An Experimental Study of the Effects of Relatedness on Reactions to Unfairness in Preschool Children

Karin Iivarinen, 40143
Master's thesis in psychology
Supervisors: Jan Antfolk (Åbo Akademi University) and Jennifer Kotler (Harvard University)
Faculty of Arts, Psychology and Theology
Åbo Akademi University

Karin Iivarinen

ÅBO AKADEMI – FACULTY OF ARTS, PSYCHOLOGY AND THEOLOGY

Abstract of Master's Thesis

Subject: Psychology	
Author: Karin Iivarinen	
Title: An Experimental Study of the Effects of Relatedness on Reactions to Unfairness in Preschool Children	
Supervisor: Jan Antfolk	Supervisor: Jennifer Kotler

Abstract:

Children rely on care provided by their parents to survive and develop, while parents often take care of the needs of multiple children simultaneously. Children are expected to compete for parental care with their siblings and therefore sibling rivalry may occur. In this study the hypotheses were that children display stronger reactions when a related person, their mother, treats them unfairly, compared to when an unrelated woman does. Further, we expected to find an interaction of provider (mother or an unrelated woman) and beneficiary (sibling or an unrelated peer) on the reactions of children. We investigated how the reactions of children are moderated by relatedness to the provider and the beneficiary of the unfair treatment in an experimental 2 x 2 repeated measures design. We found that children displayed stronger reactions when they were related to the provider of the unfairness. Relatedness to the beneficiary did not significantly alter the reactions of children and no interactions were found. No strong conclusion based on these results can be drawn as there are methodological limitations to the study.

Key words: fitness, relatedness, rivalry, sibling, unfairness

Date: 16.10.2018	Number of Pages: 38

Karin Iivarinen

ÅBO AKADEMI – FAKULTETEN FÖR HUMANIORA, PSYKOLOGI OCH TEOLOGI

Abstrakt för avhandling pro gradu

Ämne: Psykologi	
Författare: Karin Iivarinen	
Arbetets titel: En experimentell studie av släktskaps inverkan på 3–4-åriga barns reaktioner på orättvis behandling	
Handledare: Jan Antfolk	Handledare: Jennifer Kotler

Abstrakt:

För att kunna överleva och utvecklas är barn beroende av sina föräldrars omsorg. Föräldrarna däremot ombesörjer ofta flera barns behov simultant. Barn förväntas tävla med sina syskon om föräldrarnas omsorg och resurser. Rivalitet mellan syskon kan därför förekomma. Syftet med denna studie var att studera 3–4-åriga barns reaktioner på orättvis behandling. Vidare var syftet att studera huruvida dessa reaktioner påverkas av att barnet är släkt med antingen den som behandlar barnet orättvist eller med den som gynnas av den orättvisa behandlingen. Hypoteserna var att barn reagerar starkare då de blir orättvist behandlade av en släktning, i detta fall av sin mamma. Ytterligare förväntades en interaktionseffekt av den som behandlar barnet orättvist och den som drar nytta av denna orättvisa behandling. Studien baserade sig på en 2x2 inomindividsdesign, i vilken släktskap utgjorde den variabeln som manipulerades experimentellt. Studien påvisar att barn reagerade starkare om de var släkt med personen som behandlade dem orättvist. Släktskap till den som orättvist favoriserats hade inte en signifikant effekt på barns reaktioner. Vidare hittades inga interaktionseffekter. På grund av de metodologiska begränsningarna i forskningsupplägget kan inga alltför starka slutsatser dras utifrån resultaten.

Nyckelord: fitness, orättvisa, rivalitet, släktskap, syskon

Datum: 16.10.2018	Sidoantal: 38

Karin Iivarinen

Acknowledgements

I would like to thank my supervisor Jan Antfolk. Thank you for your ideas, insights and comments. I am very grateful for all your feedback. You have guided me through this process. I would also like to thank my other supervisor Jennifer Kotler, your views and comments have been very valuable to me.

I would like to thank those who were a part of this research project. Andrea Holm, thank you for sharing this project with me. I am thankful for your support and for your patience during this process. I would also like to thank the research assistants who took part in this project.

Finally, I would like to thank my family and my friends, I could not have done this without you.

Karin Iivarinen

Table of Contents

An Experimental Study of the Effects of Relatedness on Reactions to Unfairness in Preschool Children

Hamilton (1964) defines personal fitness as the amount of offspring a parent is able to raise until said offspring reaches adulthood. According to Hamilton (1964), inclusive fitness comprises the personal fitness of an individual, but also any kind of help an individual is able to provide for relatives that affects their personal fitness. Help provided to a sibling benefits one's fitness by half as much as helping an identical twin, because of different genetical relatedness.

Parental investment is defined as any kind of resource spent by the parent to benefit an offspring (Trivers, 1972). Because most resources are finite, a parental resource dedicated to one offspring will often come at a cost to another offspring and often the parent themselves. Parent-offspring conflict as defined by Trivers (1974) describes disagreement between a parent and their offspring over how the parent should divide investment between all their offspring. Because of the unequal parental investment inherent in human reproduction and child care, with mothers investing more than fathers (Trivers, 1972), parent-offspring conflict is often most pronounced between a mother and her children. Whereas the mother optimizes her fitness by balancing investment between several children, each child benefits most from investment being directed towards themselves, and less so when investment is directed towards a sibling, with whom they share only 50% of their genetic material according to Trivers (1974) parent-offspring conflict. Therefore, there is a conflict between siblings (i.e., sibling rivalry) such that children are expected to act in ways that benefit themselves more than their sibling(s) in the competition for parental investment. Moreover, whereas children tend to act egoistically, it is in the interest of the mother to encourage more altruistic behavior in the offspring, with each of whom she shares 50% of her genetic material (Trivers, 1974).

Although evolutionary theory on sibling rivalry suggests that children compete with their siblings for their mother's investment, siblings also share, on average, half of their genetic material with each other. This means that if maternal resources are directed to a sibling, this is more beneficial to that child's inclusive fitness compared to when the same resources are directed to an unrelated peer (Hamilton, 1964).

Honest and Dishonest Signaling

To attract the necessary investment, human children are expected to use different behavioral strategies that increases parents' investment in themselves; for example smiling or

pleading to receive parental care and protection (Bowlby, 1969; Godfray, 1991). Another strategy is to display negative emotions such as crying (Lummaa, Vuorisalo, Barr, & Lehtonen, 1998; Soltis, 2004). Furthermore, very young children babble to attract parental attention and, in turn, receive more than their "fair share" of parental care (Hrdy, 2007). Children, thus, signal need by using different strategies.

According to Maynard Smith (1991), signaling strategies need to be costly to prevent offspring from signaling their needs dishonestly. Costly signaling, thus, ensures a balance where offspring signal only when there is an actual need for parental investment. Godfray (1995) argues that need signaling might depend not only on the need of the offspring itself, but also on the need of siblings, who also depend on the same parental resources. The level of signaling is also larger for offspring in a bad, compared to good condition. Condition is defined by Godfray (1995) as the food requirement of an offspring. However, when an offspring in a relatively bad condition signals more, a sibling in an unchanged condition will also signal more to avoid too many resources being directed towards the offspring in the bad condition.

Dishonest offspring signaling leads to an offspring receiving more resources than its siblings. This dishonesty can be costly to a child's fitness if a sibling receives too little investment as result of it (Godfray, 1995). This inclusive fitness-cost disappears if the other child is not a sibling, and therefore there is reason to believe that decreased relatedness or no relatedness altogether with a competitor will lead to more dishonest signaling in offspring. Dishonest signaling has been shown in birds among which offspring with siblings signal their needs less honestly, demanding more than their fair share of parental resources (Caro, West, & Griffin, 2016). Whether human children display similar regulation of signaling need is unclear. The presence of siblings may influence the kinds of strategies human children display to receive parental investment.

