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Daphna Joel

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## Uncovering and Challenging the Binary Framework

Daphna Joel

School of Psychological Sciences and Sagol School of Neuroscience, Tel-Aviv University, Tel-Aviv, Israel

In their article, “Understanding the Developmental Roots of Gender Gaps in Politics,” Heck, Santhanagopalan, Cimpian, and Kinzler (2021) describe how gender stereotypes affect the choices of girls and women throughout life, leading eventually to the gender gap in STEM and politics. They list the contents of gender stereotypes in the two domains, explain how these may be related to later gender gaps, and suggest possible interventions to counteract the effects of these stereotypes on children. I would like to add to this important discussion the need to recognize the binary belief that underlies gender stereotypes regardless of their specific content – the belief that girls and boys, or men and women, constitute two distinct ‘types’ of people. Examining and challenging the content of gender stereotypes in specific domains is an important endeavor in our quest for equal opportunities; deconstructing the underlying binary belief will contribute greatly to this quest by reducing the impact of all gender stereotypes.

The binary framework runs behind, above, and beyond all discussions of gender differences. It is the often-implicit assumption that the binary division into female and male extends beyond the genitalia to other domains, such as abilities, preferences, and behaviors. The binary division of the genitalia into ‘female’ and ‘male’ relies on two facts (Joel, 2012): in most humans it is easy to identify each genital organ as female or male (e.g., clitoris versus penis, major labia versus scrotum), and most humans possess either only female genital organs or only male genital organs (Blackless et al., 2000). The binary framework is often applied to other domains, as revealed in phrases such as: “women (girls) are like this, and men (boys) are like that.” Such phrasing implies a binary distinction in specific traits (e.g., men are good at reading maps, women are lousy at reading maps) as well as across traits – men are characterized by having male-typical characteristics, and women are characterized by having female-typical characteristics.

The two assumptions do not hold true, however, when it comes to behaviors, attitudes, preferences and other gender characteristics – there are rarely distinct ‘female’ and ‘male’ scores for single gender characteristics, and humans rarely possess only female-typical or only male-typical characteristics. At the level of single gender characteristics, several reviews of meta-analyses of gender differences found that there is considerable overlap between women and men on most psychological variables (e.g., Hyde, 2005; Zell, Krizan,

& Teeter, 2015). Some overlap is observed even on the two variables showing the largest gender differences, namely, gender identity and sexual attraction (e.g., Jacobson & Joel, 2018, 2019; Joel, Tarrasch, Berman, Mukamel, & Ziv, 2014; Martin, Andrews, Ruble, England, & Zosuls, 2017). Thus, unlike genital organs, it is not easy to distinguish between a ‘female’ and a ‘male’ ‘form’ for single gender characteristics.

Also unlike genital organs, when several gender characteristics are considered together, they are rarely all in the same ‘form.’ Thus, already in 1936, Lewis Terman and Catharine Cox Miles noted that subscales of their masculinity-femininity questionnaire were poorly correlated, indicating that individuals could be masculine on some subscales and feminine on others (Terman & Cox-Miles, 1936). In 1993, Janet Spence, using a different questionnaire, obtained similar results and concluded that “men and women do not exhibit all of the attributes, interests, attitudes, roles and behaviors expected of their sex according to their society’s descriptive and prescriptive stereotypes but only some of them. They may also display some of the characteristics and behaviors associated with the other sex” (Spence, 1993, p. 633). These observations were recently corroborated by a large-scale study which found that most humans possess a ‘mosaic’ of feminine (i.e., more common in women compared to men) and masculine characteristics, and that this is true even when highly gender-stereotypical behaviors (such as watching porn and using cosmetics) are considered (Joel et al., 2015).

Studies of human brains reveal a similar picture. Although there are group-level differences between men and women in brain structure, most brains are composed of unique mosaics of brain features, some in a form more common in women compared to men, and some in a form more common in men compared to women (Joel et al., 2015, Joel, Garcia-Falgueras, & Swaab, 2020). Moreover, the brain architectures typical of women are also typical of men, and vice versa (Joel et al., 2018). In addition, although the brain architecture of an individual can be used to predict their sex category (female or male), sex category provides little information on an individual’s specific brain architecture or on how their brain is similar or different from someone else’s (Alon, Meilijson, & Joel, 2020; Joel et al., 2018, for a recent review of the binary formulations of the relations between sex and the brain and the challenges posed to them by the mosaic hypothesis, see Joel, 2021).

Whereas humans do not belong to two types in brain and behavior, gender as a social system imposes a binary division on many aspects of human lives, assigning different roles, status, and power to humans according to whether their genitalia are male or female. We describe elsewhere how the binary social system leads us to overlook others' unique mosaic, and perceive them instead as belonging to one of two distinct gender categories – women or men (girls or boys) (Joel & Vikhanski, 2019; Saguy, Reifen Tagar, & Joel, 2021). Here I would like to stress how the binary framework biases discussions of gender differences. It leads laypeople and scientists to apply the logic of the genitalia to gender differences in other domains, and interpret these differences as reflecting the existence of two types of humans, in terms of preferences, abilities and behaviors.

Importantly, the binary framework is not weakened by findings of similarities between women and men on particular traits, because the mere act of comparing between humans with female and male genitalia reinforces the notion that this division is meaningful. To appreciate this point, consider a world in which children would be repeatedly told that there are no differences between humans with blue and brown eyes. Would these children be persuaded that eye color is of no relevance, or would they strongly believe that eye color is an important social category? Children and adults do not pay attention to their eye color nor to statistics regarding the abilities, preferences and behaviors of people with different eye colors, not because many studies have failed to find differences between these groups, but because such differences, even if they exist, carry no social importance and therefore have no relevance to an individual's choices and decisions. Indeed, why should group level differences have any relevance for an individual's choices?

It follows that uncovering and refuting the binary assumption is of outmost importance for achieving equal opportunities for humans with male, female, and intersex genitalia (for several suggestions on how to achieve this, see Saguy et al., 2021; Joel & Vikhanski, 2019). This is because if children (and adults) realized that humans do not belong to two sets, then stereotypes regarding these non-existing groups would be less likely to affect their preferences, abilities and behaviors. As one of my children, 5 years old at the time, told me: "Some people are strange, they believe that boys don't like pink. But I'm a boy and I like pink."

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