behavior in 5- to 7-year-olds reports significantly higher scores in physical and verbal bullying in boys than in girls. Also, destroying peers' belongings was more common in boys than girls. As for relational bullying, however, no significant differences were found (Alsaker & Valkanover, 2001).

Results on gender differences in physical *victimization* are not consistent across studies. On the one hand, there are studies concluding that boys are more physically victimized than girls (Crick et al., 1999), whereas others report no significant gender differences in physical victimization (Kochenderfer & Ladd, 1996; Monks et al., 2005). Similarly, there are studies concluding that girls are more often relationally victimized than boys (Crick et al., 1999), whereas other studies find no gender difference in relational victimization, i.e., being excluded by peers (Kochenderfer & Ladd, 1996; Ladd & Profilet, 1996; Monks et al., 2005). Inconsistent findings are also reported for verbal victimization with some studies reporting no significant gender differences (Kochenderfer & Ladd, 1996), while others report significant gender differences (Monks et al., 2005). A study examining bullying in 4-year-olds indicated that girls were just as likely as boys to be verbally and relationally victimized. Boys on the other hand were significantly more likely than girls to be bullied physically (Ilola et al., 2016).

ECEC Centers in Norway

Children in Norway have a legal right to attend an ECEC when they are 1 to 5 years old before starting compulsory education in the year they turn six. After childbirth, Norwegian parents receive 1 year of paid parental leave, and most children are enrolled in ECEC centers when they are 1 year. Often, there are mixed age classes comprising 1- to 3-year-olds, and then, children move to larger classes with children aged 3 to 5 years during the fall in the year they turn 3 years of age. There are also other ways of allocating children to classes, however, and some ECEC centers prefer to mix children 1–5 years in the same class, whereas others may choose to have only same-age children in their classrooms. In 2022, about 88% of 1- to 2-year-old Norwegian children were enrolled in ECEC centers with a corresponding figure of 97% for the 3- to 5-year-olds (Statistics, 2022). ECEC centers in Norway may be both public and private, and both are subsidized with public money. The Kindergarten Act states that ECEC centers should have at least one employee per three children when they are younger than 3 years, and one employee per six children when they are 3 years and older (The Norwegian Kindergarten Act, 2022). Moreover, at least one teacher per classroom must have a degree in early childhood education. The remaining staff, however, comprises assistants where secondary school may be the highest level of education.

The Present Study

The high attendance rate in Norwegian ECEC centers provide a unique possibility to examine aggressive interactions between peers in early childhood. Using baseline data from a non-randomized study evaluating an intervention to prevent and handle bullying in Norwegian ECEC centers, the main aim of the present study was to estimate the prevalence of perpetrators and victims of aggressive acts among 1- to 5-year-old children in ECEC centers from two medium sized Norwegian municipalities. Drawing on the work by Alsaker and colleagues, we examined four types of aggressive acts, that is, *physical* and *verbal*, *relational* (i.e., excluding peers from play) and *object-related* (i.e., destroying peers' belongings) acts (Alsaker & Nagele, 2008; Alsaker & Valkanover, 2001). Due to the large developmental differences in such a wide age range of children (1–5 years), it was important to choose concrete and specific types of behavior that could be *observed* by teachers or caretakers in our measurement procedure.

At the current state of knowledge, we decided to take a broad approach and study children's aggression in general. In other words, we did not attempt to distinguish bullying from *other types* of aggressive behavior. As explained, there is little empirical data available on the *power imbalance* in children's aggressive interactions with peers in early childhood (Hawley & Geldhof, 2012; Ostrov et al., 2019). The power differential *and* the repetition aspect are generally regarded as the two most important criteria that distinguish bullying from general aggression (Hellström et al., 2021; Smith et al., 2002; Ybarra et al., 2014). As shown, however, the frequency aspect in children's aggressive behavior is *also* directly measured in aggression studies applying some form of rating procedure (Crick et al., 1999; Tremblay et al., 1999).

Choosing a broad approach was also important from a prevention and intervention perspective. Detecting *early* signs of aggression and victimization is emphasized in

programs designed to reduce aggression, bullying, and behavior problems in young children (e.g., Alsaker & Valkanover, 2001; Webster-Stratton et al., 2004). The general advice is to address *all types* of aggressive behaviors, and thus, the specific objectives of the study were to estimate potential age and gender differences in the prevalence of perpetrators and victims using the four types of aggressive acts.

Material and Methods

Participants

The participants in this cross-sectional study were 919 children aged 1 to 5 years enrolled in 20 Norwegian ECEC centers. The ECEC centers were recruited as part of a population-based non-randomized intervention study conducted in two medium sized municipalities in Western Norway. Baseline data on the children were collected before the intervention started. In the 20 included ECEC centers, data from 12 ECEC centers was collected in project year 1 (2017), 6 in year 2 (2018), and the remaining 2 in year 3 (2019). The data from the three cohorts of children were collected in the fall term these years and combined into *one* dataset.

ECEC centers in the two municipalities were invited to implement the Be-Prox program against bullying (Be-Prox; Alsaker & Valkanover, 2012) and recruited in collaboration with the local government monitoring the ECEC sector. Initially, 34 ECEC centers were invited and 25 agreed to participate. Of these, one ECEC center withdrew before the initiation of the data collection and one before the data collection was completed. Three ECEC centers were not included in the final analyses since they failed to provide data on the children's negative behavior (i.e., did not sufficiently fill in the questionnaires, were not able to collect parental consents, and/or did not return the completed questionnaires to the study team). In the 20 included ECEC centers, there were 1881 potentially available participants (48.6% girls). Of these, 684 were excluded due to lack of parental consent, yielding a sample size of 1197 participants (63.6% response rate). Due to missing data in the questionnaires on negative acts ($N = 278$), the final sample included data in 919 children (giving a response rate of 76.7% of all children with parental consent, and 48.9% of all potentially available children) (Fig. 1).

