Why Does Inequity Aversion Develop? – An Experimental Test of Ultimate Explanations

Emmie Marklund
Master's thesis in Psychology
Supervisor: Jan Antfolk
Faculty of Arts, Psychology and Theology
Åbo Akademi University

ÅBO AKADEMI UNIVERSITY – FACULTY OF ARTS, PSYCHOLOGY AND THEOLOGY

Summary of master's thesis

Subject: Psychology
Author: Emmie Marklund
Title: Why Does Inequity Aversion Develop? – An Experimental Test of Ultimate Explanations
Supervisor: Jan Antfolk
Abstract: Children develop inequity aversion (a tendency to respond negatively to, and correct, unfair outcomes) around age six. This is expressed by children starting to avoid inequity by sharing more equally. In the current study, we tested whether fairness norms, reciprocal altruism, or inclusive fitness underlies the development of this phenomenon. One-hundred-and-six 4- to 8-year-old children (53% girls) distributed five erasers between themselves, a sibling, a friend, and a stranger. An option was to throw away any eraser. A pattern of more erasers distributed to oneself, the sibling, and the friend, or to oneself and the sibling, would indicate reciprocal altruism or inclusive fitness as the ultimate explanation, and erasers distributed equally to all recipients would indicate fairness norms. Consistent with previous research, 6- to 8-year-olds displayed more inequity aversion (i.e, exhibited less selfish behavior and shared more equally) than younger children. The patterns found were that younger children distributed significantly more erasers to themselves than to the friend and the stranger. This deviated from predictions and did not support reciprocal altruism or inclusive fitness as the ultimate cause for the development of inequity aversion. Whether a norm of fairness can explain the development of inequity aversion remains unclear. The results suggested, however, that children become averse to inequity because of the disappearance of self-preference, as opposed to because of others becoming more important. The findings shed some light on the ultimate explanations for the development of inequity aversion but highlight the need for future research.
Keywords: children, development, fairness, inequity aversion, ultimate explanations
Date: 26.05.2020 | Page count: 29

ÅBO AKADEMI – FAKULTETEN FÖR HUMANIORA, PSYKOLOGI OCH TEOLOGI

Sammanfattning av avhandling pro gradu

Ämne: Psykologi	
Författare: Emmie Marklund	
Titel: Varför utvecklas aversion mot orättvisa? – Ett experimentellt test av ultimata orsaker	
Handledare: Jan Antfolk	
Sammanfattning: Barn utvecklar aversion mot orättvisa (en tendens att reagera negativt på, och korrigera, orättvisa utfall) kring sex års ålder. Som ett uttryck för detta börjar barn undvika orättvisa genom att dela med sig mer rättvist. I den ifrågavarande studien testades huruvida en rättvisenorm, reciprok altruism eller inkluderande duglighet ligger bakom utvecklingen av detta fenomen. Etthundrasex fyra- till åttaåringar (53 % flickor) fördelade fem suddgummin mellan sig själva, ett syskon, en kompis och ett okänt barn. Ett alternativ var att kasta bort ett eller flera suddgummin. Ett mönster av fler suddgummin fördelade åt sig själv, syskonet och vännen, eller åt sig själv och syskonet, skulle indikera reciprok altruism respektive inkluderande duglighet som ultimat förklaring. Lika många suddgummin fördelade åt alla skulle indikera en rättvisenorm. Resultaten visade att sex-, sju- och åttaåringar uppvisade mer aversion mot orättvisa (de agerade mindre själviskt och delade med sig mer rättvist) jämfört med yngre barn. Detta stämmer överens med tidigare forskning. Resultaten visade att yngre barn fördelade signifikant fler suddgummin åt sig själva än åt vännen och det okända barnet. Detta avvek från prediktionerna och därmed stödde resultaten inte reciprok altruism eller inkluderande duglighet som ultimata orsaker till att aversion mot orättvisa utvecklas. Huruvida en rättvisenorm kan förklara utvecklingen av detta fenomen förblir oklart. Resultaten antydde emellertid att barn utvecklar aversion mot orättvisa på grund av att självviskheten minskar, och inte på grund av att andra blir viktigare. Studien bidrar med nya rön om ultimata förklaringar till att aversion mot orättvisa utvecklas men vidare forskning behövs.	
Nyckelord: aversion mot orättvisa, barn, rättvisa, ultimata förklaringar, utveckling	
Datum: 26.05.2020	Sidantal: 29

Table of Contents

Introduction

The term *inequity aversion* (Fehr & Schmidt, 1999) describes the tendency to respond negatively to, and correct, unfairness. This includes a willingness to create fair outcomes even at the expense of own payoff. In earlier research, two forms of inequity aversion have been studied, namely *advantageous* inequity aversion and *disadvantageous* inequity aversion. Advantageous inequity aversion describes the tendency to respond negatively to unequal distributions of resources with oneself receiving more resources than another individual, whereas disadvantageous inequity aversion describes the tendency to respond negatively to unequal distributions of resources with someone else receiving more resources. Previous studies have shown that inequity aversion depends on age. A weakness in the previous literature is that the methods used have not properly tested different ultimate explanations for this developmental phenomenon, that is, an explanation for why this age-dependent phenomenon exists in the first place.

Previous Studies on Inequity Aversion

In most studies on inequity aversion, participants have generally been divided into age-groups with children less than six years being considered younger children and children older than six years being considered older children. Fehr, Bernhard, and Rockenbach (2008) studied how 3- to 8-year-old children allocated distributions of candy between themselves and a fictive child by asking children to choose between a fair and an unfair distribution, favoring either the subject or the recipient. They found that older, compared to younger, children demonstrated more aversion towards advantageous inequity, and less aversion towards disadvantageous inequity. Similarly, Blake and McAuliffe (2011) asked 4- to 8-year-old children to distribute candies equally or unequally between themselves and another child. Eight-year-olds were averse to both advantageous and disadvantageous inequity, whereas younger participants accepted advantageous inequity and were averse to disadvantageous inequity. Likewise, Shaw, Choshen-Hillel, and Caruso (2016) studied how 4- to 8-year-old children distribute erasers between themselves and another fictive child when choosing between a fair and an unfair option. Older children, as opposed to younger children, displayed more aversion towards advantageous inequity and were more likely to create inequity by giving an excess eraser to the fictive child, thus showing less disadvantageous inequity aversion.

In the aforementioned studies, inequity aversion was studied by having participants choose between a fair and an unfair distribution of resources. Other methods have been used as well. For instance, Shaw and Olson (2012) developed a method for studying inequity

aversion by having children distribute erasers between two fictive children. They found that older children tended to divide resources equally and preferred to throw away a resource rather than distribute them unfairly, whereas younger children showed no such preference. The fact that older children threw away a resource to create fair outcomes, despite disliking wasting resources, as shown by Rossano, Rakoczy, and Tomasello, 2011, suggests that children truly develop an aversion to inequity. Yet another method was used by Qiu, Yu, Li, Cheng, and Zhu (2017), who asked children to choose between spinning a fair wheel and an unfair wheel to receive a price. They found that older children preferred the fair wheel, even though choosing the unfair wheel would have led to greater benefit for themselves. Hence, in comparison with younger children, older children showed more aversion to advantageous inequity and less to disadvantageous inequity. Similarly, Kogut (2012) found that younger children tended to act in their own interest and older children tended to behave more fairly, when studying how children distributed ten candies between themselves and another child. With some variation within age categories, the bulk of the evidence supports the notion that older children are more averse to advantageous inequity, and less to disadvantageous inequity, and younger children show the opposite pattern. The gender of the child does not affect this (e.g., Kogut, 2012; Qiu et al., 2017). In other words, younger children tend to act selfishly and dislike others getting more, and older children tend to act fairly or even at a disadvantage to themselves.

