Siblings and aggression

An exploration of the relationship between sibling constellations and aggression in four-year-olds.

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Abstract

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Despite an abundance of stereotypes about the power of sibling constellation factors, and clinicians expressed interest in the part siblings play in children's adjustment, the contribution of siblings to children's development of aggression has been a relatively neglected topic of research. The current study explores whether differences in structural features of the sibling constellation; the number, birth order, age spacing and gender of siblings, are related to differences in four-year-old children's levels of aggression. To inform such explorations, a diverse and disorganized literature on siblings, and findings from research on childhood developmental trajectories of aggression, are reviewed. The current study utilizes pre-collected data from a population-based longitudinal study, the Behavior Outlook Norwegian Developmental Study (BONDS), provided by The Norwegian Center for Child Behavioral Development. The BONDS sample included data from 1159 children recruited in three waves, in 2006-2008. Parental interviews where administered when target children were 0.5, 1, 2, 3 and 4 years old. The current study utilizes a subsample of 741 children and data from personal interviews with mothers (including a parent-completed questionnaire) when target children where 0.5 and 4 years old. At the 4 year interview, items from a physical aggression scale designed for the BONDS, and items from the aggressive behavior syndrome scale of the Child Behavior checklist VII for ages 1 ½ - 5 years, where used to obtain estimates of children's levels of aggression. Sibling constellation characteristics where recorded at both interviews. Potential covariates where obtained at the 6 month interview. MANOVA was performed for each of the three predictor variables; *number of siblings*, *birth order and age spacing* and *sibling gender*, to investigate their relationship with the two dependent variables *physical aggression* and *aggressive behavior*. ANOVA with post hoc tests were performed for statistically significant variables, and a hierarchical multiple regression analysis was performed to control for covariates. Results suggest, that on average, mother's reported low levels of physical aggression and aggressive behaviors. In contrast to popular stereotypes on birth order effects, after controlling for possible covariates, the presence of siblings, rather than constellation factors, was associated with slightly higher levels of physical aggression in target children. Such differences where not found for the aggressive behavior syndrome scale (CBCL), highlighting the importance of comparing measures of aggression.

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1 Introduction

Most children have siblings. Some are born a sibling with a wild bunch waiting for them when they arrive, others have enjoyed their parents undivided attention for a short (or long) while, before a new addition to the family brings the title of "big brother" or "big sister" along with it. So starts what for most children will be the longest relationships they will ever have. Siblings have a shared history that starts before the arrival of their partners or friends, and most will outlive their parents. Unlike friendships, children are not given an opportunity to choose who they want as siblings, they are simply handed them. Usually when parents decide they've had enough children, the sibling "constellation", which refers to structural features such as the birth order, age spacing, number and gender of siblings, is fixed (Edwards & Weller, 2011). Popular beliefs and stereotypes on how sibling constellation characteristics such as birth order, are linked to children's adjustment outcomes are abundant; with examples such as the middle-child being the most aggressive or last born children being more likely to rebel. Despite the potential impact such beliefs can have on people's understanding and perception of their own and others behaviors, little research has examined the validity of such beliefs.

Stuck in the sibling constellation they've been given, children are likely to spend more time in direct interaction with their siblings, than their parents or significant others. Sibling interactions have been found to be typified by greater emotional intensity than the behavioral exchanges that characterize other relationships (Dunn & McGuire, 1992). The share amount of time young siblings spend together and the emotional intensity of their interaction, provides plenty of opportunities for heated disagreements, were goals are frequently at odds and conflicts between their interests are bound to happen (Ram & Ross, 2001). There is an abundance of popular self-help books on the market, to help parents deal such sibling conflict and rivalry. However, armed with self-help books or not, parents' socialization efforts can be undermined and fall short, as siblings can be seen as a subsystem of the larger family unit, from which parents are typically excluded (Bullock & Dishion, 2002). In sum, it seems reasonable to suggest that siblings play a critical role in the socialization of children, and exert unique influence on their development of aggression. The theme of this final thesis, and the goal of the current study, is to investigate if four-year-olds with siblings on average are reported by mothers to display higher levels of aggression than children with no siblings. More specifically, the current study utilizes data from a population-based longitudinal study,

the Behavior Outlook Norwegian Developmental Study (BONDS), which was provided by The Norwegian Center for Child Behavioral Development, to explore if differences in structural features of the sibling constellation, namely the number, birth order, age spacing and gender of siblings, are related to differences in four-year-old children's levels of aggression.

1.1   Siblings – a neglected topic of research

Despite clinicians and family systems theorists' expressed interest in the part that siblings play in family relationships and in individuals' adjustment, the contribution of siblings to children's development, has been a relatively neglected topic in systematic research (Dunn 1992). One reason for this may be that researchers are discouraged by the share complexity of sibling-relationships and the numerous variables researchers need to juggle and disentangle in order to study them (Kluger, 2011). A simple demonstration of this complexity is that in a family of 3 children and 2 parents, there are 10 one-on-one relationships playing out at any one time. Despite this complexity however, pioneering studies highlighted a range of issues implicating siblings in the development of individual differences in children, but there was hardly a critical mass of consistent findings (Dunn, 2005). It should come as no surprise then, that a cohesive and comprehensive theory for sibling relationships and their influence on human development has not been developed. Instead, principles from theoretical approaches such as family systems and social learning theories have been used to account for the behavior of siblings, but have not been integrated into a cohesive framework (Caspi, 2012). However, recently psychologists have begun studying siblings as never before, slowly filling the voids in the academic literature, and the current study hopes to contribute to this task.

While the majority of recent research on siblings focuses on the sibling dyad and direct mechanisms of sibling influence on children's development, far less attention has been devoted to siblings as building blocks of the family structure, and how their constellation has implications for family dynamics (McHale, Updegraff & Whiteman, 2012). There is a further lack of knowledge about the potential indirect impact of sibling constellation characteristics on children's development of aggression. If number, age spacing, birth order and gender of siblings are related to higher levels of aggression in four-year-old children, then this could suggest that sibling constellation characteristics influence family dynamics in ways that have implications for children's development of aggression. Such findings would hopefully

encourage researchers to further investigate *how* sibling constellation characteristics indirectly influence children's development of aggression, and provide valuable entry points for such exploration. In order to find ways to maximize benefits of programs to prevent the development of behavioral problems, findings of this study may elucidate the importance of incorporating siblings in such efforts. Even though it is beyond the scope of this final thesis to investigate how sibling constellation characteristics potentially indirectly influence children's levels of aggression, theories about such indirect influences will be presented and discussed. In order to present a coherent rationale for the current study, and propose how differences in levels of aggression in four-year-olds could potentially be related to sibling constellation characteristics, an attempt is made to integrate a fairly diverse and rather disorganized literature on siblings. Before such an effort is made, research on the complex, multifaceted and changing nature of aggression in early childhood, a field of research that has gained far more attention and resources, will be explored.

1.2   Definitions – aggression in preschoolers

If scientist paid comparatively little attention to sibling relationships, the same cannot be said for research on the development of aggression. Much effort has been devoted to explore the development of aggressive behavior in children, yet the interpretation of this growing body of work is complicated by different definitions of aggression (Campbell et al., 2010). A wide range of definitions have been used, varying from narrow definitions such as physical aggression (e.g., Tremblay et al., 2004), to broader higher order definitions such as externalizing behavior, which can encompass both attention problems and aggressive behaviors such as temper tantrums ((Rescorla et al., 2012). To further complicate matters, externalizing behavior, according to factor analytic studies such as that of Achenbach and Edelbrock (1978), is a multi-faceted developmental phenomenon with differing indicators across time (Kjeldsen, Janson, Stoolmiller, Torgersen & Mathiesen, 2014). Recognizing the potential impact of how we define and measure aggressive behavior on research results, the current study seeks to compare two different definitions and corresponding measures of aggression.

The current study will primarily focus on *physical aggression*. Physical aggression seems at first glance rather straightforward to define and measure, as it involves physical behaviors such as kicking and hitting, which are easily recognizable to the observer. However, as Alink

et al. (2006) point out, there is little consensus about the definition of physical aggression, and in fact most studies of physical aggression do not provide a specific definition. Those who do include a definition are divided between those who include intent in this definition (e.g., Brook, Zheng, Whiteman & Brook, 2001) and those who don't (e.g., Tremblay et al., 2004, Nærde, Ogden, Janson & Zachrisson, 2014). There has been some debate about whether intent should be included in the definition of very young children's physical aggression. Alink et al. (2006) argue that intent is extremely difficult to assess. In young children, frustration, anger, or fear may be expressed physically, resulting in behaviors that are labeled as aggressive in older children regardless of intentionality. Tremblay (2000) stated that the criterion of intent is not necessary for the definition of physical aggression. The current study defines physical aggression in line with Nærde et al. (2014), as physical force against others in the form of observable behavior such as kicking, without any consideration of intentionality. Such a behavioral definition makes for ease of measurement.

The narrow definition of *physical aggression* as measured by a new physical aggression scale especially developed for the normative sample of preschoolers in the BONDS, will be compared to results found for the broader definition of *aggressive behavior* as measured by the aggressive behavior syndrome subscale of the widely used clinical scale, the Child Behavior Checklist VII for ages 1 ½ - 5 years (CBCL) (Aschenbach & Rescorla, 2000). The aggressive behavior syndrome scale is one of six syndrome scales of the CBCL, and refers to a set of behaviors that are empirically found to co-occur (DelCarmen-Wiggins & Carter, 2004). According to the CBCL, the broader concept of aggressive behavior includes both physical aggression such as hitting others, but also temper tantrums, manageability, irritability, attention seeking and lacking feelings of guilt (Aschenbach & Rescorla, 2000). In this respect, aggressive behaviors according to the CBCL, and physical aggression according to Nærde et al. (2014) are not two distinct separate forms of aggression, but rather two concepts that partly overlap. To illustrate this, and provide a complete overview of items, an inter-item correlation matrix is provided in appendix 1. It can be argued that the physical aggression scale, with seven answer alternatives, and all items targeting specific easily observable physical actions (e.g., hair pulling), with no consideration of intent, is a one-dimensional measure. In contrast, the aggressive syndrome scale of CBCL is multidimensional, and encompasses more abstract concepts such as intent, feelings and mood states, and has only three answer alternatives. The current study seeks to address the issue of how aggression in preschoolers is defined and measured, by exploring if sibling constellation

characteristics are related in a similar fashion to both the narrow concept of *physical aggression*, and the higher order definition of *aggressive behavior* according to the CBCL. If different relationships between sibling constellation characteristics are found for the two different forms of aggression, such findings may elucidate not only the importance of how aggression is defined for the study of aggressive development, but may provide novel clues to the particular aspects of aggression sibling constellation characteristics are related to. To elucidate the importance of specifically exploring aggression in four-year-olds, an attempt will be made to present two contrasting perspectives on the origin and early development of aggression, and how these have impacted research on child aggressive behavior.

1.3   The early development of aggression

A vast amount of research, which encompasses a large variety of broad theoretical perspectives and diverse disciplines, has focused on understanding the development of aggression and antisocial behavior (Granic & Patterson, 2006). To navigate in this vast array of research, the study of aggression in children will be divided into two main approaches that provide contrasting perspectives on the origin and development of aggression. First, research that focuses on how children learn aggressive behaviors, and second, studies that propose that aggression is partly inborn, and emphasize how children learn to inhibit aggression. In addition, ways in which siblings have been proposed to influence the development, increase and maintenance of child aggressive behaviors, in line with social learning theory and Patterson's coercion model will be presented and tied to sibling constellation characteristics. Finally, four-year-olds developmental status is located on a normative developmental slope for physical aggression, and challenges faced by this age group, tied to the use and inhibition of physical aggression, will be elucidated.

Studies inspired by Albert Bandura's *social learning theory* emphasize the influence of the social environment on the onset and development of aggression, and suggest that aggression is not inborn, but rather that repertoires of aggressive behavior must be learned through imitation and reinforcement (Bandura, 1973, cited in Alink et al., 2006). Multiple studies, most of which focused on preschoolers and school-aged children, have confirmed the role of social learning processes in the development of child aggression, and in the treatment and prevention of the expression of antisocial behavior (e.g., Webster-Stratton, Reid, & Hammond, 2004). Constellation factors such as birth order may indirectly influence

children's development of aggression, by impacting the degree to which a child imitates its sibling's aggressive behavior. Research has found that siblings imitate each other, and especially younger children imitate their older siblings rather than the reverse (Pepler, Abramovitch & Corter, 1981).

