

The Fetal Position: An Examination of the Validity of Gender through the Lens of Ecological Fluidity of Behavioral Dimorphisms

Tanya Daughtry

Department of Biology; College of Arts and Sciences

Abilene Christian University

Sex and gender is not dichotomous as traditionally thought. Once the biology of sex is understood, perhaps a correction of the teaching about male and female uniqueness can be balanced with Jesus' teaching regarding eunuchs. Until this is done, persons with gender identity discontinuities will be marginalized by the church. Recognizing that this dichotomous view is incorrect is the first step in correcting the marginalization.

Sex and gender in humans are typically presented as being completely dimorphic despite the fact that this binary view excludes a large percentage of the human population. Biological sex is dependent upon several layers of independent variables, and these layers of sexual differentiation do not fall neatly into either of the two gender categories. On top of sexual ambiguity, there also appears to be a significant degree of overlap between gendered behavior, which brings into question the actual presence and role of behavioral dimorphisms. Rather than a genetic hardwiring, humans seem to employ a high degree of fluidity and variability that allow them to change with and adapt to constantly changing ecological and sociological roles.

Biology of Sex

When exploring sex, gender, and sexuality in humans, one should bear in mind why sexual reproduction occurs at all as means of preserving genetic lineage. While there are inherent risks associated with finding another gamete, as well as preserving genetic material from another organism, the adaptive benefits associated with genetic variation are useful for organisms in

constant contact with new and changing environments. As far as producing a successful zygote, there is an ecological and evolutionary benefit to sexual dimorphism.

As sexually reproducing organisms evolved to efficiently occupy a spectrum of ecological niches, a key area of specialization was in producing gametes that would best preserve and proliferate their genetic lineage. In *Why Sex Matters*, Bobbi Low points out the two most important qualities in producing a successful zygote involve gametes that can effectively reach other gametes while also having the genetic resources for a healthy zygote. While small gametes are easily produced and are able to quickly find and reach other gametes, large gametes "have resources to live longer" and produce "well-endowed and healthy" zygotes.¹ Though gamete size could potentially range from very small to very large, middle-sized gametes lost out to either extreme; zygotes that result from sexual reproduction become either small or large gamete carriers. Typically male gametes are small and female are large.

The tempting assumption for one to draw from this is that of absolute sexual

¹ Low, 2000, p. 39.

dimorphism, that is, 'male and female He created them.' What is observed in humans, however, is a picture that is not so clear cut, and, in fact, this binary distinction excludes the "approximately 1.7% of all live births [that] do not conform to a Platonic ideal of absolute sex chromosome, gonadal, genital, and hormonal dimorphism."²

Stephen Sapp identifies seven independent variables of sexual differentiation that feed into one's biological sex: genetic or chromosomal sex, gonadal sex, fetal hormonal sex, internal morphological sex, external morphological sex, sex of assignment and rearing, and 'hypothalamic' sex.³ Chromosomal sex in mammals is typically divided into XX female and XY male, but variations occur even at the chromosomal level. Blackless et al. lists six of the most common deviations from the typical XX female and XY male as XXY (Klinefelter Syndrome), XO (Turner Syndrome), XYY, XXYY, XX males (involving a translocation of the sex determining region of the Y chromosome), and 47,XXX females.⁴

Gonadal sex variables determine which type of gamete the zygote will produce. The embryo will develop either ovaries or testes, and "it is thought that *SRY* and *DAX-1* are key genes that act initially to trigger male or female development."⁵ Each is thought to have an active role in the development of testes or ovaries, respectively. The differentiation of the fetal gonads then feeds into the fetal hormonal sex. The hormones secreted by the gonads determine the sexual differentiation of the fetus, and in mammals, the fetus differentiates as male upon the presence and reception of androgens, and otherwise will develop into the female form

by default. In humans, the gonads secrete both male and female sex hormones, regardless of sex, so the amounts may vary between individuals, and the proportional amounts of each type of sex hormone plays a key role in morphological sex.

Internal morphological sex is dependent upon the presence of androgen secretions from the fetal testes, particularly of the secretion of Müllerian inhibiting factor. The absence of this hormone within the developing fetus will cause the Müllerian ducts to differentiate into the uterus, fallopian tubes, and upper vagina, while its presence will lead to the development of the Wolffian ducts into the vas deferens, seminal vesicles, and ejaculatory ducts.

