Sexual Dials (Not Switches) Theory:

An Evolutionary Perspective on Sex and Gender Complexity

David P. Schmitt

When talking about sex and gender, it's important to ground discussions with basic definitions. Sex, or *sexual identity*, is usually defined as whether one identifies as male or female (or something else). Sex differences, then, are typically about differences between groups of males and females. Whether one is psychologically male-typical or female-typical within a given society is one's *gender identity* (e.g., masculine, feminine, androgynous, etc.). The effects of gender identity can be thought of as the combined impacts of masculinity and femininity across individuals (and within sexes; Eagly and Wood 2013).

Despite these common foundational definitions, challenges remain when addressing sex and gender effects scientifically (Richardson 2013; Maney 2016;). For one, human sexual psychologies, as Kinsey, Pomeroy, and Martin (1948) famously noted, rarely take the form of discrete sheep versus goat categories. Even categories as basic as "male" versus "female" are oversimplifications of many people's sexual experience. People with complete Androgen Insensitivity Syndrome, for instance, have an X and a Y chromosome (typically, this pairing of chromosomes makes one "male"), but they usually grow up female, often unaware they are chromosomally male until infertility issues lead to a genetic revelation (Dreger 2000).

Additional intersexual conditions and disorders of sexual development further complicate defining sexual identity as categorical, including different types of Congenital Adrenal Hyperplasia (CAH), Klinefelter Syndrome, Swyer Syndrome, and 5-Alpha Reductase Deficiency

(5-ARD) in which a person with X and Y chromosomes has a feminine looking body until reaching puberty, after which their body begins to take on a masculine appearance. Interestingly, field studies of 5-ARD find even though parents often assign and raise these children as girls, once puberty is reached nearly all develop male sexual identities (Gray, McHale, and Carré 2016). In total, perhaps as many as 1.7% of all humans have an intersexual condition (Fausto-Sterling 2000). So, discrete sexual categories can be scientifically problematic, even for something as seemingly simple as male/female sexual identity.

Another challenge with defining sexual identities is most expressions of human sexuality fail to fall along one, simple dimension (let alone category). For instance, most sexual scientists view human sexual orientation as varying along at least two dimensions: androphilia (finding male bodies erotic) and gynephilia (finding female bodies erotic). It's true many people excel on only one of those dimensions, but many others (especially women) do not find only one sex erotically interesting (Lippa 2006; Chivers, Seto, and Blanchard 2007). Indeed, even a two-dimensional framework is probably too simplistic a conception of the structure and stability of sexual orientation (Klein, Sepekoff, and Wolf 1985; Bailey et al. 2016).

One response to the complex definitional problems of sexual diversity is to think about sex and gender as stemming from a series of interconnected, dimensional *sex/gender dials* (instead of just a few independent, categorical switches). So, rather than thinking about men/women as categorically different (or different along one all-encompassing gender dimension of masculinity versus femininity), sex differences can be thought of as resulting from many different evolved sexual components (or context-sensitive psychological adaptations; Schmitt and Pilcher 2004). Each of these sex/gender dials may be designed so as to turn up or down (individually, or in combinations) depending on one's genetics (autosomal and allosomal),

organizational hormone effects *in utero*, activational hormone effects at puberty, current hormone levels, current relationship status, self-perceived mate value, political and religious ideology, and a wide range of other developmental, social, and cultural factors (see Pirlott and Schmitt 2014).

As an example, one potential source of evolved sex/gender dials moving up and down is the degree of prenatal androgen exposure. According to the *organizational hypothesis,* a key cause of sexual differentiation is the prenatal experience (or lack thereof) of androgen-related brain masculinization (Baron-Cohen 2004). In humans, a critical gestational period exists during the second trimester during which male brains, but typically not female brains, are permanently altered in function and structure in ways producing masculinized psychological traits (e.g., personalities, cognitive abilities, play preferences). Prenatal androgen exposure is not a switch, however, it is a series of events over time that tend to turn the psychology of human males, to varying degrees depending on timing and intensity, in the male-typical direction.