Inspired by social leaning theory, Gerald R. Patterson proposed a *coercion model* where children's aggression is a result of family-based reinforcement processes (1986). Based on the coercion model, he formulated a "sibling trainer hypothesis", which proposed that sibling relationships could provide a training ground for aggressive behaviors, and that in particular older siblings could act as "trainers" of aggressive behaviors. Through micro social analyses of observed reinforcement dynamics in sibling relationships of children with behavioral problems, Patterson found evidence of sibling fight cycles. In such cycles, coercive actions by for example an older sibling increasingly elicit coercive reactions from a younger sibling, which again elicited further coercive reactions and extended aversive exchanges. In such fight cycles, siblings increased the amplitude of their behavior until one sibling gave in to the other's demands, and consequently reinforced the use of aggressive behavior (Patterson, 1986). From this perspective, the presence of multiple, in particular older siblings could potentially provide children with more "trainers" to learn form and react to. Patterson's insights, initiated a line of research that has consistently demonstrated that younger siblings are at higher risk of developing problem behaviors if they grow up with an older sibling who engages in and promotes delinquent behaviors (e.g., Bank, Patterson & Reid, 1996; Conger & Rueter, 1996), and his findings continue to inform contemporary research on sibling influences on problem behaviors (McHale, Updegraff & Whiteman, 2012). It is important to note, however, that the majority of this research has utilized samples of children with high levels of aggressive behaviors, and compared these to non-aggressive groups, rather than utilizing large normative samples. From both a social learning perspective, and that of Patterson's coercion model, the presence of older siblings as role models can have both positive and negative impact on target children's development of aggression, depending on whether they model and reinforce pro- or anti-social behavior.

In contrast to classical social learning theory, Patterson's theory also describes the possibility that child aggressive behavior is biologically determined and reinforcement processes may result in maintaining or increasing this behavior (Patterson, 1982, cited in Alink et al., 2006). Based on the idea that aggression may be partly inborn, Tremblay was the first to initiate a

shift in focus toward investigating aggression in infancy and early childhood. According to Tremblay et al. (2004) physical aggression in infancy is a natural way of expressing anger, and as children grow older, most of them will learn to regulate this behavior. In support of this, research is consistent in showing that physical aggression such as pushing and hitting is both normative and quite frequent in early childhood. Most children seem to follow a pattern where they start to use physical aggression during infancy, aggression peaks during the second year of life, the "terrible twos") and they learn to use alternatives before they enter primary school (Nærde, Ogden, Janson & Zachrisson, 2014; Tremblay et al., 2004; Alink et al., 2006). A similar pattern has been found for the broader concept of externalizing behaviors (Kjeldsen et al., 2014). It is important to recognize that even if aggression is present early in life, this does not mean that aggressive behaviors cannot be learned later in life, and the mechanisms proposed by Bandura (1973), and the coercive interactional patterns proposed by Patterson (1986), may still be responsible for a persistence or increase of aggression after early childhood (Alink et al., 2006).

A decline in prevalence of aggressive behavior from the age of 3 years onward is consistent with theories regarding children's development and socialization (e.g., Kochanska, Coy, & Murray, 2001). By four years of age, children have started to internalize rules and values, develop a theory of mind, and become more empathic towards others (e.g., Wellman, Cross & Watson, 2001; Hoffman, 2001; Kochanska, Coy, & Murray, 2001). They are further helped along by the exponential growth in language skills that takes place in early childhood, which increases children's capacity to express their anger verbally, which might make them less likely to turn to physical aggression (Alink et al., 2006). Based on the findings that most children start to use physical aggression during infancy, Tremblay stated that researchers should focus on how children learn to inhibit physical aggression rather than on the process of learning how to act aggressively (Tremblay, 2002). If sibling constellation factors are related to differences in reported levels of physical aggression in four-year-old children, this may encourage future research to investigate if such factors indirectly facilitate or disrupt four-year-olds' attempts to learn how to inhibit physical aggression. Children who do not learn how to inhibit physical aggression during the preschool years, risk not being able to show the adaptive school functioning that is expected of them. Most four-year-olds will receive some form of structured schooling (e.g., preschool or kindergarten), and attending such a school setting will present children with increased social and self-regulatory demands (Mesman et al., 2009). This has led Tremblay to suggest that preschoolers are in a period of

life that is particularly appropriate for preventive interventions (Tremblay et al., 2004), further highlighting the importance of research on aggression in four-year-olds.

In sum, past research has been marked by a disagreement in whether aggression is partly inborn, or a result of social learning processes. This disagreement has dictated the focus of research, with one approach focusing on how children learn aggressive behaviors, and another on how children learn to regulate their inborn aggressive behaviors. While social learning theory focuses on how in particular older siblings provide younger siblings with behaviors to imitate and learn from, Patterson's coercion model highlighted the reciprocal nature of sibling relationships, where aversive behaviors can be responded to and retaliated, and evolve into fight cycles where aggressive behaviors are amplified, prolonged and reinforced. Sibling constellation factors, in particular the presence of multiple siblings, and older siblings, are proposed to influence both the amount of potential "trainers" of aggressive behaviors available, and increase the likelihood of such behaviors being imitated by the target child. Finally, research findings on the early development of aggression are consistent with theories regarding children's moral development and socialization, and suggest that four-year-olds are busy solving the developmental task of learning how to regulate their anger and use socially acceptable alternatives to physical aggression. The importance of successfully solving this task, suggests that four-year-olds are an age group that is particularly appropriate for preventive interventions, and highlights the importance of generating knowledge about the relationship between sibling constellation characteristics and aggression in four-year-olds.

1.4   Predictors of aggression in early childhood

Existing research is consistent in showing that gender differences in physical aggression emerge by the preschool years, with boys becoming significantly more aggressive than girls. (Hay et al., 2011; Hay, 2007). Côté et al. (2006) studied developmental trajectories of physical aggression from toddlerhood to pre-adolescence, and found that children who followed a high stable trajectory of physical aggression were more likely to be boys from low income families and from families where the mother had not completed high school. In addition, family stress (e.g., Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Kjeldsen et al., 2014) low social support (Mathiesen, Sanson, Stoolmiller & Karevold, 2009), and young motherhood (e.g., Kjeldsen et al., 2014) have been found to predict high levels of

externalizing behaviors in early and middle childhood. The current study will attempt to control for such potential covariates.

1.5   The presence of siblings

In the study of the relationship between sibling constellation characteristics and the level of aggression in four-year-old children, it is important to recognize the issue of time; just as aggression can change its form and expression over time, so can the quality and impact of the sibling relationship. Findings from research with older and younger samples may therefore not generalize to four-year-olds. Thus, exploration in the current study of the relationship between sibling constellation characteristics and levels of aggression in four-year-old children needs to be founded and guided by evidence on the nature of four-year-olds' sibling relationships.

Sibling relationships have been found to be particularly central to four-year-old children's social worlds (Stauffacher & DeHart, 2005). In the early years, children develop rapidly, and it seems reasonable to assume that corresponding changes in their language, social, emotional and cognitive skills change the nature of children's interactions and relationships with siblings. Brown and Dunn (1991) found that as later born children grow from two years to four, there is an increase in the contribution of the later born sibling to the dyadic relationship with an older sibling. By four years of age, later born siblings have become more assertive in sibling-relationships, and are more interesting companions for their older siblings with whom they now spend more time talking and playing, than with their parents. The increased amount of time four-year-old children spend playing and talking with their siblings, is likely to provide more opportunities for conflicts. Especially young siblings are notoriously known for spending a lot of time in conflict. In fact, Perlman and Ross (1997) found that on average siblings between the ages of two and four years old fight an astonishing 6.3 times per hour. Kramer, Perozynski and Chung (1999) found that sibling dyads, consisting of a 3- to 5-year-old second born child and a firstborn child who was 2 to 4 years older, on average engaged in approximately 2.6 extended conflicts per 45-minutes. It seems reasonable to assume that four-year-olds are likely to have their goals and interests come at odds with those of their siblings, and set the stage for disputes.

Ross, Ross, Stein, and Trabasso (2006) make the distinction between constructive and destructive conflict, describing *constructive conflict* as including resolutions of differing goals, an enhancement of interpersonal understanding and reasoning, and *destructive conflict* as characterized by hostile, unresolved behavior that undermines and damages relationships. Constructive conflictual encounters between siblings have been found to provide children with opportunities to learn how to tolerate negative affect (Katz, Kramer, & Gottman, 1992 cited in Kramer, Perozynski, & Chung, 1999), how to construct and set personal boundaries (Raffaelli, 1992), assert their own ideas (Shantz and Hobart, 1989, cited in Kramer, Perozynski, & Chung, 1999) and practice conflict resolution (Hartup, Laursen, Stewart & Eastenson, 1988). Unfortunately, past research has found that many of the conflicts between young siblings are not constructive in nature (e.g., Phinney, 1985; Perlman & Ross, 1997). Instead of identifying a resolution to a conflict, young siblings often simply withdraw or separate from one another, and sometimes, although less frequently, conflicts end with physical aggression (e.g., Perlman & Ross, 1997). This predominance of destructive conflicts may be linked to the intimacy and emotional intensity of sibling interactions. An observational study by Tesla and Dunn (1992), followed second born siblings from age 33 to 47 months, to see if children increasingly used their developing socio-cognitive skills in interactions with their older siblings. They found that particularly when the children were emotionally upset in disputes, did they fail to use more mature reasoned argument (1992). As previously noted, Tremblay encouraged a focus on how children learn to *inhibit* physical aggression (Tremblay, 2002). The findings described above suggest, that as sibling relationships combine greater emotional intensity with incompatible goals, conflicts seem inevitable, and may disrupt four-year-olds attempts at using their more developed social skills in conflict resolution and anger regulation, and rather turn to more immature problem solving skills, such as physical aggression.

All in all, there is reason to believe that siblings influence children's levels of aggressive behavior, and that this would be particularly evident in four-year-olds, who despite their developing socio-cognitive skills, are at an age where they are prone to get into destructive conflicts with their siblings. A discussion based on relevant empirical findings, on how specific sibling constellation characteristics may be related to differences in levels of aggression in four-year-old children, is presented below.

1.6 Number of siblings

To investigate the relationship between the number of siblings children have and their level of aggression, it is necessary to compare children with siblings to children with no siblings. At the beginning of the 20th century, G. Stanley Hall, a founder of modern American psychology, reportedly said that being an only child was a disease in itself, and he was not alone in holding such views (Fenton, 1928, cited in Falbo, 1992). Seminal research which sought to compare personality and social outcomes of only children to that of their peers with siblings, found that only children seemed to be no different from others on a variety of attributes, including dominance, autonomy and peer popularity (Falbo & Polit, 1986). Only children were also significantly less likely to exhibit antisocial behavior and headstrong behavior (Dawson, 1991, cited in Falbo, 1992). Falbo (1992) suggests that one explanation for these apparent benefits of being an only child is that parents of single children are provided with more opportunity to pay attention to, and spend time interacting with their child one-on-one. In support of this, children with no siblings have been found to receive much more personal attention from their parents compared to children with siblings (Falbo & Cooper, 1980). Consequently, when a child is not behaving up to parents' standards, parents with a single child can more readily free resources and time to adjust their parenting practices, compared to parents who are obliged to meet the needs of multiple children (Falbo, 1992).

According to a *resource dilution model*, after the firstborn, each successive sibling results in lowered family investments, with negative implications for the later-born siblings (McHale, Updegraff & Whiteman, 2012). A recent Norwegian longitudinal study that followed children from a large nationally representative sample for 13 years, found that the presence of siblings in the family, especially when seen in combination with a young mother and family stress, was associated with an increased risk for following a developmental pattern marked by high stable levels of externalizing behaviors (Kjeldsen et al., 2014). These findings are similar to those of Tremblay et al. 2004, where the presence of a sibling had the largest impact on level of physical aggression during early childhood. In line with the resource dilution model, Kjeldsen et al. (2014) point out that parenting two or more children simultaneously creates higher demands on parents and family resources. Although such findings, at first glance seem to suggest that sibling constellation size sets into motion family processes that are the proximal causes of development of higher levels of aggression in children, such processes have rarely been measured directly, and no causal links can be inferred (McHale, Updegraff

& Whiteman, 2012). It is also important to note, that from a related field of research, also inspired by the resource dilution model, sibling constellation size effects on intellectual and educational achievement, have been found to be malleable. Negative family size effects, especially on later born siblings' achievement, have not always been found in countries with strong family supportive policies (Park, 2008). In addition, changes over time in sibship size effects on achievement, within the same country, have been found to correlate with changes in economic conditions and social policies (Maralani, 2008). If a relationship between children's number of siblings and levels of physical aggression exists, it is possible that such a relationship is malleable in a similar fashion, and influenced by family supportive policies and economic conditions. It seems possible, for example, that national policies promoting and subsidizing high quality nonparental child-care, can compensate for possible parental resource dilution assumed to be associated with large sibships.

However, not all research on sibling constellation size and aggressive development, have found such a relationship to be of a negative nature. Mesman et al. (2009), who investigated the development of externalizing problems from age 2 to 5 years in a small sample of children with high initial levels of externalizing behaviors, found that having more siblings, in particular older siblings, predicted a stronger decrease in externalizing problems. However, this was only found for children with difficult temperaments. Mesman et al. (2009) suggest that *differential susceptibility*; that not all children are affected equally by the family environment, may apply to the effects of environmental variables such as family structure. In contrast to the resource dilution model, Mesman et al. (2009) suggest that parents with multiple siblings are more experienced, and consequently are less likely to tolerate externalizing behaviors, and that in particular children with difficult temperaments benefit from this. Such *a learning-from-experience model*, suggests that parents become more skilled and effective at handling parenthood challenges for every child they get (McHale, Updegraff, & Whiteman, 2012). In support of this model, Whiteman and Buchanan (2002) found that older siblings influenced parents' and younger siblings expectations, knowledge and behavior associated with adolescence. More importantly, older siblings were found to influence parents' childrearing practices in ways that had implications for younger siblings. From such a perspective then, sibship size may be negatively correlated with levels of aggression in four- year-olds. Unfortunately, next to nothing is known about parents' learning experiences with preschool children (McHale, Updegraff, & Whiteman, 2012). A limitation of using the learning by experience model to explain the relationship between sibship size and children's

levels of aggression, is that not all past parenting experience has been found to be related to improved parenting skills. A study by East (1998) found that parents, through negative experience with their firstborn, could come to believe that they are unable to control their children's behavior, and give up on parenting efforts towards their younger children. A limitation of this model is then, that it can be used to explain both positive and negative relationships between sibship size and children's levels of aggression.

