



# Inheritance of Human Social Behaviour

Shruti Anand

B.Sc. Life Sciences & Chemistry (II Year), Department of Life Sciences, Jai Hind College, Churchgate, Mumbai - 400020, Maharashtra, India

## Manuscript details:

Received: 04.06.2021  
Revised :28.11.2021  
Accepted: 27.12.2021  
Published: 30.12.2021

## Cite this article as:

Shruti Anand (2021) Inheritance of Human Social Behaviour, *Int. J. of Life Sciences*, 9 (4): 423-430.

Available online on <http://www.ijlsci.in>  
ISSN: 2320-964X (Online)  
ISSN: 2320-7817 (Print)



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other thirdparty material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>

## ABSTRACT

We have all heard of the saying “nature-nurture” and how debatable the argument can be. It is not unknown to the world about the tempestuous relationship between genes and social behaviour. The basis of this thinking is because of the complex predicament of the relationships between genes, brain, and social behaviour across several timeframes, fluctuating from organismal development and physiology all the way to evolutionary time. Apart from the psychological aspects of behaviour, there is a genetic approach to it that can be taken up. For instance, when you compare two siblings in the same household, even after being raised in the same environment and being taught the same principles – they usually turn out to be complete opposites of each other, making us question why could that be? This study aims to answer the same. The study's outcome is backed up by other literature in the same field which states that genes and environment are correlated with each other when it comes to their effect on an individual's social behaviour. Gender proved to fall under the umbrella of the aforementioned factors instead of being a sole factor that contributes to human social behaviour. Although the environment is a major contributing factor, it is not the only factor responsible for an individual's social behaviour. Much light has been thrown on the genetic aspects only recently, this study aims to give an insight on the same.

**Keywords:** Genetics, social behaviour, gender, sibling relationships.

## INTRODUCTION

Just like eusocial insects, human beings are social species who spend most of their time with other human beings exchanging verbal and non-verbal signals with each other. Under the umbrella of behavioural genetics, we have something known as human behaviour genetics which is involved in studying the role of genetic and environmental influences on human behaviour. Typically, human behavioural genetics started off with studying about the inheritance of behavioural traits but now it has ventured into addressing more complex aspects, for instance, the correlation between genes and environmental factors; the importance of genetics and/or environmental factors on varying

human behavioural traits; the extent at which both these factors can impact on the overlap between the human behavioural traits and so on. (Mullineaux *et al.* 2015) (Breed *et al.* 2010).

To understand the role of genetics in social science, you need to first understand the conditions under which they have derived from. There is a common belief that out of the two sciences, social science is the older strand which leads to a series of misinterpretations of assuming that genetics is the current expression that will undermine all the older theories of social behaviour. But after reading up about the history of the two sciences from the last century, a completely varying picture is yielded which says genetics and social science make up two separate strands of science with idiosyncratic and traceable roots in the murky past where they have come together recurrently both in epic struggles and for mutual benefits. (Reiss, 2010).

Sibling research has been considered an important aspect in families to understand characteristic behavioural traits among them and how their relationship impacts their social skills and responsivity. (Brody, 2004) (Brody, 1998) In establishing the heritability of phenotype, twin studies serve as a crucial tool and are the mainstay of behavioural genetics. Critical evidence has been provided by these studies that genes play a role in our ability to understand and manipulate social relationships. The heritability is reflected in the difference in correlations between monozygotic and dizygotic twins. Although twin studies show us an overall estimate of heritability, neither the number of genes nor the effect size of each gene can be known. (Ebstein *et al.* 2010).

Apart from genetics and environmental factors, sex differences have also been considered to cause a lot of difference behaviourally in an individual. According to previous studies, it is known that sex differences cause changes in behaviour and brain of an individual. Another interesting finding is that sex differences also lead to changes in human brain structure but the cause of it is still unknown. (Hines, 2020).