Confirmatory evidence supporting organizational effects on sexual psychology is limited, but it arises from several sources (Hines 2010). For instance, CAH girls prenatally exposed to male-typical levels of androgens (compared to their unaffected sisters) express more male-typical psychology (Udry, Morris, and Kovenock 1995; Alexander, Wilcox, and Farmer 2009). This is true despite direct and intense feminine gender role socialization of CAH girls (Udry 2000; Pasterski et al. 2005), though additional confounding factors may exist (Jordan-Young 2012). Girls with male cotwins also show some evidence of masculinization (Vuoksimaa et al. 2010), and the amount of prenatal androgen exposure within *normal* levels also predicts sex differentiated psychology in girls and boys (Cohen-Bendahan, van de Beek, and Berenbaum 2005; Hines 2006; Auyeung et al. 2009), often in a causally suggestive dose-dependent manner

(Nordenström et al. 2002). Infants exhibit sex-typical sex differences before extensive gender role socialization (Geary 2010; Alexander and Wilcox 2012), with many children exhibiting sex differences before they know what gender roles are or even what gender is (see Campbell, Shirley, and Candy 2004). Many experimental and observational studies of the neural and hormonal substrates of adult sexual identity, gender dysphoria, and transsexualism imply biological origins are behind men's and women's psychological differences (Udry 2000; Saraswat, Weinand, and Safer 2015; Olsson et al. 2016). Similarly, studies of nonhuman animals (including primates) implicate evolved origins for many sex differences in personality, cognition, and behavior (Gosling and John 1999; Alexander and Hines 2002; Hassett, Siebert, and Wallen 2008; Hines 2010). Sex-linked predispositions toward masculinity or femininity arising from prenatal experiences in no way imply men's and women's psychologies form a simple dichotomous binary, nor are such sex differences fixed and unchangeable after birth (Fausto-Sterling 2012).

Nevertheless, perhaps as a result of differential *in utero* exposure to testosterone (alongside many other factors that may generate sex differences in bodies and brains; Ingalhalikar et al. 2014; Cahill and Aswad 2015; Satterthwaite et al. 2015; Paus et al. 2017), when evolutionary researchers look around the world they find in all (or nearly all) cultures that men and women differ, on average and to varying degrees, across a wide variety of physical and behavioral characteristics (Ellis 2011; Schmitt 2015). Figure 1 displays 10 types of sex/gender dials that appear to reliably produce sex differences in nearly all human cultures, including the following:

1. *Physical Traits* (e.g., height, upper-body strength, pubertal timing, vocal tone and pitch, facial structure, hirsuteness, waist-to-hip ratios; Puts, Jones, and DeBruine 2012)
2. *Mental Abilities* (e.g., mental rotation and systematizing versus mental location and verbal ability; Lippa, Collaer, and Peters 2010)
3. *Mate Preferences* (e.g., facial and bodily cues found most attractive; fertility and youth cues versus status and older age as preferred in mate choice; Schmitt 2014)
4. *Sexual Desires* (e.g., sex drive, paraphilias, and interest in casual/short-term sex versus sexual fluidity and preference for long-term mating; Baumeister, Catanese, and Vohs 2001)
5. *Personal Values* (e.g., power, stimulation, hedonism, achievement versus benevolence, universalism; Schwartz and Rubel-Lifschitz 2009)
6. *Occupational Interests* (e.g., things/realistic/investigative versus people/artistic/social professions; Lippa 2010)
7. *Social Interests* (e.g., stick toys and competitive sports versus doll toys and domestic interests; Deaner and Smith 2013)
8. *Social Behaviors* (e.g., rough-tumble play, physical aggression, risk-taking versus compliance and conformity; Archer 2009)
9. *Mental Health* (e.g., psychopathy, ADHD, and mental retardation versus depression, anxiety, dependence-related disorders; Hyde, Mezulis, and Abramson 2008)
10. *Personality Traits* (e.g., neuroticism, agreeableness; there is less than 10% overlap in men's and women's overall personalities; Del Giudice, Booth, and Irwing 2012)

From an evolutionary perspective, each sex/gender dial presented in figure 1 is an oversimplification of the many evolved psychological adaptations—and the developmental experiences to which they are especially sensitive—that generate culturally pervasive sex differences. Still, as a first step toward understanding sex/gender varieties, it is critical to think beyond categories, beyond singular dimensions, and beyond dichotomous/binary causes of variation along those dimensions.

Especially enlightening will be how sexual scientists track evidence regarding the dynamic confluence of developmentally timed and domain-specific causes of sex/gender variations (Savic, Garcia-Falgueras, and Swaab 2010; Fausto-Sterling, Garcia Coll, and Lamarre 2012). For instance, the sex/gender dial for masculine "rough and tumble play" preference may be turned up or down by prenatal androgen exposure at a particular week of *in utero* development, whereas masculine "mental rotation abilities" are influenced by varying levels of prenatal androgen exposure during a different week of development (or activationally during puberty; Saxton 2015). Sex differences in vocal pitch and grip strength are extremely large (with very little overlap), but clearly these sex differences are not present at birth and fully emerge only after puberty (Puts et al. 2016). Evolutionary selection pressures may have designed many sex differences to adaptively emerge across a cascading series of developmental stages, each dial turning a little bit up or down at key times, given key experiences.