Finally, interaction effects between the presence of multiple siblings and other factors such as having a young mother and family stress (Kjeldsen et al., 2014), and in the case of Mesman et al. (2009), a difficult child temperament, further complicate the study of the relationship between sibling constellation size and levels of aggression in four-year-olds.

All in all, it is evident that results from previous research on sibling constellation size and levels of aggression in young children, have been mixed. Two contrasting models have been proposed to explain such differences, *the resource dilution model* and *the learning from experience model*. Based on the findings of Tremblay et al. (2004), Kjeldsen et al. (2014), and those found in seminal work on children with no siblings, it seems reasonable to assume that four-year-olds with multiple siblings will have the highest levels of mother-reported levels of physical aggression, and that children with no siblings will be least aggressive. However, on the basis of the literature discussed above, it also becomes evident that sibling constellation size effects are of a malleable nature, influenced by changes in social policies and economic conditions, and that they have been found to be in close interaction with other family factors, such as maternal age and family stress. In contrast to Kjeldsen et al. (2014) and Tremblay et al. (2004), the current study not only distinguishes between the presence or absence of siblings, but rather the number of siblings (none, one, two or more), in order to differentiate between the mere presence of a sibling, and the number of siblings. If the presence of siblings is related to higher levels of aggression in four-year-olds, the current study further seeks to distinguish if birth order and age spacing are related to different levels of aggression in four-year-old children with siblings.

1.7   Birth order and age spacing

Birth order, or ordinal position, refers to a child's position in the age hierarchy of siblings. Many people seem to have a theory about how their birth order has influenced their development, and stereotypes about the power of birth order are abundant in popular culture,

such as the middle child acting out for attention, or the youngest child being the rebel. Science has lagged behind in testing the validity of such beliefs, and if they hold true, why that is. More and more researchers have been drawn to birth order research yet most of these have primarily been concerned with the effects of birth order on outcomes such as intelligence. There is a dearth of data on how birth order is related to children's development of aggression (Cundiff, 2013). The present study provides empirical data on how birth order is related to levels of aggression in four-year-olds at a fixed point in time, and in doing so hopes to contribute to filling this void in the academic literature. Although developmental patterns cannot be inferred from a single time recording of aggressive behaviors, they can provide support for, or help refute, existing theories and stereotypes on birth order effects on children's levels of aggression. In light of existing research, plausible developmental interpretations of findings can be suggested, and directions for future scholarly work proposed.

Findings from birth order research have been subject to considerable debate, with recent criticisms primarily debating if birth order should be evaluated between individuals or within families, and whether the effects of birth order observed in previous studies are causal, as birth order is a proxy variable, standing in and measuring potentially other real causal factors, such as differences in age, size, power and status within the family (Cundiff, 2013; Wichman, Rodgers, & MacCallum 2007). The unique contribution of the current study is how it uses combinations of birth order and age spacing to explore if primarily birth order, age spacing or a combination of the two, is related to different levels of aggression in four-year-olds. The current study does not try to unveil causal links, but attempts are made to predict relationships, based on relevant birth order literature and research on age spacing.

Seminal birth order literature, primarily from samples of juvenile delinquents or children with aggressive problem behaviors, seem to suggest that highly aggressive children tend to be middleborn, and less often the first or last born (e.g., Rutter, Tizard & Whitmore, 1970 cited in Patterson, 1986; Rahav, G. 1980). Similar findings were reported in a more recent study by Bègue & Roché (2005). Based on a large French representative sample, the researchers observed that middleborn children reported more minor and serious offences than firstborns. However, when parental supervision and family size were controlled for, the effect of birth order on serious offences disappeared, suggesting that the birth order effect, at least for serious offences, was affected by parental factors.

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Two different theories with corresponding models have been used to suggest why middleborn children have been found to be most aggressive. First, there is the *sibling differentiation model*, originally inspired by Alfred Adler's theory of individual psychology, were siblings, as a means of reducing competition for parental resources and attention, develop different skills and qualities and choose different niches, to differentiate or de-identify from their other siblings (Ansbacher & Ansbacher, 1956, cited in McHale, Updegraff, & Whiteman 2012). According to Adler, middleborn children often find themselves at a disadvantage in the competition for parental attention and resources, as they are constantly in competition with a larger and more intelligent firstborn rival, and can no longer extract the benefits of being the youngest in the family, leading the middleborn to differentiate from the oldest and the youngest (Adler, 1928, cited in Cundiff 2013). In support of this notion, research has found evidence of parental favoritism of one child over another, and that parents usually favor the first or last born child (Shebloski, Conger, & Widaman, 2005; Salmon, 2003). Middleborns seem often to end up as the least preferred child in the family, by parents and siblings alike. Researchers have found that first and thirdborns often form so-called "jump pairs", where they join against their middleborn sibling. When a middleborn child picks on its younger thirdborn sibling, the firstborn not only aggressively protects the thirdborn; the oldest sibling may grant the youngest permission to initiate conflict with the middleborn. Firstborns and lastborns were also found to be the most similar of the siblings, granting some support to the hypothesis that middleborns are most likely to differentiate from their siblings (Schachter, Gilutz, Shore, & Adler, 1978, cited in Caspi, 2012).

A second model to explain why middleborn children were found to be the most aggressive in seminal research is the previously mentioned "sibling trainer hypothesis" by Patterson (1986). The sibling trainer hypothesis depicts older siblings as models and "trainers" of aggressive behaviors, who initiate fight cycles with younger siblings. Patterson suggests that it may be that the middle position is facilitative of aggressive behaviors, because a middleborn child has both older and younger siblings to serve as both trainers and targets (Patterson, 1986). In support of this view, Wiehe (1997) found a cascading dynamic for sibling abuse in which the firstborn attacks the secondborn, which goes after the thirdborn.

Not all research however, suggests that middleborns are the most aggressive. More recent research, such as that of Tremblay et al. (2004), found in their longitudinal study of children aged 17-42 months, that the best predictors for following a rising trajectory of physical

aggression, was having young siblings. In line with Patterson's proposal, the researchers suggest that a possible explanation for their findings could be that in order to be physically aggressive, a child needs to have a "target". Tremblay et al. where not preoccupied with birth order (2004), or older siblings as "trainers", yet their findings might indicate that firstborns can be just as likely to act aggressively as middleborns, at least in early childhood, as both have young targets available. Martin and Ross (1995) observed sibling physical aggression in 40 families when children where approximately 2 and 4 years old, and two years later, when they were four and six years old. They observed parents and children's responses to such aggression and concluded that firstborn siblings were more aggressive than secondborns. They also found that secondborns were more likely to cry, especially when they were two years old, and parents were more likely to respond to sibling conflict if victims cried. *Parental differential treatment* may contribute to conflicts between older and younger siblings, as Felson and Russo (1988), in line with the findings of Martin and Ross (1995), found that parents typically intervene in conflicts between siblings by protecting the younger child, and that this may increase sibling conflict and aggression. Such findings suggest that firstborns are likely to be most aggressive, as they are more likely to get punished by parents when fighting with siblings. In an observational study, psychologist Hildy Ross and her colleagues (1996) found that parental interventions occur frequently when children are four years old. They found that in 60 percent of disputes between two-and four-year-olds, and in 63 percent of disputes between four and six-year –olds, parents intervened. It seems reasonable to assume that first or middleborn four-year-olds get frustrated if their parents frequently intervene in conflicts and take side with their younger sibling. The younger sibling can become a prime target for resentment, making it even more tempting for the four-year-old to turn to physical aggression. From such a perspective, firstborns may be most aggressive, followed by middleborns and lastborns.

An alternative perspective, the *learning-by-experience model*, suggests that lastborn children often have the benefit of more experienced parents, and thus are less aggressive than those born earlier. Comparisons of siblings' relationships with their parents at the same chronological ages found that parents exhibit more effective parenting behaviors, including higher levels of parental knowledge and warmth, and lower levels of conflict with secondborn than with firstborn adolescents (Shanahan, McHale, Osgood, & Crouter, 2007; Whiteman, McHale, & Crouter, 2003). In a similar vein, a recent meta-analysis found that positive parenting practices where associated with lower levels of relational aggression in

children (Kawabata, Alink, Tseng, Van Ijzendoorn & Crick, 2011). Such findings support the learning-by-experience model, and the assumption that firstborns are the most aggressive. While birth order refers to children's position in the age hierarchy of siblings, age spacing refers to the time intervals separating the births of siblings. Research on age spacing has primarily focused on how siblings who are closer in age, are at similar developmental stages, and thus are likely to have similar interests and skills, and possibly even shared friends. This in turn makes close aged siblings more attractive playmates, resulting in more time spent together, and more opportunities for heated conflicts (e.g., Aguilar, O'Brien, August, Aoun, & Hektner, 2001). However, seminal research on sibling interaction patterns, such as the longitudinal study of Pepler, Abramovitch and Corter (1981), found that age intervals between siblings (either large 2.5-4 years) or small (1-2 years), did not have much effect on patterns of cooperation, aggression, or imitation during the preschool years. In contrast, more recent research suggests that close age spacing is related to higher levels of conflict and physical aggression. Nærde, Ogden, Janson and Zachrisson (2014), utilizing data from the BONDS, found that high levels of physical aggression in infants and toddlers (8 to 26 months) were predicted by the presence of a same-age sibling (i.e., age difference up to 5 years). In a similar vein, the study of Aguilar, O'Brien, August, Aoun and Hektner (2001) suggests that close age spacing between siblings may be related to higher levels of aggression in older children too. At least for aggressive elementary school children who have older siblings within 3 years of age, there was a heightened risk for engaging in conflictual and coercive interactions. It is worth noting that all three studies of age spacing mentioned, have used different definitions for close age spacing. Whereas Pepler, Abramovitch and Corter consider 1-2 years to be close age spacing, Aoun and Hektner (2001) use a wider age spacing of within 3 years to define close age spacing, and Nærde and colleagues define siblings with an age difference up to five years to be "same age" (2014). Because the current study utilizes data from the same population sample as Nærde et al. (2014), close age spacing is defined in a similar fashion (age difference up to five years) and it is assumed that close age spacing between siblings is related to higher levels of physical aggression in four-year-old children, than wide age spacing (more than five years apart).

All in all, multiple models have been used to explain rather contradictory findings from birth order research, including theories on sibling differentiation, the sibling trainer hypothesis, parental resource dilution, differential treatment and learning-by experience. Most findings seem to suggest that lastborn children are the least aggressive, compared to firstborns and

middleborns, and a slight majority of findings suggest that middleborns are the most aggressive. Findings from research on age spacing and the development of aggression, although sometimes divergent, seems to suggest that the presence of close in age siblings is related to higher levels of aggression, than siblings with wider age spacing. Such findings have partly been explained by the similarity in developmental stages and interests in close in age siblings. Combined with findings from research on birth order, middleborn children with close in age siblings are hypothesized to be most aggressive, and lastborn children with only distant older siblings (more than five years apart) are hypothesized to be least aggressive.

1.8 Sibling gender

Findings from studies on the relationship between gender composition of sibling dyads and development of childhood aggression have been mixed. Seminal observational research by Lamb (1978) conducted with 24 infants and their preschool-aged siblings, found that boys, regardless of birth-position and gender composition of the sibling dyad, were more likely to aggress toward their siblings. Aguilar et al. (2001) studied preschoolers' sibling relationships and found that having an older male sibling was related to higher levels of observed conflict, negative affectivity and aggression. Similarly, findings obtained from studies with older samples, such as the longitudinal study of Williams, Conger and Blozis (2007) found that particularly the presence of male siblings, younger or older, was associated with elevated relational aggression over time during adolescence. As previously noted both social learning theory and Patterson's coercion model suggests that the presence of an aggressive sibling provides learning opportunities and the risk of entering coercive fight cycles, that in turn increase children's levels of aggression. If a brother is more likely to aggress towards the target child than a sister, then children with brothers could be hypothesized to have higher levels of aggression than children with only sisters.

Other studies have found that boy – boy pairs demonstrate the highest rate of conflict and aggression between siblings (e.g., McGuire, Manke, Eftekhari, & Dunn, 2000). Such findings can possibly be explained by Patterson's coercion model, as dyads where both children are male increase both the odds of one sibling initiating conflict and that the other responds aggressively, increasing the likelihood of prolonged spiraling aversive exchanges. However, Aguilar et al. (2001), based on a longitudinal sample of both aggressive and nonaggressive children, found that older brother - younger sister dyads were characterized by higher levels of negative features and lower levels of positive features, than all other gender/age dyads.

