

## Sibling Manipulation Hypothesis of Male Homosexuality

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### Synonyms

Fraternal manipulation hypothesis.

### Definition

The sibling manipulation hypothesis of male homosexuality postulates that older brothers, during their embryonic development, induce changes in the maternal organism that influence the sexual orientation of their later-born brothers. This increases the chances of these siblings being homosexual, which in turn lessens competition for family resources and mating partners, enhancing the older brothers' direct fitness.

### 1. The Mystery of Male Homosexuality's Persistence

The emergence and long-term persistence of male homosexuality in the majority of human populations represent one of the many unresolved evolutionary mysteries. Homosexual men tend to have significantly fewer offspring (Ciani, Battaglia, & Zanzotto, 2015), so this trait should rapidly disappear from the population. Homosexuality exhibits heritability, but it is possible that this trait is not genetically transmitted from generation to generation but rather epigenetically. Even in such a case, however, the trait would significantly reduce the biological fitness of its carrier. It is therefore surprising that a gene (allele) protecting its carrier from expressing this trait has not emerged in the human genome over time.

### 2. Potential Explanations for Male Homosexuality

Homosexual individuals are not only found in the majority of human populations but also occur at a relatively high frequency within these populations. This suggests that homosexuality could be an adaptation that somehow enhances its carrier's inclusive fitness. This may happen through the pleiotropic effect of the gene for homosexuality - under certain conditions, a given allele causes the emergence of homosexuality, while under other conditions, it does not and instead increases the fertility or viability of its carrier (Miller, 2000). Alternatively, the allele may decrease the direct fitness of its carriers while simultaneously increasing the fitness of their relatives, and therefore the overall inclusive fitness of carriers of the allele for homosexuality (Zietsch et al., 2021). The same-sex affiliation hypothesis suggests that homosexuality might have a purpose outside reproduction, mainly fostering enduring alliances between men (Kirkpatrick, 2000). The bisexuality byproduct hypothesis suggests that the roots of homosexuality could stem from bisexuality. It proposes that men who engage in bisexual behaviors might have a reproductive advantage over those who exclusively display heterosexual behaviors (Dewar, 2003). While these hypotheses present intriguing possibilities, none have yet been conclusively substantiated by empirical data.

### 3. Manipulation Hypotheses of Male Homosexuality

However, homosexuality might not be an adaptation, a trait increasing its carrier's fitness. It could be a *xenoadaptation*, a trait that benefits another biological entity and is controlled by that

entity's genes. One explanation for male homosexuality based on xenoadaptations offers the older *parental (maternal) manipulation hypothesis* (Ruse, 1988; Trivers, 1974), and the second, newer, *sibling manipulation hypothesis* (Flegr, 2022).

Evidence indirectly supporting these two hypothesis is found in multiple observations that demonstrate a rising probability of homosexuality in a woman's male offspring with each subsequent older brother, a known phenomenon called the *fraternal birth order effect* (Slater, 1962). Reinforcing this, a meta-analysis that gathered 24 samples of homosexual and heterosexual men from 18 different studies concluded a significant increase in the likelihood of a man being homosexual if he has older brothers (OR = 1.28) (Blanchard & Bogaert, 1996). Another study has shown that each older brother increases the probability of homosexuality of younger brothers by about 33% (regardless of whether they lived together or were separated after birth) and that only older biological brothers, not stepbrothers (or older or younger sisters), have this effect (Bogaert, 2006). According to the parental manipulation hypothesis, the mother programs the embryogenesis of later-born sons so that they are more likely to be born homosexual. In socioeconomically highly stratified polygamous societies, only the highest-ranking men reproduce, and those with low and middle-ranking have little chance of reproduction. From the perspective of the mother's fitness, it is more advantageous if younger homosexual brothers do not attempt to reproduce and thus allow the allocation of maximum family resources to the eldest brother.

The molecular mechanism behind the manipulation is unknown. Generally, the maternal organism may alter a son's future sexual preferences during embryonic development, for example, through the effects of some hormones on the developing nervous system or the expression of some genes in cells of the nervous system. The mother's organism can gain information about the existence of previous sons from the presence of antibodies against male embryo-specific antigens. A 2017 study suggests that the maternal immunological response to the Y-chromosome-linked protein neuroligin probably plays a role in the development of male homosexuality. Neuroligin is a cell adhesion molecule thought to play an essential role in specific cell-cell interactions in brain development (Bogaert et al., 2018).

### 4. Sibling Manipulation Hypothesis of Male Homosexuality

According to the sibling manipulation hypothesis, a male embryo influences the maternal organism, possibly by inducing immunity to male embryo-specific antigens, leading to an increased probability that younger brothers will be born homosexual. By orchestrating this, older brothers serve their own interests by lessening the competition for family resources and, most significantly, mating partners. In doing so, they increase their own direct fitness but compromise an essential component of their inclusive fitness – their younger brothers' direct fitness. Nevertheless, based on Hamilton's rule, resources invested by the older brother in his offspring (with a relatedness coefficient of 0.5) are twice as valuable as the same amount of resources invested in younger brothers' offspring (with a relatedness coefficient of 0.25) (Hamilton, 1964a, 1964b). Therefore, the overall budget of manipulation is positive for manipulators. The sibling manipulation hypothesis could explain the persistence of homosexuality in monogamous societies without significant socioeconomic stratification, thus offering a more universal explanation for the fraternal birth order effect than the older parental (maternal) manipulation hypothesis.