Inequity aversion seems to emerge in different countries, for example, Switzerland, Israel, and the USA (Blake & McAuliffe, 2011; Fehr et al., 2008; Kogut, 2012), as well as when using different methods and different items as resources. This indicates that inequity aversion is a universal phenomenon and that fairness is an important human value. Further supporting this is the fact that children begin to talk about fairness early, around five years of age (Lobue, Nishida, Chiong, Deloache, & Haidt, 2011), and seem to be averse to inequity even when they themselves are not subject to unfairness (McAuliffe, Jordan, & Warneken, 2015). Moreover, concerns for fairness can be found in most cultures in the world, including hunter-gatherer societies. For example, Boehm (2008) studied ten hunter-gatherer societies and detected a pervasive preference for cooperation, sharing, and altruism. Others have made similar findings (e.g., Gurven, 2004; Henrich, 2004)**.** This supports fairness as being an important and universal value. Together, this supports the notion that inequity aversion may be an evolutionary adaptation. This is further supported by the fact that a genetic influence on rejecting unfair monetary allocations has been found (Wallace, Cesarini, Lichtenstein, & Johannesson, 2007).

Cultural Influence on Inequity Aversion

It has been argued that inequity aversion may have evolved through gene-culture coevolution (Fehr & Fischbacher, 2003). As fairness is a highly regarded value in Western societies compared to other cultures (Henrich, Heine, & Norenzayan, 2010), the results obtained in studies examining inequity aversion using educated, western samples might not be universally representative. Some studies have indeed found an impact of culture on inequity aversion. Blake et al. (2015) examined inequity aversion in seven societies of different population sizes and economic situations. Disadvantageous inequity aversion was found in all populations, at varying ages ranging from four to ten. Advantageous inequity aversion was, however, found in only three societies (Canada, USA, and Uganda). As a possible interpretation of the results, the authors suggested that children may have a general tendency to develop disadvantageous inequity aversion, but that in some societies advantageous inequity may develop at a later age than the studied ages. Further complicating the picture, Paulus (2015) found that 6- to 7-year-old Ugandan children did not show aversion to inequity. This raises the question of how culture shapes inequity aversion.

As previously discussed, inequity aversion has, nonetheless, been found in different countries, as well as in both collectivist and individualist cultures, for example China (Qiu et al., 2017) and the USA (Shaw et al., 2016). Although it seems that inequity aversion is influenced by culture, the extent of this influence and the exact mechanisms behind it remain elusive.

Explanations of Inequity Aversion

Different ultimate explanations for the development of selfish behavior towards more fair behavior have been proposed. For example, one suggested driving force is the strive to maintain one's reputation (Fehr & Fischbacher, 2003). Still, the natural history of inequity aversion remains an open question.

Conforming to a social norm of fairness is one possible explanation for the development of inequity aversion. If the culture has a norm of fairness, the understanding of this norm may demand a certain level of cognitive ability. Children may develop the cognitive capacity needed to understand this norm around six years of age, and then start behaving accordingly, thus becoming averse to inequity. According to this theory, children older than six years old would tend to distribute erasers equally to all recipients. Smith, Blake, and Harris, (2013) found however, that, when asked, 3- to 8-year-olds all stated that one should share equally, indicating that even young children understand norms of fairness. Yet, when given the option to keep or share stickers with another child, only 7- and 8-year-

olds shared equally. This indicates that understanding a norm of fairness is insufficient for explaining inequity aversion, as even both younger and older children understand the norm, but only older children adopt it. Thus, other explanations also need to be considered.

One possible ultimate explanation for inequity aversion is reciprocal altruism (Trivers, 1971), which entails granting favors to others when one has resources to spare, favors which can be returned later when oneself is in need. Reciprocal altruism is possible when the cost for the behavior is small and the roles of the recipient and the distributor are likely to be reversed in the future. It has been demonstrated that cooperation is more likely if there is a high probability for future interactions (Gächter & Falk, 2002). If inequity aversion reflects reciprocal altruism, children are expected to be more prone to share with friends and close relatives, compared to strangers, as the former are long-term relationships increasing the chance of payback.

Hamilton (1964), in his theory about inclusive fitness, argued that altruistic behavior (i.e., sharing resources with others) can be explained on an evolutionary basis. According to Hamilton, a person benefits from sharing resources with an individual who shares the same alleles, because this increases the probability that the individual's genes live on. According to this theory, an individual's fitness can be increased if the cost to self of the altruistic act toward another individual is smaller than the benefit of the act to the recipient, after weighting the benefit by the relatedness between self and recipient. Consequently, the development of selfish behavior towards more fair behavior, may be explained by individuals benefitting from sharing with individuals with whom they likely share some alleles, given that the benefit for the altruistic behavior, weighted by the relatedness to the recipient, outweighs the cost. Examples of this are that people are more willing to invest in own biological children than in other related children (Antfolk, Karlsson, Sörderlund, & Szala, 2017), and that people are willing to endure more pain to earn rewards for closer relatives compared to more distant relatives (Madsen et al., 2007). The theory of inclusive fitness predicts that children are more prone to share with close relatives than with non-relatives (e.g., a friend or a stranger).

The Current Study

In most of the previous studies on inequity aversion, participants distributed resources to strangers (e.g., Fehr et al., 2008; Shaw & Olson, 2012). Testing ultimate explanations necessitates a better understanding of how the relationship between the recipient and the child modulates inequity aversion. As there is compelling evidence that children, starting out as mainly interested in their own gain, develop a tendency to avoid inequity by sharing more

fairly at around age six, but ultimate explanations for this phenomenon have not been explicitly investigated, we designed a study to test three different possible explanations. We did this by observing how children distribute resources between themselves and multiple recipients simultaneously. The method was based on an influential study by Shaw and Olson (2012), in which the recipient was a fictive child, erasers were used as resources, and the participant had the option to throw away resources. In the current study, participants distributed five erasers between themselves, a sibling, a friend, and a stranger, and we examined to whom the participants distributed the erasers when it was impossible to distribute them equally without wasting any. We recruited 4- to 8-year old children to take part in the study, as these are the age-groups most often studied in the context of inequity aversion. The outcome was likely to vary as a function of age. We derived and tested the following hypotheses:

i) Older children (age six and older) will distribute the erasers in a fair manner more often than younger children.

ii) Based on the theory of a norm of fairness, children are expected to distribute the erases equally to all recipients.

iii) Based on the theory of reciprocal altruism, children are expected to distribute more erasers to themselves, the sibling, and the friend, than to the stranger.

iv) Based on the theory of inclusive fitness, children are expected to distribute more erasers to themselves and the sibling, than to the friend and the stranger.

Method

Participants

We recruited children aged 4, 5, 6, 7, and 8 years from local day-care centers, preschools, and primary schools. The children needed to have a sibling to participate. We aimed to have 24 participants per age-group, with a total sample of 120 children. Twelve children were excluded due to not having any siblings, and two children were excluded due to failure to understand the instructions. The final sample consisted of 106 participants (53% girls). The mean age of the total sample was 77.4 months (SD = 17.1), with the youngest and oldest participant being 48 and 107 months, respectively. There was no significant age difference between girls (M = 77.2 months old) and boys (M = 77.7 months old), $t(101.26) = -0.13$, $p = .894$. Participants were recruited using convenience sampling.

Ethical Statement

Ethical approval for the present study was granted on October 23, 2019, by the Ethical Review Board of Åbo Akademi University. Permission to recruit participants was

additionally granted by the director of education in Turku, as well as by the participating day-care centers, preschools, and primary schools.