Jealousy in the Context of Sibling Rivalry

As described above, parents and offspring disagree over the optimal division of parental resources. This may serve as the catalyst for an emotional response such as jealousy within family groups. Campos, Walle, and Dahl (2010) define jealousy as a social emotion because jealousy is evoked by an important relationship to another person being challenged by a third person. Such a challenge to the important relationship evokes jealousy. Sibling rivalry for parental investment might be considered a jealousy-evoking context and displaying a jealous reaction may be a signal to behaviorally elicit investment.

Jealous reactions have indeed been shown in children when the relationship with a parent is challenged. Children of approximately 1 year of age showed different patterns of reactions (i.e., gazed more at the mother, stayed closer to her, and touched her more) when their mother attended to a doll compared to when she held a book. Importantly, the children did not show equally strong reactions when an adult stranger held these objects (Hart, Field, del Valle, & Letourneau, 1998). In another study, 2-year-old children showed more jealousy when their parents attended to a doll compared to when their parents ignored the child to do a task with paper and pen. In this study children also displayed more jealousy around mothers than around fathers, and dyadic situations (i.e., child with one parent) caused more jealousy than triadic situations (i.e., child with two parents; Szabó, Dubas, & van Aken, 2014), suggesting that threats to the child-mother relation are particularly provoking. At the age of 3-5 years, children displayed more jealousy (i.e., verbalized complaints or attempts to change the situation) when their mothers were caring for a child of a similar age, compared to when she was caring for an infant (Masciuch & Kienapple, 1993). Similarly, 2- to 6-year-old children showed jealous reactions (i.e., increased sadness or distress) when being told to play on their own while a parent played with a younger sibling (Miller, Volling, & McElwain, 2000). A longitudinal study with siblings (aged 16 months and 4 years at the start of the study), showed that their jealous reactions predicted sibling rivalry two years later (Kolak & Volling, Brenda, 2011), suggesting that jealousy is a signal that is used to compete with a sibling for resources.

In sum, these studies show that children reaction with jealousy when their mother direct her attention away from them and towards other individuals. Importantly, these reactions seem to be specifically related to mothers paying attention to other children, not just to mothers paying attention to something else. Therefore, these reactions seem to specifically arise from another individual challenging the relationship a child has with the mother.

Children's Reactions to Sharing and Unfair Treatment

Jealous reactions can also be the result of perceived unfair treatment. Unfair treatment can be viewed from two different perspectives. The term "disadvantageous unfairness" describes a situation in which a focal child receives less of a given resource in the presence of someone else who receives more. By contrast, "advantageous unfairness" describes a situation in which a focal child is favored over someone else. Several previous studies have been conducted to investigate children's reactions to these two types of unfair treatment.

A study by Fehr, Bernhard, and Rockenbach (2008), showed that 3- to 4-year-old children often accept advantageous unfairness, whereas 7- to 8-year-old children tend to

avoid both advantageous and disadvantageous unfairness in decision-making situations. In a situation where sharing is costly (i.e., sharing reduces the amount that the sharer gets), 3- to 4-year-old children acted selfishly, while almost half of the older children shared the resources equitably. In sharing situations with no cost to the sharer (i.e., the sharer received the same amount independently of how much the beneficiary received), 3- to 4-year-old children did not show a preference for either an equal division or an unequal one, while 7- to 8-year-old children preferred sharing equally. This suggests that children at the age of 3-4 tend to act selfishly (i.e., or based on what is beneficial to them), while older children seem to take the needs of others into account. A study by Blake and McAuliffe (2011) reported an outcome that further supports this notion: here, 4- to 7-year-old children rejected candy offers more often if they were disadvantageous towards themselves, than if they were disadvantageous towards the other child. In contrast, 8-year-olds rejected both advantageous and disadvantageous unfairness. Lobue, Nishida, Chiong, Deloache, and Haidt (2011) found that children of 3-5 years displayed unhappy reactions when receiving fewer stickers than an unrelated child from the same preschool. Several studies have found that younger children below the age of 6 or 7 tend to make selfish sharing decisions, whereas older children act more fairly (McAuliffe, Blake, Kim, Wrangham, & Warneken, 2013; Sheskin, Bloom, & Wynn, 2014). In fact, a study by Shaw and Olson (2012) found that 6- to 8-year-old children, but not younger children, rather threw away a resource than dividing it unequally between two unknown and unseen children. These studies suggest that older children are more aware of the social cost that come with not sharing equally. This cost is viewed as bigger than the reward that might be gained from acting selfishly. Meanwhile younger children simply take the gain from acting selfishly.

Some findings, however, complicate this pattern, at least with respect to the age when children transition into less selfish behavior. Leventhal and Anderson (1970) found that children as young as 5 preferred to divide rewards equally independently of who did most of the work on a previous task. Lane and Coon (1972) found similar results with 5-year-old children. However, 4-year-old children gave more rewards to themselves than to an unknown and unseen beneficiary for completing a task, which is in accordance with the studies mentioned above. A study by Warneken, Lohse, Melis, and Tomasello (2011) children at the age of 3 already shared rewards equally even though there were opportunities to take all the rewards for oneself. In this study, children had to work together in order to receive the rewards, which were candy or stickers. These studies show younger children preferring fair

distributions than the ones mentioned above. Therefore, the exact age at which children start to show a preference for dividing resources equally is unclear.

In sum, these studies suggest early self-favoring in children. Children seem to develop a preference for fair sharing no later than by the age of 7 or 8, when they become more cable of taking the perspective of the other child into consideration while making decisions about sharing. This indicates that younger children are more selfish and competitive, and older children are more egalitarian and fairer. There are some studies that suggest that even younger children prefer fairness, and the age at which this shift occurs is somewhat unclear.

Sharing between Children and the Presence and Identity of a Beneficiary

While a child's age seems to affect how they behave when facing unfair treatment, children's reactions depend also on the presence of a beneficiary (e.g., a person who benefits from the unfairness). One study found that the presence of a puppet beneficiary affected how 3- to 4-year-old children acted when facing unequal sharing outcomes. Children were more likely to act by rejecting, sharing, or requesting more candy when facing both advantageous and disadvantageous unfairness when a puppet beneficiary was present. Children did not try to correct the unfairness when the puppet was absent. (Ulber, Hamann, & Tomasello, 2017). Similarly, in a study of 4- to 9-year-old children, the children rejected disadvantageous offer more often when another child was present. In this study children of 8-9 years also rejected an advantageous offer in a social setting, but not in a non-social one. Children of 4-7 years accepted an advantage in the social setting (McAuliffe et al., 2013). The presence of a beneficiary may affect especially how older children behave because at this age children may start to understand the social costs of acting selfishly.

While the mere presence of a beneficiary affects how children behave in sharing situations, the identity of said beneficiary also seems to affect behavior. In a study mentioned above, costly sharing was more likely when the beneficiary was an ingroup member, compared to when he was an outgroup member (Fehr et al., 2008). Moreover, at the age of 1-2 years, children expected ingroup favoring when resources are scarce, but fairness in situations where there are enough resources and sharing is less costly (Bian, Sloane, & Baillargeon, 2018). Birch & Biuman (1986) presented similar results indicating a preference for ingroup members in young children. This suggests that the identity of the beneficiary affects how children share. Children might be willing to share costlier with ingroup members, like with members of one's family.

Children also differentiate between different ingroup members. Moore (2009) found that 4-to 6-year-old children divide resources differently depending on whether they are dividing resources with a friend, a non-friend peer, or a stranger. Children preferred dividing resources equally between themselves and friends even when there was a cost to themselves. In non-costly situations, children were less likely to share resources with a non-friend but shared with strangers. Another study found similar preferences for equal sharing with friends in 4-year-old children, but not in younger children (Paulus & Moore, 2014). Interestingly, 3-to 4-year-old children preferred giving resources to siblings and friends, but showed no preference between these categories (Olson & Spelke, 2008). At this age children have been shown to prefer friends, while older children preferred sharing with siblings (Spokes & Spelke, 2016).