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Buhrmester (1992) obtained similar results for older samples, where children with opposite-sex siblings reported the highest levels of conflict. Aguilar and colleagues propose that dissimilar interests within mixed-pairs and increased attention to gender roles may induce negative behaviors (2001). It is interesting to note how this perspective; that dissimilarity is related to higher levels of conflict between siblings, differs from that often proposed by research on age spacing, where sibling similarity is proposed to increase the frequency of conflicts and aggressive behaviors. Fagan and Najman (2003) who utilized an Australian population based sample of 414 sibling pairs, to investigate the relationship between older and younger siblings' aggression at five years of age, found similar rates of covariation in aggression among same-sex and mixed-sex sibling pairs, suggesting that sibling gender does not influence children's level of aggression. Fagan and Najman suggest that on explanation for the difference in findings between their study and that of others, may be related to how old the sibling dyads where when observed, as boys and girls generally display more similar rates of problem behavior during childhood, and sex differences become greater in adolescence (2003). It becomes evident that the mixed results of previous studies are difficult to interpret. Some researchers have compared groups of mixed-gender dyads with groups of same-gender dyads, whilst others, such as Aguilar et al. (2001) have conducted comparisons among each possible combination of gender and age. In addition, the use of different age groups and different measures and definitions of aggression has left it difficult to compare results. Aguilar et al. (2001) point out that researchers who have not found significant differences in some aggressive behaviors based on sibling gender, are uncertain whether differences could have been revealed for levels of more specific negative behaviors such as physical aggression.

Due to the lack of consistent research findings, the current study will take an exploratory approach to the relationship between sibling gender and levels of aggression. Based on research findings from samples of preschool children that indicate that same-sex and mixed-sex sibling pairs are found to have similar levels of aggression, the current study will not focus on the gender-composition of dyads, but rather explore if the presence of brothers, sisters or both, is related to differences in aggressive behavior in four-year-olds.

1.9   Strengths and limitations of past research

It is suitable and necessary to end this account of past research on siblings and children's development of aggression, with a brief reflection on overall trends in designs, samples and

measures utilized. The literature mentioned so far has been extracted from two different traditions: research on sibling relationships, and research on children's development of aggression. The vast majority of studies mentioned in the current thesis have utilized samples from the USA and Europe, leaving little evidence on sibling relationships and aggressive development in non-western cultures and in minority populations.

Research on sibling relationships and how siblings influence children's development, can roughly be divided in two, with one line of research focusing on the social and emotional processes involved in sibling interactions, and the other on how sibling structural variables are related to specific outcomes such as academic achievement (for review see Steelman, Powell & Carter, 2002) or delinquency (e.g., Cundiff, 2013).

Research on sibling interactions have mostly relied on small samples, often selected to include sibling dyads of particular ages or with specific gender compositions. Usually target children and their siblings have been observed over a time period ranging from a few months to a few years in early and middle-childhood, with frequent observation and analysis of the content and context of children's exchanges in natural or laboratory settings (e.g., Patterson, 1986; Tesla & Dunn, 1992; Martin & Ross, 1995; Ram & Ross, 2001; Stauffacher & Dehart 2005; Ross, Ross, Stein & Trabasso, 2006). For example, Dunn & Brown, 1991, a study frequently cited in the current thesis, observed six second-born children in interactions with their mothers and older siblings, in natural settings at home, at two-month intervals from 24 to 36 months. The combination of small samples, relatively short observation sessions and low incidences of target behavior, has a negative impact on the generalizability and validity of results from such studies. Another frequently found limitation in sibling research is associated with observational methods and reactivity. Depending on the type of observational measures used, children and parents alike could respond to the presence of microphones, cameras and experimenters (e.g., Stauffacher & Dehart, 2005). Despite such shortcomings, however, they provide unique detailed descriptions of the interactions that characterize sibling relationships in their attempt to unveil how siblings influence each other's development.

In contrast, sibling research on structural variables has largely been limited in that the social and psychological processes proposed to account for sibling constellation effects, such as parental differential treatment, instead of being measured directly, have been inferred on the basis of patterns of sibling outcomes (see Cundiff, 2013). The study of birth order effects is

usually based on two different procedures, one comparing children of the same family (within-family design) and another comparing children from different families (between-family design). Most birth order research, including the current study, has relied on a between-family design, as it has the advantage of not confounding participant's age and birth order (e.g., Bègue & Roché, 2005). Scrutiny of the procedures and analytic methods often used by birth order studies however have found that birth order effects on delinquency have often been spurious and products of the analytic methods used. For example, Cundiff (2013), found that birth order effects on delinquency obtained from between-individual comparisons, where not obtained when comparing children of the same family.

Recent research primarily seeking to uncover predictors and developmental trajectories of children's aggressive development, have usually included a limited number of structural sibling variables as part of a long list of potential predictors of aggression. Extensive multi-method and multi-measure longitudinal designs, utilizing large population based samples and advanced multivariate techniques such as structural equation modeling, confirmatory factor analysis and multilevel modeling, have generated robust findings, linking the presence of siblings to children's development of aggression. Four studies with longitudinal designs, Tremblay et al. (2004), Nærde et al. (2014), Kjeldsen et al. (2014) and Mesman et al.(2009), have been frequently cited in the current thesis. All have employed large normative nationally representative samples, with the exception of Mesman et al. (2009) who sampled 150 children with high initial levels of externalizing behaviors. The problem with findings from these studies is that they have often used broad categories to operationalize sibling variables, such as the presence or absence of siblings (Kjeldsen et al., 2014), of young siblings (Tremblay et al., 2004) or siblings with up to five years age difference (Nærde et al., 2014). Such broad definitions make it difficult to infer if particular sibling constellations are related to higher levels of aggression, and discuss why such relationships are found. Mesman et al. included more detailed sibling constellation variables in their study as they included both birth order (the absence/presence of older siblings and the absence/presence of younger siblings) and number of siblings, but they did not include sibling gender, utilized a comparatively small clinical sample and found results that differed from those obtained with larger normative samples. The current study is the first to provide an overview of, and examine the relationship between, multiple sibling constellation variables and children's levels of both physical aggression and aggressive behavior (CBCL) at four years of age, utilizing a large Norwegian normative sample and a cross-sectional design.

1.10 Research questions and hypotheses

To investigate the relationship between sibling constellation factors and children's levels of aggression at four years of age, a subsample from the BONDS, with 741 target children is utilized. Pre-collected data from interviews (including a computer-administered questionnaire) with mothers when target children where 6 and 48 months old, included reported scores on both a physical aggression scale and an aggressive behavior syndrome scale (CBCL). *Sibling constellation characteristics* and possible covariates such as *socio demographic factors* are also included and utilized to investigate the following research questions:

1) *Are differences in children's number of siblings (none, one, two or more), related to differences in children's level of aggression at four years of age?*

On the basis of the literature discussed above, with emphasis on how the presence of multiple siblings places higher demands on parents and family resources, and possibly sets the scene for more competition between siblings, it is hypothesized that children with many siblings are found to have, on average, higher mother-reported levels of aggression, than children with fewer or no siblings.

2) *Is the birth order of siblings (firstborn, middleborn or lastborn) and age spacing (more or less than five years age difference) related to differences in levels of aggression in target children at four years of age?*

On the basis of the literature discussed above, it is hypothesized that close age spacing between siblings is related to higher levels of physical aggression in four-year-old children, than wide age spacing (more than five years apart). Middleborn children are hypothesized to be the most aggressive, whilst children with distant older siblings (more than five years apart) are hypothesized to be least aggressive.

3) *Is the gender of siblings (brothers, sisters or both) related to differences in levels of aggression in target children at four years of age?*

Due to the lack of consistent research findings, the current study will take an exploratory approach to the relationship between sibling gender and levels of aggression.

2 METHOD

2.1 The Behavior Norwegian Development Study

The current study utilizes data from a population-based longitudinal study, the Behavior Outlook Norwegian Developmental Study (BONDS), which was provided by The Norwegian Center for Child Behavioral Development. The BONDS, including recruitment of participants, data collection up to age 4, and a limited use of official registry data was originally approved by The Regional Committee for Medical and Health Research Ethics and the Norwegian Social Science Data Services. The project is based on informed consent of parents, who may withdraw participation and ask for deletion of collected data (Nærde, Janson & Ogden, 2014).

2.2 Participants

Sample recruitment and composition

To gather a representative sample from the general population of adequate size to investigate the main research objectives, five municipalities in Southeast Norway where chosen because they, despite a relatively limited geographical spread, represent a fair variation in key demographic variables, approximating those at the national level. Families from five municipalities in southeast Norway, in the counties of Telemark and Buskerud (Bamble, Drammen, Porsgrunn, Skien and Tinn), were informed about the project in 2006-2008 at the 5-month visit at public child health clinics. The inclusion criterion was the child being the appropriate age and at least one parent being able to participate without a translator. Child health clinics in Norway are free and are attended almost universally. At the 5-month visit, families were informed by the nurse, and provided contact information if agreeing to be contacted. The families of 1,931 eligible children received information, of which 1,465 (76%) accepted to be contacted, and 1,159 (79%, or 60% of those originally informed) eventually opted to participate. Two families terminated participation and their data have subsequently been deleted, leaving 558 girls (48.2%) and 599 boys (51.8%) in the study. Several strategies have been applied to increase the likelihood of keeping the respondents over time, such as assigning participants to one interviewer for continuity of contact and small monetary compensations for time spent at interviews, and the overall retention rate is very high. Families of 96.5% (n=1118 out of 1159) of the children continued to consent to

participate in data collections up to age 4, and at that particular age 93.4% (*n*=1082) participated in a personal interview ((Nærde, Janson & Ogden, 2014).

In order to minimize the presence of possible confounding variables and ease the interpretation of results, the following criteria where used to exclude cases form the BONDS sample for the current study: 1) All children who live in more than one home, as these are possibly part of more than one sibling constellation. 2) All children who have had children living in their homes that were not categorized as siblings (such as children in foster care). 3) All children who have had siblings that moved out between the ages of 6 and 48 months, and finally, 4) all children whose mothers' have not answered all items relating to either the physical aggression scale or the aggressive behavior syndrome scale (CBCL).

The final sample used for this study consists of 741 children, 370 boys (49.9%) and 371 girls (50.1%). 725 mother's completed both scales, 735 completed the physical aggression scale and 731 completed the aggressive behavior scale (CBCL). For the formation of the birth order and age spacing variable, and the sibling gender variable, 111 children with no siblings have been excluded. A comparison of the final sample and the sample of excluded cases on key demographic variables can be seen in appendix 2. The current sample seems somewhat biased towards more firstborns and mothers with a university or college degree. Drawbacks linked to the use of conservative exclusion criteria will be discussed in the limitations section.

2.3 Measures

The BONDS is designed to track children's social development over time and includes multiple, frequent and comprehensive measures of children's behavior and social competence, ranging from videotaped child-parent interactions to assessment of language and motor development, and childcare center reports. The current study calls for a more narrow focus, and is limited to personal interviews with mothers which included a parent-completed computed administered questionnaire section.

Parental interviews and questionnaires

The final BONDS sample consists of three cohorts, born in 2006, 2007 and 2008. For each cohort, parental interviews were carried out when children were 0.5 (both parents), 1 (father), 2 (mother), 3 (father), and 4 years old (mother, and also a questionnaire to father), and continued after school entry (Nærde, Janson & Ogden, 2014). The current study combines

data from all three cohorts into one sample, and is primarily based on personal interviews with mothers when target children were aged 48 months. Key demographic characteristics such as mothers' age and education have been extracted from the first interview at 6 months. Whereas both parents were invited to participate in the first interview at age 6 months, primarily mothers were targeted in the 48-months interview. Trained and locally employed project staff interviewed the mothers in offices disposed by the project. Alternatively, interviews were conducted in the participants' homes if the mothers preferred such a setting. The personal interviews included a computer-administered questionnaire. Mothers were provided information about how to navigate through the questionnaire, and were assured that they could ask the interviewer for help at any time (Nærde, Janson & Ogden, 2014).

Measures of aggression

Two focal variables are used to measure children's level of aggression at 48 months. *Physical aggression:* Seven items developed by Nærde et al. (2014) for the BONDS were used in the current study to measure physical aggression in four-year-olds. The item list is an original instrument, designed to be easily recognizable to parents of small children, using idiomatic wordings. Inspired by chief parent-report questionnaire and interview measures applied in the major longitudinal studies to date, none of which have been standardized in Norwegian, and through consultations with two specialists in clinical child psychology, Nærde et al. (2014) constructed and piloted a list of altogether nine items on infant and toddler physical aggression. Items were designed to target low-level physical behaviors such as pinching and pulling hair, and distinguish between hitting parents and hitting siblings. Eight out of nine items were applied at the 48-month interview, and one item ("Pushes someone to get his/her will.") was excluded from the current analyses, as it referred to intent, leaving seven items in total for analyses. In the questionnaire, mothers were asked how often the child did the behavior, with responses given on a 7-point frequency scale ranging from 1 (*Never/Not in the past year*) to 7 (*3 times daily or more*). The mean reported score for each child was calculated. According to Nærde et al. (2014) this format was slightly adapted from one widely used in previous child behavior research in Scandinavia.