Undoubtedly, some master-dials exist and affect many other dials (e.g., both rough and tumble play and mental rotation, both vocal pitch and grip strength), and some dials may have antagonistic effects on other dials (i.e., more masculinity along one dial may cause less masculinity along another dial). Moreover, sex/gender movement along dials at one time might affect subsequent sexuality, both of which may depend on other direct genetic and activational

effects. The evolved systems of sex/gender development are likely to be incredibly dynamic and complex (Kenrick, Li, and Butner 2003; Fausto-Sterling, Garcia Coll, and Lamarre 2012), and many dials (rather than a few switches) are, in my view, a useful theoretical perch for understanding how and why we exhibit such a variety of sex/gender expressions within individuals, between the sexes, and around the world (see also Diamond 2006; van Anders 2015).

A sex/gender as dials (not switches) perspective may be quite useful for understanding features of transsexuality. Accumulating evidence suggests some (but not all) male-to-female transsexuals show signs of their sex/gender dials being turned toward feminine psychological and physical traits *before* transitioning (Zucker et al. 2016). That doesn't mean male-to-female transsexuals have women-typical psychology along *every* dimension (Veale, Clarke, and Lomax 2008), neither do nontranssexual cisgender women. Instead, many male-to-female transsexuals have had some of their sex/gender dials (including in their brains) (Guillamon, Junque, and Gómez-Gil 2016; Zucker et al. 2016) turned toward female-typical/feminine psychology, and which ones at which times may be especially informative regarding the causal origins of their (and everyone's) sexual identity expression. Female-to-male transsexuals also show signs of male-typicality before transitional treatments, including brain differences (Kreukels and Guillamon 2016) and body builds, such as bone proportions and fat distribution (Bosinski et al. 1997). Reviewing the extant literature on preexisting brain differences, Kreukels and Guillamon (2016) concluded that "brain phenotypes for FtM and MtF seem to exist, and provided evidence for the role of prenatal organization of the brain in the development of gender incongruence" (125).

The sex/gender as dials (not switches) view suggests for most people their sexual psychology, including their identity, may not be entirely "male" or "female" but very likely something in between. As many other cultures have done, modern societies need to make greater room for a wider, dial-based variety of sex/gender expressions. A person may be born male but consider herself primarily a woman in terms of sexual identity, androgynous in gendered identity (e.g., equally prefers masculine and feminine interests/activities), gynephilic in sexual orientation (i.e., is a self-identified lesbian), polyamorous in mating orientation, and so forth. Her sex/gender dials may not be aligned in a cisgender manner, but her sex/gender expressions may be entirely consistent with the causal biological origins and dynamic developmental processes giving rise to sex/gender in all people. Even if they weren't, however, that would not make her sexual rights illegitimate. It's dangerous ground to have our sexual rights depend on our sexuality having a naturalistic origin (Bailey et al. 2016; Diamond and Rosky 2016).

Some researchers mistakenly claim evolution does not apply to human sexual psychology because men and women do not have any evolved nature (Butler 1990), or because male and female psychologies do not form totally separate binaries (e.g., Joel et al. 2015). Put simply, that is not how sexual selection processes and the evolution of sex difference adaptations work in the natural world (Buss 1995; Del Giudice et al. 2016). Just because not all men are taller than all women does not imply sex differences in height are not important, evolved, or "real" (Gaulin and Boster 1992). Nor does finding sex differences in height are not present at birth, or are not fully mediated by sex differences in testosterone levels, or systematically vary in size across cultures—the list of misconceptions about the evolutionary origins of sex/gender differences is long (Buss and Schmitt 2011; Schmitt et al. 2012; Schmitt 2015;). Yes, evolutionary selection pressures may lead male sexual identity to generally coalign with other expressions of

masculinity (e.g., a deeper voice, Puts et al. 2016; a stronger sex drive, Baumeister, Catanese, and Vohs 2001; more interest in competitive team sports; Deaner and Smith 2013), but evolution in sexually reproducing species produces variation along many sex/gender dials (due, for instance, to sexually antagonistic selection pressures; Stearns et al. 2012; Stulp et al. 2012). Sex/gender dials do not all need to be turned "all the way up to 11" for evolution to play a role in producing human sexual diversity.

Understanding sex and gender as interconnected, dimensional dials is completely consistent with evolutionary psychology. From an adaptationist perspective, it is extremely unlikely there is one "gender switch" adaptation invariably giving rise to essentialist, determined, and dichotomous male and female psychologies. Such a portrait is a straw man view of evolutionary psychology. Rather, dozens (perhaps hundreds) of evolved sexuality adaptations likely exist, each turning the sex/gender dials of men and women in oblique, context-sensitive ways, each contributing a small part in generating the endless forms most beautiful and most wonderful of the sex/gender variations observed in our species.