Materials and Measures

The present study incorporated the use of a background form, which was filled out by the child's legal guardian. We asked for the name, gender, and age of both the participant and the sibling closest in age to the participant. Also, we asked in what way the sibling and the participant are related (full-, half-, step-, or adoptive siblings). As a measure of how close the participant and the sibling are, we asked how long the siblings have known each other (in months) and how much time they spend together, on a scale from 1 (*very little*) to 5 (*very much*). Background information was needed for conducting the experimental task as well as for the analyses. For the experimental task, a paper with four black boxes drawn onto it was used. Each box had a letter on it, referring to the person the box belonged to. We used yellow erasers in the shape of stars with faces on them as resources. Additionally, we used a small trashcan in case participants would choose to throw away erasers.

Procedure

Prior to the study, we tested a few children to ensure that the instructions were comprehensible. The actual study took place from November 2019 to February 2020. The staff of the day-care centers, preschools, and primary schools aided us by contacting all legal guardians, providing them with information about our upcoming study and inviting them to participate. After this, informed consent including a form for background information were distributed to legal guardians via the day-care centers, preschools, and primary schools. These were filled out and returned by interested parties.

The study took place during daytime at the day-care centers, preschools, and primary schools, in an available, quiet space. Participants were tested individually and could discontinue participation at any point. First, the experimenter and the participant sat down at a table. A trashcan was placed on the table next to the participant. The experimenter greeted the participant and took out a paper with four black boxes drawn onto it (see Appendix for a detailed description of the script and instructions). The experimenter then asked for the name of a friend, stated that one of the boxes belongs to that person, and told the participant to whom the other boxes belonged. In case the participant spontaneously mentioned that the friend was a relative, the experimenter asked for the name of another friend. The boxes belonged to the child, the child's sibling, and the child's friend. The fourth box belonged to a stranger, called Alexandra if the participant was a girl and Alexander if the participant was a boy, to minimize the effect of gender differences. The participant was then asked to repeat to

whom the boxes belonged, to ensure that he/she had understood the setup. This procedure was repeated if the participant failed.

Next, the experimenter took out five erasers. The experimenter told the participant, while pointing at each box, to distribute the erasers between himself/herself, the sibling, the friend, and the stranger. The experimenter told the participant that the erasers could be distributed in any way, and that, while pointing towards the trashcan, he/she may choose to throw away any eraser. Finally, the experimenter placed the erasers in front of the child, and he/she performed the task. After the participant had completed the task, the experimenter said "good job" and asked the participant not to tell the other children about the task. Additionally, the experimenter told the participant that he/she was going to get to keep the erasers that he/she distributed.

Prior to the experimental task the participants also executed two other tasks, belonging to another research project, leading the testing situation to last, in total, approximately 15 minutes per child. The children were given a ticket to an adventure park as an incentive for participation. To ensure confidentiality, all participants were given a number and the results were noted using this number. The list of the participant's names and corresponding numbers were kept separate.

Statistical Analyses

A mixed-design was used, with age as the between-subjects variable and recipient as the within-subjects variable. The dependent variable was operationalized as the number of erasers given to different recipients. The statistical analyses were performed using the statistical platform R (version 1.2.1335; R Core Team, 2008). To get a general impression of sharing behavior, we initially conducted one analysis of variance (ANOVA) for each recipient-option with age as the independent variable. Next, to specifically explore the hypotheses, we conducted one ANOVA per age group to analyze the within-age patterns of distributed erasers to self, sibling, friend, and stranger. Tukey post hoc tests ($\alpha = .05$) were used to follow up on the results. To specifically analyze inequity aversion, we first analyzed the number of even and uneven distributions of erasers. A distribution with one eraser distributed to each recipient and one thrown away was considered to be even, and any other pattern to be uneven. A chi-square test was then performed to analyze the association between age and type of distribution. Binomial tests were used to analyze the proportion of even and uneven distributions within age groups.

Results

Descriptive Statistics

The distribution of participants in terms of gender varied between age groups but was fairly even. The mean age in the different age groups was close to 4.5, 5.5, 6.5, 7.5, and 8.5 years. Most of the participants' siblings were full siblings, and the mean age difference between participant and sibling varied notably (see Table 1 for descriptive statistics). The participants with a non-full sibling had known their sibling (M = 58.3, SD = 17.6) for about as long as the participants with full siblings (M = 60.0, SD = 25.8), but spent somewhat less time with their sibling (M = 3.6, SD = 1.6) compared to participants with a full sibling (M = 4.5, SD = 0.8).

Table 1

Participant Descriptive Statistics

	Participants			Siblings		
Age-groups	Boys	Girls	Mean age (*SD*)	%female	Mean age Δ (*SD*)	%full[a]
4-year-olds	11	12	53.9 (3.5)	60.9	19.8 (39.4)	95.7
5-year-olds	9	11	67.0 (3.7)	60.0	21.4 (56.1)	85.0
6-year-olds	9	10	77.7 (3.5)	52.6	11.2 (43.0)	89.5
7-year-olds	10	13	88.1 (3.4)	47.8	-4.8 (33.4)	95.5[b]
8-year-olds	11	10	101.2 (3.6)	47.6	17.0 (39.2)	100.0

Note. Age is given in months. Δ denotes the difference in age between participant and sibling.
[a]Of those who were not full siblings two were paternal half-siblings, four were maternal half-siblings and one was a stepsibling. [b]Data from one participant is missing.

Participant Decisions

Table 2 shows the mean number of erasers distributed to the different recipients across age groups. The distribution indicated some self-preference, as the participants took most erasers for themselves, and similarly a weak tendency to avoid throwing away erasers. There were no statistically significant differences between genders.

Table 2

Number of Erasers Distributed Across Age groups

Recipient	Mean (*SD*)	Range
Oneself	1.19 (0.42)	1–3
Sibling	1.06 (0.23)	1–2
Friend	1.03 (0.26)	0–2
Stranger	1.03 (0.26)	0–2
Thrown away	0.70 (0.46)	0–1

Sharing Behavior and the Effect of Age

One one-way ANOVA with age group as the factor and distribution as the outcome was conducted per each recipient option to analyze sharing behavior and the effect of age. There was a significant effect of age group on the number of erasers thrown away, $F(4) = 3.61$, $p = .009$. A post hoc test showed that 6-year-olds ($M = 0.89$, $SD = 0.32$) on average threw away more erasers than 5-year-olds ($M = 0.45$, $SD = 0.51$, $p = .018$) and 4-year-olds ($M = 0.57$, $SD = 0.51$), although the latter difference was not statistically significant ($p = .119$). Seven-year-olds ($M = 0.78$, $SD = 0.42$) and 8-year-olds ($M = 0.81$, $SD = 0.40$) also threw away more erasers than the 5-year-olds and the 4-year-olds, but these differences were not statistically significant ($p = .105$, $p = .453$, and $p = .075$, $p = .357$ respectively). Similarly, there was a significant effect of age on the numbers of erasers given to oneself, $F(4) = 4.01$, $p = .005$. A post hoc test showed that 5-year-olds ($M = 1.40$, $SD = 0.60$) took more erasers for themselves compared to 6-year-olds ($M = 1.05$, $SD = 0.23$). This difference was almost statistically significant ($p = .054$). Five-year-olds took significantly more for themselves compared to 7-year-olds ($M = 1.04$, $SD = 0.21$, $p = .031$). Five-year-olds also took more for themselves compared to 8-year-olds ($M = 1.10$, $SD = 0.30$), but this was not statistically significant ($p = .105$). Furthermore, 4-year-olds took more erasers for themselves ($M = 1.35$, $SD = 0.49$) compared to 6-, 7-, and 8-year-olds, but these differences were not statistically significant ($p = .120$, $p = .075$, and $p = .220$ respectively). There was no statistically significant effect of age on numbers of erasers distributed to the sibling, the friend, or the stranger (see Figure 1 for the mean number of erasers distributed to different recipient as a function of age). The results indicated self-preference among the younger children, which disappeared with age, with a significant shift in the age between five and seven.

