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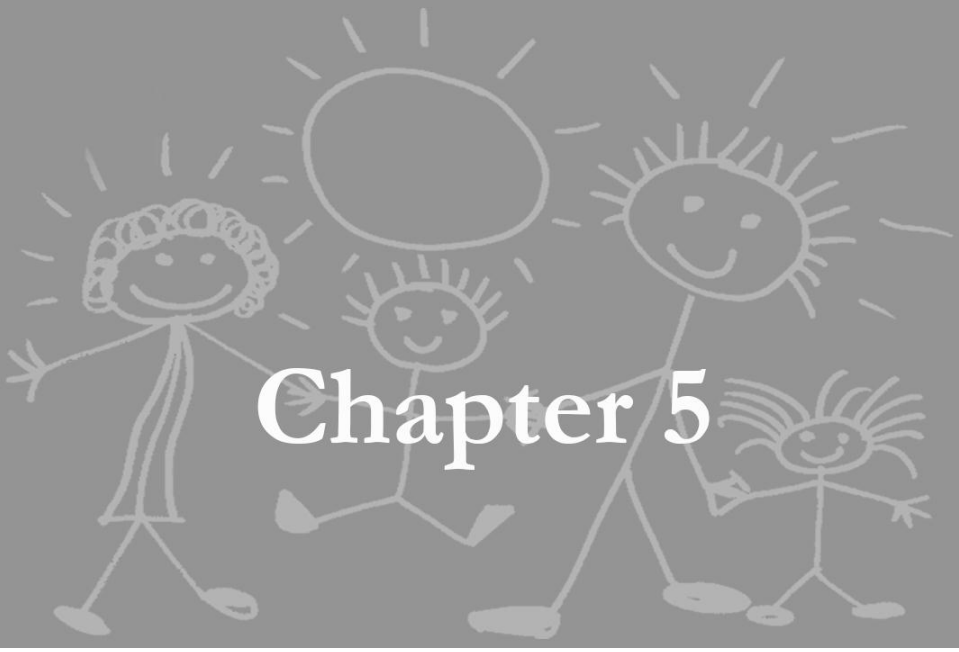

Chapter 5

Birth-Order Effects on Social Development in Early Childhood: A Within-Family Study

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ABSTRACT

Birth order may be an important factor influencing the development of siblings, but has been studied mostly in relation to cognitive development and not social development. We used a longitudinal within-family design to compare social behaviors of firstborn and second-born children in the same family at the same age. In a sample of 215 families, fathers with both children and mothers with both children were visited at home twice: once when the firstborn children were on average three years old and once two years later when the second-born children were three years old. Sibling sharing and compliance were observed, empathy and externalizing behavior were measured using parental reports, and inhibitory control was measured with a computerized Go/NoGo task. Second-born children shared more, were more compliant, and were reported to show more empathy and more externalizing behaviors compared to their firstborn siblings at the same age. This may be due to having more experienced parents, the observation of interactions between parents and the firstborn child, and interactions with an older sibling that may provide a training ground for both positive and negative behaviors. Regarding inhibitory control, only second-born girls with older brothers developed higher levels of inhibitory control than their older sibling.

Keywords: birth order, social development, siblings, within-family design

INTRODUCTION

Siblings growing up in the same family may develop very differently. An important factor associated with differences between siblings' experiences within the family is birth order (Steelman, Powell, Werum, & Carter, 2002). Most studies concerning birth-order effects focus on cognitive development (e.g., Steelman et al., 2002; Zajonc & Sulloway, 2007), and only a few studies examined these effects on child social development. Experiences with sibling interactions and birth-order effects related to these interactions influence however both adaptive social behaviors like sharing (Cassidy, Fineberg, Brown, & Perkins, 2005) and empathy (Jenkins & Astington, 1996) and maladaptive social behaviors like externalizing behavior (Recchia, & Howe, 2009). The few studies on birth-order effects in the socio-emotional domain show mixed results, with some finding that second-born children display more prosocial behavior and less antisocial behavior compared to firstborns (Stauffacher & DeHart, 2006; Van Lange, Otten, De Bruin, & Joireman, 1997), while others find no differences between firstborn and second-born children (Donenberg & Baker, 1993; Riggio & Sotoodeh, 1989). Although birth order is a typical within-family variable, most studies do not use within-family designs to assess its effects on child development, and this may account for the inconsistent results. Further, given evidence for different interactions between same-sex siblings versus mixed-sex siblings (Pepler, Abramovitch, & Corter, 1981; Schachter & Stone, 1985), sibling gender configuration may influence birth-order effects, but is rarely addressed. The aim of this study is to examine the effects of birth order and sibling gender configuration on social development.