Ethics Approval and Consent to Participate

The study was conducted in accordance with the Declaration of Helsinki. According to the guidelines provided by the Norwegian ethical committee of Norway, ethical clearance was not deemed necessary due to the non-sensitive nature of the data. Data was handled according to applicable regulations and the Norwegian Data Protection (NSD) services recommended the study (ID 596228). For all included children, parents signed a written consent for the participation in the study. Teachers were informed about the project in letters to each ECEC centers and all agreed to fill in questionnaires on children's negative behavior.

Procedure

On entering the project in the fall term, the staff in each ECEC centers attended an introductory session on aggressive behavior and bullying among preschool children (Alsaker & Valkanover, 2001). The meaning of basic terms like aggression, bullying, and negative acts was explained in this session. Two to 3 months later, the questionnaires were handed out, and the ECEC centers received written guidance reminding them about discussions in the introductory session related to the questionnaire items on children's negative acts. The ECEC centers were instructed to fill in questionnaires on the *negative acts* for each child in staff meetings with all teachers present. Their task was to discuss and summarize how often each child had been victimized by peers (victimization) or had exposed peers to negative acts (perpetration) during the past 2–3 months. The questionnaires were collected and kept safe at the respective ECEC centers and handed over to the project team along with information regarding children's date of birth and gender after parental consent was received.

Measures

Types of Aggressive Acts

To measure aggressive acts, we used an adapted version of the eight item questionnaire from the *Pathways to Victimization* study (Alsaker et al., 2008), previously used to measure teacher-rated bullying behavior in Swiss kindergartens showing acceptable construct validity (Alsaker & Gutzwiller-Helfenfinger, 2010; Perren & Alsaker, 2006). In Alsaker and Valkanover's (2001) original questionnaire, the term bullying was used. In the questionnaire of the present study, however, the word bullying was replaced with the term *negative act.* It was explained to teachers that the term refers to actions causing discomfort or pain in other children—physically and/or mentally (Alsaker, 2016). Four items in the modified questionnaire tap negative acts conducted by the child as a perpetrator (i.e., exposing peers to negative acts), and four items tap acts experienced by the child as a victim (i.e., being exposed to negative acts by peers) (Table 1). The four items concerned negative acts

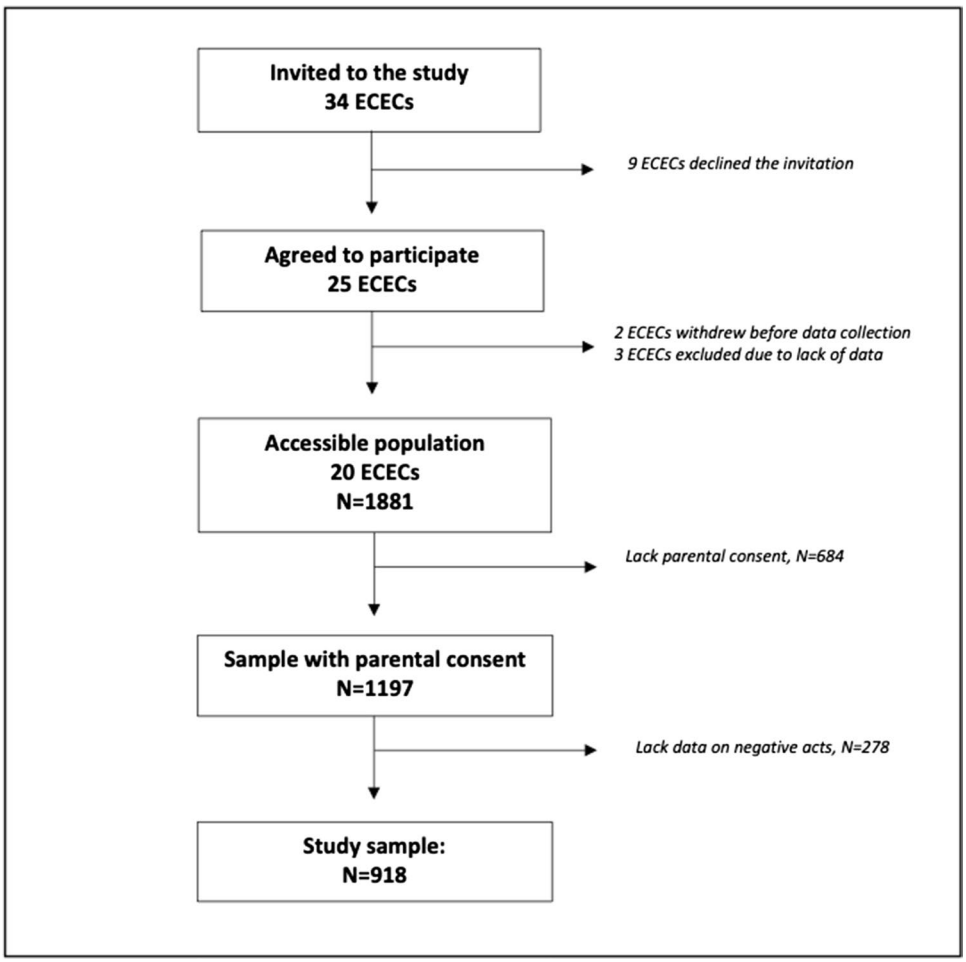


Fig. 1 Overview of the study sample

that were physical, verbal, relational (e.g., excluding others from play) and object-related (e.g., destroying others' belongings). Each item was scored on a 6-point scale ranging from 0 to 5: "never," "seldom," "once a month"; "2–3 times a month"; "once a week"; and "several times a week." The category "2–3 times a month" was added in the current study after suggestions from ECEC center teachers in an initial piloting of the questionnaire and thus differed from the original questionnaire. The time frame for all items was the past 2 to 3 months, starting in August after the summer vacation.