External morphological sex is the most obvious way people differentiate between male and female; however, these external structures all develop from the *same* primordial anlagen into either the clitoris or the penis. Testicular hormones must be present during a critical period of development for the fetus to differentiate as male, and in the absence of these hormones, the fetus will develop as female. Deviations in these variables are the main causes of intersexuality in humans.

The most common type of intersexuality in XX females is Congenital Adrenal Hyperplasia.⁶ In this condition, females are chromosomally XX, but high levels of fetal testosterone masculinize the external genitalia. Other common forms of intersexuality include Androgen Insensitivity Syndrome, in which an individual is chromosomally XY, but does not have the receptors to respond to androgens produced by the gonads, and 5-

² Blackless, 2000, p. 161.

³ Sapp, 1977, p. 83.

⁴ Blackless, 2000, p. 152.

⁵ Fujimura, 2006, p. 62.

⁶ Blackless, 2000, p. 154.

alpha reductase deficiency, which is “a syndrome in which androgens are in the normal range, but an enzyme necessary for male genital development is not present.”⁷ In both cases, an individual has female external genitalia, but AIS females develop entirely as females, while 5-ARD individuals have more ambiguous genitalia and develop masculine secondary sex characteristics at puberty. Remembering that gonads in humans usually secrete both male and female sex hormones, the typical female (defined by Blackless et al. as having “two X chromosomes, functional ovaries which ensure a feminizing puberty, oviducts connecting to a uterus, cervix and vaginal canal, inner and outer vaginal lips, and a clitoris, which at birth ranges in size from 0.20 to 0.85 cm”⁸) is exposed to more androgens in her lifetime than an AIS female is, despite having XY chromosomes.

There are still more ways in which intersexuality can occur, and in *Sexing the Body*, Anne Fausto-Sterling compares the frequency of intersexual births to albinism, “another relatively uncommon human trait but one that most readers can probably recall having seen,” which occurs in 1 of 20,000 live births as opposed to the 1-2 per 100 live births of intersexuality.⁹ What can be gathered from this high a prevalence of deviations from absolute sexual dimorphism is that such a strict division excludes a significant population of humans and is more accurately depicted as a bimodal continuum.¹⁰

The final variable of sexual differentiation identified by Sapp is “hypothalamic” sex, with the suggestion that fetal androgens masculinize the hypothalamus. Thirty-three

years later, Cordelia Fine points out in *Delusions of Gender* that even with current neuroscience, researchers still do not have a full picture of what a masculinized brain entails structurally, much less behaviorally. Through the help of neuroimaging, one can see the primary differences in brain activation between males and females is in “how much activation is seen and where that activation is,” but neither provides a clear picture of “psychological sex differences.”¹¹ Fine also points out, albeit sarcastically, that “high levels of fetal testosterone are strongly correlated with having a penis. That means that a correlation between fetal-testosterone and later sex-typed behavior could have nothing to do with fetal testosterone and everything to do with the different socialization of boys and girls.”¹² While sex-typed behavior may be observed in humans, this behavior cannot as easily be identified as being biologically or sociologically based, and with the two being virtually inseparable, the question of what it means to have a male brain or a female brain is all the more confusing.

(Mis-)handling Sexual Dimorphism in Society

If humans were as sexually dimorphic as our society presumes them to be, the sex of assignment and rearing would be more straightforward, but even in fetal development, deviations from the typical male or female may occur on a number of levels. If humans are categorized into a sexual or gender binary, outliers are inevitable, and Fausto-Sterling points out that “complete maleness and complete femaleness represent the extreme ends of a spectrum of possible body types,” even if they are the most frequently occurring.¹³

⁷ Jordan-Young, 2010, p. 67.

⁸ Blackless, 2000, p. 152.

⁹ Fausto-Sterling, 2008, p. 52-53.

¹⁰ Blackless, 2000, p. 162.

¹¹ Fine, 2010, p. 191.

¹² Fine, 2010, p. 106.

¹³ Fausto-Sterling, 2008, p. 76.

Forcing sexual dimorphism on a population that does not express an absolute dimorphism inevitably leads to categorizing sexually ambiguous individuals through incomplete terminology. Parents and physicians who choose whether to categorize and intersex individual as male or female “[employ] social definitions of gender.”¹⁴ This categorization is based on arbitrary rules on what it means for one to be male or female, especially as far as the size of one’s genitalia are concerned. If at birth the clitoris is out of the “normal” range of 0.2-0.85 cm or the penis is not in the 2.5-4.5 cm range, physicians will often force the individual to undergo “corrective” surgery.

