



# Nature or Nurture: The Case of the Boy Who Became a Girl

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## Part I – A Tragic Error

In 1965, Janet Reimer of Winnipeg gave birth to twin boys named Bruce and Brian (Colapinto, 2004; CBC, 2004). Both infants were normal and healthy, but because they had difficulty urinating doctors recommended that they undergo circumcision (i.e., surgical removal of the foreskin of the penis) at six months of age. Although this is a routine operation, the doctors who performed this procedure used an unconventional method that resulted in the destruction of Bruce's penis. Mr. and Mrs. Reimer sought the advice of numerous specialists, but all agreed that Bruce would have to live without a penis.

At the time that the Reimers were coping with the mutilation of their son's genitalia, a Johns Hopkins University psychologist was receiving considerable attention for his ideas on the biology of gender and sexuality. He promoted the theory that a child's gender identity (i.e., the identification of the self as male or female) was determined by environmental variables such as the social conditions in which the child is raised. This idea is a form of the "nurture theory" of development. A competing view is the so-called "nature theory"; that is, the idea that a person's innate qualities are determined solely by biological mechanisms.

The psychologist was essentially advocating the view that a feminine identity could be developed simply by rearing a child as a girl. This possibility, together with the fact that the surgical construction of a vagina is less risky and less difficult than construction of a penis, compelled the Reimers to explore the possibility of changing Bruce's gender and raising him as a girl. The Reimers arranged an appointment with the Johns Hopkins psychologist who concluded that Bruce was an ideal candidate for gender re-assignment. At 21 months of age, Bruce was subjected to castration (i.e., removal of the testicles) and his parents were told to raise him as a girl, but not to divulge this information to anyone including their sons. Following surgery, the Reimers returned home with their "new daughter," who they named Brenda. They proceeded to raise her as a girl and not tell her about her medical history.

## Questions

1. Some people have argued that the Johns Hopkins psychologist used this opportunity as an experiment to test his nurture theory of gender identity. What are the expected results of this experiment, assuming that the nurture theory is valid?
2. According to the nurture theory, predict the gender identity Bruce would express if he were not subjected to gender re-assignment surgery and raised as a boy?

## Part II – A Boy Living as a Girl

The Reimers faithfully adhered to the gender re-assignment protocol, accepted their child as their daughter, and attempted to raise her as a “gentle lady.” In spite of their efforts, Brenda resisted this treatment and eventually became unmanageable (Diamond and Sigmundson, 1997a; 1997b). For example, Brenda frequently rejected girls’ toys, activities, and clothing. She would also mimic her father’s behaviors (e.g., shaving) as opposed to her mother’s behaviors (e.g., applying makeup). On the other hand, her mother reported that at times Brenda could act quite “feminine,” referring to the fact that the child was “neat and tidy.” As she grew older, Brenda complained that she felt like a boy and viewed her physical characteristics as more masculine than feminine. Her brother appears to have shared her impression, recalling that “[t]he only difference between him [Brenda] and I was he had longer hair.”

Brenda’s rejection of the feminine identity continued in middle school. In her fantasies she was a “big guy” with “lots of muscles” and a “slick car.” Even though she lacked a penis, Brenda repeatedly tried to stand while urinating and frequently tried to use the boys’ bathroom in school. The other girls prevented her from using the girls’ bathroom. In response to teasing and harassment by other girls, Brenda fought back and was repeatedly punished for fighting. When Brenda was nine years old, the Johns Hopkins psychologist urged the Reimers to have Brenda undergo surgery to construct a vagina to replace her mutilated genitalia. The child protested strongly and threatened to kill herself if forced to submit to this treatment. She also resisted repeated attempts by doctors to force her into accepting a feminine identity. By the time Brenda was 14 years old, her behavior had become so destructive (several suicide attempts) that a local psychiatrist convinced the Reimers to divulge the truth to their daughter. Upon hearing the details of her early childhood, Brenda cut her hair and began living as David.

In order to re-capture the physical aspects of his masculine identity, David agreed to undergo a double mastectomy to remove breasts that had developed from estrogen treatments, a series of surgeries to construct male genitalia (a penis with plastic prosthesis and artificial testicles), and regular injections of testosterone to restore masculine body features.

### Questions

1. What, if any, aspects of David’s experiences support the nurture theory of gender identity?
2. What, if any, aspects of David’s experiences support the nature theory of gender identity?

## Part III –Nature or Nurture Revisited

As David assumed his male status, he expressed many of the physical and behavioral traits of typical teenage boys. He was readily accepted by his male peers and engaged in sexual activities with young women. He eventually married and he and his wife enjoyed a loving and fulfilling relationship. Unfortunately, David suffered from chronic depression and committed suicide in 2004. The extent to which his childhood experiences contributed to his suicide is unknown.