Aggressive behavior and the CBCL: 19 items from the aggressive behavior syndrome scale were adapted from the Norwegian version of the Child Behavior Checklist for ages 1 ½ -5 years (CBCL) to measure aggression in four-year-olds. The CBCL is a clinical scale that is part of the Aschenbach System of Empirically Based Assessment (ASEBA), which is widely

used in mental health services and research on children's mental health (for more information see www.aseba.org). The CBCL consist of two higher order internalizing and externalizing scales with a total of six corresponding syndrome scales. The syndrome scales *aggressive behavior* and *attention problems* make up the externalizing scale (Rescorla et al., 2012). Past research on childhood aggression has been found to utilize only selected subscales rather than the entire CBCL (e.g., Fagan & Najman, 2003). For the current study 19 items from the aggressive behavior syndrome scale where used. The Norwegian translation was used with permission from the Norwegian publisher, Centre for Child and Adolescent Mental Health Eastern and Southern Norway (RBUP Oslo). The items had the same wording as the Trondheim Early Secure Study (for more information see tidligtrygg.no). These items were part of a computer-administered questionnaire, which mothers completed as a part of the personal interview when the target child was 48-months old. Aggressive behavior items were rated on a 3-point Likert-scale (0 = *not true [as far as you know]*; 1 = *somewhat or sometimes true*; 2 = *very true or often true*) based on children's functioning over the preceding 2 months. An overview of items is provided in appendix 1. In line with previous research (e.g., Fagan & Najman, 2003), the multidimensional aggressive behavior syndrome scale, was used one-dimensionally in the current study. A mean score was calculated and reported for each child. The Cronbach's alpha coefficient was .85 for the current study.

Sibling constellation characteristics

Number of siblings: At the four-year interview, mothers listed all the children that currently lived in the same house as the target child. If the target child belonged to more than one household, children in the second household where reported separately. Half-siblings and adoptive siblings where registered as "siblings", whilst children in foster care were registered as "other children". As previously mentioned, children with more than one home and children with other non-related children living in the home, where excluded from the current study.

Siblings' birth order and age spacing: The number of children who resided in the same residence as the target child where reported in interviews at 6 and 48 months. At each interview, every sibling was recorded and categorized separately according to age and gender. The age intervals used for these categories, where based on the assumption that siblings with an age difference up to five years can be considered same age (Nærde et al., 2014). Siblings older than 17 years, are considered as adults and where not included in the current study. At the six months interview, the categories where therefore: *0) no other*

children 1) sister 0-5 ½ years 2) sister 5 ½ - 17 years 3) Brother 0-5 ½ years 4) brother 5 ½ - 17 years 5) other girl 0-5 ½ years 6) other girl 5 ½ -17 years 7) other boy 0-5 ½ years and *finally 8) other boy 5 ½ -17 years*. At the four year interview the categories for siblings' age and gender were the same, except that the age intervals where *"younger than 9 years old"* and *"9-17 years old"*. As previously mentioned, target children who resided in the same house as other children not categorized as siblings, were excluded from the sample. Based on data from all the registered siblings in the 6 and 48 month interviews, new categories were formed for the current study, dividing children into the following categories based on their birth order and age spacing; *1) firstborns with younger siblings* 2) *lastborns with close older siblings (less than five years age difference)* 3) *lastborns with distant older siblings (more than five years age difference)* and *4) middleborns with both younger and older siblings (more and less than five years age difference)*. The original plan was to split the final group into two groups, based on the age difference between the target child and its older siblings. However, it turned out that out of 42 cases of target children with both younger and older children, 38 of these had close older siblings (age difference less than five years), leaving only 4 cases of middleborn children with both younger siblings and distant older siblings, which are not enough to form a group of their own. Four dummy variables were created for hierarchical multiple regression with the group *children with no siblings* as baseline.

Gender of the target child and siblings: The target child's gender was recorded at the six-month interview. Based on the sibling characteristics recorded in the 6 and 48 month interviews, children were divided into groups based on the gender of their siblings; *1) sisters 2) brothers* and *3) both sisters and brothers*.

Key demographic characteristics

Mothers' age and educational level: Information about *maternal age* was obtained from the interview at 6 months, and dichotomized into *1) younger than 25 years* and *2) older than 25 years,* in line with the work of Nærde et al. (2014). Likewise, information about *educational level* (in six categories) was obtained in the same interview, and for the current study rearranged into the following four categories: *1) high school or less* 2) *vocational education 3) short higher education (up to four years)* and *4) long higher education (four years or more). Mothers' troubled relationships with friends or family members* was assumed to be an indicator of both family stress and lower social support, two factors associated with higher levels of aggression in early childhood (e.g., Kjeldsen et al., 2014; Mathiesen, Sanson,

Stoolmiller & Karevold, 2009). Mothers were asked to report about potentially stressful life events they had experienced the last 12 months. Mothers where shown a list of eight possible events, and a ninth answer alternative if none of the other eight events had taken place. This list of events ranged from psychological, physical or sexual abuse, to pregnancy or birth. For the current study, the presence of conflicts in mothers' relationships with friends or family members where recorded and coded as 1 for present and 0 for absent.

Living space: At the four-year interview mothers reported how many bedrooms and living-rooms there is in the home the child spends most of its time, as an indicator of socioeconomic conditions. Rooms larger than 6 m^2 or more where recorded. Kitchen, bathroom, hallways, laundry rooms or similar rooms where not recorded.

2.4 Strategy for statistical analyses

All analyses presented in this thesis have been performed using SPSS version 22. An analytic strategy for the current study is presented below.

Comparing groups

Multivariate analysis of variance (MANOVA): For this thesis, multivariate analysis of variance (MANOVA) will be performed for each of the three predictor variables; 1) *number of siblings*, 2) *sibling birth order and age spacing*, and 3) *sibling gender*, to investigate their relationship with each of the two dependent variables *physical aggression* and *aggressive behavior*. Multivariate analysis of variance involves a number of separate analyses, and thus a more strict alpha level of .0125 will be set to reduce the chance of a type 1 error, by applying a Bonferroni adjustment according to the four main analyses conducted (0.05/4). This will keep the alpha across all the tests at a reasonable level.

Follow up analyses (ANOVA): Because each of the three independent variables have three or more levels, a significant MANOVA will be followed up using one-way between groups analysis of variance (ANOVA) with post hoc comparisons, to identify where the significant differences lie. Due to the explorative nature of the current study and the unequal group sizes obtained, Bonferroni and Games-Howell post hoc tests will be used. Bonferroni is a conservative test with sound control of the type 1 error rate, but lacks statistical power. However, it has more power when the number of comparison is small, compared to other post

hoc tests such as Tukey (Field, 2009). Field (2009) recommends applying Games-Howell post hoc test in addition to any other post hoc tests, when the population variances are unequal, as it offers the best performance under such circumstances.

Effect size: The current study utilizes a large sample, where even very small differences between groups can become statistically significant. This does not mean that the difference has any practical or theoretical significance (Pallant, 2007). To indicate the relative magnitude of the differences between means, eta squared values will be provided for the MANOVA results. The effect sizes of the results from the one-way between groups ANOVA and the post hoc tests, will be provided in the form of *Omega Squared* values*,* and calculated using the following formula: $\omega_2 = \frac{SS_M - (df_M)MS_R}{SS_T + MS_R}$

Effect size will be reported according to Cohen's classification of .01 as a small effect, .06 as a medium effect and .14 as a large effect (Pallant, 2007).

Hierarchical multiple regression: If significant relationships between sibling constellation characteristics and aggression in four-year-olds is found through the MANOVA and follow-up analyses, a hierarchical multiple regression analysis will be performed for significant variables, to control for possibly confounding variables, namely maternal characteristics (mother's age at the 6 months interview and relational problems with family members and friends), socio economic measures (maternal education and number of living/bedrooms in the home) and the gender of the target child.

2.5 Preliminary Analyses

Representativeness

Key demographic variables (target child's gender and birth order, mother's birth country, age at birth and education) reported by mother's in the final sample, where compared to the BONDS sample, anonymous records of the eligible families kept by the child health clinics, as well as population statistics for the recruitment period (see appendix 2). The sample for the current study resembled the BONDS sample and the eligible families fairly well, except for mother's education, where the current sample seemed biased toward fewer mother's with primary education only, and more with higher education. It is quite common to find a bias towards higher education in research based on voluntary participation (Nærde, Janson & Ogden, 2014). The current sample, similarly to the BONDS sample, also contained a larger

proportion of European-born mothers than the group of eligible families. The current sample resembled the general Norwegian population closely on variables such as target child gender and mother's age at birth, but it contained a substantially smaller proportion of foreign-born mothers and larger proportion of European-born mothers. The bias towards fewer immigrant mothers was at least partly caused by the inclusion criteria. The current sample, the BONDS sample and the eligible group of families, consist of more firstborns than the general population, with the current sample containing the most. Such a bias towards more firstborns has in a similar fashion been found in previous studies as well (Nærde, Janson & Ogden, 2014). All in all, the sample seems moderately biased toward mothers with higher education, fewer immigrant mothers and more firstborns. This probable bias however does not seem to grossly distort the sample, as non-firstborns, immigrant mothers and mothers' with lower education, are far from absent.

Reliability

Cronbach's alpha coefficient was used as an indicator for the internal consistency of the physical aggression scale and the aggressive behavior syndrome scale (CBCL) as measured at the 48 months interview. Both the physical aggression scale and the CBCL had good internal consistency in the current study with a Cronbach's alpha coefficient reported of .75 for the physical aggression scale, and .85 for the CBCL.

Distribution and outliers

The two independent variables, *physical aggression* and *aggressive behavior*, were used with parametric statistical techniques which assume that the distribution of scores on the dependent variables are normal. A careful consideration of the distribution and outliers was performed using descriptive statistics and tests of normality. Transformations were applied to both scales to better meet the assumption of a normal distribution.

Test of normality

Physical aggression scale: Information was obtained for 735 children, with a score range from 1 to 4.14, a potential score range of 1-7, a mean of 1.80 and a standard deviation of 0.62. The relatively low mean and standard deviation indicates that the sample potentially is positively skewed, or affected by outliers. To test if extreme scores have a strong influence on the mean, the mean is compared with a 5% trimmed mean of 1.76. A difference of 0.04 between the mean and the 5% trimmed mean is tolerable. A boxplot indicated no extreme

points, but eight outliers with values well above the majority of other cases. A skewness and kurtosis value of 0 is obtained if the distribution is perfectly normal. However, this is a quite uncommon occurrence in the social sciences (Pallant, 2007). For the physical aggression variable a skewness of 1.03 and a kurtosis of .90 were found. The positive skewness value indicates that scores are clustered to the left of the low values. There is a positive skew in the distribution of scores, which indicates that most respondents recorded low scores on the scale. The positive kurtosis value indicates that the distribution is clustered in the center, shaped like a peak with long thin tails. Skewness will not make a substantive difference in the analysis if reasonably large samples are utilized (Tabachnick & Fidell, 2013). Kurtosis can potentially result in an underestimate of the variance, but in large samples like the current one, this risk is reduced (Tabachnick & Fidell 2013). A Kolmogorov-Smirnov statistic compared the scores in the current sample, to a normally distributed set of scores with the same mean and standard deviation (Field, 2009). A significance value of .000 was obtained, which suggests that the distribution is significantly different from a normal distribution. However, with large samples like the current one, significant results can be obtained from small deviations from normality (Field, 2009). In a similar vein, Tabachnick & Fidell (2013) point out that tests evaluating skewness and kurtosis values are too sensitive with large samples, and recommend inspecting the actual shape of the distribution using a histogram. In this case the histogram confirms that the distribution is positively skewed. Normal probability plots (Normal Q-Q plots) confirmed the positive skew. In Normal Q-Q plots the observed value for each score is plotted against the expected value from the normal distribution. A fairly straight line indicates a normal distribution, but in this case the points deviate from the expected straight line (Pallant, 2007). The Detrended Normal Q-Q plot shows the actual deviation of the observed scores from the expected values of a normal distribution. There should be no real clustering of points, with most collecting around the horizontal zero line (Pallant, 2007). For the physical aggression variable, the Detrended Normal Q-Q plots show a slight clustering of points beneath the zero line. In normative samples, high levels of physical aggression in childhood are rare (e.g., Tremblay 2010). Scores from a measure of physical aggression in children from a population sample are therefore likely to be positively skewed, with few reporting high levels of physical aggression.

Aggressive behavior scale (CBCL): For this variable (N = 731), the minimum value of scores is 1 and maximum is 2.47, the potential score range is 1-3, the mean is 1.37, the standard deviation is .26 and the 5% trimmed mean is 1.36. The difference between the mean and the

5% trimmed mean is rather small (.01) suggesting that potential outliers have not had a strong influence on the mean. The relatively low value of the standard deviation indicates that scores are slightly clustered around the mean. With a skewness value of 0.80 and kurtosis of 0.34, there is reason to assume that the distribution is positively skewed and slightly peaked. The histogram clearly shows a positively skewed distribution, and the box plot indicates the presence of seven outliers with values well above the majority of other cases. The CBCL aggressive syndrome subscale is a clinical measure of aggression, designed to identify problem behaviors. In a normative sample, with only three answer alternatives provided, many mothers are likely to report low or no occurrence of the behaviors targeted. Thus both the physical aggression scale and the CBCL were expected to yield positively skewed distributions. Rather than abandon the use of parametric statistics and use non-parametric alternatives, scores can be mathematically modified through logarithm, so the distribution looks more normal. Although such procedures are recommended to avoid the potential impact of outliers and failures of normality, linearity and homoscedasticity, this approach is not without controversy, with some authors strongly opposed to transforming variables primarily because transformed variables can be harder to interpret (Pallant, 2007; Tabacknick &Fidell, 2013).