These studies suggest that children are affected by the presence of a beneficiary; if the beneficiary is an ingroup member, this increases their willingness to share more equally. Older children may understand the consequences of being fair to facilitate future reciprocal social interactions. Based on these studies a clear pattern of preference for sibling over friends does not seem to emerge.

Provision and Division of Communal Resources

Children are dependent on parental resources to ensure survival and development, but as children grow, resources are increasingly provided by others as well. Children in traditional societies are weaned at approximately 2-3 years of age (Kennedy, 2005). For the first year of a child's life, a nursing mother may provide for all of the child's energy needs. After the age of approximately 1,5 years, children in traditional societies may start to receive some of their energy needs from solid foods (Kennedy, 2005). When children become less dependent on nursing, they simultaneously become less dependent on being fed by the mother specifically.

Instead, other members of the community may provide for the child. Allomothers may aid in childrearing and so further child survival and development. Allomothers are often related females but may also be unrelated females, who spend time with infants to provide investment in them (Ivey, 2000).

Most human societies and social groups indeed divide communal resources, and communal goods can contribute to a child's growth. In hunter-gatherer societies with co-operational breeding (Hill & Hurtado, 2009), communal resources, including food, are often supplied by others than the parents and contribute substantially to child's survival and

development. Educational efforts like preschool programs can be seen as communal resources in modern day societies that contribute to child development (Camilli, Vargas, Ryan, & Barnett, 2010). This meta-analysis demonstrated that attending preschool have a positive impact on child development, suggesting that they confer a fitness benefit for the child.

In sum, whereas young children rely on parental investment, older children may also depend on others. Therefore, as children are more dependent on their mothers during the first year of life, they might therefore be more competitive for maternal resources than older children who are able to receive food from other sources as well.

The Current Study

The purpose of the current study was to examine 3- to 4-year-old children's reactions to unfair treatment. While earlier research has focused on how children divide resources and child reactions to unfairness, studies on how kinship affects these reactions are scarce. We investigated how reactions to unfairness are moderated by whether the individual acting unfairly is the mother of the child or an unrelated woman. Additionally, we investigated how reactions of children to unfair treatment are moderated by whether the beneficiary is a sibling or an unrelated peer. We did this by measuring how children reacted when their mothers treated them unfairly, compared to how children reacted when unrelated women provided unfair treatment. The children were treated unfairly by receiving unequal rewards for completing the same task. Reactions were also measured when a sibling or an unrelated child was the beneficiary.

Based on the aforementioned arguments, our hypotheses were:

1. Displays of competitive reactions are stronger when the mother (vs. unrelated woman) is disadvantageously unfair.
2. Displays of competitive reactions are strongest when maternal disadvantageous unfairness favors a sibling compared to when it favors an unrelated child.
3. Children show a stronger competitive reaction to disadvantageous unfairness by an unrelated provider (rivalry regarding communal resources) when the beneficiary is a sibling compared to when it is an unknown and unrelated child.

Method

Participants

Altogether 40 children participated in the study (19 female and 21 male). The mean age was 3.99 years (*SD* = .55) and almost all the participating children (n = 33) were in preschool. The participating siblings had a mean age of 6.37 years (*SD* = 1.82). All the participating sibling pairs had the same biological mother and the mean number of children in participating families were 2.63 (*SD* = .90). Of the mothers, 27 reported that both siblings lived with both of their parents (data on this variable was missing from five families).

The current study was conducted in large Finnish towns. Recruitment was done through e-mail to principals of preschools and by contacting different hobby groups for children, through Facebook posts, and through snowball sampling. Participating families were required to have a 3- to 4-year-old child, and a sibling from the same biological mother within the age range of 3-12 years. The participating mothers and children had to understand either Finnish or Swedish.

Ethical Permissions

The study was granted ethical permission by The Board for Research Ethics at Åbo Akademi University in May of 2017.

Procedure

Data was gathered during the fall of 2017 and the spring of 2018. A research assistant with no knowledge of the hypotheses was trained to conduct the study.

Mothers of all participating children gave written consent to participating in the study. Children were told that they would participate in a game and that they could interrupt at any point if they wanted to.

In each trial two focal children were present, and they took part in every second condition to ensure sufficient breaks for the focal children. Additionally, the siblings and mothers of the focal children were present. The participating children performed a simple task; children placed balls in buckets of the same color (See Figure 1). Children performed this task twice and both the focal child and the beneficiary received the same reward, a sticker. When performing the task a third time, the two children received an unequal number of the stickers. The focal child received one sticker after performing the task (consistent with the fair tasks). After this, the beneficiary (an unrelated peer or a sibling) received three stickers for performing the task. This reward modelled disadvantageous unfairness (from the

perspective of the focal child) in the distribution of resources. At the end of each condition, the focal child was compensated for the inequality by receiving two more stickers.

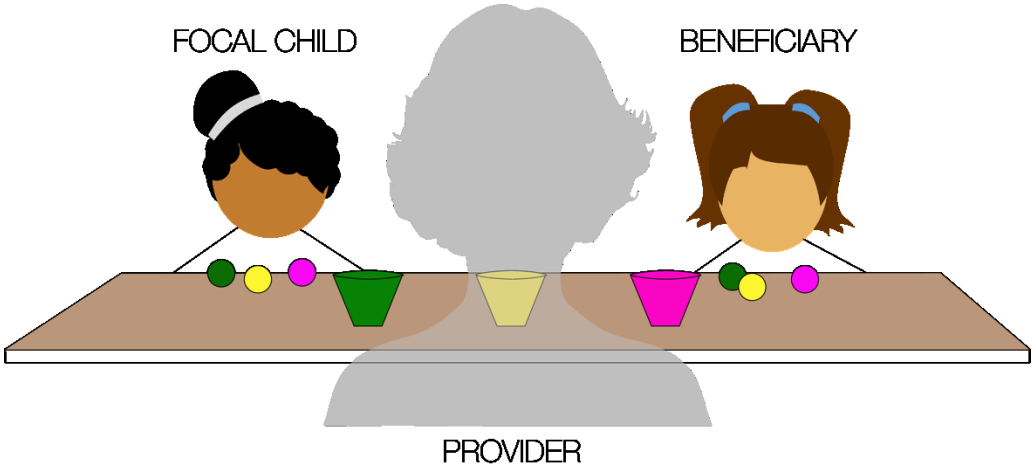

Figure 1. Schematic overview of the task. In this task, the children were asked to put the colored ball (red, yellow and blue in the actual trials) in a bucket off the same color. After successfully completing the task the child was rewarded with either one or three stickers. Each trial included the focal child (i.e., participant), a beneficiary (i.e., an unrelated peer or a sibling) and a provider (i.e., the participant's mother or an unrelated woman).

By switching the provider between the participant's mother and the unrelated woman (i.e., the test leader) and the beneficiary between sibling and unrelated peer, each participated in four different conditions: a) the mother (provider) and sibling (beneficiary); b) the mother (provider) and another unrelated peer (beneficiary); c) an unrelated woman (provider) and sibling (beneficiary); and d) an unrelated woman (provider) and another unrelated peer (beneficiary). A Latin square procedure was used to counterbalance the conditions (see Appendix A). To decrease possible order effects, a break of a few minutes occurred between each condition during which the other focal child performed the task.

Prior to the task, participating mothers were instructed to remain as neutral as possible during participation in the study. The received illustrated instructions on how to behave during the trials they participated in. The mothers of the children were asked to complete a questionnaire about background data on the families during the conditions that the mothers were not participating in (see Appendix B). Participation in the study took approximately 45 minutes and all trials were filmed. For participation in the study, the families received tickets to an adventure park.