Portions of this essay were previously published as a blog post: https://www.psychologytoday.com/blog/sexual-personalities/201605/sex-and-gender-are-dials-not-switches (retrieved December 2, 2016).

Works Cited

Alexander, Gerianne M., and Melissa Hines. 2002. "Sex Differences in Response to Children's Toys in Nonhuman Primates (*Cercopithecus Aethiops Sabaeus*)." *Evolution and Human Behavior* 23 (6): 467–79. doi:10.1016/S1090-5138(02)00107-1.

Alexander, Gerianne M., and Teresa Wilcox. 2012. "Sex Differences in Early Infancy." *Child Development Perspectives* 6 (4): 400–406. doi:10.1111/j.1750-8606.2012.00247.x.

Alexander, Gerianne M., Teresa Wilcox, and Mary Elizabeth Farmer. 2009. "Hormone–Behavior Associations in Early Infancy." *Hormones and Behavior* 56 (5): 498–502. doi:10.1016/j.yhbeh.2009.08.003

Archer, John. 2009. "Does Sexual Selection Explain Human Sex Differences in Aggression?" *Behavioral and Brain Sciences* 32 (3–4): 249–66.

Auyeung, Bonnie, Simon Baron-Cohen, Emma Ashwin, Rebecca Knickmeyer, Kevin Taylor, Gerald Hackett, and Melissa Hines. 2009. "Fetal Testosterone Predicts Sexually Differentiated Childhood Behavior in Girls and in Boys." *Psychological Science* 20 (2): 144–48. doi:10.1111/j.1467-9280.2009.02279.x.

Bailey, J. Michael, Paul L. Vasey, Lisa M. Diamond, S. Marc Breedlove, Eric Vilain, and Marc Epprecht. 2016. "Sexual Orientation, Controversy, and Science." *Psychological Science in the Public Interest* 17 (2): 45–101. doi:10.1177/1529100616637616.

Baron-Cohen, Simon. 2004. *Essential Difference: Male and Female Brains and the Truth about Autism*. **CITY?** Basic Books.

Baumeister, Roy F., Kathleen R. Catanese, and Kathleen D. Vohs. 2001. "Is There a Gender Difference in Strength of Sex Drive? Theoretical Views, Conceptual Distinctions, and a Review of Relevant Evidence." *Personality and Social Psychology Review* 5 (3): 242–73. doi:10.1207/S15327957PSPR0503_5.

Bosinski, Hartmut A. G., Inge Schröder, Michael Peter, Reinhard Arndt, Reinhard Wille, and Wolfgang G. Sippell. 1997. "Anthropometrical Measurements and Androgen Levels in

Males, Females, and Hormonally Untreated Female-to-Male Transsexuals." *Archives of Sexual Behavior* 26 (2): 143–57. doi:10.1023/A:1024506427497

Buss, David M. 1995. "Psychological Sex Differences: Origins through Sexual Selection." **JOURNAL?** 50 (1): 164–68. doi:10.1037/0003-066x.50.3.164.

Butler, Judith. 1990. "Gender Trouble and the Subversion of Identity." *New York et Londres: Routledge*.

Cahill, Larry, and Dana Aswad. 2015. "Sex Influences on the Brain: An Issue Whose Time Has Come." *Neuron* 88 (6): 1084–85. doi:10.1016/j.neuron.2015.11.021.

Campbell, Anne, Louisa Shirley, and Julia Candy. 2004. "A Longitudinal Study of Gender-Related Cognition and Behaviour." *Developmental Science* 7 (1): 1–9. doi:10.1111/j.1467-7687.2004.00316.x.

Chivers, Meredith L., Michael C. Seto, and Ray Blanchard. 2007. "Gender and Sexual Orientation Differences in Sexual Response to Sexual Activities versus Gender of Actors in Sexual Films." *Journal of Personality and Social Psychology* 93 (6): 1108–21. doi:10.1037/0022-3514.93.6.1108.

Cohen-Bendahan, Celina C. C., Cornelieke van de Beek, and Sheri A. Berenbaum. 2005. "Prenatal Sex Hormone Effects on Child and Adult Sex-Typed Behavior: Methods and Findings." *Neuroscience & Biobehavioral Reviews* 29 (2): 353–84. doi:10.1016/j.neubiorev.2004.11.004.

Deaner, Robert O., and Brandt A. Smith. 2013. "Sex Differences in Sports across 50 Societies." *Cross-Cultural Research* 47 (3): 268–309. doi:10.1177/1069397112463687.