Often, there is nothing physiologically wrong with the infant, but the surgery is still done for cosmetic purposes. The procedure often involves withholding information from the parents and especially from the child, which leads to strained, distrustful patient-physician relationships, especially when this withholding of information is combined with physical scarring and psychological trauma, as it often does. The sex of assignment in these cases may not always align with the individual’s gender identity, and “medical practitioners unintentionally reveal their anxieties that a full disclosure of the facts about intersex bodies would threaten individuals’ –and by extension society’s –adherence to a strict male-female model.”¹⁵ Rather than forcing society to redefine gender, intersex individuals are “fixed” to fit into a binary view of gender.

With respect to hypothalamic sex, an area of research that is helpful in separating biologically determined behavioral dimorphisms is in comparing play activity in females with congenital adrenal hyperplasia

to unaffected males and females. This is particularly useful because researchers can study the effects of high levels of fetal testosterone without this coinciding with the individual being raised male. Unaffected males and females have significantly different levels of rough-and-tumble play, and males are traditionally credited with having greater mental rotation ability. If either of these are due to increased levels of fetal testosterone, then one would expect CAH girls to participate in play activity in the same way that boys do. However, despite marked differences in rough-and-tumble play between unaffected boys and unaffected girls, there is no difference between CAH girls and unaffected girls, nor is there difference in play activity involving stimulation of visuospatial skills.¹⁶ In fact, mental rotation ability in CAH females are shown to be either worse or no different than unaffected females. The difference in play activity seems to lie in the perceived boyishness of the activity, such as expressing a preference towards dressing up as a male rather than female character.¹⁷

If there is a difference in neurological stimulation by different types of toys that cause girls to be drawn to one type of toy and boys to be drawn towards another, then these differences should be consistent. Yet a five-year old will readily identify a brown-spiky tea set as being for boys and a truck decorated in smiley faces and hearts as being for girls.¹⁸ This indicates that the metaphorical gender cues and perception of boyishness or girlishness of an activity seem to have more effect on whether a boy or girl will play with it than the play activity itself does. Primatologist Frances Burton’s suggestion is that “the effect of fetal hormones in primates is to predispose them

¹⁴ Fausto-Sterling, 2008, p. 58.

¹⁵ Fausto-Sterling, 2008, p. 65.

¹⁶ Jordan-Young, 2010, p. 71-72.

¹⁷ Fine, 2010, p. 122.

¹⁸ Fine, 2010, p. 224.

to be receptive to whatever behaviors happen to go with their own sex in the particular society into which they are born.”¹⁹ If this is the case, then this also helps to explain some instances of why an individual's gender identity may not align with one's physical sex or sex of assignment.

If there are hardwired, genetic differences in how variations in hormones or in brain structure affects gendered behavior in humans, then one could reasonably expect these differences to show up clearly in research. However, many of these studies produce mixed results, and both Fine and Jordan-Young attribute these variable differences to statistical probability, that is, results that falsely appear correlated due to either chance or small sampling sizes.²⁰

Furthermore, in psychological studies, differences in gender can appear or disappear depending on whether one's gender is primed before or during the study. Greater mental rotation ability is usually attributed to men and is used as a reliable cognitive difference between men in women. One study done in 1994 had two groups of men and women perform mental rotation tasks. One group was told that high performance is linked to successful abilities in such things as navigation and engineering. The other group was told that high performance is correlated with better capacity for interior design and fashion.

While in the first group, the males greatly outperformed women, in the second group where mental rotation was presented as a feminine quality, male performance plummeted.²¹ In a 2001 study testing empathy, a skill usually associated with

women, the femininity of empathetic accuracy was emphasized by first having the participants take survey self-reporting sympathy ratings. In this group, women outperformed men. Another group was offered \$2 for each question they got correct, and this time, men and women performed equally.²² Not only do different incentives for performance seem to change supposed gendered performance, but “once [one has] categorized someone as male or female, activated gender stereotypes can then color our perception.”²³ If there is a difference in sex-type behavior, more than anything else, this difference is decided by the one with whom one identifies and why.

Practical Parenting Considerations

When examining gender identity, the ultimate question is how early gender perception begins. In interviews with parents about why they wanted to have a son or a daughter, common answers for wanting a son included having someone to play ball with, whereas for a daughter, someone with whom a mother could have a strong emotional connection to was emphasized.²⁴

While few parents would readily admit to a son or a daughter being a different type of reproductive investments, they had clear gendered expectations that were markedly different for either a son or a daughter. This is indicative of the distinction between the implicit and explicit expectations parent have for the gender performance of their children. In a study done with 26 preschoolers and their parents concerning cross-gender play, the parents stated that they would be willing for their daughters to play Little League or for their sons to have a baby doll. Yet despite the parents' seeming encouragement of their daughter's

¹⁹ Fine, 2010, p. 123.

