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Genetic relatedness predicts contact frequencies with siblings, nieces and nephews: Results from the Generational Transmissions in Finland surveys

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ABSTRACT

Kin selection theory predicts that people should invest more in their full than their half siblings, and more in their nieces and nephews via full siblings than via half siblings. To study these predictions we use two nationally representative surveys that were collected as a part of the Generational Transmissions in Finland project. The subjects are representative of an older generation (born in 1945–1950) and a younger generation (born in 1962–1993). We found that both generations reported more contacts with full than with half siblings, and more with nieces and nephews via full than half siblings respectively. The results of the study are in line with the kin selection theory.

1. Introduction

Humans have a predisposition to evolve positive emotions of affection toward their kin (Salmon & Shackelford, 2011). From an evolutionary point of view the function of this attachment is explained by kin selection theory (Hamilton, 1964), which predicts that the genetic relatedness in general, and the specific degree of this relatedness, have an impact on the amount of kin investment in societies of both the past and the present. In this article we study whether individuals invest more in their full than half siblings, and more in nieces and nephews via full than half siblings in contemporary Finland.

According to kin selection theory (Hamilton, 1964), help channeled toward genetically related kin enhances an individual's own inclusive fitness, because individuals share a certain amount of genes with genetically related kin. In line with kin selection theory, many studies among several populations have shown correlations between genetic relatedness and parental investment (e.g. Anderson, 2005; Gurven, Allen-Arave, Hill, & Hurtado, 2001; Ivey, 2000; Tifferet, Jorev, & Nasanovitz, 2010; see Anderson, 2011 for review). Parallel with these results, biological children also assess their relationship to their parents better than stepchildren do (Schnettler & Steinbach, 2011). Similar results were also found in the case of grandparents (e.g. Block, 2000; Christensen and Smith; 2002; Eggebeen, 1992; Sanders & Trygstad, 1989; see Euler, 2011 for review).

People share on average 50% of their genes with full siblings, 25% of their genes with half siblings as well full siblings' children, and 12.5% of their genes with half siblings' children. Hence, kin selection theory predicts that an individual's investment in full siblings (50% shared genes) should be greater than in half siblings (25% shared genes), and similarly investment in nieces and nephews via full siblings (25% shared genes) should be more substantial than that of nieces and nephews via half siblings (12.5% shared genes).

In concordance with kin selection theory (Hamilton, 1964), previous studies concerning genetic relatedness and sibling relationships indicate that the relationship between full siblings is closer than the relationship between half siblings (see Pollet & Hoben, 2011 for review). This could be the case, even though cultural values are against favoring full siblings over half siblings (Jankowiak & Diderich, 2000). For example, White and Riedmann (1992) found that adults in the US have more contact with full siblings compared to half siblings. Pollet (2007) found that Dutch adults had more face-to-face contact with their full than with their half siblings and that their relationship was stronger with full than half siblings, even though childhood proximity was controlled for. In another study Pollet and Nettle (2009) found that respondents were more likely to know whether their full siblings than their half-siblings

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were "dead or alive". In addition, two previous studies showed that aunts and uncles who are monozygotic twins of their siblings (and thus "genetic parents" of their nieces and nephews) invested more toward their nieces and nephews than did aunts and uncles who were dizygotic twins of their siblings (Segal & Marelich, 2011; Segal, Seghers, Marelich, Mechanic, & Castillo, 2007).

According to kin selection theory, "all else being equal" individuals are predicted to invest more in their closer related kin than distantly related kin (Hamilton, 1964). Obviously, in human populations there are several factors that may not be equal. In addition to genetic relatedness, the effects of genetic certainty, different reproductive interests between men and women, the reproductive value of an individual as well his or her sibling, and different life situations may also affect kin investment (Michalski & Euler, 2008; Pollet & Hoben, 2011). With this in mind, we have drawn from previous studies different variables which potentially confound individuals' relationships with siblings, nieces and nephews.

The sex of a sibling as well as the sex of the individual may be important confounders. From an evolutionary viewpoint sex matters in kin relationships for two particular reasons. First, due to women's higher obligatory invest in reproduction the reproductive interests between men and women differ (Trivers, 1972). Second, due to paternity uncertainty men can never be as sure as women that offspring really are their own, thus the certainty of genetic relatedness is higher in matrilineal than patrilineal kin (Michalski & Euler, 2008). In accordance with the predictions of the effects of genetic certainty and different reproductive interests, many studies have shown that aunts invest more in nieces and nephews than uncles, and individuals invest more in matrilineal than patrilineal kin (e.g. Gaulin, McBurney, & Brakeman-Wartell, 1997; Pashos & McBurney, 2008).