Del Giudice, Marco, Tom Booth, and Paul Irwing. 2012. "The Distance between Mars and Venus: Measuring Global Sex Differences in Personality." *PloS one* 7 (1): e29265. doi:10.1371/journal.pone.0029265.

Del Giudice, Marco, Richard A. Lippa, David A. Puts, Drew H. Bailey, J. Michael Bailey, and David P. Schmitt. 2016. "Joel et Al.'s Method Systematically Fails to Detect Large, Consistent Sex Differences." *Proceedings of the National Academy of Sciences USA* 113 (14): E1965-E1965. doi:10.1073/pnas.1525534113.

Diamond, Lisa M., and Clifford J. Rosky. 2016. "Scrutinizing Immutability: Research on Sexual Orientation and US Legal Advocacy for Sexual Minorities." *Journal of Sex Research* 53 (4–5): 363–91. doi:10.1080/00224499.2016.1139665.

Diamond, Milton. 2006. "Biased-Interaction Theory of Psychosexual Development: 'How Does One Know if One Is Male or Female?'" *Sex Roles* 55 (9–10): 589–600. doi:10.1007/s11199-006-9115-y.

Dreger, Alice Domurat. 2000. *Hermaphrodites and the Medical Invention of Sex*. Cambridge, MA: Harvard University Press.

Eagly, Alice H., and Wendy Wood. 2013. "The Nature–Nurture Debates 25 Years of Challenges in Understanding the Psychology of Gender." *Perspectives on Psychological Science* 8 (3): 340–57. doi:10.1177/1745691613484767

Ellis, Lee. 2011. "Identifying and Explaining Apparent Universal Sex Differences in Cognition and Behavior." *Personality and Individual Differences* 51 (5): 552–61. doi:10.1016/j.paid.2011.04.004.

Fausto-Sterling, Anne. 2000. *Sexing the Body: Gender Politics and the Construction of Sexuality*. **CITY?** Basic Books.

———. 2012. *Sex/Gender: Biology in a Social World*. CITY? Routledge.

Fausto-Sterling, Anne, Cynthia Garcia Coll, and Meaghan Lamarre. 2012. "Sexing the Baby: Part 2—Applying Dynamic Systems Theory to the Emergences of Sex-Related Differences in Infants and Toddlers." *Social science & medicine* 74 (11): 1693–1702. doi:10.1016/j.socscimed.2011.06.027.

Gaulin, Steven J. C., and James S. Boster. 1992. "Human Marriage Systems and Sexual Dimorphism in Stature." *American Journal of Physical Anthropology* 89 (4): 467–75. doi:10.1002/ajpa.1330890408.

Geary, D. C. 2010. *Male, Female: The Evolution of Human Sex Differences.* CITY? American Psychological Association.

Gosling, Samuel D., and Oliver P. John. 1999. "Personality Dimensions in Nonhuman Animals: A Cross-Species Review." *Current Directions in Psychological Science* 8 (3): 69–75. doi:10.1111/1467-8721.00017.

Gray, Peter B., Timothy S. McHale, and Justin M. Carré. 2016. "A Review of Human Male Field Studies of Hormones and Behavioral Reproductive Effort." *Hormones and Behavior*. VOL? PAGES? doi:10.1016/j.yhbeh.2016.07.004.

Guillamon, Antonio, Carme Junque, and Esther Gómez-Gil. 2016. "A Review of the Status of Brain Structure Research in Transsexualism." *Archives of Sexual Behavior* VOL? 1–34. doi:10.1007/s10508-016-0768-5.

Hassett, Janice M., Erin R. Siebert, and Kim Wallen. 2008. "Sex Differences in Rhesus Monkey Toy Preferences Parallel Those of Children." *Hormones and Behavior* 54 (3): 359–64. doi:10.1016/j.yhbeh.2008.03.008.

Hines, Melissa. 2006. “Prenatal Testosterone and Gender-Related Behaviour.” *European Journal of Endocrinology* 155 (1): S115–S121. doi:10.1530/eje.1.02236.

———. 2010. “Sex-Related Variation in Human Behavior and the Brain.” *Trends in Cognitive Sciences* 14 (10): 448–56. doi:10.1016/j.tics.2010.07.005

Hyde, Janet Shibley, Amy H. Mezulis, and Lyn Y. Abramson. 2008. “The ABCs of Depression: Integrating Affective, Biological, and Cognitive Models to Explain the Emergence of the Gender Difference in Depression.” *Psychological Review* 115 (2): 291–313. doi:10.1037/0033-295X.115.2.291.