Measures

Child reactions to unfair treatment were measured in four different conditions. The two children received different amounts of stickers as a reward from performing the same task, with the beneficiary receiving three stickers and the focal child only receiving one. Two independent raters with no knowledge of the hypotheses rated the reactions of the focal children. Bodily, verbal, facial and deceitful reactions were coded. Bodily reactions included 13 reactions, for example, gestures, posture changes, and other kinds of movement. Verbal reactions included 16 different reactions, for example, the focal child protesting or demanding correction to the unfair situation. Tone of voice, such as screaming or whispering, was also considered a verbal reaction. The facial reactions included 6 reactions, for example, staring and face color for instance. Deceitful reactions signified reactions where the child reacted in a positive manner when facing unfairness, for example by laughing or smiling. This variable also included the focal child giving away the stickers or rejecting them altogether. Altogether 6 different reactions belonged to this category. In sum, 41 different reactions were coded for (see Appendix C for details).

The reactions were rated from when the unfairness occurred until the focal child was compensated by receiving more stickers. Reactions were compared to behavior before the unfairness and only changes in behavior were rated. Each reaction was rated on a scale from 0 to 1, with 1 meaning that said reaction was present during the rated period and 0 meaning that child did not display said reaction. We calculated the *ICC*(1,k) for each variable as a measure of inter-rater consistency. The inter-rater consistency for bodily reactions was poor (*ICC* = . 26 [.11, .40]). The inter-rater consistency for the other variables ranged from good to excellent (*ICC* = . 82 [.76, .87] for verbal, *ICC* = . 59 [.47, .68] for facial, and *ICC* = . 60 [.49, .69] for deceitful reactions). The different emotional reactions were averaged between the two raters to form four variables.

Design

The current study was conceptualized as an experimental study. Although we studied naturally occurring dyads/triads, we experimentally manipulated the relationships between the focal child, the beneficiary, and the provider between conditions. The study had a 2x2 repeated measures design with two within-subject's factors, each with two levels. The factors and levels were provider (unrelated woman vs. mother) and beneficiary (unrelated peer vs. sibling).

Statistical Analyses

Before statistical analyses were conducted, six observations were excluded due to errors made during the test procedure. The raters indicated that an unfairness did not occur the correct way during these conditions, and therefore a reaction could not be rated.

For descriptive data analysis SPSS (IBM Corp, 2017) and R (R Core Team, 2008) were used. A linear mixed-model ANOVA was conducted with the lme4-package (Bates, Maechler, Bolker, & Walker, 2015) for R (R Core Team, 2008). Provider, beneficiary and the interaction of the two were independent variables, while the reactions of the children were dependent variables.

Results

Descriptive Results

We first calculated means and standard deviations for each reaction (bodily, verbal, facial, and deceitful reactions). These were calculated across all four experimental conditions, that is, up to four conditions per participating child (see Table 1).

Table 1

Means, Standard Deviation, Number of Observations, and Zero-Order Correlations between Reactions

Reaction Types	*n*	*Mean*	*SD*	1	2	3	4
1. Bodily reactions	154	0.55	0.57		.23	.12	.19
2. Verbal reactions	154	1.52	1.40			.19	.09
3. Facial reactions	154	0.68	0.55				-.09
4. Deceitful reactions	154	0.39	0.53				

To test the hypotheses, we first created an outcome variable by summing verbal, facial and deceitful reactions. Due to the low inter-rater consistency for bodily reactions, this measure was not included. We also followed up the main analysis, with analyses for each of the different reactions. Again, no analysis was conducted for bodily reactions.

To test our hypotheses, we conducted a 2 x 2 ANOVA-type linear mixed model regression with Provider (mother or unrelated woman) and Beneficiary (sibling or unrelated peer) and their interaction as predictor terms and reactions (sum variable) as the outcome. Random intercepts were modeled for each observation within participant.

Table 2

Model Effects for the Linear Mixed Model Regression

Predictors	Df_{NUM}	Df_{DEN}	F	p
Provider	1	114.27	4.76	.03
Beneficiary	1	112.07	3.09	.08
Provider x Beneficiary	1	112.10	0.01	.92

Note: Df_{NUM} = numerator degrees of freedom; Df_{DEN} = denominator degrees of freedom. Satterthwaite approximations are used for degrees of freedom.

To follow up on the statistically significant effect of provider on the children's reactions, we conducted a post-hoc contrast between the two levels. Reactions were stronger when the provider was the child's mother (M = 3.40, SE = 0.25) compared to when the provider was an unrelated woman (M = 2.84, SE = 0.25, t = 2.18, p = .03).

The follow-up analyses using the different reactions revealed that the effect of provider was only found on verbal reactions, $F(1, 113.9) = 6.76$, p = .011. Again, reactions were stronger when the provider was the child's mother (M = 1.74, SE = 0.19) compared to when the provider was an unrelated woman (M = 1.28, SE = 0.18, t = 2.60, p = .01). The effect of provider was not statistically significant for facial or deceitful reactions (ps > .05). The effect of the beneficiary was not statistically for any of the reactions (ps > .05). Nor were there any interaction effects of provider and beneficiary on any of the reactions (ps > .05).

To conduct a more formal test our second hypotheses, we conducted analyses on the effect of beneficiary within trials with the mother as provider. We found no statistically significant effects of the identity of the beneficiary on any of the reactions (ps > .05). To conduct a more formal test our third hypotheses, we conducted analyses on the effect of beneficiary within trials with the unrelated woman as the provider. We found no statistically significant effects of the identity of the beneficiary on any of the reactions (ps > .05).

Discussion

The purpose of this study was to study the reactions of 3- to 4-year-old children when facing disadvantageous unfairness. Based on previous studies, we expected that children would show negative reactions when facing disadvantageous unfair situations. This study also examined whether the intensity of these reactions depended on the identity of the provider (mother or unrelated woman) or by the identity of the beneficiary (sibling or

unrelated child). Based on evolutionary theory, we expected that the reactions would be strongest when mothers were unfair. We also expected an interaction effect, so that in situations where the mother was the provider, stronger reactions would be displayed if the beneficiary was a sibling compared to unrelated child, and in situations where the provider was an unrelated woman, stronger reactions would be displayed if the beneficiary was an unrelated child compared to a sibling.

Reactions to Disadvantageous Unfairness

Children displayed stronger reactions when they were treated unfairly by their mothers, compared to when treated unfairly by an unrelated woman. Therefore, we found support for our first hypothesis, as reactions to unfairness were affect by the identity of the provider. This result gives support to the notion that children specifically show competitive reactions when parental resources are directed towards someone else. As parental resources are finite, the loss of these resources may have unfavorable effects on a child's own development. At this young age, communal resources (here represented by an unrelated woman) have not been as critical for the survival and development of the child. In line with this, children did not react as strongly when an unrelated woman was unfair to them and gave resources to another child.

The differences in children's' reactions that were due to the identity of the provider were displayed verbally. Previously a study found that in jealousy evoking situations, children verbalized discontent by complaining or by trying to alter the situation (Masciuch & Kienapple, 1993). Lobue and colleagues (2011) found that of 3- to 4-year-old children who faced a disadvantage, a minority verbalize their discontent, while most children still stated that it was fair. There seem to be contrasting findings on the ability of children to verbalize discontent at this age. The verbal reactions displayed by children in this study may related to verbalizations being the most straight forward form of communication available to the children. When facing a loss of resources, children seem to signal their discontent as clearly as possible by verbalizations in the hopes of changing the situation.

In the current study, no main effects of the identity of the beneficiary were found. Whether the beneficiary was a sibling, or an unknown child did not significantly affect how the children reacted to unfair treatment. This result may be related to that children most often compete for parental resources with siblings. Children share their parents and surroundings with the siblings and therefore the most intense competition for parental resources is with said sibling. Children are most likely to lose parental resources to a sibling, and therefore children show competitive reactions to unfairness despite shared genes with siblings. It might

be due to this that no differences in reactions to both kinds of losses studied here could be found. The second and the third hypothesis were not supported. No interaction effects between the identity of the provider and the identity of the beneficiary were found.

Limitations

The current study employed a within-subjects design as the children participated in all four conditions. All four conditions had the same task and the same rewards distributed in the same order. This design may have influenced child reactions as children may have been able to expect the unfair treatment after participation in the first few conditions and this might have altered and reduced reactions. Although the conditions were counterbalanced across participants, the within-subjects design may have led to order effects that explain why the reactions to unfairness were quite modest overall.