The case of David Reimer seems to refute the nurture theory; that is, the idea that gender identity is due solely to social effects. However, certain aspects of this case make rejection of the nurture theory premature. For example, David did not begin gender re-assignment until almost two years of age, a period of time that might have been sufficient for establishing a male gender identity. This raises the question of whether gender re-assignment would be successful if initiated at birth. The outcome of this single case does not provide sufficient information for accepting or rejecting either the nature or nurture theory. In spite of over 50 years of research on the sexual differentiation of behavior, there appears to be no consensus on whether a person's gender identity is shaped by either biological or social variables. Perhaps nature and nurture interact to determine how the sexual self develops.

Evidence for the nature theory of sexual identity is based largely on studies done with laboratory animals (Gorski and Johnson, 1982; Wilson, 1999). There is consensus that the sexual behavior expressed as an adult is the result of exposure to sex hormones during fetal and (or) early postnatal development. Briefly, exposure to testosterone (produced by the testicles) early in life promotes development of the brain in ways that allow male behavior to be expressed as an adult. The absence of testosterone (due to the presence of ovaries instead of testicles) results in a female pattern of behavior. Results of these types of studies are summarized in Table 1.

Table 1. Effects of neonatal castration and steroid hormone treatment on sexual behavior of laboratory rodents.

Type of Animal <sup>1</sup>	Sexual Behavior as Adult <sup>2</sup>
Non-treated Male	Masculine
Non-treated Female	Feminine
Castrated Female	Feminine
Female + Testosterone	Masculine
Castrated Male	Feminine
Castrated Male + Testosterone	Masculine

<sup>1</sup>Treatments imposed within 7 days after birth.

<sup>2</sup>In the presence of appropriate sex steroid hormones.

The extent to which exposure to hormones affects gender identity in humans remains unclear. This is illustrated by two recent studies. Reiner and Gearhart (2004) documented the gender identities of genetically male children who were born without penises, castrated soon after birth, and reared as females. Out of 16 subjects, five were living as females, three had unclear gender identities, and eight were living as males. Of the eight living as males, six underwent male gender re-assignment treatments to obtain masculine physical traits. In a related study, Berenbaum and Bailey (2003) studied the gender identities of 43 girls who were exposed to androgens (hormones similar to and including testosterone) during fetal development. Scores on gender identity interviews for girls exposed to androgens were similar to control girls (not exposed to androgens before birth). Moreover, girls whose exposure to androgens resulted in development of male genitalia were no more likely to express masculine behaviors than control girls.

### Questions

1. How well do the results of studies in humans agree with the studies in rodents that support the nature theory of gender identity? Explain your answer.
2. In light of this newer research on gender identity, what advice would you give parents who are considering gender re-assignment of a male infant who lacks a penis, but has functional testicles?
3. How would an advocate of the nature theory explain homosexual behavior in men and women?

4. How would an advocate of the nurture theory explain homosexual behavior in men and women?
5. Design an experiment that would resolve the nature versus nurture controversy. What are some reasons why this experiment hasn't been done?

### References

- Berenbaum, S.A., and Bailey, J.M. 2003. Effects on gender identity of prenatal androgens and genital appearance: Evidence from girls with congenital adrenal hyperplasia. *Journal of Clinical Endocrinology and Metabolism* 88: 1102–1106.
- Colapinto, J. 2004. Gender Gap: What were the real reasons behind David Reimer's suicide? *Slate*: <http://www.slate.com/id/2101678/> Last accessed: 08/04/11
- CBC News In Depth. 2004. David Reimer: The boy who lived as a girl: <http://www.cbc.ca/news/background/reimer/> Last accessed: 08/04/11 (Source of photographs that can be used for the case.)
- Diamond, M., and Sigmundson, H.K. 1997a. Sex reassignment at birth: A long term review and clinical implications. *Archives of Pediatrics and Adolescent Medicine* 151: 298–304.
- Diamond, M., and Sigmundson, H.K. 1997b. Management of intersexuality: Guidelines for dealing with individuals with ambiguous genitalia. *Archives of Pediatrics and Adolescent Medicine* 151: 1046–1050.
- Gorski, R.A., and Johnson, C.D. 1989. Sexual differentiation of the brain. *Frontiers in Hormone Research* 10: 1–14.
- Reiner, W.G., and Gearhart, J.P. 2004. Discordant sexual identity in some genetic males with cloacal exstrophy assigned to female sex at birth. *New England Journal of Medicine* 350: 333–341.
- Wilson, J.D. 1999. The role of androgens in male gender role behavior. *Endocrine Reviews* 20: 726–737.



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