Differences in the development of firstborn and second-born children have been addressed in a number of theories focusing on aspects of sibling interactions and development. The literature generally points to a potential advantage in cognitive development of second-born children over firstborn children, because firstborn siblings can teach new skills to their younger sibling. According to Vygotsky's theory (1978) on the acquisition of new skills in the zone of proximal development, more experienced partners can guide others and help them to complete tasks which are too difficult for them to complete on their own. Firstborn children may thus guide their younger siblings. Indeed, children provide more explanations and positive feedback, and exert more control over their younger siblings than they do in

interactions with other children, and firstborn children can be successful in guiding their younger siblings to complete difficult tasks (Azmitia & Hesser, 1993).

Somewhat more complex is confluence theory (Zajonc & Markus, 1975; Zajonc & Sulloway, 2007), which suggests that advantages of birth order may depend on child age. Confluence theory proposes that when children reach school age, firstborns' intellectual abilities will benefit from teaching new skills to younger siblings, which will result in higher cognitive levels of firstborns compared to second-born children (Sulloway, 2007; Zajonc & Sulloway, 2007). During early childhood however, the family environment is intellectually richer for second-born children than for firstborn children, because all family members are more skilled than the second-born child, while the level of the firstborns' intellectual environment declines with the birth of a less skilled younger sibling.

In contrast, other theories expect second-born children to have a disadvantage compared to firstborn children when it comes to cognitive skills. The resource dilution model (Blake, 1981) states that since parental resources such as attention and time spent with parents are limited, each individual child will receive less of these resources when the number of children in the family increases. Since firstborns have a period of being the only child and receiving all parental resources, they may have an advantage over second-born children. Other models concerning differential parental investment are evolutionary theories that presume that parents invest more in children who increase their inclusive fitness (Trivers, 1974). Given that firstborn children have survived for a longer period of time than their younger siblings, they have a greater chance to reach reproductive maturity (Sulloway, 1996). Several studies found that parental investment differs between children, favoring firstborns in amount of stimulation (Thoman, Leiderman, & Olson, 1972), quality time (Price, 2008), and face-to-face contact (Keller & Zach, 2002), leading to advanced cognitive development and school achievement during middle childhood and adolescence in firstborns compared to later-born children.

Regardless of predictions about whether the younger or older siblings will have an advantage in cognitive skills, a cognitive advantage may or may not generalize to advantages in other areas of functioning. It can be argued that more advanced cognitive skills may stimulate the development of theory of mind, the understanding of social situations and social information

processing skills, which are important for the development of adaptive social behavior (Blair & Razza, 2007; Lemerise & Arsenio, 2000). Some theories and empirical studies indeed address differences in social functioning between firstborn and later-born children. A theory that proposes advantages of second-born children in social development is social cognitive learning theory (Bussey & Bandura, 1999). According to this theory, children learn social skills by observing behaviors of others within social contexts, also referred to as vicarious learning. In line with this theory, second-born children may learn new skills and behaviors at a younger age than firstborns by imitating their older siblings and by observing interactions between their parent and the older sibling (Barr & Hayne, 2003). For example, at the ages of 4 and 8 years, second-born children display less aggression than firstborn children at the same age and are more socially accepted by peers (Kitzmann, Cohen, & Lockwood, 2002; Stauffacher & DeHart, 2006). Moreover, there is some evidence that second-born children are exposed to different experiences compared to firstborn children because of the presence of an older sibling. They are exposed to more family talk about feelings, desires, and thoughts of others because these are discussed with the older sibling (Symonds, 2004), which facilitates the development of perspective taking (Ruffman, Perner, Naito, Parkin, & Clements, 1998; Ruffman, Perner, & Parkin, 1999) and in turn may stimulate the younger child's prosocial development.

In addition, experiential learning theory (Kolb, 1984) submits that experiences play a central role in adult learning process. In line with this theory, parents may provide more effective parenting towards the second-born child, due to their experiences with the firstborn child and possible more accurate expectations concerning child development. For example, parents display more warmth towards and have fewer conflicts with second-born adolescents compared to firstborn adolescents, as a consequence of having more realistic ideas about behavioral changes during adolescence (Shanahan, McHale, Crouter, & Osgood, 2007; Whiteman, McHale, & Crouter, 2003). Second-born children could thus also have a developmental advantage over firstborns through indirect sibling influences. However, studies on parents' learning experiences with younger children are lacking and it remains unclear whether parenting becomes more effective with a second-born child (Whiteman et al, 2003). Contrary to the experiential learning theory several studies found that parents are more sensitive and provide more high-quality

care to their firstborn children (Furman & Lanthier, 2002; Van IJzendoorn et al., 2000).