Age and Gender

We also collected information on date of birth and gender in the children. The age variable was constructed by combining children's date of birth with the time (year and month) by which the ECEC teachers answered the questionnaires on aggressive acts. The continuous age variable (varying from 8 to 71 months) was categorized into five groups: 1 year (8–23 months), 2 years (24–35 months), 3 years (35–47 months), 4 years (48–59 months), and 5 years (60–71 months).

Statistical Analysis

Statistical analyses were performed using SPSS version 29 (data management) and Stata version 17 (statistical analyses). Baseline data from the three cohorts of children were collapsed to one data set. For each of the eight items on aggressive acts, we estimated the prevalence rates of children involved in aggressive behavior using "2–3 times a month" as cut-off point. The response categories "2–3 times a month" and more often were collapsed and scored as 1, whereas the categories less than "2–3 times a month" were scored as 0, and presented as percentage (%) by age category (1–5 years) and by gender. In line with common practice in epidemiological studies, we calculated the *period prevalence* (Rothman et al., 1998) of aggressive acts since the questionnaire items refer to a time period of 2 to 3 months. In epidemiology, the period prevalence refers to the number of people in a population having a disease or other characteristic during a specified time period, divided by the total

Table 1 Questions on negative acts rated by teachers in 20 Norwegian Early Childhood Education and Care centers

How often did it happen during the last 2 to 3 months, that…	
Perpetration—exposing peers to negative acts	
Physical	The child exposes other children to physical negative acts (hits, kicks, pinches, bites…)
Verbal	The child exposes other children to verbal negative acts (laughs at, call names, teases, yells at or speaks in a derogative manner)
Relational	The child excludes other children from play
Object-related	The child has hidden or destroyed other children's property (also things that other children have made, for example drawings or something in the sandbox)
Victimization—being exposed to negative acts by peers	
Physical	The child was exposed to physical negative acts (hit, kicked, pinched, bitten)
Verbal	The child was exposed to verbal negative acts (laughed at, called names, teased, yelled at, or spoken to in a derogative manner)
Relational	The child was excluded from play by other children
Object-related	The child's property was hidden or destroyed (also things that the child had made, for example, drawings or something in the sandbox)

number of persons exposed to risk (Rothman et al., 1998). To estimate the difference in the prevalence between the age groups for the aggressive acts, we calculated risk differences (RD) using generalized linear models for the binominal family (binreg command in Stata). A positive RD value means increased risk, while a negative RD means decreased risk of displaying the negative behavior between age groups. Significant *p*-values for the differences between age-groups are depicted in footnotes to the relevant figures. Gender differences were estimated using chi-square.

Results

Demographic information of the 919 children included in the study is shown in Table 2. In 2017, a cohort of 478 children were included, 323 in 2018, and 118 in 2019. Of the participants, 49.7% were girls, and the mean (standard deviation [sd]) age was 3.5 (1.4), with 550 (62.1%) of the children aged 3 years and below.

Prevalence of Perpetrators by Age Group

The prevalence of children exposing peers to aggressive behavior "2–3 times a month" or more often (perpetration) is shown in Fig. 2. The prevalence of exposing peers to physical aggressive acts was significantly higher among the 2-year-olds (54.1%) compared to all other age categories (Fig. 2). Children in the age groups above 2 years exhibited less and less physical aggressive acts towards others, with the 5-year-olds being the group of children that showed least physical aggressive acts (14.6%) and significantly lower than all other age categories. Compared

Table 2 Demographic characteristics of 919 children from 20 Norwegian Early Childhood Education and Care centers

Demographic characteristic		Total sample		Girls		Boys	
		n		*n*	%	*n*	%
Cohorts							
	Fall 2017	478		240	50.2	238	49.8
	Fall 2018	323		161	49.9	162	50.1
	Fall 2019	118		56	47.5	62	52.5
		Mean (SD) age in years	*n*	*n*	%	*n*	%
Total sample		3.5 a(1.4)	919	457	49.7	462	50.3
	1 year (8–23 months)	1.6 (0.3)	156	65	41.7	91	58.3
	2 years (24–35 months)	2.5 (0.3)	188	86	45.7	102	54.3
	3 years (36–47 months)	3.5 (0.3)	206	114	55.3	92	44.7
	4 years (48–59 months)	4.5 (0.3)	171	74	43.3	97	56.7
	5 years (60–71 months)	5.4 (0.2)	164	97	59.2	67	40.8

[a]Missing data on age in 34 children

to the 1-year-olds, the risk of exposing peers to physically aggressive acts was reduced by 15 percentage points in 4-year-olds and 23 percentage points in 5-year-olds (both $p < 0.001$).

For verbal aggressive acts, the prevalence increased by age group from a prevalence of 12.3% in the 1-year-olds to 36.6% in the 5-year-olds (Fig. 2). Notably, the prevalence in the 1-year-olds was significantly lower than in all other age categories ($p < 0.001$), while the prevalence estimates were similar between the age categories from 3 up to 5. Excluding peers from play (relational acts) showed a similar prevalence pattern as for verbal acts. Destroying others' belonging was a low-prevalent act among the children (ranging from 5.6% to 13%), and although the prevalence pattern was similar to the physical aggressive acts, the differences between the prevalence estimates were non-significant (except for a 7.4% difference between the 2- and 5-year-olds, $p < 0.05$).