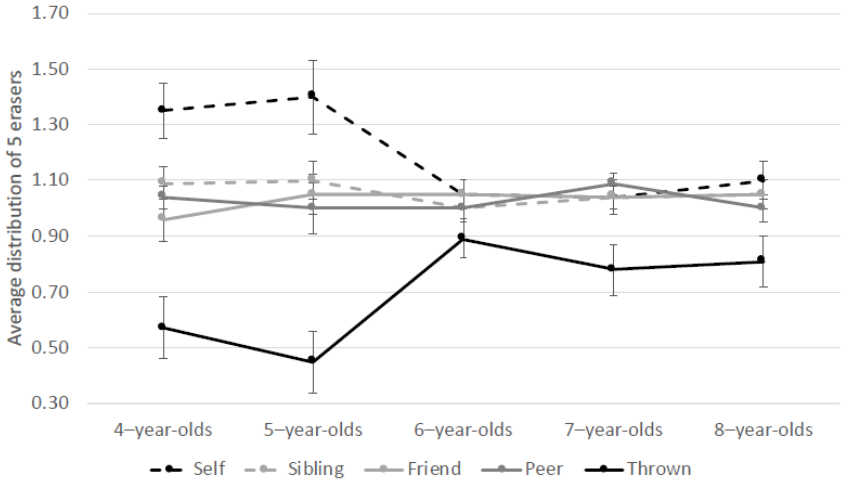

Figure 1. Distribution of erasers by recipient type and age group. Error bars represent standard errors.

Age-Specific Preferences for Distributing Erasers

We conducted one ANOVA per age group to analyze the hypotheses, namely, to analyze the within-age pattern of distributed erasers to self, sibling, friend, and stranger. In the case of a norm of fairness, we would expect children to distribute the erasers equally among all recipients. In the case of reciprocal altruism, we would expect them to distribute significantly more erasers to themselves, the sibling, and the friend than to the other recipients, and in the case of inclusive fitness, we would expect them to distribute significantly more erasers to themselves and the sibling than to the other recipients. There were significant differences in the number of erasers distributed to the different recipients among the 4-year-olds, $F(3) = 5.24$, $p = .002$. A post hoc test showed that the 4-year-olds distributed significantly more erasers to themselves ($M = 1.35$, $SD = 0.49$) than to the friend ($M = 0.96$, $SD = 0.21$, $p = .002$). No other pairwise comparisons were statistically significant. Similarly, there were significant differences in the number of erasers distributed to the different recipients among the 5-year-olds, $F(3) = 3.62$, $p = .017$. A post hoc test showed that the 5-year-olds distributed significantly more erasers to themselves ($M = 1.40$, $SD = 0.60$) than to the stranger ($M = 1.00$, $SD = 0.32$, $p = .019$). They also distributed more erasers to themselves than to the friend ($M = 1.05$, $SD = 0.39$), which was almost statistically significant ($p = .051$). The remaining pairwise comparisons were not statistically significant. Among the 6-, 7-, and 8-year-olds, there were no significant differences in the distribution of erasers between the different recipients (see Figure 1 for the distribution of erasers within age groups).

Analysis of Inequity Aversion

Because inequity aversion would be expressed as an even distribution of erasers, with one eraser given to each recipient and one eraser thrown away, we further analyzed the pattern of distributed erasers according to age group. Six- to eight-year-olds had notably higher rates of even distributions compared to 4- and 5-year-olds. A chi-square test showed a statistically significant association between age and type of distribution of erasers, $\chi^2(4, 106) = 13.27$, $p = .010$. To test whether distributions differed from chance level (50%) in each age group, we analyzed the data using binomial tests. The binomial tests showed that 4- and 5-year-olds randomly distributed the erasers evenly or unevenly ($p = .678$ and $p = .824$), and that 6-year-olds ($p = .001$), 7-year-olds ($p = .011$), and 8-year-olds ($p = .007$) distributed the erasers significantly more often evenly than unevenly (see Table 3 for frequency distributions). The results suggest that 6- to 8-year-olds were more averse to inequity than 4-

and 5-year-olds, and that this aversion, expressed as a significant majority of the distributions being even, could be seen at its earliest in 6-year-olds.

Table 3

Frequency of Type of Distribution by Age Group

	4-year-olds	5-year-olds	6-year-olds	7-year-olds	8-year-olds
Even	13	9	17	18	17
Uneven	10	11	2	5	4

Note. A distribution with one eraser distributed to each recipient and one thrown away was labeled an even distribution. Any other pattern of distribution was labeled an uneven distribution.

Discussion

The present study sought to test three different causes for the development of inequity aversion: a fairness norm, reciprocal altruism, and inclusive fitness. A subsidiary hypothesis was that older children are more fair than younger children. We found that younger children preferred to distribute the erasers to themselves whereas the older children distributed the erasers more evenly among all recipients, thus appearing to be fairer, with a shift in the age between five and seven. We also found that the results did not support the hypotheses for reciprocal altruism or inclusive fitness guiding the sharing behavior. Finally, we found some support for the older children's behavior being guided by a fairness norm.

Sharing Behavior

The finding that 4- and 5-year-olds preferred themselves when distributing resources, and older children shared more equally, is consistent with previous studies (e.g., Blake & McAuliffe, 2011; Fehr et al., 2008; Kogut, 2012; Shaw et al., 2016). Our finding that the younger children threw away less of the erasers than the older children is best explained by their demonstrated self-preference, as they took the erasers for themselves instead of throwing them away. Interestingly, there were no age-related trends for distributing the erasers to the sibling, the friend, or the stranger. This suggests that children, regardless of age, do not have strong preferences regarding recipients when distributing resources. This indicates that the effect that children start to share more equally and become averse to inequity is not because of some type of other recipient becoming more important, but rather due to oneself becoming less important. This novel finding could prove important for understanding the development of inequity aversion.

Although the younger children took more for themselves compared to the older children, the only statistically significant difference was between 5- and 7-year-olds, though

the difference between 5- and 6-year-olds was close to significance level. This may be the result of low statistical power. Moreover, the behavior of the 4-year-olds resembled the behavior of the older children to a greater extent than expected. This might be explained by the fact that the experimental task was complex and hence might have been too difficult for the youngest age group to fully understand, leading to increased randomness in their responses.

Inequity Aversion and Individual Differences

We found that the 6-, 7-, and 8-year-olds were averse to inequity, as they made significantly more even than uneven distributions of erasers, whereas the younger children showed no such aversion. This is consistent with previous studies (e.g., Fehr et al., 2008; Shaw et al., 2016) and suggests that our method is valid and can be utilized in future studies.

All the older children did not show inequity aversion by distributing the erasers evenly. This may be explained by individual variation in maturation or experience. For example, some of the participating children in our study seemed to think about their decisions for a longer time compared to others, and some children distributed the erasers and then changed their minds. This might reflect individual differences in maturation or experience, leading some children to reflect upon, and in some cases alter their decision. The participants also seemed to adopt different strategies. Some children verbally stated that one should be fair, while some said that one should not waste. Then again, it has been suggested that people are bad at introspecting why they behave in a certain way (Nisbett & Wilson, 1977), which means that such statements could have been mere post hoc justifications of behavior. Nonetheless, the fact that some of the participants seemed reluctant to throwing resources away is consistent with the fact that children have been shown to react negatively to wasting resources (Rossano et al., 2011). The fact that we found inequity aversion despite this, supports inequity aversion being a genuine effect in our study. In sum, different strategies, and personal attributes, possibly influenced by values and socialization by parents and peers, may play a part in individual sharing behavior. In this way, culture may have an impact on inequity aversion.