My study aims to throw light upon the aforementioned factors contributing in an individual's inheritance of social behaviour. The main objective of this paper is to study how social behaviour can be inherited from generation to generation. Along with other objectives such as to compare the differences in social behaviour

of siblings and to compare the various factors that can cause these differences. The outcome of this study has also been compared with the results of similar studies conducted by different behavioural geneticists and social scientists with the use of statistical and analytical methods.

## MATERIAL AND METHOD

A survey was conducted using Google Forms. The questionnaire was shared among the population that consists of siblings. A total of 26 sets (54 individuals) of siblings have responded and the analysis was done by taking into consideration the following factors – Gender, Inheritance (people you are genetically related to), Peer (people you are socially involved with), and Lifestyle (environment you are raised in). Since my study is a comparative study, each sibling sets' forms were compared and analysed together to gain an insight on the stark differences and commonality points among them.

Analysis: The responses were analysed with a graphical representation using Microsoft Excel for bar graphs. It was used to represent the collected data for easier understanding and interpretation of the information obtained.

## RESULTS AND CONCLUSION

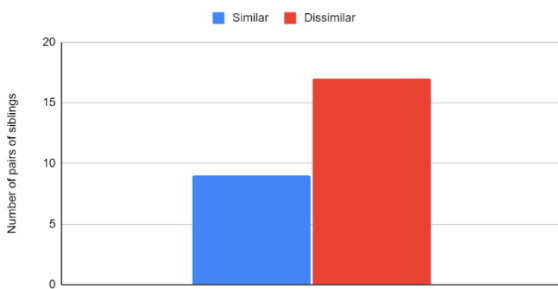
The main aim of this study was to explore whether siblings from the same environment grow out to have distinctive characteristics and behaviour. The questionnaire was divided into 3 parts to cover up the different factors that may play a significant role in an individual's behaviour. In all the graphs, the two bars are representing a) similar siblings (blue) and b) dissimilar siblings (red). The results of the questionnaire are as follows:

### Part 1 – You & Your Family

This section consisted of additional questions/sub-questions to set up a premise in understanding each sibling relation dynamic with the members in their household and helped in gaining more insight on how it affected their choices in the questions asked. Each of the subsequent questions had follow-ups about their mother and father's reply to the same to gain an insight on who each of the siblings might have gotten a certain trait from.

**Question 1 –**

How would you categorize yourself - Introvert, Ambivert or Extrovert?

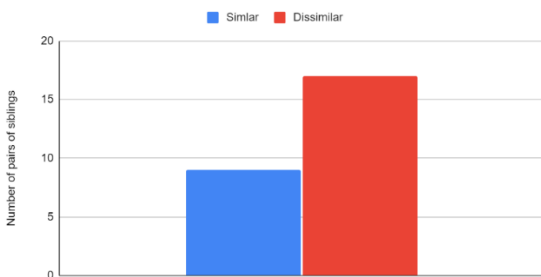


**Figure 1 – Similarities & Dissimilarities of Siblings on Being Introverts, Extroverts or Ambiverts**

Out of 26 sets of siblings, 17 (65.4%) of them showed differences in their categorization of themselves whereas only 9 (34.6%) of them showed commonality in their categorization. The data that can be interpreted from this question is to understand how the siblings may interact in their day-to-day life.

**Question 2 –**

How would you identify yourself - Optimistic, Pessimistic, Realistic, Idealistic?

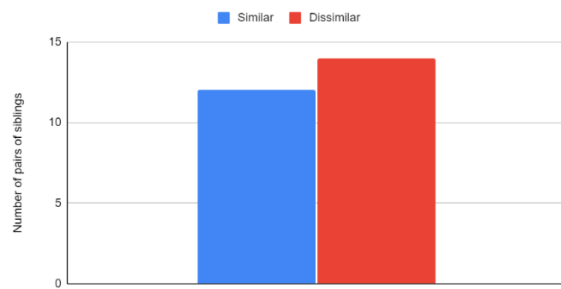


**Figure 2 - - Similarities & Dissimilarities of Siblings on Being Optimistic, Pessimistic, Realistic, or Idealistic**

Out of 26 sets of siblings, 17 (65.4%) of them showed differences in their identification of themselves whereas only 9 (34.6%) of them showed commonality in their identification. The data that can be interpreted from this question is to understand how the siblings may look at day-to-day situations.