Prevalence of Victims by Age Group

For being victimized by aggressive acts from peers "2–3 times a month" or more often, the prevalence estimates primarily show the same patterns as for exposing peers. Half of the 1- and 2-year-old children (51 and 55.9%, respectively) were exposed to physical aggressive acts which is significantly larger than the other age categories ($p < 0.001$). For the 3 to 5-year-olds, there is a steady decline in the prevalence estimates, but the difference in these is only significant between the 3- and 5-year-olds (32.5% vs. 15.9%, $p < 0.001$) (Fig. 3). For being exposed to verbal aggressive acts and excluded from play, prevalence estimates increased from the 1- to 5-year-olds. One exception was a decrease between the 3- and 4-year-olds for verbal victimization, and then an increase from the 4- to 5-year-olds. The 1-year-olds is the age group with the lowest prevalence estimate for both these aggressive acts (17.7 and 11%, respectively). These estimates are significantly different from the other age groups, except for the 4-year-olds for verbal aggressive acts. Few children were reported to experience their belongings being destroyed (prevalence estimates ranging from 1.2 to 8.2%). The 1- and 5-year-olds were the groups with the lowest prevalence, and the prevalence among the 5-year-olds were significantly lower than the 2-, 3-, and 4-year-olds.

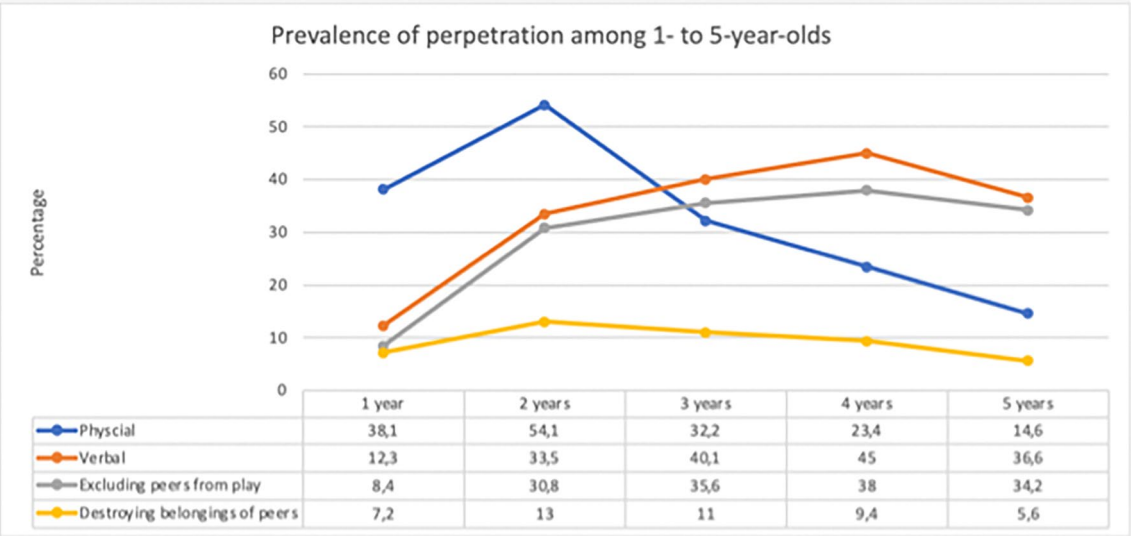
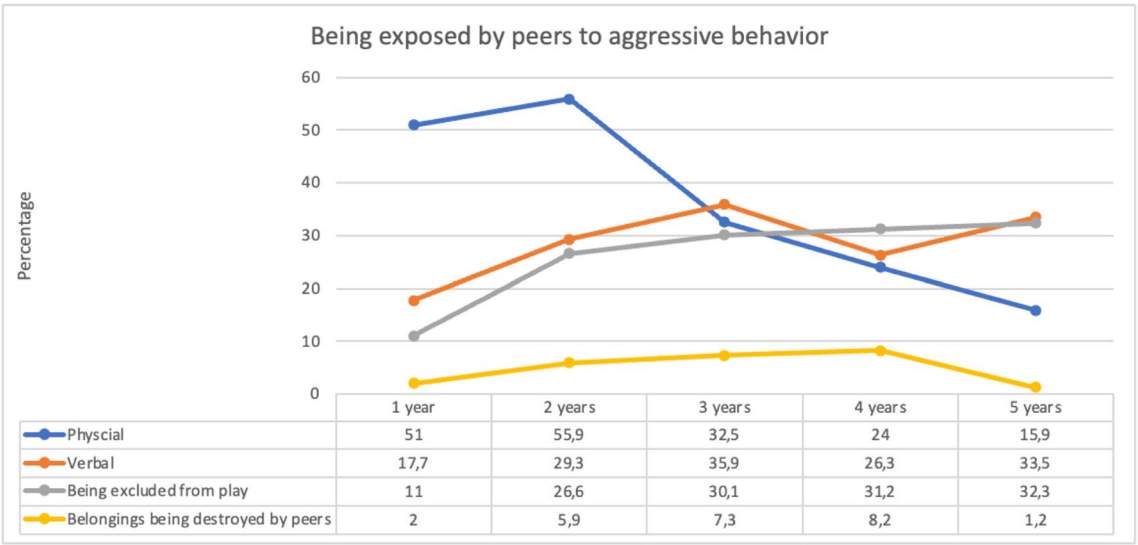


Fig. 2 Percentage of children across age using physical, verbal, relational, or object-related aggressive acts toward peers "2–3 times a month" or more often in Norwegian ECEC centers. Legend: 1 year = 1yr, 2 years = 2yrs, 3 years = 3yrs, 4 years = 4yrs, 5 years = 5yrs; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; p-values are retrieved through generalized linear models for the binominal family (binreg in Stata). Physical: 1-year-olds: < 2yrs**, > 3yrs**, > 4yrs **; 2-year-olds: > 1yr**, > 3yrs***, > 4yrs***, > 5yrs***; 3-year-olds: < 2yrs***, > 5yrs***; 4-year-olds: < 1yr**, < 2yrs***, > 5yrs*; 5-year-olds: < 1yr***, < 2yrs***, < 3yrs**, < 4yrs*. Verbal: 1-year-olds: < 2yrs***, < 3yrs***, < 4yrs***, < 5yrs***; 2-year-olds: > 1yr***, < 4yrs*; 3-year-olds: > 1yr***; 4-year-olds: > 1yr***, > 2yrs*; 5-year-olds: > 1yr***. Excluding peers from play: 1-year-olds: < 2yrs***, < 3yrs***, < 4yrs***, < 5yrs***; 2-year-olds: > 1yr***; 3-year-olds: > 1yr***; 4-year-olds: > 1yr***; 5-year-olds: > 1yr***. Destroying belongings of peers: 2-year-olds: > 5yrs*; 5-year-olds: < 2yrs*