Theoretical Considerations

The present study did not yield any support for the hypotheses that inclusive fitness or reciprocal altruism underlies the development of inequity aversion. It has been argued that kin selection, including inclusive fitness, and reciprocal altruism both are evolutionary unstable and therefore insufficient explanations for social evolution (Zahavi, 1995), and the results may reflect this. Hence, there may be other candidates as the ultimate explanation for

the development of inequity aversion. One such candidate that has gained some research interest is for instance, costly signaling (Gintis, Smith, & Bowles, 2001). Gintis et al. (2001) argue that costly signaling is an evolutionarily stable strategy and may, therefore, be a mechanism in the evolution of cooperation. According to costly signaling, individuals signal favorable traits with altruistic acts, such as sharing resources, to convey one's desirability as a mate or ally, thus increasing one's fitness. Some studies have pointed to a relationship between signaling and prosocial behavior. For instance, Bliege Bird, and Power (2015) found that Martu hunters signal desirability as hunting partners by being generous and sharing their food. Costly signaling could be studied further to explore its relation to inequity aversion and whether it can explain the developmental timing of this phenomenon.

The results are in line with the notion that the behavior of the 6- to 8-year-olds was governed by a fairness norm, as they did not distribute the erasers significantly differently between the recipients. Studies have, however, shown that sharing behavior is affected by the presence of an audience and a motive to appear fair (McAuliffe, 2013; Shaw et al., 2014). In our study, an experimenter was present while the participant performed the experimental task, which could have led to the participants behaving more fairly. Indeed, some of the participating children stated that they would take more for themselves if no one was watching. It is, therefore, possible that inequity aversion stems from children selectively adopting a norm of fairness; only when being watched. The puzzling question that remains is why children develop a preference for fairness or at least for appearing fair, expressed as inequity aversion, at around age six.

Adrenarche

To understand the developmental timing of inequity aversion, it is beneficial to understand the biological development occurring at the same age. Adrenarche coincides with the development of inequity aversion and is a biological, prepubertal phase in humans and some other primates (Cutler et al., 1978), in which the production of adrenal androgen precursors increases, with one of the best serum-markers for this being dehydroepiandrosterone sulfate (DHEAS). Adrenarche is usually said to occur around age 5–8, when DHEAS levels become high enough to be detected using standard techniques (Voutilainen & Jääskeläinen, 2015).

Adrenarche coincides with the so-called 5–7-year shift. According to Weisner (1996), changes in cognitive abilities, social skills, and self-regulation are part of this shift, and children begin to understand and use social rules. Most children around the world start attending school at this age, which further indicates that children generally acquire cognitive

and social skills needed in such an environment at this age, such being, for example, comprehension and learning, as well as the ability to create and maintain relationships with unfamiliar children. These changes could be the result of adrenarche. Campbell (2006) proposed that the changes associated with the increase in DHEAS, via its effect on amygdala and hippocampus, increase social interaction and shape cognitive development. Providing an evolutionary explanation, Haig (2010) suggested that children at the age of adrenarche go from being reliant on kin to be more reliant on other social networks, thus necessitating developing socio-cognitive skills. Inequity aversion may be part of this shift since being fair is important in a social context, as studies have shown a positive correlation between prosocial behavior and peer acceptance in children (Wang, Wang, Deng, & Chen, 2019). Furthermore, there is considerable individual variation in levels of adrenal androgen precursors in children (Remer, Boye, Hartmann, & Wudy, 2005), indicating variable timing of adrenarche. This provides a possible explanation for individual differences in when inequity aversion develops, and it could explain why some of the older participants in our study did not show inequity aversion. Also, societies may be differently structured, so that factors potentially precipitating adrenarche occur at different ages in different societies, causing the find that inequity aversion in some societies may develop later than around age six (Blake et al., 2015). Hence, adrenarche could be a mediating mechanism for the age-related development of inequity aversion through its effects on social behavior and cognition, with the ultimate cause for it being increased fitness, through social adjustment.

Strengths and Limitations

The present study can be considered more ecologically valid compared to previous studies on inequity aversion, since the participants distributed resources between multiple recipients simultaneously, including an actual sibling and an actual friend. This is more likely to resemble everyday situations for children, compared to sharing resources in a two-person situation, often only with fictive strangers, which has been the case in many previous studies.

There are some limitations that need to be considered when interpreting the results and that could be addressed in future research. First, relatively low statistical power may account for the fact that we did not obtain statistically significant differences between all younger and all older age groups. Future studies could replicate this study using larger samples.

Second, the study was conducted in environments where children are used to there being expectations on performance. Consequently, this could have influenced the participants

to distribute the erasers in a manner they presumed to be expected. This could be addressed in future research by clarifying that there is no right or wrong answer.

Third, one participant reported that he had not realized that he was going to receive the erasers distributed to himself, and stated that he, in that case, would have distributed them differently. Similarly, some participants did not seem to understand that the choice to throw away any eraser led to them actually being thrown away. This may have affected the way the participants distributed the erasers. Future research could address these limitations by making sure participants understand that they receive the erasers distributed to themselves, and that the erasers are actually thrown away.

Finally, prior to the present study, the participants executed two other tasks, belonging to another research project. The two tasks in the preceding study were similar to the one in the present study, as they involved distributing and throwing away erasers. Participants were told "good job" after each task, and this feedback may have affected the results in our study by reinforcing individual responses.

Conclusion and Future Directions

The present study represents, to our best knowledge, the first attempt to experimentally study ultimate explanations for the development of inequity aversion. We found that 6- to 8-year-olds were more averse to inequity than younger children: They shared more equally and showed less self-preference. This finding is consistent with previous research. The results also suggested that the development of this phenomenon is not governed by inclusive fitness or reciprocal altruism. Moreover, we conjecture that the development of inequity aversion may stem from children selectively adopting a norm of fairness, but this is currently unclear. The lack of clarity regarding the ultimate explanation for the age-related shift towards inequity aversion constitutes a central gap in the literature and warrants further studies. Though, a novel finding that sheds some light on the development of inequity aversion was that children seem to become averse to inequity because of the disappearance of self-preference, as opposed to because of others becoming more important.

Adrenarche is an interesting area for future research to gain more insight into the biological precursors of inequity aversion. Future studies could study inequity aversion and simultaneously measure levels of dehydroepiandrosterone sulfate (DHEAS) to explore whether a certain level of DHEAS in children (indicating adrenarche) covaries with the development of inequity aversion.

Summery in Swedish – Svensk sammanfattning

Varför utvecklas aversion mot orättvisa? – Ett experimentellt test av ultimata orsaker

Termen *aversion mot orättvisa* beskriver en tendens att reagera negativt på orättvisa. Detta inkluderar en villighet att skapa rättvisa utfall på bekostnad av egen utdelning. Två undertyper av aversion mot orättvisa har studerats. Aversion mot fördelaktig orättvisa innebär en tendens att reagera negativt på fördelningar där en person själv får en större andel än en annan person. Aversion mot ofördelaktig orättvisa innebär en tendens att reagera negativt på fördelningar där en annan person får en större andel än en själv.