**Question 3 –**

How would you categorize yourself - Left-Brained or Right-Brained?

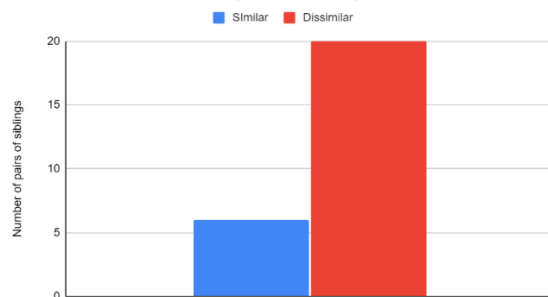


**Figure 3 – Similarities & Dissimilarities of Siblings on Cerebral Dominance**

Out of 26 sets of siblings, 14 (53.8%) of them showed differences in their thinking process whereas 12 (46.2%) of them showed commonality in their thinking process. The data that can be interpreted from this question is to observe how siblings' thinking & processing abilities might differ; if they are logic driven or emotionally driven.

**Question 4 –**

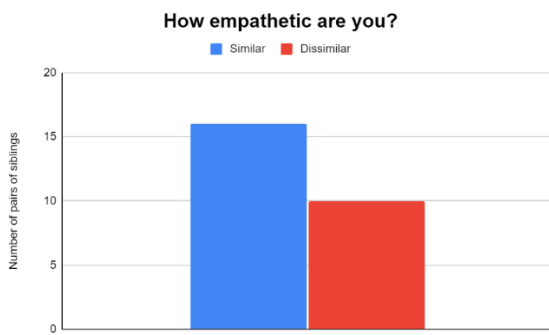
How expressive are you?



**Figure 4 – Similarities & Dissimilarities of Siblings on Expressivity**

Out of 26 sets of siblings, 20 (76.9%) of them showed differences in their expressivity of their emotions and feelings whereas 6 (23.1%) of them showed commonality in their expressivity. The data that can be interpreted from this question is to observe siblings if they are expressive about their emotions and feelings.

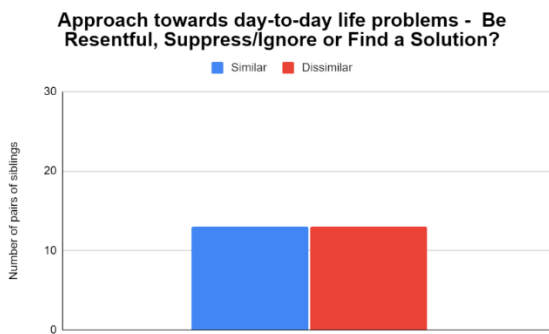
**Question 5 –**



**Figure 5 – Similarities & Dissimilarities of Siblings on Empathy**

Out of 26 sets of siblings, 10 (38.5%) of them showed differences in their empathy quotient whereas 16 (61.5%) of them showed commonality in their empathy quotient. The data that can be interpreted from this question is to observe how empathy quotients can be differing or similar in siblings depending on their relationship dynamics with each other and their parents respectively which would lead to higher or lower levels of empathy towards their peers.