	1 year	2 years	3 years	4 years	5 years
Physcial	51	55,9	32,5	24	15,9
Verbal	17,7	29,3	35,9	26,3	33,5
Being excluded from play	11	26,6	30,1	31,2	32,3
Belongings being destroyed by peers	2	5,9	7,3	8,2	1,2

Fig. 3 Percentage of children across age being victimized by peers using physical, verbal, relational, or object-related aggressive acts "2–3 times a month" or more often in Norwegian ECEC centers. Legend: 1 year = 1yr, 2 years = 2yrs, 3 years = 3yrs, 4 years = 4yrs, 5 years = 5yrs; $*p < 0.05$, $**p < 0.01$, $***p < 0.001$; *p*-values are retrieved through generalized linear models for the binominal family (binreg in Stata). Physical: 1-year-olds: > 3yrs***, > 4yrs***, > 5yrs***; 2-year-olds: > 3yrs***, > 4yrs***, > 5yrs***; 3-year-olds: < 1yr***, < 2yrs***, > 5yrs***; 4-year-olds: < 1yr***, < 2yrs***; 5-year-olds: < 1yr***, < 2yrs***, < 3yrs***. Verbal: 1-year-olds: < 2yrs*, < 3yrs***, < 5yrs***; 2-year-olds: > 1yr*; 3-year-olds: > 1yr***, > 4yrs*; 4-year-olds: < 3yrs*; 5-year-olds: > 1yr**. Excluding peers from play: 1-year-olds: < 2yrs***, < 3yrs***, < 4yrs***, < 5yrs***; 2-year-olds: > 1yr***; 3-year-olds: > 1yr***; 4-year-olds: > 1yr***; 5-year-olds: > 1yr***. Destroying belongings of peers: 1-year-olds: < 3yrs*, < 4yrs**; 2-year-olds: > 5yrs*; 3-year-olds: > 1yr*, > 5yrs**; 4-year-olds: > 1yr**, < 5yrs**; 5-year-olds: < 2yrs*, < 3yrs**, < 4yrs**

Prevalence of Perpetrators and Victims by Age and Gender

The prevalence of children exposing peers and being exposed by peers to aggressive acts "2–3 times a month" or more often from 1 to 5 years of age by gender is shown in Fig. 4.

Chi-squared tests for the difference between boys and girls for each age group are shown in Supplementary Table 1. For children younger than 3 years, and for verbal and relational acts, there are no observed differences between boys and girls. More boys than girls among the 3- to 5-year-olds exposed peers to physical aggressive acts (X^2 (1, $N = 206$) = 7.5, $p = 0.006$; X^2 (1, $N = 171$) = 9.18, $p = 0.002$ and X^2 (1, $N = 164$) = 13.57, $p < 0.001$ for 3-, 4-, and 5-year-olds, respectively) and destroyed peers belongings (X^2 (1, $N = 200$) = 5.61, $p = 0.018$; X^2 (1, $N = 171$) = 44.33, $p = 0.038$ and X^2 (1, $N = 162$) = 5.62, $p = 0.018$) (Fig. 4A and Supplementary Table 1). For being exposed to aggressive behavior, the difference between boys and girls only reach statistical significance for physical acts in children 4 and 5 years old (X^2 (1, $N = 171$) = 10.0, $p = 0.002$ and X^2 (1, $N = 164$) = 10.3, $p = 0.001$), and for verbal aggressive acts in the 4-year-olds (X^2 (1, $N = 171$) = 5.13, $p = 0.023$) where boys demonstrate more aggressive acts than girls (Fig. 4B and Supplementary Table 1).

Discussion

In the current study, we examined the prevalence of perpetration and victimization by peers using teacher ratings of four types of aggressive acts in a sample of 919 1- to 5-year-old children enrolled in Norwegian ECEC centers. The study is one of few providing year-by-year prevalence rates of aggressive behavior in children from 1 to 5 years of age. Detailed knowledge on the frequency of such acts across all age groups provide important and basic knowledge on which types of acts are most prevalent at each age level, increasing our understanding of children's development as well as informing prevention and intervention efforts in ECEC centers.

Age Variations in the Prevalence of Aggressive Acts

The prevalence of perpetration and victimization across age in our study varied with type of aggression. For *each type* of aggression, however, the shape of the prevalence curves for