One's own age as well as the age of siblings, nieces and nephews may all matter when considering contacts with siblings and investments in siblings' children. In general, the relationship between siblings tends to change as individuals get older (Pollet & Hoben, 2011). In childhood and adolescence sibling rivalry is the prevalent factor in sibling relationships, but in adult life siblings are mostly providers of help and emotional support (Connidis, 1992; White, 2001).

The relative age of the sibling may be also important, on the one hand because support given to fertility-aged siblings and their children may substantially increase the fitness of the helpers themselves (Sear & Mace, 2008). On the other hand, if one has fertility-aged siblings he or she is probably also of fertility age, and in terms of one's own inclusive fitness it could be more beneficial to invest in one's own reproductive career instead (Pollet & Hoben, 2011). However, non-reproductive aunts may especially benefit by investing in their nieces and nephews (Lahdenperä, Gillespie, Lummaa, & Russell, 2012). In the case of investing in nieces and nephews their age may also matter, since younger children may need more support than older ones (Euler, 2011). In addition, birth order may influence sibling relationships (Salmon & Daly, 1998; Salmon, 1999, 2003). Pollet and Nettle (2007), for instance, found that firstborns had more contact with their siblings than later borns. In addition, the total number of siblings may matter, because the more siblings there are the less time there is to spend with each of them (Michalski & Euler, 2008).

Sibling relationship varies through different life stages (Pollet & Hoben, 2011). Two important life history events bearing on this relationship are the existence of a spouse and the existence of one's own children. According to preferential investment perspective, whether individuals have biological children of their own is an important factor (Pollet & Dunbar, 2008). In the case of younger adults, the existence of a spouse is important, since it increases the probability of having one's own children in the future (Waynforth, 2011). If one tries to maximize his or her own inclusive fitness it could be more beneficial to invest in one's own children and reproduction rather than siblings, nieces and nephews (Hamilton, 1964). However, previous studies have shown that while marriage decreases emotional closeness between siblings, the birth of one's own children does not have the same effect (Connidis, 1992; Cicirelli, 1995). Previous studies show that the geographical distance between siblings correlate with contact frequencies. Those who live closer also tend to have more contacts (e.g. Pollet, 2007; Pollet & Nettle, 2007). In addition, sibling relationships may vary according to socioeconomic factors. There are studies showing that less educated individuals often give less support to their siblings than their more highly educated counterparts (Pollet, 2007; White, 2001).

Finally, since sibling ties primarily develop in childhood there are two other important factors to note. First, the age difference between siblings is a factor which may influence contact between siblings (Pollet, 2007). In the case of a large age difference it is less likely that siblings have shared childhood experiences, which could result in less emotional closeness between siblings in adulthood. Hence, the larger the age difference between siblings, the less likely will be contact in adulthood. Second, childhood proximity may matter. Full siblings have normally grown up together, while it is more probable that half siblings have not. Here we follow Pollet's (2007) example and divide half sibling relationships into those between maternal half siblings and paternal half siblings. We assume that siblings who have the same mother have in most cases been raised together, due to the fact that in Finland children normally stay with their mothers if parents separate (Statistics Finland, 2012).

2. Hypotheses

Based on kin selection theory we predict that:

(H1) Individuals will have more contacts with their full than half siblings
(H2) Individuals will have more contacts with nieces and nephews via full than half siblings

3. Data, methods and measurement

In this article we use data from the Generational Transmissions in Finland (Gentrans) project. The aim of Gentrans is to gather longitudinal information on two generations: the Finnish baby boomer generation born between 1945 and 1950 ($M = 1947$, SD = 1.67) (i.e. the older generation), and their adult children born between 1962 and 1993 ($M = 1976$, SD = 5.6) (i.e. the younger generation). The first wave of the Gentrans surveys was gathered in 2007. This article uses the second wave of representative surveys, which were collected in 2012 by Statistics Finland via mail. The surveys of the older and younger generations are independent samples that were gathered separately. The older generation's survey included altogether 2278 respondents, and the younger generation's survey reached 1753 respondents.

In the Gentrans surveys, respondents were asked whether they and their sibling have the same mother and father, same mother only, or same father only. If the respondents had the same mother and father as the sibling, the relationship was coded as a full sibling relationship. In the cases where there was only the same mother or only the same father, the relationship was coded as a half sibling relationship. In addition, we separated maternal half siblings and paternal half siblings into different categories.

This study conducts two-stage analyses with two different selection criterions. In the first stage we included only those