**Question 6 –**



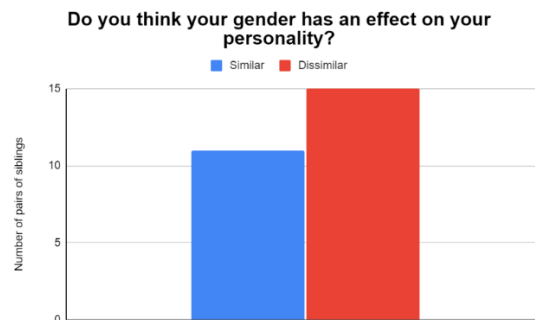
**Figure 6 – Similarities & Dissimilarities of Siblings on Approach Towards Day-To-Day Life Problems**

Out of 26 sets of siblings, there was a 13-13 (50%) division in the common and difference in siblings' approach towards their day-to-day life problems. The data that can be interpreted from this question is to observe how each sibling approached their day-to-day life problems – the most common option chosen between the siblings was finding a solution and the least common option happened to be, being resentful.

**Part 2 – Gender**

This section had additional questions to understand if any sibling has faced biases in their family, peers and so on, to gather an understanding if it's a prevalent factor to consider for behaviour being affected amongst them and shows the differences in the environment they are being brought up in. This factor would play a significant role in studying differences in siblings' behaviours of opposite genders.

**Question 7 –**



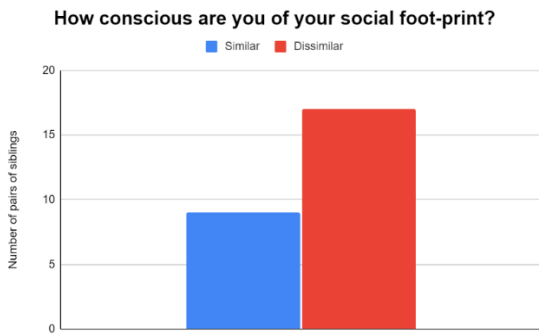
**Figure 7 – Similarities & Dissimilarities of Siblings on Gender & Personality**

Out of 26 sets of siblings, 15 (56.7%) of them showed differences in if they think gender affects their personality whereas 12 (43.3%) of them showed commonality in if they think gender affects their personality. The data that can be interpreted from this question is to observe how gender may or may not affect them including their gender or facing certain issues due to their gender that leads to how their social interactions are being altered.

**Part 3 – Social Environment**

This part of the questionnaire dealt with the non-shared environment settings that the siblings are a part of. It includes peer, social media, and every other form of socializing apart from the household they are brought up in to see how that may have an affect on them as individuals and shapes them.

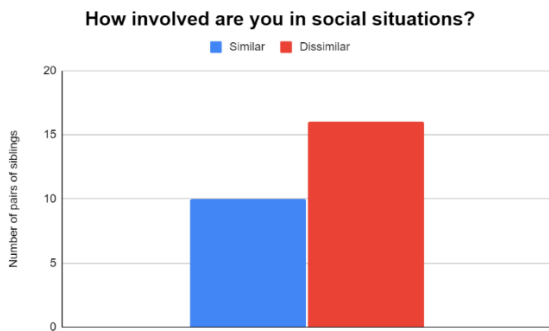
**Question 8 –**



**Figure 8 – Similarities & Dissimilarities of Siblings on Social Footprint**

Out of 26 sets of siblings, 17 (65.4%) of them showed differences in their social consciousness whereas 9 (34.6%) of them showed commonality in their social consciousness. The data that can be interpreted from this question is to observe how conscious or careful each sibling may be about their social footprint.

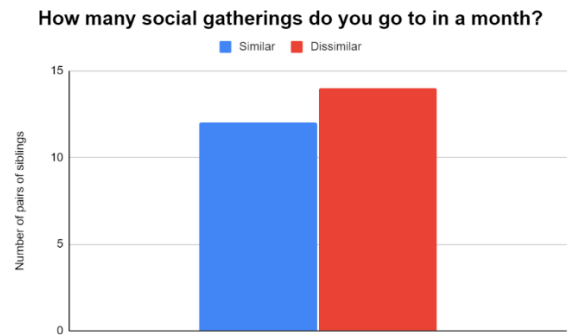
**Question 9 –**



**Figure 9 – Similarities & Dissimilarities of Siblings on Social Involvement**

Out of 26 sets of siblings, 16 (61.5%) of them showed differences in their social involvement and 10 (38.5%) of them showed commonality in their social involvement. The data that can be interpreted from this question is to observe each siblings' involvement in social situations.