Another limitation in this study is the measures of reactions to unfairness used. While verbal, facial, and deceitful reactions had good or excellent inter-rater consistency, the bodily reactions had poor inter-rater consistency. Because of this, some important reactions that children have in unfair situations may not be reflected in the results of this study. Intensity of the individual emotional reactions were not measured, but only its occurrence. Because of this, important information about the intensity of the reactions to unfairness might be missing from this study. For example, it is possible that a child reacted very strongly but only in one specific manner and therefore appears as having reacted quite modestly. Furthermore, the correlations between different types of reactions were low, suggesting that the same underlying construct might not even be measured by the different types of reactions.

A further limitation to the study is the small sample size. Because the sample consisted of only 40 participants, there is a risk for Type II error in rejecting hypotheses. In addition to the sample size, the sampling method may also be regarded as a limitation. A convenience sample and snowball sampling may have caused the sample to be biased in some way. A criterion for participating in the study was that the families had to have two children, and as stated above the mean number of children in the participating families were 2.63 children. The mean number of children birthed by women in Finland in 2017 was 1.49 (Suomen virallinen tilasto, 2017), which implies that the participating families might differ from the general population in other ways as well. Because of the limited sample size and sampling method the results should be interpreted with caution.

Finally, the lack of ecological validity may be a concern. The research setting may not resemble real life situations in which children compete with others. Related to this, the reward was intended to represent a resource and in the case of a mother as provider, a

parental resource. Children may not have seen stickers as a finite resource worth being upset about. Food or even candy may have been a more straightforward representation for the kind of resources discussed in theories about the parental investment, parent-offspring conflict and sibling rivalry (Hamilton, 1964; Trivers, 1972, 1974). However, using candy or food as a resource in the current study was not feasible due to dietary and safety concerns. Stickers may not have been considered an important enough resource to elicit strong reactions. Previous studies have shown that adults report that they favor siblings over friends in high cost or life or death situations, and friends in low cost situations (Stewart-Williams, 2007, 2008). It is possible that children could have reacted differently or reacted stronger if the rewards would have been of higher value or more important to their survival and development.

Future Directions

The present study had limitations related to design, measures of reactions, and limited statistical power. In the future, the use of between-subjects designs may better reveal how kindship affects the reactions of children to unfair treatment. To ensure an appropriate sample size, power analyses are also needed. More sophisticated methods for measuring child competitive reactions may give more accurate and distinct information. For example, physiological measures of stress, measures of emotional intensity, or a combination of different types of measures could be utilized.

This study focused on children of 3-4 years. As stated above, previous studies suggest children at this age are relatively selfish, while older children might be more egalitarian and fairer. In the future it would be interesting to study also the reactions of older children to unfair treatment.

As this study only concentrated on female providers, mothers or an unknown woman, it would be interesting to conduct a similar study with other providers. Fathers could be included in future studies, but also relatives of different degrees of relatedness, like aunts, uncles, or grandparents. Comparison of child reactions in such settings may provide interesting insight into how children elicit parental and communal resources. Future research might also take interest in if the beneficiary being of different degrees of relatedness might affect how children react when facing disadvantageous unfairness.

Conclusion

The purpose of this thesis was to study reactions of 3- to 4-year-old children to unfair treatment and the effects of kinship on these reactions. The results of the current study show that children display more competitive reactions when they are treated unfairly by their

mothers, compared to when they are treated unfairly by an unrelated woman. Relatedness to the beneficiary does not seem to affect how children react in unfair situations. Methodological limitations of the study make it difficult to draw any strong conclusions based on these results. Further research in the field is needed.

Swedish Summary - Svensk sammanfattning
En experimentell studie av släktskaps inverkan på 3–4-åriga barns reaktioner på orättvis behandling

Hamilton (1964) definierar inkluderande fitness (eng. *inclusive fitness*) som både den mängd individens avkomma som lyckas överleva till vuxen ålder, men också som alla andra sätt som en individ befrämjar sina egna gener. Att hjälpa sina släktingar främjar alltså individens inkluderade fitness.

Enligt Trivers (1972) teori om föräldrainvestering (eng. *parental investment*) satsar föräldrar resurser på sin avkomma. Dessa resurser är begränsade och därför leder satsning på ett visst barn till att färre resurser finns kvar för föräldern själv eller för förälderns övriga barn. Enligt Trivers (1974) leder detta till en konflikt mellan förälder och avkomma gällande hur föräldern borde fördela sina resurser. Ett barn gagnas mest av att föräldern satsar sina resurser på just honom eller henne, medan föräldern gagnas av att fördela sina resurser jämnt mellan alla barn. Ett barn delar 50% av sina gener med sina syskon och därför gagnas barnet mest av satsning på en själv. Detta leder till tävling och rivalitet mellan syskon. För att främja sitt intresse uppmuntrar föräldrarna mer altruistiskt beteende hos avkomman (Trivers, 1974). Samtidigt är det mer fördelaktigt för ett barn om förälderns tillgångar tilldelas ett syskon än om föräldern skulle satsa resurser på ett barn utan släktskapsrelation. Detta förklaras med att syskon delar hälften av sina gener med varandra och därför gagnar en släktnings överlevnad också individens inkluderande fitness (Hamilton, 1964).

Barn använder sig av olika strategier för att öka föräldrainvestering i sig själva. De kan t.ex. le, be om omsorg, gråta eller då det är frågan om väldigt unga barn, jollra (Bowlby, 19692; Godfray, 1991; Hrdy, 2007; Lummaa et al., 1998; Soltis, 2004). Med dessa olika strategier kan ett barn signalera sina behov och försöka öka förälderns investering. Att signalera i sig innebär enligt Maynard Smith (1991) en kostnad för barnet för att dessa strategier inte ska missbrukas. Ytterligare hävdar Godfray (1995) att barnets signaler inte enbart utgår från de egna behoven, utan även utifrån syskonens behov. Om ett barn får mera resurser än han eller hon egentligen behöver, kan detta leda till att ett syskon inte kan tillgodose sina behov eftersom föräldrarnas resurser är begränsade. Ett välmående syskon gagnar barnets inkluderande fitness såsom ovan nämnt.

Avundsjuka och rivalitet mellan syskon

Föräldrar och avkomma kan ha olika syn på hur föräldraresurserna borde fördelas, såsom tidigare beskrivits. Samtidigt kan barn använda sig av olika strategier för att öka föräldrainvesteringen i sig själva. Enligt Campos, Walle and Dahl (2010) uppstår avundsjuka hos barnet i sociala situationer då en tredje part utmanar en för individen viktig relation. I kontexten av denna avhandling är det fråga om att barn kan uppleva att ett syskon inkräktar på den viktiga relationen som barnet har till sin mamma. Detta får barnet att känna avundsjuka. Syskonrivalitet kan anses förorsaka avundsjuka och avundsjuka kan ses som en signal som syftar på att attrahera mera föräldrainvestering.

Redan barn i 1-års åldern visar starkare reaktioner då mamman tar hand om en docka jämfört med då hon höll en bok. Dessa reaktioner orsakades specifikt av att det var mamman som höll föremålen. Då en för barnet obekant vuxen person höll föremålen kunde man inte se ett liknande reaktionsmönster (Hart, Field, del Valle, & Letourneau, 1998). En liknande studie med 2-åriga barn och deras föräldrar uppvisade likartade resultat. Barnen visade mer avundsjuka då föräldrarna höll i en docka jämfört med att dessa utförde en uppgift med papper och penna (Szabó et al., 2014). Barn i 3–5 årsålder visade mer avundsjuka reaktioner då mamman tog hand om ett barn i samma ålder, jämfört med att hon tog hand om en baby (Masciuch & Kienapple, 1993). Barn reagerade också med avundsjuka då de ombads att leka för sig själva medan föräldern lekte med ett yngre syskon (Miller et al., 2000).