I tidigare studier har gränsen mellan yngre och äldre barn ofta dragits vid sex års ålder. Aversion mot orättvisa har studerats med olika metoder. En del har undersökt hur barn agerar då de får välja mellan en rättvis och en orättvis fördelning av föremål (Blake & McAuliffe, 2011; Fehr, Bernhard & Rockenbach, 2008; Shaw, Choshen-Hillel & Caruso, 2016). Andra har undersökt fenomenet genom att observera hur barn fritt fördelar föremål (Kogut, 2012) och hur barn väljer att fördela suddgummin mellan två fiktiva barn (Shaw & Olson, 2012). Den tidigare forskningen visar sammantaget att yngre barn, jämfört med äldre, uppvisar mer aversion mot ofördelaktig orättvisa och mindre aversion mot fördelaktig orättvisa. Med andra ord tenderar yngre barn agera själviskt och ogilla att andra får mera än de, medan äldre barn tenderar agera rättvist och misstycker inte om andra får mera än de.

Forskningen om aversion mot orättvisa indikerar att rättvisa är en viktig värdering. Att rättvisa är en viktig värdering stöds av det faktum att barn till och med uppvisar aversion mot orättvisa fastän de själva inte är de som blir utsatta för orättvisan (McAuliffe, Jordan & Warneken, 2015). Därtill verkar det finnas en genomgående preferens för rättvisa i de flesta kulturer, inklusive i jägare-samlare samhällen (Boehm, 2008; Gurven, 2004; Henrich 2004), vilket antyder att rättvisa dessutom är en universell värdering. Det finns emellertid forskare som har funnit en effekt av kultur på aversion mot orättvisa, men resultaten från dessa studier är motstridiga (Blake m.fl., 2015; Paulus, 2015). Effekten av kultur på aversion mot orättvisa är således oklar. Sammantaget är det möjligt att aversion mot orättvisa är en evolutionär adaption. Detta stöds av att forskare funnit att gener influerar huruvida orättvisa monetära fördelningar avvisas eller accepteras (Wallace, Cesarini, Lichtenstein & Johannesson, 2007).

Tidigare forskning har visat att barn utvecklar en preferens för att fördela föremål rättvist kring sex års ålder. Förklaringen till varför aversion mot orättvisa uppkommer har emellertid inte undersökts i tidigare forskning. En förklaring kunde vara att barn tar till sig en rättvisenorm. Enligt teorin om en rättvisenorm skulle barn tendera fördela föremål jämnt

mellan alla mottagare. En annan möjlig förklaring är reciprok altruism (Trivers, 1971). Enligt reciprok altruism delar en person med sig för att senare få en tjänst i gengäld. Reciprok altruism är möjligt då kostnaden för att dela med sig är liten och relationen mellan mottagaren och fördelaren är sådan att rollerna är sannolika att vara ombytta i framtiden. Om reciprok altruism ligger bakom utvecklingen av aversion mot orättvisa skulle barn vara mer benägna att dela med sig åt vänner och nära släktningar jämfört med främlingar. Ytterligare en möjlig förklaring är inkluderande duglighet (Hamilton, 1964). Enligt denna teori kan utvecklingen av rättvist beteende förklaras av att en person börjar dela med sig åt genetiska släktingar för att således öka sannolikheten att de egna generna förs vidare, förutsatt att fördelen med det altruistiska beteendet är större än kostnaden. Inkluderande duglighet predicerar att barn är mer benägna att dela med sig åt genetiska släktingar än icke-släktingar.

Syftet med vår studie var att testa ultimata förklaringar till varför aversion mot orättvisa utvecklats, det vill säga, orsaker till att detta fenomen existerar. Vi undersökte hur barn fördelar suddgummin mellan sig själva, ett syskon, en kompis och ett okänt barn. Metoden baserades på en inflytelserik studie av Shaw och Olson (2012). Ifall barnen fördelar suddgummina jämnt mellan alla mottagare skulle det indikera en rättvisenorm som förklaring till att aversion mot orättvisa utvecklas. Ifall barnen fördelar suddgummina åt sig själva, syskonet och vännen, eller endast åt sig själva och syskonet, skulle det indikera reciprok altruism respektive inkluderande duglighet som förklaring till att aversion mot orättvisa utvecklas. Utfallen förväntades variera med ålder. En sekundär hypotes var att äldre barn uppvisar rättvist beteende oftare än yngre barn.

Metod

Etiskt tillstånd för studien beviljades av den forskningsetiska nämnden vid Åbo Akademi. Samplet bestod av 106 barn (53 % flickor) i åldrarna 4 till 8 år, rekryterade från daghem, förskolor och grundskolor. Personalen bistådde oss med att informera vårdnadshavarna om studien, samt med att dela ut samtyckesblanketter och bakgrundsformulär. Frågorna i bakgrundformuläret gällde namn, kön och ålder, både för det deltagande barnet och syskonet närmast i ålder, samt på vilket sätt syskonen är släkt och hur mycket tid de spenderar tillsammans. För testuppgiften användes suddgummin formade som stjärnor och en papperskorg. Barnen testades individuellt, dagtid, i daghemmet, förskolan eller grundskolan. Testledaren tog fram ett papper med fyra rutor på, vilka tillhörde barnet självt, ett syskon, en vän och ett okänt barn. Deltagaren tillfrågades om namnet på en god vän. Namnet på en annan vän efterfrågades ifall deltagaren spontant nämnde att vännen var en släkting. För att minimera effekten av könsskillnader kallades det okända barnet

Alexandra om deltagaren var en flicka och Alexander om deltagaren var en pojke. För att försäkra sig om att deltagaren hade förstått upplägget ombads hen berätta för testledaren vilken ruta som tillhörde vem. Testuppgiften utgjordes av att deltagaren fördelade fem suddgummin mellan sig själv, syskonet, vännen och det okända barnet (se Appendix för en beskrivning av instruktionerna). Ett alternativ var att kasta bort ett eller flera suddgummin. Deltagaren fick behålla suddgummina och fick även en biljett till ett äventyrsland som tack. Testsituationen tog ungefär 15 minuter. För att trygga konfidentialiteten gavs alla deltagare ett nummer som användes för att registrera resultaten.

Resultat

En analys av generella beteendemönster visade att de yngre barnen (fyra- och femåringarna) fördelade fler suddgummin åt sig själva jämfört med de äldre barnen. De kastade även bort färre suddgummin än de äldre barnen (se figur 1). Dock fanns de enda statistiskt signifikanta skillnaderna mellan fem- och sexåringarna, och mellan sex- och sjuåringarna. Det fanns ingen signifikant effekt av ålder på antal suddgummin fördelade åt syskonet, vännen eller det okända barnet. För att utforska hypoteserna analyserades mönstret av fördelade suddgummin inom åldersgrupperna. Bland fyraåringarna fanns det signifikanta skillnader i antal suddgummin fördelade åt olika mottagare. Ett så kallat post hoc test visade att fyraåringarna fördelade signifikant fler suddgummin åt sig själva än åt vännen. Även bland femåringarna fanns signifikanta skillnader. Ett post hoc test visade att femåringarna fördelade fler suddgummin åt sig själva än åt det okända barnet. Bland sex-, sju- och åttaåringarna fanns inga signifikanta skillnader i antal suddgummin fördelade åt olika mottagare (se figur 1). För att specifikt analysera aversion mot orättvisa analyserades antal ojämna och jämna fördelningar per åldersgrupp (en fördelning betraktades som jämn om ett suddgummi gavs till var mottagare och ett kastades). Analysen visade att de äldre barnen uppvisade aversion mot orättvisa, eftersom de fördelade suddgummina signifikant oftare jämt än ojämnt (se tabell 3).