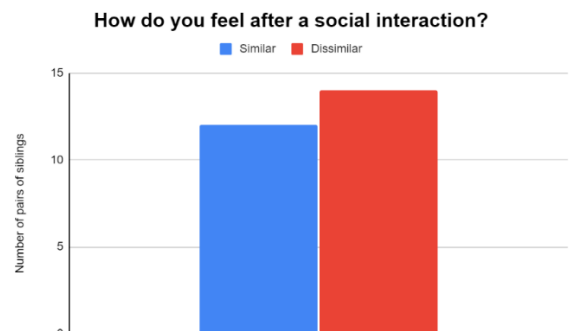
**Question 10 –**



**Figure 10 - Similarities & Dissimilarities of Siblings on Social Gatherings in a Month**

Out of 26 sets of siblings, 14 (53.8%) of them showed differences in how many social gatherings they may be a part of in a month whereas 12 (46.2%) of them showed commonality. The data that can be interpreted from this question is to observe how much does each sibling get out of their house and usual environment.

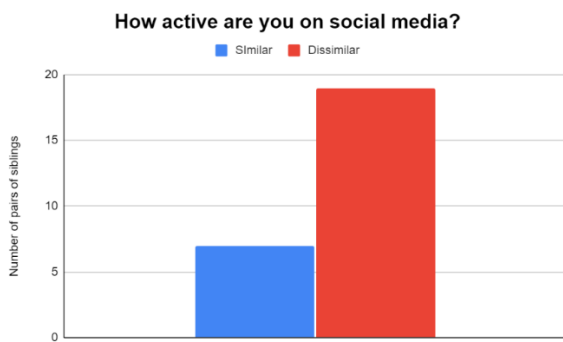
**Question 11 –**



**Figure 11 - Similarities & Dissimilarities of Siblings on Feelings of Social Interaction**

Out of 26 sets of siblings, 14 (53.8%) of them showed differences in how they may feel after a social interaction whereas 12 (46.2%) of them showed commonality in that feeling. The data that can be interpreted from this question is to observe the after effect, social interactions may have on each sibling. The most common options chosen were satisfaction and burnout.

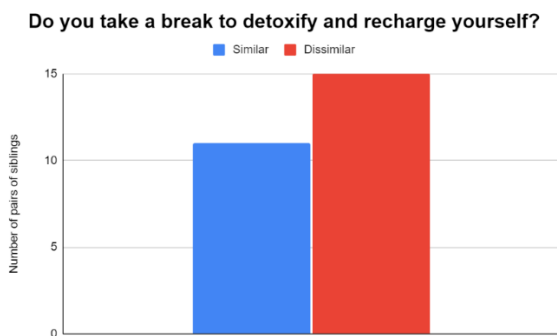
**Question 12 -**



**Figure 12 - Similarities & Dissimilarities of Siblings on Activity on Social Media**

Out of 26 sets of siblings, 19 (73.1%) of them showed differences in their activity on their social media whereas 7 (26.9%) of them showed commonality in their activity. The data that can be interpreted from this question is to observe how siblings' social media consumption and activity can be differing.

**Question 13 -**



**Figure 13 - Similarities & Dissimilarities of Siblings on Detoxification/Social Breaks**

Out of 26 sets of siblings, 15 (56.7%) of them showed differences in how often they take a break for self-care and reflection whereas 11 (43.3%) of them showed commonality. The data that can be interpreted from this question is to observe how often each sibling takes time off for reflection, self-care or nourishing their inner child.

**DISCUSSION**

This study proves the hypothesis that I had previously stated about both genes and environment playing a significant role in the development of siblings as an individual rather than just the environmental factors such as parenting, peer, adolescent period, and many biological factors such as hormonal influences etc.