Sammanfattningsvis kan man hävda att dessa studier tyder på att barn reagerar med avundsjuka då mammorna koncentrerar sig på antingen andra personer eller dockor vilka ju symboliserar andra personer. Reaktionerna verkar vara kopplade specifikt till andra barn i ungefär samma ålder och inte enbart till att mamman koncentrerar sig på någonting annat än barnet.

Samhällets gemensamma resurser

Trots att barn är beroende av föräldrainvestering för att överleva och utvecklas, kan även andra delta i att ta hand om barnet. I traditionella samhällen kan mamman tillgodose sitt barns hela energibehov genom att amma det under det första levnadsåret. Så småningom behöver barnet även annan föda (Kennedy, 2005). I traditionella samhällen brukar barn sluta dia i 2–3 årsåldern (Kennedy, 2005). Andra medlemmar i samhället kan förse barnet med mat och på så sätt öka barnets chanser till överlevnad (Hill & Hurtado, 2009).

Barn är alltså beroende av sina föräldrars omsorg, men då barnen växer börjar de få sina behov tillfredsställda även på andra sätt. På grund av detta kan man anta att yngre barn

som är beroende av sina föräldrar upplever mer konkurrens jämfört med äldre barn vilka inte är fullt lika beroende av förälderns resurser.

Barns reaktioner på orättvis behandling

Ett flertal studier indikerar att det sker en förändring i barns förmåga att handskas med orättvisa situationer och att denna förändring hänger ihop med barnets ålder. Yngre barn verkar handla självviskt, de kan välja att ta emot förmåner på bekostnaden av andra barn, t.ex. i situationer där barn ska fatta beslut om hur godis eller leksaker ska fördelas. Samtidigt kan äldre barn i 7–8 års ålder börja dela mer prosocialt och ta i betraktande andra barns behov (Blake & McAuliffe, 2011; Fehr et al., 2008; Lobue et al., 2011; McAuliffe et al., 2013; Shaw & Olson, 2012; Sheskin et al., 2014). Få studier har granskat hur barn delar med sig till sina syskon. I 3–4 årsålder visade barn inga preferenser då de delade med sig till syskon eller vänner, men de föredrog att dela med sig till både syskon och vänner framom obekanta (Olson & Spelke, 2008). I en annan studie prefererade barn i den här åldern sina vänner, men i 5-årsålder föredrog de deltagande barnen sina syskon (Spokes & Spelke, 2016).

Sammanfattningsvis kan man konstatera att det verkar ske en åldersrelaterad förändring i hur barn handlar i orättvisa situationer. Äldre barn verkar vara mer rättvisa, medan yngre barn handlar mer självviskt. Man har dock inte kunnat påvisa preferenser mellan syskon eller vänner i dylika situationer.

Hypoteser

Avhandlingens syfte var att studera 3–4 år gamla barns reaktioner på orättvis behandling. Tidigare studier har fokuserat på hur barn delar med sig och på hur barn reagerar då de blir orättvist behandlade. Tidigare forskning har inte i någon större utsträckning beaktat hur släktskap och familjeförhållanden påverkar barns reaktioner då de behandlas orättvist. Denna studie fokuserar på hur barns reaktioner på orättvisa påverkas av släktskapet till dels den som utför den orättvisa handlingen, samt till den som orättvist favoriseras. Avhandlingens hypoteser var:

1. Barns negativa reaktioner på orättvis behandling är stakare då deras mamma behandlar barnen orättvist jämfört med då en kvinna som inte en släktning står för den orättvisa behandlingen.
2. De starkaste negativa reaktionerna framkommer då mamman behandlar sitt barn orättvist genom att favorisera barnets syskon, jämfört med då mamman favoriserar ett barn som inte är en släkting.

3. Barn visar starka negativa reaktioner på orättvis behandling då en kvinna som inte är en släkting behandlar barnet orättvist genom att favorisera barnets syskon, jämfört med då kvinnan favoriserar ett barn som inte heller är en släkting.

Metod

Deltagarna rekryterades med hjälp av bekvämlighetsurval, genom e-post till daghemsföreståndare och olika hobbygrupper för barn, via Facebookinlägg och snöbollsurval. Kriterier för deltagandet var att familjen skulle ha ett barn i åldern 3–4 år, att detta barn skulle ha ett syskon i åldern 3–12 år, samt att båda dessa barn skulle ha samma biologiska mamma som även skulle ha möjlighet att delta.

Sammanlagt 40 barn deltog i studien (19 flickor och 21 pojkar), medelåldern var 3,99 år (*SD* = 0,55). Syskonen som deltog i studien hade en medelålder på 6,37 år (*SD* = 1,82). Alla syskonpar hade samma biologiska mamma och i medel hade familjerna 2,63 barn (*SD* = 0,90).

Åbo Akademis forskningsetiska nämnd gav studien etiskt tillstånd i maj 2017.

Forskningsupplägget

Forskningsuppläget bestod av fyra betingelser där den som handlade orättvist, alltså försöksledaren, och den som drog nyttan av orättvisan var de faktorer som manipulerades. I varje försök deltog ett 3–4 årigt barn (i fortsättningen: försökspersonen) och ett annat barn. Det andra barnet var antingen ett syskon till försökspersonen eller ett barn som inte var släkt med försökspersonen. Antingen barnens mamma eller en kvinnlig forskningsassistent som inte var släkt till försökspersonen ledde försöken. Genom att man växlade personerna som deltog i försöken tillsammans med den 3–4-åriga försökspersonen, uppstod sammanlagt fyra betingelser:

a) Mamman (försöksledare) och ett syskon
b) Mamman (försöksledare) och ett annat barn (icke-släkting)
c) Forskningsassistent (försöksledare) och ett syskon
d) Forskningsassistent (försöksledare) och ett annat barn (icke-släkting)

Försökspersonerna deltog i alla fyra betingelser. För att motverka ordningseffekter motbalanserades betingelserna med en latinsk kvadrat.

Båda barnen som deltog skulle göra en lätt uppgift som gick ut på att lägga en boll i ett ämbar enligt försöksledarens instruktioner. Som belöning för detta fick barnen ett klistermärke. Barnen gjorde uppgiften tre gånger. Under de två första gångerna fick båda barnen ett klistermärke per man som belöning. På den tredje gången fick försökspersonen

endast ett klistermärke medan det andra barnet fick tre stycken. Efter en kort stund kompenserades försökspersonen med ytterligare två klistermärken.

Försöksledarens uppgift var att be barnen att göra uppgiften och sedan ge belöningen. Dessutom fyllde mammorna i ett frågeformulär gällande bakgrundsinformation om familjerna.

Mått

Två forskningsassistenter – vilka inte kände till hypoteserna – poängsatte materialet. Barnens reaktioner på orättvisan poängsattes under en kodningssekvens från stunden då barnen fått olika många klistermärken fram till att det 3–4-åriga barnet kompenserades med ytterligare två klistermärken.

Verbala reaktioner, kroppsliga reaktioner, ansiktsuttryck och falska positiva reaktioner mättes på en skala från 0 till 1. Barnens reaktioner gavs 0 om beteendet i fråga inte kunde observeras under kodningssekvensen och 1 om barn betedde sig på sättet i fråga. Samstämmigheten mellan de två forskningsassistenternas poäng mättes med ICC (eng. *interclass correlation*). De verbala och falska positiva reaktionerna samt ansiktsuttrycken nådde god eller utmärkt samstämmighet mellan assistenterna. De kroppsliga reaktionerna däremot nådde inte tillräckligt hög samstämmighet. Ett medeltal av båda assistenternas poäng räknades ut och dessa medeltal formade fyra reaktionsvariabler.

Resultat

För att pröva hypoteserna ovan, gjordes en 2 x 2 ANOVA där försöksledaren, det favoriserade barnet och interaktionen mellan dessa två var oberoende variabler. Barnens reaktioner på orättvisan var beroende variabler.