Finally, the family-niche model, developed by Sulloway (1996, 2001), explains birth-order effects on personality and behavioral development by processes of sibling rivalry over parental resources. Firstborn children, according to this model, identify strongly with their parents and are motivated to fulfill parental expectations. Second-born children, on the other hand, need to create their own unique niche within the family by (un)consciously differentiating their behavior from their firstborn siblings (also known as de-identification) to receive at least as much parental attention as firstborn children. Through this de-identification second-born children are supposedly less likely to identify with parental values and standards, and more open to new experiences than firstborns, leading to more "rebellious" behaviors in later-born children. Second-born children can be expected to be less compliant and to show more externalizing behavior, and because they would be more open to new experiences, they may also be better in adapting their behaviors to new situations than firstborn children.

Studies with adolescents have found evidence supporting the family-niche model with a pattern of results showing both potentially advantageous outcomes for firstborns as well as for second-born children. Firstborn adolescents have been found to be more dominant, achieving, and conscientious, and second-born adolescents were more open to new experiences and more rebellious (Beck, Burnet, & Vosper, 2006; Healey & Ellis, 2007; Paulhus, Trapnell, & Chen, 1999). These differences in behavior may lead to different career opportunities, as for example among political leaders firstborns are overrepresented (Andeweg & Berg, 2003; Hudson, 1990). Most studies concerning the family-niche model focus on adolescents therefore it is unclear whether the processes described by this model foster differential development between siblings in early childhood.

Theories on birth-order effects predict differences between firstborn and second-born children. However, several studies found no birth-order effects on personality (Crozier & Birdsey, 2003; Freese, Powell, & Steelman, 1999; Michalski & Shackelford, 2002), social skills (Riggio & Sotoodeh, 1989), or on early childhood aggression (Donenberg & Baker, 1993; Updegraff, Thayer, Whiteman, Denning, & McHale, 2005) and perspective taking (Jenkins & Astington, 1996; McAlister & Peterson, 2007). Thus, the evidence

concerning the presence and direction of birth-order effects on social development is inconclusive. The same is true for effects of sibling gender configuration on child development, with some studies finding more imitation between same-sex compared to mixed-sex siblings (Pepler et al., 1981), and others finding more differentiation between same-sex compared to mixed-sex siblings (Grotevant, 1978; Schachter & Stone, 1985). Again, yet other studies have not found any effect of sibling gender configuration (Azmitia & Hesser, 1993; Garner, Jones, & Palmer, 1994; Howe & Recchia, 2009). Most studies on birth-order effects do not address the possible influence of sibling gender configuration on differences between firstborn and second-born children, and vice versa. In addition, the majority of studies on birth-order effects use cross-sectional data and compare firstborn and second-born children between families, but it is essential to investigate birth-order effects in a within-family design to distinguish them from differences between families (Rodgers, 2001; Rodgers, Cleveland, Van den Oord, & Rowe, 2000).

The current study uses a longitudinal within-family design to investigate the effect of birth order on social development, and to examine the role of sibling gender configuration on birth order effects. We measured both adaptive social behaviors, i.e. sharing, empathy, inhibitory control, and compliance, and maladaptive social behaviors, i.e. externalizing behavior in both siblings at the same ages. We expected that as a result of having more experiences with sibling interactions with an *older* sibling and with observing parent-sibling interactions than firstborn children at the age of three years, second-born children, compared to firstborn children at the same age, would share more, display higher levels of empathy, inhibitory control, and compliance and lower levels of externalizing behavior. We investigated the influence of sibling gender configuration with a more explorative aim.

METHOD

Sample

The sample was recruited in the context of the longitudinal study *Boys will be Boys?* examining the influence of gender-differentiated socialization on the socio-emotional development of boys and girls in the first years of life. Families with two children in the Western region of the Netherlands were selected from municipality records. Families were eligible for participation if

at the time of recruitment the second-born child was around 12 months of age and the first born child was between 2.5 and 3.5 years old. Exclusion criteria were single parenthood, severe physical or intellectual handicaps of parent or child, and parents being born outside the Netherlands or not speaking the Dutch language. Eligible families were invited by mail to participate between April 2010 and May 2011; 31% (n = 390) of the 1,249 families agreed to participate. The participating families did not differ from the non-participating families on degree of urbanization of the place of residence, and age and educational level of both parents (all ps > .11). This paper reports on data from the first and the third wave. In the third wave 18 families did not participate as a result of moving abroad (n = 5), family problems (n = 3), or because families considered further participation as too demanding (n = 10). Furthermore, for the analyses of this paper, families were excluded (1) if one of the parents had not completed the questionnaires on child behavior (n = 103), (2) if observations of sharing or noncompliance of one visit were missing (n = 29), (3) if a child refused to complete the computer task (n = 10), or (4) if the age difference between siblings on time of measurement was more than 6 months (n = 17), resulting in a final sample of 215 families. The distribution of sibling gender configuration was as follows: 61 boy-boy (28%), 51 girl-girl (24%), 55 boy-girl (26%), and 48 girl-boy (22%).