Due to the improvement in analytical methods, many studies have shown that environmental and genetic factors mix in a much more complex amalgamation. It consists of 3 concepts – Gene x Environment Interaction, Gene x Environment Correlation and Genetic Contribution to Covariance between the measures of social environment and behavioural development. The first one talks about how the variations in the expressivity of genetic factors to that of social behaviour are dependent, the second one talks about the correlation of the two factors in any population and the last one covers up the contribution of genes to covariate between social environment and behavioural development. For instance, genetic factors that influence antisocial behaviour in adolescents also end up influencing the hostile and critical interaction between parents and children. To sum it up, all three ideas point out the characteristics between the measures of the social environment and genetic factors. Example – for decades, positivity in parent-child relationship has been the index of the child's social environment. But a child's genes induce parental positivity and parent's genes affect their positive responses to their children. (Reiss, 2010).

Here, two parts of the study will be discussed simultaneously – “You & Your Family” and “You & Your Social Environment” (peers and anything outside the household) since they are correlated. Considering figures 1 and 2, it can be observed that there are more dissimilar sets of siblings than similar ones with comparatively less role and involvement of the parental attributes. While studying the data, it was observed that in most cases, at least one of the siblings and parent had a common answer but exceptions were seen. In figure 3, there was comparatively lesser difference in the sets of similar and dissimilar siblings. It was observed that most women were right-brained and most men were left-brained which could imply that this is a trait that daughters inherit from their mothers and sons inherit from their fathers resulting in the slightly dissimilar sets. On the other hand, figures 4 and 5 showed vastly contrasting results implying that expressivity is a highly dissimilar trait whereas empathy is a highly similar trait among the sets of siblings. While analysing the data, it was seen that most mothers happened to be on the expressivity or neutral spectrum whereas most fathers were on the neutral or non-expressivity spectrum of the scale. Similarly, for empathy, it was seen that most mothers were empathic whereas most fathers happened to be

on the neutral to no empath's spectrum of the scale. In figure 6, there was an equal ratio of similar and dissimilar sets for their approach towards day-to-day life problems. Here, the most common option that was chosen was finding a solution which was either common between both the parents or the father and mothers were inclined towards suppressing or ignoring their emotions. Considering figures 8-11, there was a stark difference observed in the number of dissimilar and similar siblings with the higher end of the graph being the former. In the figure 12, there was a comparatively large spike in the difference of numbers in the sets of siblings with the dissimilar set still on the higher end. Lastly, in figure 13, the difference was minor in the numbers of dissimilar and similar siblings over the time they take off for reflection with again, the dissimilarity ratio still leading.

Parenting is one of the earliest exposures for a child to empathy. In a study by Ebstein et al., it was stated that parenting is not solely influenced by the parent's genotype nor is it a pure environmental measure rather the children's genes influence not only the way the child is parented but also, the child's reaction to that parenting. On the self-reported parenting of fathers and mothers with respect to the positivity, negativity, monitoring and control, there is evidence of gene-environment correlations. (Ebstein *et al.* 2010) Apart from parenting, sibling relationships play a prevalent role in the environment a child is being brought up in. In previous studies, it has been implied that these relationships are categorized by a balance of nurture and conflict providing an erratic opportunity for a child to develop an empathetic nature, to learn to manage and resolve disagreements and to aid themselves. (Brody, 2004) In a study, it was explored that maternal genotype has a substantial effect on the child's brain development beyond classical inheritance. (van der Knaap *et al.* 2014) It was also found that older siblings that are academically and socially competent had a part to play in boosting their mother's self-esteem and a decline in their mother's depressive symptoms. Due to the positive changes in the mother's psychological functioning, an adjustment could be forecasted in her parenting practices with the younger sibling. (Brody, 2004).