### **5. Homosexuality as a Reproductive Strategy in Highly Stratified Societies: Biological Adaptation or Manipulation?**

In societies characterized by high socioeconomic stratification, homosexuality could notably boost the inclusive fitness of younger brothers. This enhancement in inclusive fitness results from a greater number of gene copies passed onto subsequent generations via the offspring of older brothers. This may more than compensate for the decrease in their direct fitness due to fewer gene copies transmitted in their own, likely fewer, offspring. Consequently, in such settings, biological factors may predispose younger brothers to homosexuality. Therefore, male homosexuality may not necessarily be the outcome of manipulation by older brothers or mothers but could be a strategic biological adaptation of younger brothers themselves.

With the advent of agriculture, human societies witnessed a period of significant socioeconomic stratification (Apostolou, 2010; Stephens, 1963). In numerous such societies, primarily the eldest son, the customary inheritor of the family's resources, had a substantial opportunity for successful reproduction or securing a high-quality partner. In response, younger brothers were driven to adopt alternative reproductive strategies, with homosexuality potentially emerging as one viable approach.

In this context, the antibodies against male embryo-specific antigens present in the mother's blood may not represent a manipulative tool employed by mothers or older brothers, intending to steer the sexual orientation of younger brothers towards homosexuality to enhance the direct fitness of older brothers. Instead, these antibodies might act as biological cues, not signals, for the embryos of younger brothers, denoting the presence of older siblings, potentially swaying them towards homosexuality.

Generally, the younger son adaptation hypothesis, with its emphasis on cues rather than signals, offers a novel pathway towards understanding the evolutionary and developmental mechanisms of male homosexuality.

### **6. Testing the Manipulation Hypotheses of Male Homosexuality: Parental vs Sibling Manipulation vs Younger Son Adaptation**

In the exploration of male homosexuality within the context of socioeconomically stratified societies, three primary hypotheses have emerged: parental manipulation, sibling manipulation, and the younger son's adaptation. To discern the validity of these hypotheses, a comprehensive investigation that integrates fields such as human reproductive biology, embryology, genetics, immunology, and sociobiology is paramount.

The parental manipulation hypothesis suggests that the occurrence of homosexuality in a family enhances the mother's biological fitness, specifically by increasing the number of grandchildren. To test this, it would be necessary to compare the effect of a man's homosexual orientation on his mother's fitness. On the other hand, the sibling manipulation hypothesis posits that older brother's manipulation increases the direct fitness of elder brothers at the expense of younger brothers' fitness. This implies that the presence of homosexual brothers in the family could reduce the total number of a mother's grandchildren, thus decreasing the mother's biological fitness. These contrasting effects present a clear distinction that can be investigated within appropriate societal contexts.

The third hypothesis, that of the younger son's adaptation, proposes that the transition to homosexuality may be a biologically advantageous response to a highly stratified socioeconomic environment. In this scenario, the average inclusive fitness of homosexual younger brothers should surpass that of their heterosexual counterparts. Theoretically, we can distinguish between these

scenarios by comparing the inclusive fitness of homosexual and heterosexual younger brothers. If the inclusive fitness of heterosexual younger brothers is higher, this would suggest that the shift to homosexuality is more likely an outcome of parental or sibling manipulation.

However, testing these hypotheses within modern human societies poses significant challenges. The dramatic transformation of social environments, combined with widespread contraceptive use which separates sex from reproduction, means that modern humans may not be the ideal species for such investigations. This context substantially alters the dynamics of these hypotheses and must be thoroughly considered in future research.

### **Conclusion**

The exploration of the evolutionary dynamics of male homosexuality has generated a variety of intriguing hypotheses, each positing different mechanisms for the phenomenon's persistence across human populations. These hypotheses include parental manipulation, sibling manipulation, and the younger son's adaptation, which all offer unique perspectives, intertwining with our understanding of human reproductive biology, embryology, genetics, immunology, and sociobiology.

The parental and sibling manipulation hypotheses suggest a level of direct fitness gained by the mother or elder brothers through manipulation of the sexual orientation of the younger brother during his embryonic development. Conversely, the younger son's adaptation hypothesis sees homosexuality as a strategic response of the younger brother's embryo to the probable existence of an older brother in a highly stratified socioeconomic environment. Although these hypotheses offer promising routes for validation, putting them to the test within modern human societies poses significant challenges. The rapid social transformation and the separation of sex from reproduction necessitate careful contextual consideration.

In this context, the sibling manipulation hypothesis offers an interesting angle that incorporates both biological and social factors. This hypothesis posits that male homosexuality may be a manifestation of competition between siblings for resources, particularly in the realm of mating. However, this hypothesis also demands rigorous empirical scrutiny.

Each hypothesis presents a unique perspective, highlighting that the expression of human sexuality, including homosexuality, is likely influenced by a complex interplay of genetic, hormonal, environmental, and social factors. It's also crucial to acknowledge the possibility of various subgroups of gay men with potentially distinct biodevelopmental origins of homosexuality (Swift-Gallant, Coome, Aitken, Monks, & VanderLaan, 2019). The maternal immunological reaction is hypothesized to be a proximal cause of homosexuality in only one of these subgroups. As such, future research should aim to comprehensively integrate these factors, paving the way for a more nuanced understanding of the complexity of male homosexuality.

### **Cross-References**

Parental manipulation hypothesis of male homosexuality; younger son's adaptation hypothesis of male homosexuality; xenoadaptations; male homosexuality; sexuality;

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