At the time of Wave 1 firstborn children were, on average, 3.0 years old (SD = 0.3) and their younger siblings were, on average, 1.0 years (SD = 0.0). In the third wave, the second-born children were, on average, 3.1 years (SD = 0.0) and the firstborns had a mean age of 5.1 years (SD = 0.3). At Wave 1 mothers were aged between 26 and 46 years (M = 33.9, SD = 3.9) and fathers were between 26 and 53 years of age (M = 36.9, SD = 5.1). Most participating parents were married or had a registered agreement (94%), and the remaining 6% lived together without any kind of registered agreement. With regard to educational level, most of the mothers (80%) and fathers (74%) had a high educational level (academic or higher vocational schooling). At the time of Wave 3 a third child had been born in 39 (18%) of the families and parents of four families were divorced (2%). Analyses with and without these families yielded similar results, so these families were retained in the current data set.

Procedure

Each family was visited twice at every wave, within a period of approximately two weeks, once for observation of the mother and the two children and once for observation of the father and the two children. The order of father and mother visits was counterbalanced. After the two visits families received a gift of 30 Euros and small presents for the children. Before each home visit both parents were asked to individually complete a set of questionnaires. During the home visits parent-child interactions and sibling interactions were filmed. At Wave 1 only the firstborns and both parents completed computer tasks, while from Wave 3 both children completed computer tasks. All visits were conducted by pairs of trained graduate or undergraduate students. All participating families gave their informed consent. Ethical approval for the study was provided by the Research Ethics Committee of the Institute of Education and Child Studies of Leiden University.

Measures

Sharing. Children received a small box of raisins (a common children's treat in the Netherlands) and were instructed by the experimenter to share these with their siblings. At Wave 1 firstborns shared with their second-born sibling and at Wave 3 second-born children shared with their firstborn siblings. The sharing task was administered during both the father and mother visits. Parents were present during the task and were free to interfere if they considered this necessary. The task was filmed and the number of treats shared with the sibling was counted. Treats that the siblings took without permission of the child, and treats shared with or by the parent were not counted; when a child took treats back from the sibling these were subtracted from the total number of shared treats. Parents within the same family were coded by different coders to guarantee independence among ratings. Interobserver reliabilities between all pairs of 11 independent coders were adequate with intraclass correlations (single rater, absolute agreement) all above .70. The number of treats shared ranged from not sharing any treats to giving all the treats to the sibling (score range 0-30).

Empathy. Empathy was measured with the subscale Empathic, Prosocial Response to Another's Distress from the My Child Questionnaire (MCQ; Kochanska, 2002). Both fathers and mothers indicated whether they considered any of the 13 empathic responses (e.g., 'Promptly notices others'

feelings') on a 5-point scale to be typical of their firstborn child at Wave 1 and their second-born child at Wave 3. Three items with item-total correlations lower than .30 were deleted. The resulting internal consistencies (Cronbach's alpha) were .75 (fathers) and .77 (mothers) for the fist-born children, and .77 (fathers) and .78 (mothers) for the second-born children.

Inhibitory Control. To measure inhibitory control an adapted version of the Cat-Mouse task (Simpson & Riggs, 2006), a computerized Go/NoGo task for 3-year-old children, was administered during either the first or the second visit (counterbalanced). To make this task applicable for 2.5-year-olds the inter-trial interval was increased from 1.5s to 3s during the practice session, providing the children with more time to understand the task. The experimenter explained that the child had to catch all the mice that appeared on the screen (Go-stimuli) by pressing a red button. The child was told not to catch the cats that appeared on the screen (NoGo-stimuli). The task consisted of a practice session, in which five mice and five cats were presented (in alternating order), and a test session, in which 30 mice and 10 cats were displayed in random order. Only during the practice session was the child given feedback. After the practice session the experimenter repeated the instructions for the child. Commission errors (responses to NoGo-stimuli) were used as a measure for a lack of inhibitory control (Groot, De Sonneville, Stins, & Boomsma, 2004). To generate a measure for inhibitory control the sum score of the commission errors was subtracted from the total number of NoGo-stimuli (10 – number of commission errors).