Transforming variables

The physical aggression variable was transformed to better meet the assumptions of parametric techniques. After the physical aggression variable was transformed using Logarithm, the mean is .23 and the 5 % trimmed mean is .23. Standard deviation is .14, minimum is .00 and maximum is .62, with a potential score range of 0 to 0.845. A graphical assessment of box plots and histograms reveal a proximal normal distribution with no extreme values. *The aggressive behavior* variable was also transformed using Logarithm, resulting in a mean of 0.13 and the 5 % trimmed mean is 0.13, which suggest that outliers are not affecting the mean. Standard deviation is .08, minimum is .00 and maximum is .35, with a potential score range of 0 to 0.477. The histogram shows a less skewed distribution, which is supported by box plots, which show that the transformation has successfully removed all but one outlier.

3 RESULTS

3.1 Descriptive statistics

Detailed descriptive statistics of the two dependent variables *physical aggression* and *aggressive behavior* have already been provided in the preliminary analyses. Descriptive statistics for the three key sibling constellation variables will be presented below.

Number of siblings: With 741 children in total, 111 had no siblings (15%), the vast majority of 460 children had one sibling (62.1%), and finally 170 had two or more siblings (22.9%).

Age spacing and birth order: Descriptive statistics for the age spacing and birth order variable, found that out of the 741 children in total, 111(15%) had no siblings and where left out of the analyses, leaving a new total of 630 children. Out of these 630 children, most children belonged either to the group of 250 (39.7%) firstborns with younger siblings (up to four years age difference) or the 252 (40%) lastborns with close older siblings (less than five years age difference). 86 (13.6%) children were found to be last born with distant older siblings (more than five years age difference), whilst the minority of children belonged to the group of 42 (6.7%) middleborns with both younger and older siblings (more and less than five years age difference).

Sibling gender: A closer look at the distribution of siblings' gender, after excluding the 111 cases of children with no siblings, revealed that out of 630 children with siblings, 283 (38.2%) of target children had only sisters, 274 (37.0%) had only brothers, whilst 73 (9.9%) had both brothers and sisters.

3.2 Comparing groups

The current thesis sought to explore the relationship between sibling constellation characteristics (number, birth order and age spacing, and gender of siblings) and the levels of physical aggression and aggressive behavior in four-year-old children as reported by their mothers. The specific research questions of the current study will be repeated below, and results from the corresponding statistical analyses will be presented.

Number of siblings

A one-way between groups multivariate analysis of variance (MANOVA) was performed to investigate the first research question, to see if differences in the number of siblings four-

year-old children have, is related to differences in their mother reported levels of aggression. Two dependent variables were used: *physical aggression* and *aggressive behavior*. The independent variable was *number of siblings* (none, one, two or more). Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. There was a statistically significant difference between children with different numbers of siblings, on the combined dependent variables: $F(4, 1444) = 6.785$, $p=.000$. Pillai's Trace $=.037$; partial eta squared $= .018$. When the results for the dependent variables were considered separately, the only difference to reach statistical significance, using an alpha level of .0125, was found for physical aggression, $F(2, 722) =10.69$, $p = .000$, partial eta squared $=.029$. A partial eta squared of .029, is according to generally accepted criteria considered quite a small effect. No statistically significant difference between children with different numbers of siblings was found for aggressive behaviors, $F (2, 722) =1.67$, $p = .189$.

A one-way between groups analysis of variance (ANOVA) revealed a significant difference in mean levels of physical aggression between the groups. Through Games Howell and Bonferroni post hoc tests, an inspection of the mean scores indicated that mothers of target children with no siblings reported slightly lower levels of physical aggression (M =.18, SD = .13) than mothers of children with one sibling (M =.24, SD = .14), or of children with two or more siblings (M = .25, SD =.14). There is a significant difference in mothers' reported levels of physical aggression in children with no siblings, and children with siblings (one, two or more) at a .0125 level. There is no significant difference in level of physical aggression between those with one sibling and those with multiple siblings. An omega squared of .026 was calculated, revealing a small effect. Results are presented figure 1.
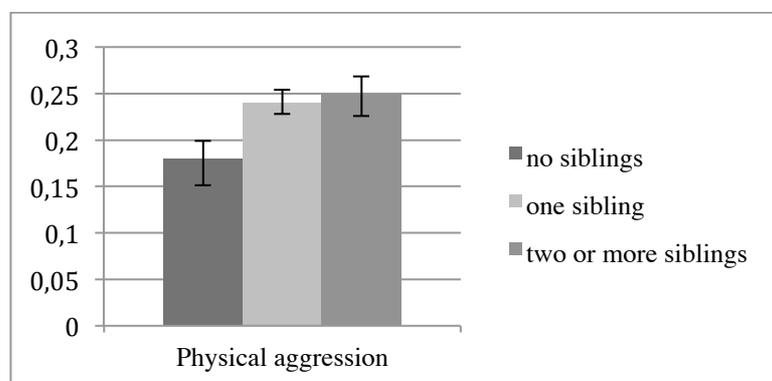

Figure 1. Mean level of reported physical aggression by sibship-size. Error bars represent 95% confidence intervals.

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Birth order and age spacing

A MANOVA was performed to investigate if different combinations of birth order and age spacing are related to differences in mother reported levels of aggression in four-year-olds. Two dependent variables were used: *physical aggression* and *aggressive behavior* (*CBCL*). The independent variable was a combination of *birth order and age spacing*. Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. There was a statistically significant difference between children with different combinations of birth order and age spacing, on the combined dependent variables: $F(6, 1226) = 4.087$, $p=.000$. Pillai's Trace $=.039$; partial eta squared $= .021$. When the results for the dependent variables were considered separately, the only difference to reach statistical significance, using an alpha level of .0125, was found for physical aggression, $F(3, 613) = 3,932$ $p = .009$, partial eta squared $=.018$. No statistically significant difference between children with different combinations of birth order and age spacing was found for aggressive behaviors (CBCL), $F(3,613) = .897$, $p = .442$.

An ANOVA with Games Howell and Bonferroni post hoc tests, revealed a significant difference in mean levels of physical aggression between the groups. An inspection of the mean scores indicated that mothers of target children with younger siblings reported slightly lower levels of physical aggression (M =.22, SD = .15) than mothers of children with both younger and older siblings (M =.28, SD = .14). These two groups were the only two groups that were significantly different from each other. An omega squared of .013 was calculated, revealing a small effect. They were not significantly different from the remaining two groups of children with close (less than five years age difference, M =.26, SD =.13) or distant older siblings (more than five years age difference, M =.23, SD =.15). Results are presented in figure 2.
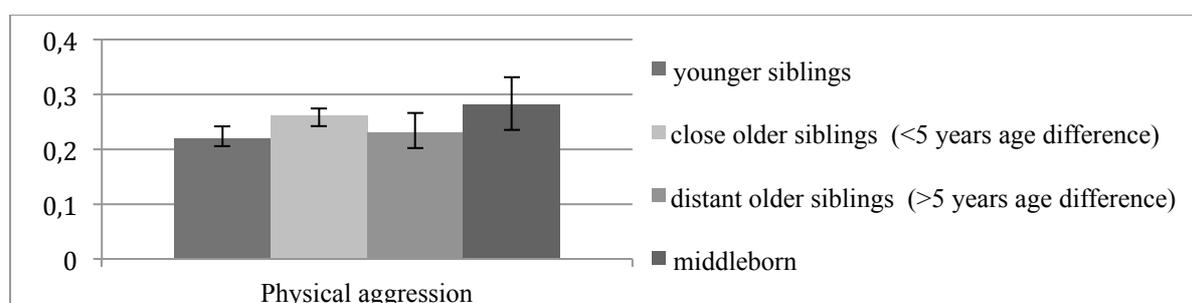

Figure 2. Mean level of reported physical aggression by birth order/age spacing. Error bars represent 95% confidence intervals.

Sibling gender

A MANOVA was performed to investigate if differences in children's siblings' gender are related to differences in mother reported levels of aggression in four-year-olds. Two dependent variables were used: *physical aggression* and *aggressive behavior (CBCL)*. The independent variable was *siblings' gender* (1. only brothers, 2. only sisters, and 3. brothers and sisters). Preliminary assumption testing was conducted to check for normality, linearity, univariate and multivariate outliers, homogeneity of variance-covariance matrices, and multicollinearity, with no serious violations noted. No significant difference between children with only sisters, only brothers, or both brothers and sisters, was found in terms of their level on the combined dependent variables; $F(4, 1228) = 1.04$, *p*=.387. Pillai's Trace =.042; partial eta squared = .003.When the results for the dependent variables were considered separately, no difference reached statistical significance using an alpha level of .0125, for *physical aggression* ($F(2, 614)$ =1.90, *p* = .151, partial eta squared =.006) or *aggressive behavior* ($F(2, 614)$ = 1.04, *p* = .353, partial eta squared =.003). *Siblings' gender* was consequently left out of the hierarchical multiple regression analysis.

3.3   Hierarchical multiple regression

A hierarchical multiple regression analysis was conducted to assess the ability of children's *birth order and age spacing* to predict levels of *physical aggression* in four-year-olds, after controlling for the influence of *maternal age*, *maternal troubled relationships with friends or family members*, two socio-economic measures (*maternal education* and *number of living/bedrooms in the home*) and *gender of the target child*. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity and homoscedasticity. Results are presented in table 1.

Potential covariates where entered at step one. These variables combined explained 4.1% of the variance in physical aggression. Four age spacing and birth order combination variables where added to the model and entered at step 2. Children with no siblings were coded as baseline. After this entry, the total variance of the model as a whole was 8.6%. The *birth order and age spacing* variables explained an additional 4.5% of the variance in physical aggression, after controlling for socioeconomic status, maternal age, gender of target child and maternal troubled relationships. In the final model, the measures that were statistically

significant, in order of highest to lowest beta values, where: *1) close older siblings (age difference less than five years) versus no siblings*, 2) *younger siblings versus no siblings,* 3) *younger and older siblings versus no siblings*, 4) *The gender of the target child*, 5) *distant older siblings (age difference more than five years) versus no siblings* and finally 6) *Mother's troubled relationships with friends or family*.

Table 1. Physical aggression predicted by sibling constellations and socio-economic variables

Predictors step 1	B	SE B	β
Constant	.20	.03	
Mother's Age	-.03	.02	-.05
Mother troubled relationships	.04	.01	.10**
Number of Rooms	.00	.00	.00
Mother's Educational Level			
High school or less vs. longer higher education	.02	.02	.05
Vocational education vs. longer higher education	.00	.02	.01
Shorter higher education vs. longer higher education	.00	.01	.01
Child's Gender	.05	.01	.16***
Predictors step 2	**B**	**SE B**	**β**
Constant	.16	.03	
Mother's Age	-.01	.02	-.01
Mother troubled relationships	.03	.01	.10**
Number of Rooms	-.01	.00	-.05
Mother's Educational Level			
High school or less vs. longer higher education	.02	.02	.05
Vocational education vs. longer higher education	.01	.02	.02
Shorter higher education vs. longer higher education	.00	.01	.01
Child's Gender	.05	.01	.17***
Siblings			
Younger siblings vs. no siblings	.06	.02	.18***
Close older siblings vs. no siblings	.09	.02	.31***
Distant older siblings vs. no siblings	.06	.02	.15**
Younger and older siblings vs. no siblings	.11	.03	.17***

Note. $R^2 = 4.1\%$, $\Delta R^2 = 8.6\%$, $F = 4.40$, $\Delta F = 6.11***$.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

4 Discussion

4.1 Number of siblings

The theme of this final thesis, and the goal of the current study, has been to investigate if four-year-olds with siblings on average are reported by mothers to display higher levels of aggression than children with no siblings. More specifically, the current study explored if differences in the number of siblings, are related to differences in mother reported levels of physical aggression and aggressive behavior in four-year-old children. Two definitions and measures of aggression where used to investigate if similar patterns of differences in levels of aggression where found for the narrowly defined *physical aggression* as measured by an original physical aggression scale, and more broadly defined *aggressive behavior*, defined in accordance with, and measured by items from a widely used clinical scale (CBCL).

Results reveal that the presence of siblings, rather than the number of siblings as originally hypothesized, is related to statistically significant higher levels of physical aggression in four-year-olds, compared to children with no siblings. However, such differences where not found for aggressive behaviors measured by the CBCL. One explanation for this may be that the presence of a sibling as a "target" may increase the odds of children showing physical aggression in settings where their mother can actually observe it. More broadly defined aggressive behavior, as measured by CBCL, includes behavior that does not rely on the presence of a "target", such as having angry or irritable moods, and being sullen or stubborn. Many of the CBCL items do not specify the targets the aggressive behaviors are directed at, in contrast to the physical aggression scale, where one item is specifically designed to measure how often the target child hits siblings. Children with no siblings will automatically get a low score on this item.