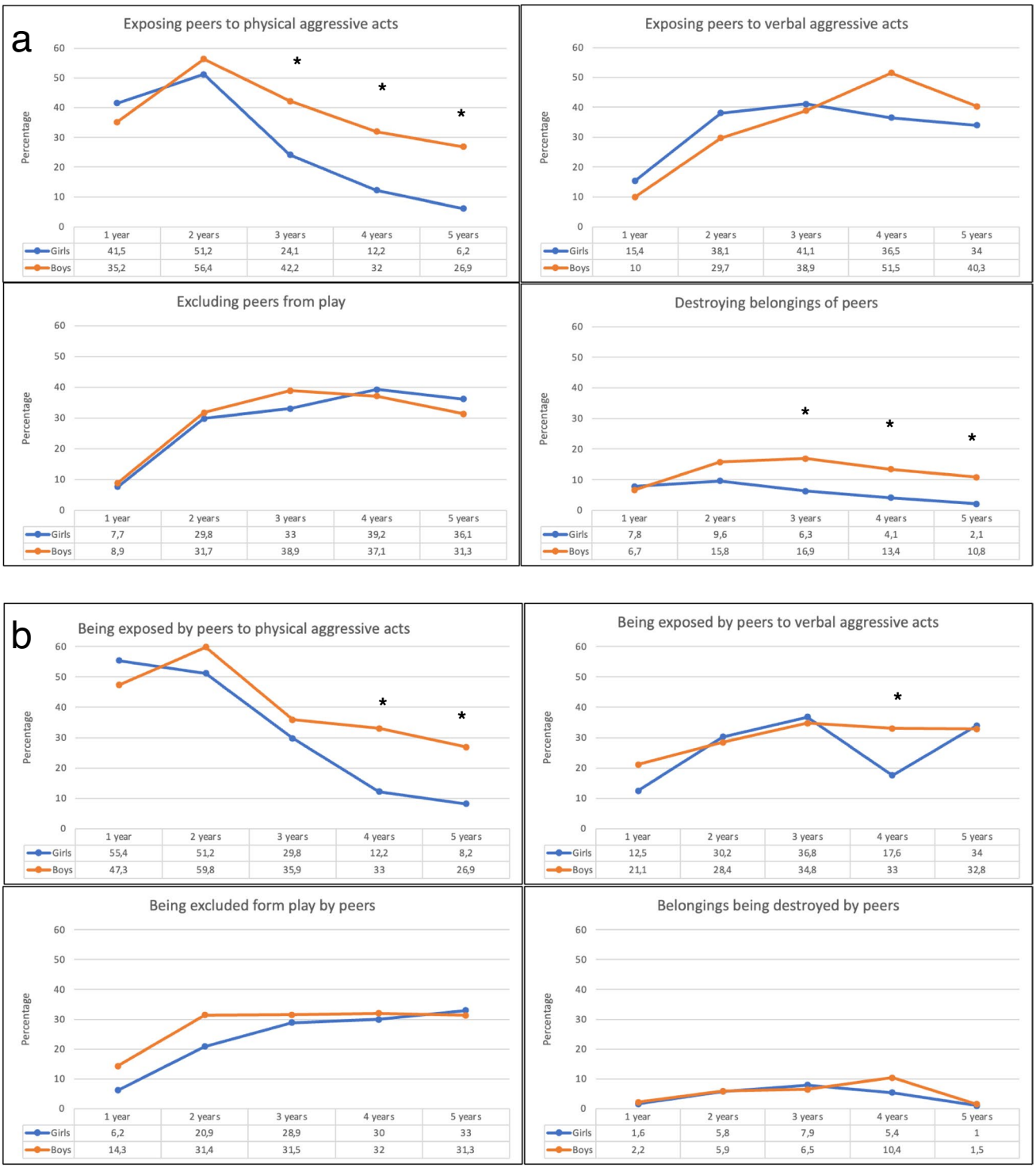


Fig. 4 Prevalence of children 1–5 years old in Norwegian ECEC centers by gender exposing peers (perpetration) (**a**) and being exposed by peers (victimization) (**b**) to aggressive behavior "2–3 times a month" or more often. Legend: $*p < 0.05$

perpetration and victimization across age was remarkably similar, also in terms of absolute percentage levels.

The prevalence curve for physical aggression was quite in line with previous research using parents as data source (Alink et al., 2006; Côté et al., 2006; Nærde et al., 2014; Tremblay, 2002). After an increase between 1 and 2 years of age, the prevalence declined in 3- to 5-year-olds. Although the age-prevalence curve for physical aggression resembled

that of other studies, the absolute percentage values in our data were lower than in studies from Canada (Tremblay et al., 1999) and the Netherlands (Alink et al., 2006). In 1-year-olds, for example, the prevalence was 38% in the current study, whereas it amounted to 52% and almost 80% in the Dutch and Canadian studies, respectively. In addition to differences in context (ECEC vs. private home) and data source (teachers vs. parents), there were several other differences between the studies. In the present study, physical aggression concerned only peers (i.e., not parents and siblings), different cut-off points were used ("2–3 times a month" vs. "sometimes") to decide involvement in physical aggression, and we used a single-item measure of physical aggression (including four specific examples of physical acts shown in parenthesis to this item), whereas the two other studies used an 11-item scale providing respondents with more examples of physical aggression. Notably, our results suggest destroying other children's belongings is a low prevalent phenomenon in Norwegian ECEC centers compared to direct physical attacks on peers. However, the age-prevalence curve for destroying things resembled that of physical attacks on peers.

The prevalence rates of both *verbal* and *relational aggressive acts* increased across age in the current study from about 8–12% in the 1-year-olds to about 34–36% in the 5-year-olds. It may be argued that due to developmental characteristics, such as the acquisition of language and social cognitive skills, it is too early to measure the prevalence of verbal and relational aggressive acts in children as young as 1 year of age. As expected, these acts were low-prevalent at this age in the current study and significantly lower than in all other age categories. It should be noted that the 1-year-old category comprised children from 8 to 23 months constituting children at very different developmental stages.

The decline in the prevalence of physical aggressive acts after 2 years and the comparable increase in verbal and relational aggressive acts may reflect normative development in early childhood. With increasing language skills, children become more able to express their frustrations and anger verbally (Roberts et al., 2018) and are less inclined to use physical acts (Tremblay & Nagin, 2005). The capacity to regulate negative emotions and conform to social norms are also important developmental tasks in this period (Di Maggio et al., 2016). Moreover, the increase in relational aggression with age might be linked to friendship formation and social dominance (Correia et al., 2022).

As already noted, the age-prevalence curves for perpetrators and victims were very similar in this study. This contrasts with self-report studies of school bullying, where, in primary grades the experience of being bullied usually is more prevalent than bullying others (Casper, 2021; Craig et al., 2009; Olweus, 1993). It may be argued that teachers are more objective observers than young children and therefore provide more reliable data. In that sense, it should be expected that the prevalence curves for perpetration and victimization should be similar in the present study. Moreover, it is the perpetrator who decides which forms of aggression are being used on specific occasions. The target or the receiver's experience is a direct reflection of the perpetrator's choice. Nevertheless, a single perpetrator may aggress against several children, and a single child may have several perpetrators. This illustrates the importance of assessing the prevalence of both perpetration and victimization in the same study.