Compliance. Compliance was measured in a 4-minute disciplinary *don't* context (Kochanska, Coy, & Murray, 2001). The parent was asked to put a set of attractive toys on the floor in front of both children, and to make sure the children did not play with or touch the toys. After 2 minutes, both siblings were allowed to play for another 2 minutes only with an unattractive stuffed animal. Noncompliance was coded with an event-based coding system. An event was coded when the child reached towards or touched the prohibited toys after the parent explained that the child was not allowed to touch them. If a child reached or touched the toys more than once within 10 seconds this was coded as one event of noncompliance. Noncompliance scores could range between 0 and a maximum of 24 events (i.e. 240 seconds/ 10 seconds). The two observations of compliance for each child within the same family (once with the mother present, once with the father present)

were coded by different coders to guarantee independence of the ratings. Interobserver reliability was good with all intraclass correlations (single rater, absolute agreement) for all pairs of the 31 coders above .80. To prevent coder drift regular meetings with coders were organized. To generate a measure for compliance the total number of events of each child was subtracted from the maximum number of events (24 – noncompliant events).

Child Externalizing Behaviors. The Child Behavior Checklist for preschoolers (CBCL/1½-5; Achenbach & Rescorla, 2000) was used to assess externalizing behaviors of the firstborn at Wave 1 and the second-born at Wave 3. Both fathers and mothers indicated whether they observed any of the 36 behavior problems in the last two months on a three-point scale. The internal consistencies (Cronbach's alpha) were .92 (fathers) and .91 (mothers) for the fist-born children and .92 (both fathers and mothers) for the second-born children.

Data-Analysis

Data inspection was conducted according to the procedures described by Tabachnick and Fidell (2012). All measures were inspected for possible outliers that were defined as values more than 3.29 *SD* below or above the mean. Outliers were winsorized to make them no more extreme than the most extreme value that fell within the accepted range conform a normal distribution. Compliance was positively skewed, and a square root transformation was used for analyses. All other measures were normally distributed.

To assess the effect of birth order on child behavior without the confounding factor of child age, we compared the behaviors of the two children at the same ages, i.e., the behaviors of the firstborn children as measured at Wave 1 (when they were on average 3 years old) and the behaviors of the second-born siblings as measured at Wave 3 (when they were on average 3 years old as well). Analyses of birth-order effects on sharing, empathy, compliance, and externalizing behavior were conducted using a GLM Repeated Measures MANOVA. Main effects and the interaction between the within-subjects factors birth order (oldest, youngest) and parent gender (father, mother) were examined. There was no within-subjects parent gender factor for inhibitory control because this variable was measured only once for each child (during the father visit), and a GLM

Repeated Measures ANOVA was conducted for the effect of birth order on inhibitory control. Furthermore, two-way interactions between the within-subject factor birth order and the between-subjects variable sibling gender configuration were examined. Since the age difference between siblings at the time of assessment ranged from -0.5 to 0.5 years (age firstborn at Wave 1 *minus* age second-born at Wave 3) this variable was added to the analyses as a covariate.

RESULTS

Bivariate correlations between the behaviors of both siblings as measured when they were 3 years old are presented in Table 1. All child variables measured during the father visit and the mother visit, and reported by father and mother, were positively related, indicating significant stability in child behavior between visits (with father or mother present, within a two-week period) and significant agreement between parent reports. Correlations between behavior ratings of the firstborn and the second-born were significant for empathy, compliance, and externalizing behavior. This indicates congruence between siblings' behavior according to both parent report and observation. For the firstborn children, more parent-reported externalizing behavior was related to less compliance towards this specific parent. Compliance in the presence of mother was related to higher levels of inhibitory control and sharing in the presence of father was related to less mother-reported externalizing behavior. For the second-born children, sharing in the presence of a parent was associated with more compliance towards this specific parent. Compliance in the presence of father was related to lower levels of mother-reported empathy and more sharing in the presence of father was related to less father-reported empathy. Finally, for the second-born children higher levels of inhibitory control were related to less mother-reported externalizing behavior. Correlations between the other child behaviors were not significant.

The GLM Repeated Measures MANOVA for sharing, empathy, compliance, and externalizing behaviors, with age difference between siblings at the time of assessment as covariate, showed a main effect of birth order, $V = 0.52$, $F(4, 205) = 54.44$, $p < .001$, $\eta_p^2 = .52$. Table 2 displays the results of the univariate analyses for the four child variables. Compared to their firstborn siblings at the same age, second-born children were observed to share more with their siblings and to show more compliance, and they

Table 1.