Ingalhalikar, Madhura, Alex Smith, Drew Parker, Theodore D. Satterthwaite, Mark A. Elliott, Kosha Ruparel, Hakon Hakonarson, Raquel E. Gur, Ruben C. Gur, and Ragini Verma. 2014. “Sex Differences in the Structural Connectome of the Human Brain.” *Proceedings of the National Academy of Sciences USA* 111 (2): 823–28. doi:10.1073/pnas.1316909110.

Joel, Daphna, Zohar Berman, Ido Tavor, Nadav Wexler, Olga Gaber, Yaniv Stein, Nisan Shefi et al. 2015. “Sex beyond the Genitalia: The Human Brain Mosaic.” *Proceedings of the National Academy of Sciences USA* 112 (50): 15468–73. doi:10.1073/pnas.1509654112.

Jordan-Young, Rebecca M. 2012. “Hormones, Context, and ‘Brain Gender’: A Review of Evidence from Congenital Adrenal Hyperplasia.” *Social Science & Medicine* 74 (11): 1738–44. doi:10.1016/j.socscimed.2011.08.026.

Kenrick, Douglas T., Norman P. Li, and Jonathan Butner. 2003. “Dynamical Evolutionary Psychology: Individual Decision Rules and Emergent Social Norms.” *Psychological Review* 110 (1): 3–28. doi:10.1037/0033-295X.110.1.3.

Kinsey, Alfred C., Wardell B. Pomeroy, and Clyde E. Martin. 1948. *Sexual Behavior in the Human Male*. Philadelphia: W. B. Saunders.

Klein, Fritz, Barry Sepekoff, and Timothy J. Wolf. 1985. "Sexual Orientation: A Multi-Variable Dynamic Process." *Journal of Homosexuality* 11 (1–2): 35–49. doi:10.1300/J082v11n01_04.

Kreukels, Baudewijntje P. C., and Antonio Guillamon. 2016. "Neuroimaging Studies in People with Gender Incongruence." *International Review of Psychiatry* 28 (1): 120–28. doi:10.3109/09540261.2015.1113163.

Lippa, Richard A. 2006. "Is High Sex Drive Associated with Increased Sexual Attraction to BothSexes? It Depends on Whether You Are Male or Female." *Psychological Science* 17 (1): 46–52. doi:10.1111/j.1467-9280.2005.01663.x.

———. 2010. "Sex Differences in Personality Traits and Gender-Related Occupational Preferences across 53 Nations: Testing Evolutionary and Social-Environmental Theories." *Archives of Sexual Behavior* 39 (3): 619–36.

Lippa, Richard A., Marcia L. Collaer, and Michael Peters. 2010. "Sex Differences in Mental Rotation and Line Angle Judgments Are Positively Associated with Gender Equality and Economic Development across 53 Nations." *Archives of Sexual Behavior* 39 (4): 990–97.

Maney, Donna L. 2016. "Perils and Pitfalls of Reporting Sex Differences." *Philosophical Transactions of the Royal Society B: Biological Sciences* 371 (1688): 20150119. doi:10.1098/rstb.2015.0119.

Nordenström, Anna, Anna Servin, Gunilla Bohlin, Agne Larsson, and Anna Wedell. 2002. "Sex-Typed Toy Play Behavior Correlates with the Degree of Prenatal Androgen Exposure

Assessed by CYP21 Genotype in Girls with Congenital Adrenal Hyperplasia." *Journal of Clinical Endocrinology & Metabolism* 87 (11): 5119–24. doi:10.1210/jc.2001-011531.

Olsson, Andreas, Eleni Kopsida, Kimmo Sorjonen, and Ivanka Savic. 2016. "Testosterone and Estrogen Impact Social Evaluations and Vicarious Emotions: A Double-Blind Placebo-Controlled Study." *Emotion* 16 (4): 515. doi:10.1037/a0039765

Pasterski, Vickie L., Mitchell E. Geffner, Caroline Brain, Peter Hindmarsh, Charles Brook, and Melissa Hines. 2005. "Prenatal Hormones and Postnatal Socialization by Parents as Determinants of Male-Typical Toy Play in Girls with Congenital Adrenal Hyperplasia." *Child Development* 76 (1): 264–78.

Paus, Tomáš, Angelita Pui-Yee Wong, Catriona Syme, and Zdenka Pausova. 2017. "Sex Differences in the Adolescent Brain and Body: Findings from the Saguenay Youth Study." *Journal of Neuroscience Research* 95 (1–2): 362–70. doi:10.1002/jnr.23825.