In the last part of the study, gender was the factor that was being considered (Figure 7) and it was seen that there were a greater number of dissimilar siblings

than similar ones. Further, a large part of the respondents have an opinion that their personality is affected by their gender. However, it is not the sole factor in how an individual may behave. Literature shows that sex differences and the factors that may influence the behaviour and brain are highly correlated. The factors that end up influencing sex differences both in behaviour and the brain are likely to be genes on the sex chromosomes; hormones prenatally, during mini-puberty or at adolescent puberty; socialization by parents, peers, and others; and self-socialization, based on cognitive understanding of gender. (Hines, 2020).

## CONCLUSION

To conclude, in siblings, a correlation between genetics and social behaviour was observed from the analysis of the varying factors – namely Gender, Inheritance (people you are genetically related to), Peer (people you are socially involved with), and Lifestyle (environment you are raised in). Inheritance and Social Environment (Lifestyle with Peer) play a key role in variation of social behaviour whereas Gender comes under the umbrella of sex differences in humans. Gender is a broad concept which requires an individual's cognitive understanding about the same, for its identification. Recent studies have started studying genetics and social science together instead of one after the other, which will lead to a better understanding of behavioural genetics. For instance, twin studies are a critical tool used by scientists to understand how genetics and environment can lead to similarities and differences in monozygotic and dizygotic twins, but there has not been much study done with respect to siblings with age and/or sexual differences. I think studying sibling relationships with respect to genetics and environment would provide us a more insightful approach towards behavioural genetics.

**Conflicts of Interest:** The authors declare no conflict of interest.

## REFERENCES

- Breed M & Sanchez L (2010) Both Environment and Genetic Makeup Influence Behaviour. *Nature Education Knowledge* 3(10):68.
- Brody GH (1998) SIBLING RELATIONSHIP QUALITY: Its Causes and Consequences. *Annual Review of*

Psychology, 49(1), 1-24. doi:10.1146/annurev.psych.49.1.1

Brody GH (2004) Siblings' Direct and Indirect Contributions to Child Development. *Current Directions in Psychological Science*, 13(3), 124-126. doi:10.1111/j.0963-7214.2004.00289.x

Ebstein RP, Israel S, Chew SH, Zhong S, & Knafo A (2010) Genetics of human social behaviour. *Neuron*, 65(6), 831-844.  
<https://doi.org/10.1016/j.neuron.2010.02.020>

Hines M (2020) Neuroscience and Sex/Gender: Looking Back and Forward. *The Journal of neuroscience: the official journal of the Society for Neuroscience*, 40(1), 37-43.  
<https://doi.org/10.1523/JNEUROSCI.0750-19.2019>

Mullineaux PY & DiLalla LF (2015) Genetic Influences on Peer and Family Relationships Across Adolescent Development: Introduction to the Special Issue. *J Youth Adolescence* 44, 1347-1359.  
<https://doi.org/10.1007/s10964-015-0306-0>

Neiderhiser JM, Reiss D, Pedersen NL, Lichtenstein P, Spotts EL, Hansson K, Cederblad M, & Ellhammer O (2004) Genetic and environmental influences on mothering of adolescents: a comparison of two samples. *Developmental psychology*, 40(3), 335-351.  
<https://doi.org/10.1037/0012-1649.40.3.335>

Reiss D (2010) Genetic Thinking in the Study of Social Relationships: Five Points of Entry. *Perspectives on psychological science: a journal of the Association for Psychological Science*, 5(5), 502-515.  
<https://doi.org/10.1177/1745691610383516>

Van Anders SM, Steiger J, & Goldey KL (2015) Effects of gendered behavior on testosterone in women and men. *Proceedings of the National Academy of Sciences*, 112(45), 13805-13810.

Van der Knaap NJ, El Marroun H, Klumpers F, Mous SE, Jaddoe VW, Hofman A, Homberg JR, White T, Tiemeier H, & Fernández G (2014) Beyond classical inheritance: the influence of maternal genotype upon child's brain morphology and behavior. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 34(29), 9516-9521.  
<https://doi.org/10.1523/JNEUROSCI.0505-14.2014>