Due to lack of research in 1- to 3-year-olds, the various forms of victimization in our study could only be compared with children 4 to 6 years old in other studies. To illustrate, Monks et al. (2005) report that 27.7% of the 4- to 6-year-olds were verbally victimized, whereas our study indicated a prevalence rate of 26.3% and 33.5% in 4- and 5-year-olds, respectively. The discrepancy in physical victimization was larger, however, with a prevalence of 34.4% in Monks and colleagues' study, whereas our study had estimates of 24% and 15.9% in 4- and 5-year-olds, respectively (Monks et al., 2005).

Gender Differences and Similarities in the Prevalence of Aggressive Acts Across Age

Overall, our results suggest a general picture of similarities between girls and boys rather than differences. In all four types of aggressive acts conducted against peers, there were no significant gender differences among the 1- and 2-year-olds. Also, the prevalence of being victimized by aggressive acts was similar in girls and boys in this age group. Thus, our data supports other studies also concluding that gender differences are not present in 1-year-olds (Alink et al., 2006; Hay et al., 2011; Perra et al., 2021), but tend to evolve gradually over early childhood (Hay, 2017). These findings, however, contrast with the Canadian studies reporting significant gender differences already at 17 months of age (Tremblay et al., 1999; Baillargeon et al., 2007b). Nevertheless, the high percentage of 1-year-olds involved in physical aggression as either perpetrators (38%) or victims (51%) in our study supports Tremblay and Nagin's assertion that physical aggression is a natural and inborn way of expressing negative feelings and solving conflicts in this period (Tremblay & Nagin, 2005). In contrast to our findings on 2-year-olds, previous studies on physical aggression conclude that gender differences appear in the first (Tremblay et al., 1999) or second year of life (Alink et al., 2006). It should be noted, however, that previous research is mainly based on reports from parents (Alink et al., 2006; Nærde et al., 2014; Tremblay et al., 1999) and not directly comparable

to the current findings. While parents mainly observe their children interacting with family members and friends at home or in the neighborhood, the ECEC context provides children with far more opportunities for interactions with peers. Moreover, adults in the ECEC centers may respond differently to aggressive behavior than adults in family settings, as suggested in a recent study where teachers in ECEC settings tended to intervene in young children's aggressive behavior more often than parents in familial social contexts (Swit, 2019). Hence, the difference in context could partly explain the contrasting findings with previous results, suggesting that the ECEC context can both affect the onset and the use of physical aggression in young children. This may also include verbal, relational, and object-related forms of aggression.

Our result of finding no gender difference in physical aggression in the second year of life may also have other explanations. On entering the project, the teachers received a form of training in the first session in which they had the possibility to discuss concepts and tasks with other employees. In the months to follow, it may have improved their observational skills before the questionnaires were filled in. The teachers in our study had also more options than parents in the Canadian and Dutch studies as the questionnaire on the frequency of negative acts contained six specific response alternatives compared to three in the other studies (Alink et al., 2006; Baillargeon et al., 2007a, 2007b; Tremblay et al., 1999). Our methodology may have captured similarities between the two genders which are not detected using a less detailed response format. Detecting null findings in this area is just as important as detecting significant differences.

Among the 3- to 5-year-olds in our study, we found significant gender differences in *physical aggressive acts* in all three age categories. At 5 years of age, about 27% of the boys used physical force against peers, whereas the corresponding figure for girls was 6%. Also, the prevalence of destroying peers' belongings in the 3- to 5-year-olds was significantly larger in boys than girls. These gender differences are in line with previous conclusions in the aggression literature showing that boys tend to enact more physical aggression than girls (Crick et al., 2006; Ostrov et al., 2004). Also, studies of bullying behavior in 5- to 7-year-olds report that boys have higher scores than girls in physical forms of bullying (Alsaker & Valkanover, 2001). It is noteworthy that gender differences in these studies are mainly analyzed using sample means, whereas we have used sample proportions.

As for *relational aggressive acts*, our data were clearly in accordance with previous studies reporting *no* gender differences in relational aggressive behavior in early childhood (Kupersmidt et al., 2000; Monks et al., 2021). In their meta-analytic review, Card and colleagues stated, however, that studies from early childhood were not well represented and that more primary studies in this age groups are needed (Card et al., 2008). The recent systematic review of relational aggression points to large differences in instruments used (Swit & Slater, 2021). As for the current study, it should be kept in mind that our item measuring relational aggressive acts does not distinguish between direct and indirect exclusions of peers. The same item was used by Alsaker and colleagues, and they found no significant gender difference in relational bullying in 5- to 7-year-old children (i.e., exposing peers to exclusions from play) in accordance with the current findings (Alsaker & Valkanover, 2001).

For *verbal aggressive acts*, except for 4 years old children, the overall findings were that of no gender differences. At 4 years, there were, however, significantly more boys than girls being exposed to negative verbal acts, which was also, although less marked, a finding for exposing peers to verbal negative acts at 4 years. Whether the current finding should be viewed as a spurious finding due to multiple comparisons or is reflecting a difference in behavior among 4-year-old boys and girls should be examined further in future studies.