Correlations for Firstborn and Second-born Children's Behaviors at Age Three Years

Firstborn child	Second-born child								
	1	2	3	4	5	6	7	8	9
1. Sharing during father visit	**-.08**	.24**	-.14*	-.03	.09	.17*	.01	-.08	-.04
2. Sharing during mother visit	.25**	**.00**	.02	.08	-.00	.10	.14*	-.02	.08
3. Empathy (father report)	-.02	.00	**.36****	.24**	.07	.05	.03	-.02	-.00
4. Empathy (mother report)	.10	.10	.34**	**.47****	-.07	-.20**	-.11	-.08	-.04
5. Inhibitory control	.04	-.01	.02	.05	**.03**	-.00	-.00	-.06	-.16*
6. Compliance during father visit	.04	.01	.03	-.02	.13	**.36****	.33**	.03	-.11
7. Compliance during mother visit	.07	.10	-.02	-.02	.14*	.34**	**.31****	.03	-.05
8. Externalizing behavior (father report)	-.06	.01	.01	-.07	-.07	-.14*	-.09	**.42****	.46**
9. Externalizing behavior (mother report)	-.14*	-.07	-.00	-.05	-.00	.09	-.18**	.61**	**.41****

* $p < .05$ ** $p < .01$

Note: correlations below the diagonal refer to associations between variables of the fist-born child, correlations above the diagonal refer to associations between variables of the second-born child, and correlations on the diagonal reflect associations between siblings.

were reported to show higher levels of empathy, and more externalizing behavior. No effect for parent gender was found, indicating that there were no differences in externalizing behavior or empathy between father and mother reports, or sharing and compliance between father and mother visits. Furthermore, the interaction effects between parent gender and child birth order were not significant. The GLM Repeated Measures ANOVA showed no main effect of birth order for inhibitory control (Table 2).

Table 2.

Means and Standard Deviations for Firstborn and Second-born Children's Behaviors at Age Three Years

	Firstborn *M (SD)*	Second-born *M (SD)*	*Pillai's F*	η_p^2
Observed sharing			163.85**	.44
In presence of father	9.37 (4.92)	14.57 (5.37)		
In presence of mother	9.36 (4.66)	14.37 (5.57)		
Empathy			14.56**	.07
Father-reported	24.21 (6.58)	25.77 (6.41)		
Mother-reported	25.12 (6.88)	26.70 (6.65)		
Inhibitory control			2.24	.01
	6.66 (3.00)	7.06 (2.70)		
Observed compliance			21.11**	.09
With father	17.85 (5.34)	19.18 (4.98)		
With mother	17.28 (4.92)	18.68 (5.50)		
Externalizing behavior			18.61**	.08
Father-reported	18.41 (9.54)	21.04 (10.29)		
Mother-reported	17.64 (9.29)	20.47 (10.23)		

* $p < .05$ ** $p < .01$

Note. To facilitate interpretation, the non-transformed scores are presented.
Pillai's *F* represent the main effect between firstborn and second-born children.

Sibling gender configuration was examined as a between-subjects factor. The interaction between birth order and sibling gender configuration showed a significant effect only for inhibitory control, $F(3, 210) = 2.79$, $p < .05$, $\eta_p^2 = .04$. Follow-up paired *t*-tests revealed that in families with a firstborn boy and a second-born girl, the second-born girls displayed higher levers of inhibitory control than the firstborn boys at the same age, whereas other sibling gender combinations showed no differences in inhibitory control between firstborn and second-born children (Figure 1).