Diskussion

Resultaten visade att de yngre barnen tenderade fördela suddgummina åt sig själva, medan de äldre barnen fördelade suddgummina mer jämnt mellan de olika mottagarna. Således framstod de äldre barnen som mer rättvisa än de yngre. Detta stämmer överens med tidigare forskning (till exempel, Blake & McAuliffe, 2011; Kogut, 2012; Shaw m.fl., 2016). Intressant nog indikerade resultaten att barn, oberoende av ålder, inte har några starka preferenser för mottagare, förutom för sig själv. Detta antyder att aversion mot orättvisa utvecklas på grund av att självviskheten minskar, och inte på grund av att andra personer blir

viktigare. Att de signifikanta skillnaderna endast fanns mellan fem- och sexåringarna och mellan fem- och sjuåringarna kan bero på låg statistisk styrka. Vidare indikerade resultaten att sex-, sju- och åttaåringarna uppvisade aversion mot orättvisa, vilket stämmer överens med tidigare studier. Således antyder resultaten att vår metod är valid. Alla äldre barn uppvisade inte aversion mot orättvisa genom att fördela suddgummina jämnt. Detta kan bero på individuella skillnader i mognad eller erfarenhet, eller på att de använde sig av olika strategier. Vissa observationer i vår studie indikerade detta. På detta sätt är det möjligt att värderingar och socialisering, och därigenom kultur, har en effekt på aversion mot orättvisa.

Resultaten stödde inte hypoteserna om reciprok altruism eller inkluderande duglighet som förklaringar till att aversion mot orättvisa utvecklas. Det är således möjligt att etiologin för aversion mot orättvisa är en annan. En möjlig kandidat är till exempel *costly signaling* (ung. dyr signalering; Gintis m.fl., 2001). Vissa studier har indikerat ett samband mellan costly signaling och prosocialt beteende, men framtida studier kunde specifikt undersöka relationen mellan costly signaling och aversion mot orättvisa. Resultaten indikerade att en rättvisenorm kunde ligga bakom de äldre barnens beteende, eftersom de inte fördelade suddgummina signifikant olika mellan mottagarna. Emellertid har studier visat att barns beteende påverkas av ett motiv att framstå som rättvis (McAuliffe, 2013; Shaw m.fl., 2014). I vår studie var en testledare närvarande, vilket kan ha lett till att de äldre barnen agerade mer rättvist. Således är det möjligt att aversion mot orättvisa härstammar från att barn selektivt tar till sig en rättvisenorm, det vill säga, endast då någon ser på.

Tidig könsmognad (eng. *adrenarche)* är en biologisk utvecklingsfas hos människan som sammanfaller med utvecklingen av aversion mot orättvisa. Denna fas kunde bidra med förståelse för varför aversion mot orättvisa utvecklas i en specifik ålder. En markör för tidig könsmognad är en ökning av hormonet dehydroepiandrosteronsulfat (DHEAS) (Vuotilainen & Jääskeläinen, 2015). Campbell (2006) föreslog att förändringarna associerade med ökningen av DHEAS ökar social interaktion och formar kognitiv utvecklig. Haig (2010) bidrog med en evolutionär förklaring och föreslog att barn i denna ålder blir mer beroende av sociala nätverk utanför hemmet, och således blir social anpassning viktigt. Det är möjligt att aversion mot orättvisa är en del av den sociala anpassningen. Därmed är det möjligt att tidig könsmognad medierar utvecklingen av aversion mot orättvisa genom dess effekter på socialt beteende och kognition. Den ultimata orsaken till att aversion mot orättvisa utvecklas kunde följaktligen vara ökad fitness, via social anpassning. Därtill har det visats finnas stora individuella skillnader i nivåer av DHEAS hos barn, vilket antyder att barn genomgår tidig

könsmognad i lite olika åldrar, vilket kan förklara individuella skillnader i när aversion mot orättvisa utvecklas.

En styrka i vår studie är att den kan anses vara mer ekologiskt valid än tidigare studier om aversion mot orättvisa. Till begräsningarna hör att studien utfördes i en miljö där barn är vana vid att vuxna har vissa förväntningar på dem, vilket kan ha influerat hur barnen fördelade suddgummina. En annan begräsning är att vissa barn uppgav att de inte förstått att de skulle få behålla suddgummina som de fördelade, vilket kan ha påverkat hur barnen fördelade suddgummina. Relativt låg statisk styrka utgör därutöver en begränsning och kan ha resulterat i avsaknaden av signifikanta skillnader mellan vissa åldersgrupper. Ytterligare en begränsning utgörs av att deltagarna utförde två liknande uppgifter innan de deltog i vår studie. Efter dessa två uppgifter fick deltagarna höra ”bra jobbat”, och denna feedback kan ha influerat individuella svarsmönster i vår studie. Begränsningarna bör beaktas i tolkningen av resultaten.

Resultaten indikerar att det finns behov av vidare forskning kring varför aversion mot orättvisa utvecklas. Framtida studier kunde till exempel undersöka huruvida tidig könsmognad sammanfaller med utvecklingen av aversion mot orättvisa.

References

Antfolk, J., Karlsson, L. C., Söderlund, J., Szala, A. (2017). Willingness to invest in children: Psychological kinship estimates and emotional closeness. *Evolutionary Psychology, 15*(2), 1–10. doi:10.1177/1474704917705730

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. doi:10.1016/j.cognition.2011.04.006

Blake, P. R., McAuliffe, K., Corbit, J., Callaghan, T. C., Barry, O., Bowie, A., … Warneken, F. (2015). The ontogeny of fairness in seven societies. *Nature*, *528*(7581), 258–261. doi:10.1038/nature15703

Bliege Bird, R., & Power, E. A. (2015). Prosocial signaling and cooperation among Martu hunters. *Evolution and Human Behavior*, *36*(5), 389–397. doi:10.1016/j.evolhumbehav.2015.02.003

Boehm, C. (2008). Purposive social selection and the evolution of human altruism. *Cross-Cultural Research*, *42*(4), 319–352. doi:10.1177/1069397108320422

Campbell, B. (2006). Adrenarche and the evolution of human life history. *American Journal of Human Biology*, *18*(5), 569–589. doi:10.1002/ajhb.20528

Cutler, G. B., Glenn, M., Bush, M., Hodgen, G. D., Graham, C. E., & Loriaux, D. L. (1978). Adrenarche: A survey of rodents, domestic animals, and primates. *Endocrinology*, *103*(6), 2112–2118. doi:10.1210/endo-103-6-2112

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Egalitarianism in young children. *Nature*, *454*(7208), 1079–1083. doi:10.1038/nature07155

Fehr, E., & Fischbacher, U. (2003). The nature of human altruism. *Nature*, *425*(6960), 785–791. doi:10.1038/nature02043

Fehr, E., & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. *The Quarterly Journal of Economics*, *114*(3), 817–868. doi:10.1162/003355399556151

Gintis, H., Smith, E., & Bowles, S. (2001). Costly signaling and cooperation. *Journal of Theoretical Biology*, *213*(1), 103–119. doi:10.1006/jtbi.2001.2406

Gurven, M. (2004). Reciprocal altruism and food sharing decisions among Hiwi and Ache hunter-gatherers. *Behavioral Ecology and Sociobiology*, *56*(4), 366–380. doi:10.1007/s00265-004-0793-6

Gächter, S., & Falk, A. (2002). Reputation and reciprocity: Consequences for the labour relation. *The Scandinavian Journal of Economics*, *104*(1), 1–26. doi:10.1111/1467-9442.00269

Haig, D. (2010). Transfers and transitions: Parent-offspring conflict, genomic imprinting, and the evolution of human life history. *Proceedings of the National Academy of Sciences of the United States of America*, *107*(suppl. 1), 1731–1735. doi:10.1073/pnas.0904111106