Det fanns en signifikant effekt av försöksledaren på barnens reaktioner F (1; 114,27) = 4,76, p <0,05. Post-hoc test visade att reaktionerna var starkare då försöksledaren var barnets mamma (M = 3,40, SE = 0,25), jämfört med då en okänd kvinna var försöksledare (M = 2,84, SE = 0,25; t = 2.18, p = .03). Vidare analyser visade att denna effekt endast var signifikant för verbala reaktioner F (1; 113,9) = 6,76, p = 0,011. Det favoriserade barnets identitet, syskon eller annat barn, hade inte en signifikant effekt på barnens reaktioner.

Diskussion

Resultaten gav stöd för den första hypotesen. Barn reagerade starkare då de behandlades orättvist av sin mamma jämfört med om de behandlades orättvist av en kvinna som inte var en släkting. Dessa reaktioner var främst verbala. Det fanns inga signifikanta

effekter av det andra barnets identitet. Reaktionerna skilde sig inte åt signifikant då det favoriserade barnet var ett syskon eller en icke-släkting. Varken den andra eller den tredje hypotesen fick stöd emedan det inte förekom några interaktionseffekter mellan variablerna försöksledare och det favoriserade barnet.

Sampelstorleken kan ha haft en inverkan på dessa resultat. Studiens deltagarantal var endast 40 barn. I fortsatt forskning kunde ett större sampel ge ett resultat med högre reliabilitet. Det är även möjligt att forskningsupplägget inte hade tillräckligt hög ekologisk validitet. En mer vardaglig orättvis situation kunde ge ytterligare information gällande barns reaktioner. I framtiden kunde liknande studier använda andra reaktionsmått, t.ex. fysiologiska mått, mått på känslointensitet eller en kombination av olika sorters mått. På detta sätt kunde barnens reaktioner möjligen mätas på ett mer tillförlitligt sätt. På grund av de metodologiska begräsningarna i forskningsupplägget kan inga vidare slutsatser dras på basen av resultaten.

References

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, *67*(1), 1–48.

Bian, L., Sloane, S., & Baillargeon, R. (2018). Infants expect ingroup support to override fairness when resources are limited. *Proceedings of the National Academy of Sciences*, *115*(11), 2705–2710. https://doi.org/10.1073/pnas.1719445115

Birch, L. L., & Biuman, J. (1986). Preschool Children's Food Sharing with Friends and Acquaintances. *Child Development*, *57*(2), 387–395.

Blake, P. R., & McAuliffe, K. (2011). "I had so much it didn't seem fair" Eight-year-olds reject two forms of inequity. *Cognition*, *120*(2), 215–224. https://doi.org/10.1016/j.cognition.2011.04.006

Bowlby, J. (19692). *Attachment and loss: Vol 1. Attachment*. New York: Basic Books. https://doi.org/10.1177/000306518403200125

Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S. (2010). Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development. *Teachers College Record*, *112*(3), 579–620. Retrieved from http://www.gregorycamilli.info/papers/early education interventions.pdf

Campos, J. J., Walle, E. A., & Dahl, A. (2010). What Is Missing in the Study of the Development of Jealousy. In L. Hart, S & M. Legerstee (Eds.), *Handbook of jealousy: Theories, research, and multidisciplinary approaches* (pp. 312–328). Malden, MA: Wiley-Blackwell.

Caro, S. M., West, S. A., & Griffin, A. S. (2016). Sibling conflict and dishonest signaling in birds. *Proceedings of the National Academy of Sciences*, *113*(48), 13803–13808. https://doi.org/10.1073/pnas.1606378113

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Egalitarianism in young children. *Nature*, *454*(28), 1079–1083. https://doi.org/10.1038/nature07155

Godfray, H. C. J. (1991). Signalling of need by offspring to their parents. *Nature*, *352*(25), 328–330.

Godfray, H. C. J. (1995). Signaling of Need between Parents and Young : Parent-Offspring

Conflict and Sibling Rivalry. *The American Naturalist*, *146*(1), 1–24.

Hamilton, W. D. (1964). The genetical evolution of social behaviour. I. *Journal of Theoretical Biology*, *7*(1), 1–16. https://doi.org/10.1016/0022-5193(64)90038-4

Hart, S., Field, T., del Valle, C. Del, & Letourneau, M. (1998). Infants protest their mothers' attending to an infant-size doll. *Social Development Development*, *7*(1), 54–61. https://doi.org/10.1111/1467-9507.00050

Hill, K., & Hurtado, A. M. (2009). Cooperative breeding in South American hunter-gatherers. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1674), 3863–3870. https://doi.org/10.1098/rspb.2009.1061

Hrdy, S. B. (2007). Evolutionary Context of Human Development: The Cooperative Breeding Model. In C. A. Salmon & T. K. Shackelford (Eds.), *Family relationships: An evolutionary perspective* (pp. 9–32). New York: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195320510.003.0003

IBM Corp. (2017). IBM SPSS Statistics for Windows. Armonk, NY: IBM Corp.

Ivey, P. K. (2000). Cooperative Reproduction in Ituri Forest Hunter-Gatherers: Who Cares for Efe Infants? *Current Anthropology*, *41*(5), 856–866. https://doi.org/10.1086/317414

Kennedy, G. E. (2005). From the ape's dilemma to the weanling's dilemma: Early weaning and its evolutionary context. *Journal of Human Evolution*, *48*(2), 123–145. https://doi.org/10.1016/j.jhevol.2004.09.005

Kolak, A. M., & Volling, Brenda, L. (2011). Sibling Jealousy in Early Childhood Longitudinal Links to Sibling Relationship Quality. *Infant and Child Development*, *20*, 213–226. https://doi.org/10.1002/icd

Lane, I. M., & Coon, R. C. (1972). Reward Allocation in Preschool Children. *Child Development*, *43*, 1382–1389. https://doi.org/10.2307/1127523

Leventhal, G. S., & Anderson, D. (1970). Self-interest and the maintenance of equity. *Journal of Personality and Social Psychology*, *15*(1), 57–62. https://doi.org/10.1037/h0029173

Lobue, V., Nishida, T., Chiong, C., Deloache, J. S., & Haidt, J. (2011). When Getting Something Good is Bad: Even Three-year-olds React to Inequality. *Social Development*,

20(1), 154–170. https://doi.org/10.1111/j.1467-9507.2009.00560.x

Lummaa, V., Vuorisalo, T., Barr, R. G., & Lehtonen, L. (1998). Why Cry? Adaptive Significance of Intensive Crying in Human Infants. *Evolution and Human Behavior*, *19*(3), 193–202. https://doi.org/10.1016/S1090-5138(98)00014-2

Masciuch, S., & Kienapple, K. (1993). The Emergence of Jealousy in Children 4 months to 7 years of age. *Journal of Social and Personal Relationships*, *10*, 421–435.

Maynard Smith, J. (1991). Honest signalling: the Philip Sidney game. *Animal Behaviour*, *42*(6), 1034–1035. https://doi.org/10.1016/S0003-3472(05)80161-7

McAuliffe, K., Blake, P. R., Kim, G., Wrangham, R. W., & Warneken, F. (2013). Social influences on inequity aversion in children. *PLoS ONE*, *8*(12), 1–11. https://doi.org/10.1371/journal.pone.0080966

Miller, A. L., Volling, B. L., & McElwain, N. L. (2000). Sibling Jealousy in a Triadic Context with Mothers and Fathers. *Review of Social Development*, *9*(4), 433–457. https://doi.org/10.1111/1467-9507.00137

Moore, C. (2009). Fairness in children's resource allocation depends on the recipient. *Psychological Science*, *20*(8), 944–948. https://doi.org/10.1111/j.1467-9280.2009.02378.x

Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition*, *108*(1), 222–231. https://doi.org/10.1016/j.cognition.2007.12.003

Paulus, M., & Moore, C. (2014). The development of recipient-dependent sharing behavior and sharing expectations in preschool children. *Developmental Psychology*, *50*(3), 914–921. https://doi.org/10.1037/a0034169

R Core Team. (2008). R: A Language and Environment for Statistical Computing. Vienna: R Foundation for Statistical Computing.