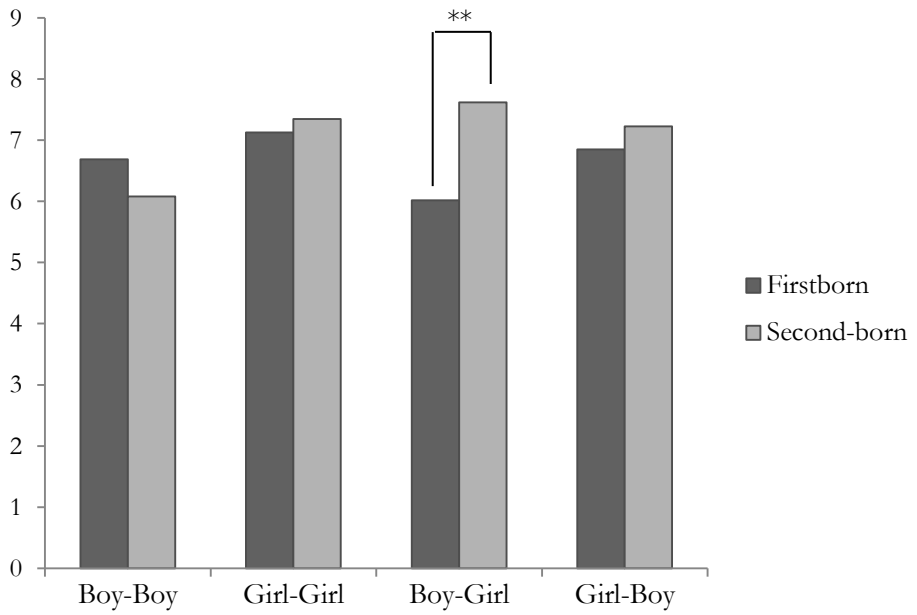

Figure 1.
Interaction of birth order and sibling gender configuration on inhibitory control.
** $p < .01$

DISCUSSION

Compared to firstborn children, second-born children showed more adaptive social behaviors, i.e. they shared more with their siblings, displayed more compliance, and were reported by their parents to show higher levels of empathy at the same age as their older sibling a few years before. However, parents also reported more maladaptive behaviors, in that they reported more externalizing behavior in their second-born than in their firstborn children. Furthermore, second-born girls displayed higher levels of inhibitory control compared to their firstborn brothers, while the other sibling gender configurations showed no difference between firstborn and second-born children.

Second-born children showed more adaptive social behaviors (sharing behavior, empathy, and compliance) at the age of three than their firstborn siblings did at the same age. This is in line with social cognitive learning theory (Bussey & Bandura, 1999) and extends Vygotsky's sociocultural theory (1978) on cognitive development. Second-born children may learn new behaviors by imitating their older siblings' behavior, by following their older siblings' guidance during difficult tasks, and by observing parent-sibling interactions (Azmitia & Hesser, 1993; Barr & Hayne, 2003). In addition, given that second-born children have had older siblings from birth, while firstborn children have experienced a period in which they were the only child in the family, second-born children have more experience with sharing and situations that require recognizing others' emotions than firstborns. Although results from previous studies have been mixed, some studies have found a positive effect of the number of older siblings on prosocial behavior and perspective taking (Jenkins & Astington, 1996; Ruffman et al., 1999; Van Lange et al, 1997). Furthermore, the presence of an older sibling has been found to positively influence the amount of parental talk about others' thoughts, feelings, and believes, which in turn may stimulate the development of empathy in second-born children (Symonds, 2004).

With respect to compliance, second-born children may profit from the presence of an older sibling who can serve as a role model how to behave during parental limit-setting (Barr & Hayne, 2003). Given that compliance improves with age (Kochanska et al., 2001), second-born children are confronted with a more compliant sibling, which may help them to be compliant themselves through imitation processes. In addition, second-born

children may learn about the potential negative consequences of noncompliance by observing parental discipline directed towards their older sibling, which in turn may enhance their compliance through processes of vicarious learning. Furthermore, older siblings have also been found to discipline their younger siblings in the context of parental limit-setting (Author, 2014), promoting second-born children's compliance with parental requests.

Seemingly contradictory to the finding that second-born children show more adaptive social behaviors than firstborn children, our results indicate that second-born children also display more externalizing behavior. Social cognitive theory may also explain these results. Because second-born children have more experience with sibling interactions than firstborn children at the same age do, they also have more experience with conflicts and rivalry. Previous research has indicated that firstborn children use more aggression during sibling conflicts than second-born children, which is likely to be due to the fact that firstborns are stronger and more dominant than their younger siblings (Howe, Rinaldi, Jennings, & Petrakos, 2002). Nonetheless, these conflicts and experiences with externalizing behavior of an older sibling may teach second-born children that the use of aggression can be effective, for example in conflicts with peers (Hay et al., 2011) or to gain parental attention (Volling, McElwain, & Miller, 2002).

Another explanation for the seemingly discrepant finding of more compliance and more externalizing problems in second-born children compared to firstborns may lie in the difference in assessment methods. Compliance was measured through standardized observations during a don't touch task, whereas externalizing behavior was measured through parent reports that do not specify a particular situation or context. Thus, second-born children may display more compliance towards their parents in a discipline situation, but show more externalizing behaviors towards others such as peers or siblings in different social contexts. In addition it could be that parents consider second-born children as more difficult because they compare them with their older siblings, who as a result of being more mature display fewer externalizing behaviors (Alink et al., 2006). This comparison could lead to inflated perceptions of second-born children's externalizing behaviors.