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

Henrich, J. (2004). Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior and Organization*, *53*(1), 3–35. doi:10.1016/S0167-2681(03)00094-5

Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3), 61–83. doi:10.1017/S0140525X0999152X

Kogut, T. (2012). Knowing what I should, doing what I want: From selfishness to inequity aversion in young children's sharing behavior. *Journal of Economic Psychology*, *33*(1), 226–236. doi:10.1016/j.joep.2011.10.003

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. doi:10.1111/j.1467-9507.2009.00560.x

Madsen, E. A., Tunney, R. J., Fieldman, G., Plotkin, H. C., Dunbar, R. I. M., Richardson, J. M., & McFarland, D. (2007). Kinship and altruism: A cross-cultural experimental study. *British Journal of Psychology*, *98*(2), 339–359. doi:10.1348/000712606X129213

McAuliffe, K. J. (2013). *The evolution and development of inequity aversion*. (Doctoral dissertation, Harvard University). Retrieved from https://dash.harvard.edu/

McAuliffe, K., Jordan, J. J., & Warneken, F. (2015). Costly third-party punishment in young children. *Cognition*, *134*, 1–10. doi:10.1016/j.cognition.2014.08.013

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*(3), 231–259. doi:10.1037/0033-295X.84.3.231

Paulus, M. (2015). Children's inequity aversion depends on culture: A cross-cultural comparison. *Journal of Experimental Child Psychology*, *132*, 240–246. doi:10.1016/j.jecp.2014.12.007

Qiu, X., Yu, J., Li, T., Cheng, N., & Zhu, L. (2017). Children's inequity aversion in procedural justice context: A comparison of advantageous and disadvantageous inequity. *Frontiers in Psychology*, *8,*(1855). doi:10.3389/fpsyg.2017.01855

R Core Team. (2008). R: A Language and Environment for Statistical Computing (version 1.2.1335) [Computer software environment]. Retrieved from https://www.R-project.org/

Remer, T., Boye, K. R., Hartmann, M. F., & Wudy, S. A. (2005). Urinary markers of adrenarche: Reference values in healthy subjects, aged 3-18 years. *Journal of Clinical Endocrinology and Metabolism*, *90*(4), 2015–2021. doi:10.1210/jc.2004-1571

Rossano, F., Rakoczy, H., & Tomasello, M. (2011). Young children's understanding of violations of property rights. *Cognition*, *121*(2), 219–227. doi:10.1016/j.cognition.2011.06.007

Shaw, A., Choshen-Hillel, S., & Caruso, E. M. (2016). The development of inequity aversion: Understanding when (and why) people give others the bigger piece of the pie. *Psychological Science*, *27*(10), 1352–1359. doi:10.1177/0956797616660548

Shaw, A., Montinari, N., Piovesan, M., Olson, K. R., Gino, F., & Norton, M. I. (2014). Children develop a veil of fairness. *Journal of Experimental Psychology: General*, *143*(1), 363–375. doi:10.1037/a0031247

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

Smith, C. E., Blake, P. R., & Harris, P. L. (2013). I should but I won't: Why young children endorse norms of fair sharing but do not follow them. *PLoS ONE*, *8*(3), 1–11. doi:10.1371/journal.pone.0059510

Trivers, R. (1971). The evolution of reciprocal altruism. *The Quarterly Review of Biology, 46*(1), 35–57. Retrieved from https://www.jstor.org/

Voutilainen, R., & Jääskeläinen, J. (2015). Premature adrenarche: Etiology, clinical findings, and consequences. *Journal of Steroid Biochemistry and Molecular Biology*, *145*, 226–236. doi:10.1016/j.jsbmb.2014.06.004

Wallace, B., Cesarini, D., Lichtenstein, P., & Johannesson, M. (2007). Heritability of ultimatum game responder behavior. *Proceedings of the National Academy of Sciences of the United States of America*, *104*(40), 15631–15634. doi:10.1073/pnas.0706642104

Wang, M., Wang, J., Deng, X., & Chen, W. (2019). Why are empathic children more liked by peers? The mediating roles of prosocial and aggressive behaviors. *Personality and Individual Differences*, *144*, 19–23. doi:10.1016/j.paid.2019.02.029

Weisner, T. (1996). The 5 to 7 transition as an ecocultural project. In A. J. Sameroff & M. M. Haith (Eds.), *The five to seven year shift: The age of reason and responsibility* (pp. 295–326). Retrieved from https://www.researchgate.net/

Zahavi, A. (1995). Altruism as a Handicap: The Limitations of Kin Selection and Reciprocity. *Journal of Avian Biology*, *26*(1), 1–3. doi:10.2307/3677205

Appendix

Script and instructions given to the participant

The following was said (in Swedish) when greeting the participant:

I am so happy that you are here. You are going to do an easy task. It is a short one, it will not take long. If you do not feel comfortable being here, you can tell me.

Then, the participant was thanked for participating and the setup was explained:

Thank you for doing this task with me. You will now get to distribute some erasers. This is your box, this is your sibling's box, you have a sibling called X, right? Then this is X's box. This is your friend's box, do you have a good friend? What is his/her name? Then this is his/her box. This box belongs to a child called Alexander/Alexandra, he/she is a child that you do not know. Can you tell me to whom each box belongs?

Finally, instructions for the experimental task were given:

You will now get to distribute erasers between yourself, you sibling, your friend, and Alexandra/Alexander, by placing the erasers in the boxes. There are these five erasers. You can distribute them however you like. You may also choose to throw away erasers, in that case you may throw them into the trashcan. You can tell me when you are done.

PRESSMEDDELANDE

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

Resultaten från en pro gradu-avhandling vid Åbo Akademi tyder på att varken reciprok altruism eller inkluderande duglighet ligger bakom utvecklingen av aversion mot orättvisa, och huruvida en rättvisenorm kan förklara denna utveckling förblir oklart. Resultaten tyder på att barn utvecklar aversion mot orättvisa på grund av att barn blir mindre självcentrerade, och inte på grund av att andra personer blir viktigare. Man fann att sex-, sju- och åttaåringar uppvisade mer aversion mot orättvisa jämfört med yngre barn genom att agera mindre själviskt och dela med sig mer rättvist, vilket replikerar resultat från tidigare forskning. Forskarna har experimentellt undersökt huruvida en rättvisenorm, reciprok altruism eller inkluderande duglighet ligger bakom utvecklingen av aversion mot orättvisa. Studien bidrar med nya rön om utvecklingen av aversion mot orättvisa men det finns ett tydligt behov av vidare forskning, säger forskarna vid Åbo Akademi.

Aversion mot orättvisa beskriver en tendens att reagera negativt på, och korrigera, orättvisa fördelningar. Aversion mot orättvisa utvecklas kring sex års ålder och uttrycks genom att barn börjar undvika orättvisa genom att dela med sig rättvist. Förklaringar till varför fenomenet uppkommer har inte undersökts i tidigare forskning.

I ifrågavarande studie deltog 106 barn i åldern 4–8 år. Deltagarna fördelade fem suddgummin mellan sig själva, ett syskon, en kompis och ett okänt barn. Ett alternativ var att kasta bort ett eller flera suddgummin. Olika mönster av fördelade suddgummin inom åldersgrupperna skulle indikera olika ultimata förklaringar.

Avhandlingen utfördes av Emmie Marklund under handledning av Jan Antfolk.

Ytterligare information fås av:
Emmie Marklund
Magisterstuderande i psykologi
Psykologi/Åbo Akademi
+358505851914
emarklun@abo.fi