Implications for Practice and Future Research

Our findings could guide future practice in several ways. The very clear downward trend in the prevalence of physical aggressive acts in both genders from 3 years of age could suggest an increased susceptibility to change in the youngest children. Hence, early interventions starting as early as 3 years to prevent early trajectories of peer-directed aggressive behavior could be called for. More than half of the 2-year-olds exposed peers to physical aggression. The high numbers suggest that aggressive interactions with peers for the youngest children may also comprise acts that can be considered normal reactions to frustrations, fear, or other developmental demands as Trembly and Nagin (2005) have asserted. On the other hand, it may blind us to important individual differences in young children if aggressive acts are mainly regarded as normative behavior (Hay, 2017; Perra et al., 2021). To prevent stable negative behavior patterns between peers to develop, it is important for teachers and other caregivers to monitor infants' and toddlers' aggressive acts in ECEC settings, including efforts to distinguish the early emergence of more serious negative acts from normative developmental trends. The magnitude of aggressive behavior at the level of the ECEC centers and the respective classrooms should also be monitored on a regular basis. A recent study found that the level of physical aggression increased in children having two or more aggressive peers in their classrooms (Ribeiro & Zachrisson, 2019). Instruments designed to assess the prevalence of aggressive behavior are not screening instruments, however, and

should be supplemented with instruments developed for other purposes.

For future research, it is evident that the knowledge base on peer-directed aggressive behavior in early childhood needs to be strengthened. More large-scale primary studies on the prevalence of aggressive acts in this age group are called for. This type of knowledge is useful for planning interventions in ECEC centers by revealing the magnitude of the problems and the demand for taking measures against aggressive behavior. To ease comparisons of prevalence estimates across studies, greater consensus in definitions and measurements are called for. More researchers in the field should look to epidemiological studies. Greater use of time- and calendar-based response categories, for example, would be one important step forward as they may leave less room for personal interpretations compared to categories like *sometimes* and *frequent*. Prevalence studies of aggressive behavior should also provide teachers and parents with information on the length of the timeframe or reference period when asking them to rate children's behavior. Thus, greater adherence to established rules in epidemiology may reduce some of the variability in prevalence estimates across studies. Moreover, in accordance with the definition of aggression and bullying, it is important to further explore in what ways children's *intentions* may be expressed in early childhood. To be able to distinguish bullying from general aggression, the concept of *power imbalance* in young children's relationships with peers should also be given more empirical attention using different sources of data. These aspects are difficult to measure, particularly in very young children. A recent study of 3-4-year-olds suggests, however, that there are reliable differences between general aggression and bullying behavior constructs (Ostrov et al., 2019). Although researchers in general aggression and bullying behavior represent somewhat different research traditions, joining forces could lead to increased understanding of these phenomena.

Strength and Limitations

Strengths of the study include the large sample size including children 1 to 5 years old, providing unique data on different forms of aggressive behavior in ECEC centers and the comprehensive time-based assessment both on victimization and perpetration. It cannot be ruled out that using only *one* data source may have affected the prevalence of aggressive acts in the present study. Nevertheless, previous research suggests that teachers are capable of providing reliable and valid information on children's aggressive behavior (Ostrov et al., 2004; Swit & Slater, 2021). It should also be noted that we used only *one* item per type of aggression, which may be considered a limitation to our study. Moreover, the ECEC centers in the present study were asked to fill in the questionnaire in meetings where all teachers were present allowing for discussions involving different views and perspectives. Filling in questionnaires in ordinary meetings may also be a limitation, however, if there are strong opinion holders among the staff. Teachers were instructed to summarize the frequency of specific negative acts observed between children in the past 2–3 months and not expected to make any inferences about the perpetrator's intentions or possible power imbalance in the relationship between the perpetrator and victim. Still, our time-based assessment provides the opportunity to evaluate aggressive behavior that occurs repeatedly (i.e., 2–3 times a month or more often). We did not systematically collect information on the number of teachers present when filling in the information on child behavior, nor do we have demographic information such as gender, age, and education, which could be considered a limitation to our study. The response rate in our study (76.7% of all children with parental consent; and 48.8% of all potentially available children) may question the generalizability of our data, and new large-scale studies are called for to confirm our findings. While Norway and other Nordic countries have a unified ECEC system covering all children aged 1 to 5 years, many other countries distinguish between childcare (0–2 years) and pre-school education (3–6 years). More research is needed to uncover if and to what extent such differences in context may have impacted the generalizability of the prevalence estimates from the current study. This also includes different systems for allocating children to classrooms, for example, the use of mixed age-classes versus same-age classes. Nevertheless, the fact that we have reported prevalence rates for each age category separately may facilitate comparisons with studies from other countries.

Conclusion

In a large sample of 1- to 5-year-old children in Norwegian ECEC centers, this study documented that the prevalence of all four types of aggressive acts increased from the 1-year-olds to the 2-year-olds. While after the second year of life, the age-prevalence rate of physical aggressive acts declined, verbal and relational aggressive acts remained stable or increased. Overall, we found few gender differences in our sample. The frequency of relational aggression and victimization in boys and girls was similar across all age groups. Also, the well-established gender difference in physical aggression did not appear until 3 years of age.

Abbreviations ECEC: Early Childhood Education and Care; RD: Risk difference; SD: Standard deviation

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s42380-025-00286-5.

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Author Contribution Mona E Solberg: conceptualization, funding acquisition, methodology, project administration, formal analysis, writing—original draft preparation. Francoise D. Alsaker: conceptualization, methodology, writing—review and editing. Jon Opsahl: data curation, validation, writing—review and editing. Mariann Eidsør: project administration, data curation, writing—review and editing. Ingrid Kvestad: conceptualization, funding acquisition, formal analysis, writing—original draft preparation.

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Data Availability The data that support the findings of this study are available upon reasonable request from the corresponding author.

Declarations

Ethics Approval The study was conducted in accordance with the Declaration of Helsinki. According to the guidelines provided by the Norwegian ethical committee of Norway, ethical clearance was not deemed necessary due to the non-sensitive nature of the data. Data was handled according to applicable regulations, and the Norwegian Data Protection (NSD) services recommended the study (ID 596228).

Consent to Participate For all children included, parents signed a written consent for the participation in the study.

Consent for Publication Not applicable.

Conflict of Interest The authors declare no competing interests.

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