No main effect of birth order was found for inhibitory control. Since regulation of behavior shifts during toddlerhood from external to self-control and before the age of two children need guidance of a more experienced other to regulate their behavior and to acquire self-control (Kochanska et al., 2001), parental guidance may be more important for the development of inhibitory control than experiences with sibling interactions. In addition, genetic factors have been found to explain an important part of the variance in inhibitory control, especially during childhood (Bezdjian, Baker, & Tuvblad, 2011), and may be more influential in the development of inhibitory control than in the development of social behaviors (Burt, 2009). This could result in smaller differences between siblings in inhibitory control compared to the other social behaviors. We found however an interaction effect between birth order and sibling gender configuration. Second-born sisters outperformed their firstborn brothers on inhibitory control, whereas no such difference was found for other sibling gender configurations. The combination of the tendency of parents to stimulate inhibition of disruptive behavior more in girls than in boys (Bjorklund & Kipp, 1996), and being more experienced in providing external regulation to foster inhibitory control once they have their second child (Whiteman et al., 2003) may be responsible for the pattern of second-born girls outperforming their firstborn brothers on inhibitory control.

Notably, sibling gender configuration only moderated birth-order effects on children's inhibitory control and not for the other social behaviors. Previous studies have related differences between sibling dyads in social behaviors, such as aggression and prosocial behavior, to sibling gender configuration (Ligthart, Bartels, Hoekstra, Hudziak, & Boomsma, 2005; Stauffacher & DeHart, 2006; Van Lange et al., 1997). However, these studies only focused on the main effect of sibling gender configuration, whereas our study examined the interaction between birth-order effects and sibling gender configuration. In addition, the difference in the influence of genetic factors on inhibitory control and other social behaviors could explain why birth-order effects were only influenced by gender for inhibitory control (Burt, 2009).

The results of this study support the social cognitive theory (Bussey & Bandura, 1999), which suggests that second-born children may acquire more adaptive and maladaptive social skills through vicarious learning. In addition,

Vygotsky's sociocultural theory (1978) proposed that sibling teaching may lead second-born children to acquire more skills than their firstborn siblings at the same age, and our results may provide evidence to extend this to social development. Because we found that second-born children had more adaptive social skills than their firstborn siblings at the age of three, this could even be in line with the confluence model which states that during early childhood second-born children will outperform firstborn children (Zajonc & Markus, 1975; Zajonc & Sulloway, 2007). The result concerning externalizing behavior could be seen as evidence in favor of the family niche model with second-born children displaying more rebellious behavior than firstborns, but the results on compliance seem to contradict this idea. The results on externalizing behavior may be interpreted as evidence in favor of theories proposing that firstborns would have a developmental advantage over second-born children in terms of social behaviors (as suggested by the resource dilution model and evolutionary theories).

This study extends previous work on birth-order effects with its strong longitudinal within-family design and its focus on social behavioral development. However, some limitations need to be mentioned. First, the presence of the other sibling during the observational tasks used to measure sharing behavior and compliance may have amplified birth-order effects. Firstborn children had to share with a preverbal and less powerful sibling, while second-born children shared with stronger and more dominant siblings who were very well able to communicate their wishes. In the compliance task, firstborn children were confronted with a younger sibling who had more difficulty with being compliant, while second-born children were confronted with an older sibling who was better able to comply with the parent. However, these situations are representative for how siblings influence each other in daily life, and thus have high ecological validity. It seems reasonable to expect that these experiences within the family also shape the social behaviors that a child displays in other settings. Future studies could address this by comparing social behaviors of firstborn and second-born children displayed within and outside the family context. A second limitation is the use of parent report to measure child externalizing behavior. These measures may provide information on how parents perceive child problem behavior instead of providing an objective measure of actual child behavior. Finally, our

sample consisted primarily of highly educated parents, which may limit the generalizability of the results.

This is one of the very few longitudinal studies on birth-order effects on child development using a within-family design, enabling a comparison between firstborn and second-born children from the same family at the same age. At the age of three years, unique experiences of firstborn versus second-born children already appear to have influenced their social development, with second-born children, especially girls with older brothers, having developmental advantages over their firstborn siblings. Observations of parent-sibling interactions, having more experienced parents, and interactions with an older sibling may be important factors underlying this advantage. Future research may investigate these factors more explicitly by observing sibling interactions during early childhood and triadic interactions including a parent and two children. Although the processes through which birth order influences social development require further research, this study emphasizes the importance of birth order as a within-family factor that explains individual differences in children's social development.