Pirlott, Angela G., and David P. Schmitt. 2014. "Gendered Sexual Cultures." In *New Directions in the Psychology of Culture*, edited by A. Cohen, 191–216. Washington, DC: American Psychological Association Books. doi:10.1037/14274-007

Puts, David A., Alexander K. Hill, Drew H. Bailey, Robert S. Walker, Drew Rendall, John R. Wheatley, Lisa L. M. Welling et al. 2016. "Sexual Selection on Male Vocal Fundamental Frequency in Humans and Other Anthropoids." *Proceedings of the Royal Society B: Biological Sciences* 283 (1829): 20152830. doi:10.1098/rspb.2015.2830.

Puts, David A., Benedict C. Jones, and Lisa M. DeBruine. 2012. "Sexual Selection on Human Faces and Voices." *Journal of Sex Research* 49 (2–3): 227–43.

Richardson, Sarah S. 2013. *Sex Itself: The Search for Male and Female in the Human Genome*. Chicago: University of Chicago Press.

Saraswat, Aruna, Jamie Weinand, and Joshua Safer. 2015. "Evidence Supporting the Biologic Nature of Gender Identity." *Endocrine Practice* 21 (2): 199–204. doi:10.4158/EP14351.RA.

Satterthwaite, Theodore D., Daniel H. Wolf, David R. Roalf, Kosha Ruparel, Guray Erus, Simon Vandekar, Efstathios D. Gennatas et al. 2015. "Linked Sex Differences in Cognition and Functional Connectivity in Youth." *Cerebral Cortex* 25 (9): 2383–94. doi:10.1093/cercor/bhu036.

Savic, Ivanka, Alicia Garcia-Falgueras, and Dick F. Swaab. 2010. "Sexual Differentiation of the Human Brain in Relation to Gender Identity and Sexual Orientation." *Progress in Brain Research* 186:41–62. doi:10.1016/B978-0-444-53630-3.00004-X.

Saxton, Tamsin K. 2015. "Experiences during Specific Developmental Stages Influence Face Preferences." *Evolution and Human Behavior* 37 (1): 21–28. doi:10.1016/j.evolhumbehav.2015.06.001.

Schmitt, David P. 2014. "Evaluating Evidence of Mate Preference Adaptations: How Do We Really Know What *Homo sapiens sapiens* Really Want?" In *Evolutionary Perspectives on Human Sexual Psychology and Behavior*, edited by Viviana A. Weekes-Shackelford and Todd K. Shackelford, 3–39. New York: Springer.

———. 2015. "The Evolution of Culturally-Variable Sex Differences: Men and Women Are Not Always Different, but When They Are … It Appears Not to Result from Patriarchy or Sex Role Socialization." In *The Evolution of Sexuality*, edited by Viviana A. Weekes-Shackelford and Todd K. Shackelford , 221–56. **CITY?** Springer. doi:10.1007/978-3-319-09384-0_11.

Schmitt, David P., Peter K. Jonason, Garrett J. Byerley, Sandy D. Flores, Brittany E. Illbeck, Kimberly N. O'Leary, and Ayesha Qudrat. 2012. "A Reexamination of Sex Differences in Sexuality New Studies Reveal Old Truths." *Current Directions in Psychological Science* 21 (2): 135–39. doi:10.1177/0963721412436808.

Schmitt, David P., and June J. Pilcher. 2004. "Evaluating Evidence of Psychological Adaptation: How Do We Know One When We See One?" *Psychological Science* 15 (10): 643–49. doi:10.1111/j.0956-7976.2004.00734.x.

Schwartz, Shalom H., and Tammy Rubel-Lifschitz. 2009. "Cross-National Variation in the Size of Sex Differences in Values: Effects of Gender Equality." *Journal of Personality and Social Psychology* 97 (1): 171–85.

Stearns, Stephen C., Diddahally R. Govindaraju, Douglas Ewbank, and Sean G. Byars. 2012. "Constraints on the Coevolution of Contemporary Human Males and Females." *Proceedings of the Royal Society of London B: Biological Sciences* 279 (1748): 4836–44. doi:10.1098/rspb.2012.2024.

Stulp, Gert, Bram Kuijper, Abraham P. Buunk, Thomas V. Pollet, and Simon Verhulst. 2012. "Intralocus Sexual Conflict over Human Height." *Biology Letters*: rsbl20120590.

Udry, J. Richard. 2000. "Biological Limits of Gender Construction." *American Sociological Review* 65:443–57. doi:10.2307/2657466.

Udry, J. Richard, Naomi M. Morris, and Judith Kovenock. 1995. "Androgen Effects on Women's Gendered Behaviour." *Journal of Biosocial Science* 27 (3): 359–68. doi:10.1017/s0021932000022884.

Van Anders, Sari M. 2015. “Beyond Sexual Orientation: Integrating Gender/Sex and Diverse Sexualities via Sexual Configurations Theory.” *Archives of Sexual Behavior* 44 (5): 1177–1213. doi:10.1007/s10508-015-0490-8.