²⁰ Jordan-Young, 2010, p. 88; Fine, 2010, p. 138.

²¹ Fine, 2010, p. 28.

²² Fine, 2010, p. 21.

²³ Fine, 2010, p. 56.

²⁴ Fine, 2010, p. 192.

athleticism or their son's socialization, few of the preschoolers thought their parents would be happy for them to participate in cross-gender play, especially among the boys.²⁵ When boys and girls are constantly separated into boys and girls, the constant emphasis on this division feeds the child's identity, and he will want to know which side of the line he falls on and what other types of things go with his group. Variations in gender expression do not change an individual's biological sex, nor does it change an individual's worth, yet certain behavioral traits become successful among boys or girls because the individual of a given sex is praised when a specific quality is present but shamed, whether implicitly or explicitly, when it is not, even though there may be nothing innately successful about the trait itself.

Plasticity of Gender Assignment – A Spectrum not a Dichotomy

Genes are preserved and proliferated because they work, not necessarily because they are the best, so there is a necessity for fluidity in gene expression to adaptation. While the genes themselves cannot be changed, gene activity can be shut on or off, which is important because organisms need to be able to change dynamically with “ecologically novel environments.”²⁶

Neurophysiologist Ruth Bleier describes the idea that “biology can be said to define possibilities but not determine them.”²⁷ Nature and nurture are inseparable, and while genes are important in outlining biological potential, environment and socialization can alter how these genes are expressed, and a certain level of fluidity is required. In a study done by Robert Sapolsky on a troop of baboons, a

tuberculosis outbreak caused the most aggressive males in the troop to die. The troop was left with uncharacteristically unaggressive male survivors, but most significantly, twenty years later, after the initial cohort of survivors had already died out, the males in the troop still behaved the same way, indicating that new males in the group assimilated the initial cohort's unaggressive behavior.²⁸ When discussing gender, a certain level of neuroplasticity is important because this allows “new members of the species to develop sex-appropriate behaviors despite changes in what those behaviors might be.”²⁹ One unique characteristic of humans is that humans are not helplessly bound to their biology, but rather seem to play an active hand in the trajectory of their own evolution and interaction with nature. An appeal to nature as reasoning for traditional gender roles may make some ecological sense, but does not seem to work for humans. Males who are fully capable of being primary caregivers and females who are fully capable of being resource controllers is in line, not with nature, but with a species that has for so long separated itself from natural selection using technology and culture.

When one inspects sex, gender, and sexuality in humans, complete dimorphism is *not* seen; rather, there is a dynamic spectrum that is able to change and interact with ecologically changing environments. The necessity for behavioral adaptation requires that genes be able to change their expression and requires that gendered behaviors not be mutually exclusive. The sexual and behavioral fluidity among humans suggest that a dimorphic view of genetic hardwiring between the sexes be

²⁵ Fine, 2010, p. 202.

²⁶ Low, 2000, p. 31.

²⁷ Quoted in Fine, 2010, p. 178.

²⁸ Sapolsky, 2004.

²⁹ Quoted in Fine, 2010, p. 123.

replaced with an epigenetic interpretation of interactions with ecological novelties.

How Should the Church Respond?

Ever since the old law was replaced by Christ's new law of love, the old adage of "male and female He created them" has to be balanced, perhaps replaced, with Jesus' own words, "Not everyone can accept this teaching, but only those to whom it is given. For there are eunuchs who have been so from birth, and there are eunuchs who have

been made eunuchs by others and there are eunuchs who have made themselves eunuchs for the sake of the kingdom of heaven. Let anyone accept this who can." (Matt. 19:11-12) Here, the interpretation of eunuch might be rethought in light of the examples of intersexed individuals discussed above. Of equal importance to consider but more challenging will be the church's acceptance of transgendered persons and of different orientation.³⁰

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³⁰ Two recent theses explore these very issues: DeFranza, Megan K., "Intersex and Imago: Sex, Gender, and Sexuality in Postmodern Theological Anthropology" (2011). *Dissertations (2009 -)*. Paper 117. http://epublications.marquette.edu/dissertations_mu/117

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