Shaw, A., & Olson, K. R. (2012). Children discard a resource to avoid inequity. *Journal of Experimental Psychology: General*, *141*(2), 382–395. https://doi.org/10.1037/a0025907

Sheskin, M., Bloom, P., & Wynn, K. (2014). Anti-equality: Social comparison in young children. *Cognition*, *130*(2), 152–156. https://doi.org/https://doi.org/10.1016/j.cognition.2013.10.008

Soltis, J. (2004). The signal functions of early infant crying. *The Behavioral and Brain Sciences*, *27*(4), 443–490. https://doi.org/10.1017/S0140525X0442010X

Spokes, A. C., & Spelke, E. S. (2016). Children's expectations and understanding of kinship as a social category. *Frontiers in Psychology*, *7*(440), 1–13. https://doi.org/10.3389/fpsyg.2016.00440

Stewart-Williams, S. (2007). Altruism among kin vs. nonkin: effects of cost of help and reciprocal exchange. *Evolution and Human Behavior*, *28*(3), 193–198. https://doi.org/10.1016/j.evolhumbehav.2007.01.002

Stewart-Williams, S. (2008). Human beings as evolved nepotists : Exceptions to the rule and effects of cost of help. *Human Nature*, *19*(4), 414–425. https://doi.org/10.1007/s12110-008-9048-y

Suomen virallinen tilasto (SVT). (2017). Syntyneet. Retrieved from http://www.stat.fi/til/synt/2017/synt_2017_2018-04-27_fi.pdf

Szabó, N., Dubas, J. S., & van Aken, M. A. G. (2014). Jealousy in Firstborn Toddlers within the Context of the Primary Family Triad. *Social Development*, *23*(2), 325–339. https://doi.org/10.1111/sode.12039

Trivers, R. L. (1972). Parental investment and sexual selection. In B. Campbell (Ed.), *Sexual Selection and the Descent of Man; 1871-1971* (pp. 136–179). Chicago: Aldine-Atherton. https://doi.org/10.1002/ajpa.1330400226

Trivers, R. L. (1974). Parent-offspring conflict. *American Zoologist*, *14*(1), 249–264. https://doi.org/10.1093/icb/14.1.249

Ulber, J., Hamann, K., & Tomasello, M. (2017). Young children, but not chimpanzees, are averse to disadvantageous and advantageous inequities. *Journal of Experimental Child Psychology*, *155*, 48–66. https://doi.org/10.1016/j.jecp.2016.10.013

Appendices

Appendix A. Latin Square Table

a) Focal child, mother and sibling

b) Focal child, mother and unrelated peer

c) Focal child, unrelated woman and sibling

d) Focal child, unrelated woman and unrelated peer

Trial	Order
1	abcd
2	bcda
3	cdab
4	dabc
5	acbd
6	cbda
7	bdac
8	dacb
9	adbc
10	dbca
11	bcad
12	cadb
13	adcb
14	dcba
15	cbad
16	badc
17	acdb
18	cdba
19	dbac
20	bacd
21	abdc
22	bdca
23	dcab
24	cabd

Appendix B. Questionnaire for the Mothers

Questionnaire for Mothers Participating in the Study

Date and time:_____

Child participating in the study

First name of the child:_____

Age of the child:_____

Gender of the child:_____

Is the child in preschool___, taken care of at home___ or in school___?

Is the child a first born? If not, please indicate the child's birth order_____
(1.= first born, 2.= second born and so forth)

Does the child have half siblings?_____

If the child has half siblings, are they from the mother___ or the father___ ?

Does the child live with his/her mother___,father___or both the majority of the time___?

The other child participating in the study

First name of the child:_____

Age of the child:_____

Gender of the child:_____

Is the child in preschool___, taken care of at home___ or in school___?

Is the child a first born? If not, please indicate the child's birth order_____
(1.= first born, 2.= second born and so forth)

Does the child have half siblings?_____

If the child has half siblings, are they from the mother___ or the father___ ?

Does the child live with his/her mother___,father___or both the majority of the time___

The family's background

Amount of children living in the family:_____

How many of these are half siblings?_____

Do both children participating in the study have the same biological mother?_____

Do both children participating in the study have the same biological father?
_____

How many days a week do the children participating in the study spend with each other?(0-7 days)_____

Appendix C. Measures of Child Reactions to Unfairness

Scale 0 = the reaction is not present during the period after the unfairness
1= the reaction is present during the period after the unfairness

Bodily reactions:
The focal child stands up
The focal child sits straighter
The focal child hits his/her fist on the table
The focal child waves or gestures with his/her arms
The focal child leaves the room
The focal child tries to leave the room
The focal child tries to leave the room (without succeeding)
The focal child slouches
The focal child hangs with his/her head
The focal child stiffens up
The focal child is restless
The focal child takes stickers from the other child
The focal child tries to take stickers from the other child (without succeeding)

Verbal reactions:
The focal child points out the unfairness
The focal child answers yes when provider asks about the unfairness
The focal child protests or complains about the unfairness
The focal child states that he/she needs to be compensated with stickers
The focal child answers yes on question about the need for compensation
The focal child demands some other kind of change than compensation
The focal child insults the provider
The focal child questions the situation
The focal child protests/complain about the game or again getting fewer stickers
The focal child has a shaky voice when speaking
The focal child raises his/her voice
The focal child shouts

The focal child lowers his/her voice
The focal child counts his/her stickers autonomously
The focal child states how many stickers he/she when the provider or the beneficiary asks
The focal child states how many stickers the beneficiary has

Facial reactions:
The focal child cries
The focal child alternates looking at the provider/one's own stickers/the stickers of the beneficiary (two out of the three needed)
The focal child stares at the provider
The focal child stares at his/her stickers
The focal child frowns or shows a sad face (e.g., sad eyes and mouth turned down)
The color of the of face focal child changes

Deceitful reactions:
The focal child smiles
The focal child laughs
The focal child states that fewer stickers is fair/good/positive
The focal child does not want the stickers at all/refuses to take them
The focal child tries to give or gives his/her stickers to the beneficiary
The focal child tries to give or gives his/her stickers to the provider

Did the reaction of the child have to be calmed down? (other than giving the child more stickers)
1= No
2= Yes

Is the sticker compensation effective? (in calming the child)
1= Yes
2= No

Did the focal child notice the unfairness?
0= Unclear

Karin Iivarinen

1= No

2= Yes

Did the test leader (provider) depart from the instructions in such a way that a unfair situation does not occur?

1= No

2= Yes

Karin Iivarinen

PRESSMEDDELANDE

Släktskaps inverkan på 3–4-åriga barns reaktioner på orättvis behandling

Pro gradu-avhandling i psykologi
Fakulteten för humaniora, psykologi och teologi

Resultaten från en pro gradu-avhandling vid Åbo Akademi visar att barn reagerar negativt på orättvis behandling och att barn reagerar starkare då de är släkt med personen som behandlar dem orättvist. I studien mättes barns verbala, kroppsliga och falska positiva reaktioner, samt ansiktsuttryck då de blev behandlade orättvist. Studien fokuserade på hur barns reaktioner på orättvisa påverkas av släktskap till dels den som utför en orättvis handling, samt till den som orättvist favoriseras. Släktskap till den som orättvist favoriseras hade inte en signifikant effekt på barns reaktioner.

Sammanlagt 40 barn i åldern 3–4 år deltog i studien, 19 flickor och 21 pojkar. Studien baserade sig på en inomindividsdesign där barnen deltog i fyra olika betingelser. Baren gjorde en lätt uppgift och fick sedan klistermärken antingen av sin mamma eller av en kvinna som inte var släkt till barnet. Barnen gjorde uppgiften tillsammans med sitt syskon eller med ett barn som inte var en släktning.

Ytterligare information fårs av:

Karin Iivarinen
Psykologistuderande
Psykologi, Åbo Akademi
+358 50 495 0979
karin.iivarinen@abo.fi