Veale, Jaimie F., Dave E. Clarke, and Terri C. Lomax. 2008. “Sexuality of Male-to-Female Transsexuals.” *Archives of Sexual Behavior* 37 (4): 586–97. doi:10.1007/s10508-007-9306-9.

Vuoksimaa, Eero, Jaakko Kaprio, William S. Kremen, Laura Hokkanen, Richard J. Viken, Annamari Tuulio-Henriksson, and Richard J. Rose. 2010. “Having a Male Co-Twin Masculinizes Mental Rotation Performance in Females.” *Psychological Science* 21 (8): 1069–71. doi:10.1177/0956797610376075

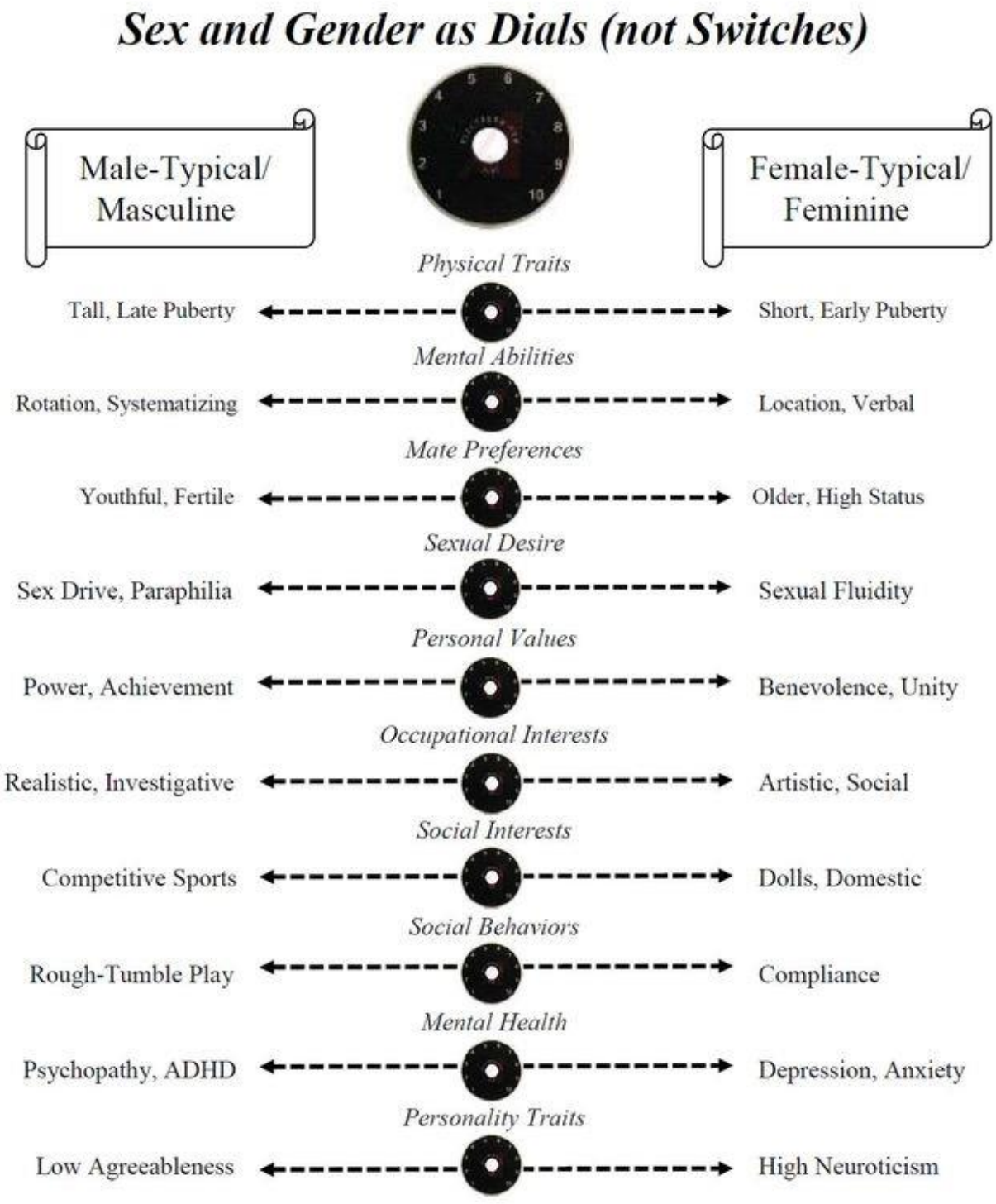

Figure 1. Sex and Gender as Dials (Not Switches)