Children with two or more siblings had slightly higher levels of physical aggression, than children with one sibling, but this difference did not reach statistical significance. Although children with siblings were reported to display significantly higher levels of physical aggression than children with no siblings, the actual difference in mean scores between the groups was quite small. Such effects must be evaluated with caution, as small effects can occur by chance in large samples like the current one. The small differences found in children's levels of aggression based on their sibling constellation, may be closely related to the use of a normative sample, where incidences of aggressive behaviors are expected to be

sparse. Similar to previous studies based on normative samples in childhood, children's levels of aggression where in the current study on average found to be low, and instances of high reported levels of aggression where rare (e.g., Tremblay, 2010). On average mothers replied to items on the physical aggression scale, that instances of physical aggression had not occurred the last year (answer alternative 1) or had occurred once (answer alternative 2). Mothers were asked to estimate the extent to which the aggressive behavior items of the CBCL were currently (or during the last two months) true of the child, and on average most replied that the behaviors where either not true of the child (answer alternative 1) or sometimes true of the child (answer alternative 2). Such low reported levels of both physical aggression and aggressive behaviors make attempts at differentiating between target children's levels of aggression based on sibling constellation characteristics more difficult.

There is a trend found in the current sample that might indicate that the presence of siblings can be used to predict differences in children's levels of physical aggression, and this trend is somewhat in line with the resource dilution model and past findings that link the presence of siblings and sibship size to higher levels of aggression. However, based on the small effect size, it is assumed that other factors not accounted for in the current study are responsible for the variance found in children's level of physical aggression, rather than the presence or absence of siblings. Nærde et al. (2014), who utilized the same BONDS sample as the current study at earlier ages, investigated and identified different developmental trajectories of physical aggression in children from 8 to 26 months, and found that the presence of maternal and paternal mental distress, and difficult child temperament predicted higher levels of physical aggression. It is possible that these factors continue to impact children's levels of aggression as they grow older, and contributed to the variance found in children's level of physical aggression in the current study.

It could also be that sibship size indirectly influences children's levels of aggression, but that such effects are leveled out and compensated for by other child, family or community factors. As previously mentioned, sibling constellation size effects on intellectual and educational achievement have in some studies been found to be dependent on countries' economic conditions and family policies (Park, 2008; Maralani, 2008), and it is possible that effects of sibship size on physical aggression are subject to similar influences. Child-care can possibly be a factor that mediates the effects of sibship size on children's levels of aggression. The current study utilized a sample of children from Norway, a country, which as an important

means of promoting social equalization, offers universal access to highly subsidized child-care of adequate standards of quality (UNICEF Innocenti Research Center, 2008; Ministry of Education, 2007). Considering that the vast majority of four-year-olds in Norway attend child-care, and most of these are likely to spend the majority of their hours awake in child-care facilities on workdays (www.ssb.no/utdanning/statistikker/barnehager), it is proposed that child-care potentially can compensate for possible indirect influences of sibship size on children's levels of physical aggression. Child-care divides and distributes the tasks of caring and raising children between parents and child-care workers, and exposes all children, regardless of their number of siblings, to the competition for child-care personnel's resources and attention. This might minimize the potential effects of factors such as parental experience and resource dilution on children's levels of aggression, that have been hypothesized to be influences by sibsip size. Although nonparental child-care has been proposed to have negative implications for children's socio-emotional development, a study by Dearing, Zachrisson and Nærde (2015) who utilized the same BONDS sample as the current study, found that earlier, extensive, and long durations of nonparental child-care only had fading impact on children's levels of physical aggression.

Finally, it is possible that the differences found in mother reported levels of physical aggression for children, based on their differing numbers of siblings, are related to physical aggression often requiring the presence of a target, preferably an easy one, to be observed. Mother's with multiple siblings, who mostly observe their children at home, may then simply be provided with more opportunities to observe physical aggression, and consequently report more frequent occurrences of such behaviors. This highlights the need for reports and possibly also direct observation of child behavior from more than one source, and from settings outside the home.

4.2   Birth order and age spacing

Target children with siblings, where further divided into groups based on a combination of the constellation characteristics birth order and age spacing, to investigate if such combinations where related to differences in reported levels of physical aggression and aggressive behavior. Statistically significant differences of mean levels of aggression between groups, where only obtained for physical aggression and not for aggressive behaviors. Middleborn children were found to have significantly higher reported levels of physical aggression than those reported for firstborn children with younger siblings. The

difference in mean scores between the two groups was small, suggesting that, contrary to popular belief, birth order and age spacing between siblings may not be related to children's levels of physical aggression at four years of age, and that other factors not accounted for in the current study caused the observed differences in levels of physical aggression. In some respects, this is good news to parents, siblings and child-professionals, as age spacing is a structural characteristic of sibling constellations that is not subject to change, and the same goes for birth order as soon as parents are done having children.

Alternatively, a real relationship between birth order and age spacing, and children's levels of physical aggression exists in the sample and in the real world, but is compensated for by other factors not measured in the current study. Child-care has been proposed as a potential factor. Finally, it is possible that the measures used by the current study where not sensitive enough to capture such a relationship. A more detailed discussion of how the study potentially was limited by the wide age spacing categories used will be presented in the *limitations* section of this final thesis.

As mentioned in the method section, descriptive statistics revealed that the vast majority of middleborns in the current study had close older siblings with an age difference less than five years, rather than distant older siblings (more than five years age difference). In addition, lastborn children with close older siblings were found to have mother reported levels of physical aggression closest to those of middleborns. In contrast to the findings of Tremblay et al. (2004), the current study found that children with only younger siblings, on average, had the lowest reported levels of physical aggression. Thus the tendencies found in the current sample, although most where not statistically significant, seem to point in the direction that the presence of close in age older siblings, rather than age spacing or birth order as separate factors, was related to higher levels of physical aggression in four-year-olds. If a real relationship between the presence of close in age older siblings and four-year-old children's levels of physical aggression exists, one explanation for this may simply be that four-year-old children, are more likely to play with older rather than younger siblings. Brown and Dunn (1991) found, as mentioned, that later born siblings, as they grew from two years to four, spent an increased amount of time playing and talking with their older siblings. However, Brown and Dunn (1991) studied sibling dyads, and did not investigate if later born children at four years of age had a preference for older over younger siblings as playmates. However, they found that as later born children grew from two to four years old, they became more

attractive playmates for older siblings. In light of such findings, it may be in the current study, that in particular older siblings close in age to the target child are likely to show an increased interest in their younger siblings, when target children turn four years old. If this is the case, then naturally, more opportunities arise for disputes and conflicts between siblings, which in turn might increase the likelihood that target children use physical aggression, and that such use is observed and reported by mothers. Siblings that are more than five years older than the target child, most likely find themselves at a more advanced developmental stage, where their younger sibling is of less interest, at least as a playmate. In line with this, the current study found that children with distant older siblings, and children with only younger siblings, had the lowest reported levels of physical aggression. For now, however, such explanations remain speculations. As previously mentioned Nærde et al. (2014) who also utilized data from the BONDS found that close age spacing (less than five years) was related to a developmental trajectory of high levels of physical aggression in infancy and toddlerhood, but they did not distinguish between older and younger siblings. Tendencies found in the current sample, suggest that such a distinction could be useful.

4.3   Sibling gender

The results of the current study indicate that the gender of children's siblings is not related to differences in four-year-olds' mother reported levels of physical aggression or more broadly defined aggressive behaviors. As previously noted, most research on the relationship between sibling gender and children's level of aggression, have focused on the gender composition of sibling dyads. Rather than focusing on differences in levels of aggression between mixed-sex and same-sex sibling pairs, the current study included larger sibships, and focused on the presence of brothers, sisters or both, regardless of target child gender, leaving few studies to compare results to. However, the findings of the current study are in line with those of Fagan and Najman (2003), who found similar rates of covariation in aggression among same-sex and mixed-sex sibling pairs at age five, suggesting that sibling gender does not affect children's level of aggression. The similarity in measures of aggression used (maternal reports with items from the CBCL), target child age (4 and 5 years), and use of large population based samples from western cultures (Norway and Australia), might explain why the current study has obtained similar findings to those of Fagan and Najman (2003). Findings from the current study diverge from those of Aguilar et al. (2001) who found that the presence of an older male brother (within six years of age of the target child) was

associated with elevated levels of observer ratings of aggression. Aguilar et al. (2001) utilized a sample of sibling dyads where the youngest sibling was a preschooler and the oldest was less than six years apart in age, similar to the age of target children and the age intervals between siblings used in the current sample. In contrast to the study of Aguilar et al. (2001), the current study included larger sibships and considered birth order and age spacing, separately from sibling gender. Considering that the results of the current study indicated that the presence of older siblings close in age might be associated with higher levels of aggression in target children compared to other age spacing and birth order combinations, it is possible that a further distinction between close in age older male and older female siblings would have yielded different results.

In line with social learning theory and Patterson's coercion model, sibling gender can influence children's level of aggression, if sibling gender is related to differences in the frequency and nature of aggressive behaviors displayed by the sibling in front of, or aimed at, the target child. In other words, if brothers are more aggressive than sisters, they may provide the target child with more opportunities to imitate, and respond with, aversive acts, and in turn increase the child's level of aggression. Such a gender difference would provide target children with different amounts of aggressive behaviors to imitate and respond to, depending on the gender of their siblings. One explanation of the current findings could then be that brothers and sisters of the target children in the current sample, display similar levels of aggression, leaving target children with brothers, sister or both, with the same amount of aggressive behaviors to imitate and react to. Considering that boys and girls generally display more similar rates of aggression during early childhood (Hay et al., 2011) and the majority of children in the current sample have younger siblings or older siblings close in age, it is possible that gender differences in siblings' aggressive behaviors where non-existent or to small to impact target children's levels of aggression. In light of the low levels of aggression found in normative samples, levels of aggression displayed by siblings of target children in the current sample, although not measured, are likely to be low. Aguilar et al. (2001), in contrast to the current study, originally sampled two groups of children for their initial low or high levels of aggressive behaviors, and found that the presence of older brothers was related to higher levels of aggression, in a sample where the two groups where combined. Their sample, most likely contained higher average levels of aggressive behaviors than those obtained from the normative sample of the current study, suggesting that further research on

clinical samples of children with higher levels of aggressive behaviors is necessary to see if the findings of the current study apply to such populations.

4.4 Consideration of socio-demographic variables

Multiple hierarchical regression found that children with siblings, with different forms of birth order and age spacing combinations, all had significantly higher levels of mother reported levels of physical aggression, than children with no siblings, after controlling for the potential influence of child gender, number of rooms in the home, maternal age, education and troubled relationships. Such findings suggests that the presence of siblings, more than the specific birth order and age spacing constellation, explained parts of the variance found in reported levels of physical aggression in four-year-olds. Results showed that the birth order and age spacing variables explained 4.5% of the variance in physical aggression, after controlling for socioeconomic status, maternal age, gender of target child and maternal troubled relationships. In total the model only explained 8.6% of the variance found in physical aggression levels, suggesting that other factors not measured in the current study account for the majority of variance in physical aggression.

Interestingly, of all the control variables, only maternal troubled relationships with friends and family members, and the gender of the target child, were significantly related to differences in reported levels of physical aggression when children where four years of age in both the partial and the full regression model. Mothers' troubled relationships with friends or family members is assumed to be related to both higher levels of family stress and possibly lower social support, factors that have been associated with higher levels of physical aggression in previous studies (e.g., Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Kjeldsen et al., 2014; Mathiesen, Sanson, Stoolmiller & Karevold, 2009).

In line with existing research (e.g., Hay et al., 2011; Hay, 2007) statistically significant gender differences in physical aggression where found for the current sample, with boys having slightly higher mother reported levels of physical aggression than girls. According to Hay (2007) such gender differences could possibly be due to girls maturing sooner than boys. Girls may be biologically more susceptible than boys are to the social pressures that advocate resistance from physical aggression. Alternatively, the general trend for boys to be more aggressive than girls may largely be caused by a minority of troubled boys who engage in

high rates of aggressive behaviors. Lastly, boys, in contrast to girls, may be expected to play in ways that promote physical aggression (Hay, 2007). This expectation in turn, may bias mother's perception of their children's behavior, causing them to interpret and report more behaviors as physical aggression, than they would with girls.

In contrast to previous findings, such as those of Kjeldsen et al. (2014), maternal age and education did not significantly predict children's levels of physical aggression. One reason for this could be the that, due to the high mean age of mothers in the sample, wide age categories where used which did not adequately separate young mothers from older ones (under and over 25 years at the six month interview). In support of this, Nærde et al. (2014) found no relationship between maternal age and level and development of physical aggression, for the same sample at earlier ages. The number of bedrooms and living rooms in the child's home, and maternal education, where assumed to be predictors of socioeconomic conditions, yet such variables did not predict differences in children's levels of physical aggression, suggesting that either these measures did not adequately measure the underlying socioeconomic conditions, or alternatively, that differences in socioeconomic conditions between families, and their potential impact on physical aggression, is compensated for by family supportive policies in Norway.

4.5 Limitations and suggestions for future research

This study is limited in a few ways. Firstly, in line with most previous research on child development, mothers where used as informants. Mothers' single time report of a limited number of behaviors may result in weak reliability. Furthermore, mothers have been found to report higher levels of aggression than fathers. For example, Nærde et al. (2014), who utilized data from the BONDS; compared maternal to paternal reports on infants and toddlers' levels of physical aggression, and found that the results did not differ substantially, although mothers on average where found to report higher levels of physical aggression. One reason for this may be, that research has shown that mothers tend to engage in more frequent interactions with their children than fathers (Lewis & Lamb, 2003), which in turn might make them more emotionally involved in their children's aggressive behaviors. In general, parents' ratings of externalizing problem behaviors have been found to be negatively biased, because they are more emotionally involved with their children's aggressive behaviors than are external observers (e.g., Van der Ende & Verhulst, 2005). However, in light of the low levels of aggression reported by mothers for the current normative sample, such a negative bias has

most likely not distorted results. Despite the limitations of relying on maternal reports alone, mothers are provided with plenty of opportunities to observe their children, as four-year-olds spend a lot of time in the family setting. This makes mothers privileged informants on children's behavior. In future studies maternal reports should be supplemented by reports from other respondents such as fathers and kindergarten teachers. A multi-informant strategy has the advantage of both avoiding shared-method variance between predictor and outcome measures and of partly coping with measurement biases in the assessment of aggressive behaviors. Direct observations are suggested as valuable complementary means of aggressive behavior assessment in future research, as such observations avoid both informant effects and the influence of past transactions on how current behavior is interpreted (Hughes et al., 2002). By relating predictors to child aggressive behavior, both as rated by parents and as observed by external raters, future studies can aim to depict a more complete and objective view of sibling constellation characteristics' indirect influence on children's levels of aggression, than was obtained by the current study.

The current study was further limited in its use of a single time measurement. There may be great short-time fluctuations in physical aggression, aggressive behavior and parent reporting. A single time measurement of physical aggression and aggressive behaviors are therefore not likely to capture reliably or validly an underlying level of aggression, and may not be telling of long-term developmental trends (Nærde et al., 2014). Thus, it is suggested that future research, instead of using a single time mother report, rely on multi-informant and multi-method strategies, frequently and multiple times during the preschool years, to more reliably and validly explore the role siblings play in four-year-olds attempts at anger regulation.

Also in line with previous research, the physical aggression scale used in the current study, relied on a limited range of behaviors that are fairly concrete and objective, which can easily be reported (e.g., Nærde et al., 2014; Tremblay et al., 2004). However, a single time measurement of such a limited and narrow range of behaviors, are not likely to capture reliably or validly an underlying level of aggression. In an attempt to get closer to such an underlying level of aggression, items on aggressive behaviors, from the multidimensional widely used CBCL, were added. Future research should include measures of verbal or relational aggression, as four-year-olds, in line with their developing language and social skills, may rely more on such forms of aggression and less on physical aggression.

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The current study utilized data from the BONDS, which had already been collected. In line with Nærde et al. (2014) who relied on the same data, due to the age and gender categories used in the original BONDS interview at 48 months, age spacing was divided into more or less than five years age difference. Siblings' birth dates where unfortunately not collected, which otherwise could have enabled the creation of more narrow age intervals, and more specific birth order categories, especially for middleborn children with more than two siblings. The current study had to compare information on the presence of siblings from the four year interview to those obtained in the six month interview, to estimate if siblings where younger or older than the target child. Those siblings who were already present at the six month interview were, due to the target child's age, assumed to be older than the target child, while those only registered at the 48 month interview where assumed to be younger siblings. Adoptive siblings and half siblings where registered as siblings, which left the current study with no means of controlling for the potential presence of new adoptive siblings at the four year interview that were older than the target child, or the presence of older biological siblings that had moved back inn. However, it was assumed that if present at all, families where older adoptive or biological siblings had joined the family between interviews, and where erroneously recorded as "younger siblings" in the current study, would be so few that they would not influence the final results in any significant way. Families with foster care children and other children that had entered the family since the six-month interview where excluded.

It can be argued that the inclusion criteria used where to conservative. Excluding all cases where mothers had not responded to all items of either the physical aggression scale or the CBCL, may have had negative implications for the external validity of results. Although conservative criteria have the benefit of optimizing internal validity, the results of the current study cannot be assumed to apply to exclude cases, as participants not meeting inclusion criteria per definition differ from those included. A comparison of the final sample and excluded cases on key demographic variables confirmed that the final sample differed from the excluded cases (see appendix 2), especially in terms of containing more firstborns and mothers with higher education. However, as previously mentioned, such biases are quite common in research based on voluntary participation (Nærde, Janson & Ogden, 2014).

It can be argued that the age intervals used for the age spacing categories for the current study, similar to those used by Nærde et al. (2014), where inappropriately wide, for the

exploration of the relationship between sibling age spacing and children's levels of aggression. Due to the five year intervals used to categorize siblings in both the six- month and 48 month interviews, for the current study, younger siblings could not be divided into groups with more or less than five years age spacing, as target children where only four years old. Similarly, due to the wide age spacing definitions used, the vast majority of middleborn children were found to have close older siblings less than five years apart, preventing the formation of a comparison group of middleborn children with distant older siblings. The wide age spacing categories, coupled with a sample biased towards more firstborn children, may have contributed to the uneven distribution of participants between the groups, with most target children found to have younger siblings or close older siblings. The BONDS is still ongoing, which provides future opportunities for the researchers, in up-coming interviews, to add an item recording siblings' birth dates, which would enable a future longitudinal exploration of the relationship between sibling constellation factors and reported levels of both physical aggression and aggressive behaviors in line with CBCL.

Furthermore, the current study assumes that children with close age spacing are at similar developmental stages, yet no measures of children's social skills have been included. It may be that target children's age, and developmental stage, moderate the relationship between sibling age spacing and children's level of physical aggression. More specifically, it is possible that extensive changes in emotional, social, cognitive, motor or language skills, influence children's preference for older or younger siblings as playmates, and potentially the part age spacing plays in dictating how similar or different siblings interests and coping strategies are. Thus the relative impact of age spacing and birth order on children's levels of physical aggression may be closely tied to children's age and developmental stage. Future research could include measures of target children's and their siblings' social development and coping skills, to explore if the relative difference in developmental status and social competence between the target child and it's siblings, facilitates or disrupts four-year-olds' attempts to learn how to inhibit physical aggression.

Based on the results of Nærde et al. (2014), the presence of maternal and paternal mental distress has been proposed as two possible factors that may account for the differences found in the current study in four-year-olds levels of aggression. It is possible that sibling constellation factor effects on child aggressive behavior are mediated by parental factors such as mental distress. The current study is limited in this respect, as it only accounts for a few

maternal factors, and does not consider how siblings indirectly influence each other through their effects on other family members and broader family dynamics.

Limiting the focus of the current study to structural sibling constellation factors, has left the reciprocal influences of siblings on each other's development, and the potentially moderating effects of child and sibling characteristics such as temperament, unexplored and not accounted for. As previously mentioned, Mesman et al. (2009) found that having more siblings, in particular older siblings, predicted a stronger decrease in externalizing problems, but only for children with a difficult temperament. Differential susceptibility was linked to differences in child temperament, and by not accounting for the potential moderating effects of child temperament, the current study may potentially over or underestimate the environmental effects of sibling constellation factors on the development of aggression. Both social learning theory and Patterson's coercion model emphasize that sibling's influence on children's development largely depends on the nature of the behavior being modeled and reinforced. The current study does not account for the nature of the exchanges between siblings, and does not consider the quality of the sibling relationship. Including direct measures of child and siblings' personal qualities such as temperament, and direct observations of sibling interactions in addition to parental reports on sibling behaviors and relationship quality, could potentially provide valuable insight into how such factors moderate the relationship between sibling constellation characteristics and children's levels of aggressive behaviors. Such a design would enable researchers to move beyond group comparisons of aggressive behavior outcomes, to examine the processes behind them.

Finally, due to the low frequency of aggressive behaviors in the normative sample of four-year-olds utilized in the current study, differences in children's levels of aggression were difficult to detect. Past research has found higher levels of conflictual behaviors in sibling interactions in samples of aggressive children, compared with nonaggressive children (e.g., Aguilar et al., 2001), suggesting that the inclusion of a comparison group of children sampled for their high levels of aggression, or a clinical sample of children with behavioral problems, would enable researchers to examine if similar relationships between sibling constellation factors and children's levels of aggression are obtained in normative and clinical samples, and investigate the relative strength of such relationships.

5 Conclusion

The current thesis explored the relationship between sibling constellation characteristics (number, birth order, age spacing and gender of siblings) and four-year-old children's mother reported levels of 1) physical aggression and 2) aggressive behavior (CBCL). Findings suggest that the presence of siblings, rather than sibling constellation characteristics, is related to higher levels of physical aggression. However, such a relationship was found to be weak, suggesting that, at least in normative samples, the presence of siblings is not a strong predictor of four-year-old children's levels of physical aggression. Neither the presence of siblings nor sibling constellation characteristics, were related to statistically significant differences on the aggressive behavior syndrome scale (CBCL). One explanation for this difference in results obtained for the two measures of aggression could be that physical aggression, in contrast to aggressive behaviors such as having angry or irritable moods, requires the presence of a target. Siblings can serve as such targets, and may increase the odds of children showing physical aggression in settings where their mothers can actually observe it. The current study demonstrates the importance of including multiple measures of children's aggressive behaviors in the search for predictors of childhood aggression, and demonstrates how predictors associated with one type of aggression, do not necessarily predict other forms of aggressive behaviors.

Popular beliefs about birth order, such as the middle child being more aggressive, gain little support from the findings of the current study. Children were on average found to have low mother reported levels of aggression. Although middleborn children were found to be the most aggressive, the only groups of children they significantly differed from were firstborn children with younger siblings and children with no siblings, and the differences where small. Tendencies found in the results suggested that the presence of close in age older siblings (less than five years age difference), rather than birth order, was related to higher levels of aggression, but further studies are needed to confirm such assumptions.

A clearer understanding of how siblings contribute to children's socialization can help answer important societal questions about why some children turn into well-adjusted adults, and others don't. Popular beliefs about the impact of sibling constellation factors on childhood aggression can distort such an understanding. The findings of the current study can contribute to diminishing the impact of such beliefs.

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Appendices

Appendix 1

Inter-item correlation matrix for physical aggression scale and CBCL

CBCL-VII	Physical Aggression Scale for the BONDS						
	Hits you	Hits siblings	Pulls hair	Pinches someone others	Throws things at others	Bites someone	Kicks someone
Can't stand waiting, wants everything now	.16	.13	.05	.10	.18	.08	.11
defiant	.20	.12	.11	.18	.20	.16	.12
demands must be met immediately	.22	.18	.12	.13	.20	.11	.15
Destroys things belonging to his/her family or other children	.16	.22	.13	.18	.17	.14	.14
disobedient	.25	.17	.12	.22	.22	.24	.18
Doesn't seem to feel guilty after misbehaving	.11	.13	.05	.05	.10	.13	.08
Easily frustrated	.13	.11	.06	.12	.20	.06	.15
Gets in many fights	.14	.24	.18	.19	.22	.14	.15
Hits others	.40	.50	.28	.34	.32	.33	.30
Hurts animals or humans without meaning to	.11	.13	.06	.08	.11	.10	.07
Is often angry	.23	.18	.20	.18	.24	.14	.21
physically attacks people	.25	.32	.19	.17	.25	.27	.16
Punishment doesn't change his/her behavior	.18	.26	.16	.18	.18	.23	.17
screams a lot	.19	.27	.17	.16	.18	.06	.16
Selfish or won't share	.16	.18	.13	.15	.20	.13	.19
Stubborn, sullen or irritable	.12	.12	.14	.11	.19	.14	.12
Temper tantrums or hot temper	.28	.19	.20	.17	.24	.17	.15
uncooperative	.20	.17	.13	.18	.18	.09	.15
Wants a lot of attention	.09	.07	.07	.18	.08	.08	.06

Appendix 2

Key demographic variables in the current sample, excluded cases, the BONDS sample, in the group of eligible families informed about the project at child health clinic visits, and for births in Norway in the years of the recruitment period.

	Sample				
Variable	Current study	Excluded cases	BONDS	Child health clinic visits	Births in Norway 06-08
	N=741	N = 418	N=1159	N=1931	N=177501
Baby's gender (Male)	50.1%	55 %	51.8%	51.0%	51.3%
Birth order (Firstborn)	51.0%	40.1%	47.1%	46.3%	42.6%
Mother's birth country (foreign-Europe)	7.6%	6 %	7.0%	5.3%	10.4%
Mother's birth country (outside Europe)	6.0%	6.9%	6.3%	7.7%	12.0%
Mother's age at birth* (average)	30.4	30.1	30.3	N/A	30.3
Mother's age at birth* (Standard Deviation)	4.5	5.5	4.9	N/A	5.2
Mother's education (only primary)	1.1%	3.3%	1.7%	5.9%	17.5%
Mother's education (college/university)	67.8%	52.8%	63.3%	57.1%	50.3%

* mother's age at six month interview, subtracted by 6 months