

(Super-)cultural clustering explains gender differences too. Commentary on Uchiyama, Spicer, & Muthukrishna. Behavioural and Brain Sciences, 2022

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Summary: The target paper shows how cultural adaptations to ecological problems can underpin 'paradoxical' patterns of phenotypic variation. We argue: 1) Gendered social learning is a cultural adaptation to an ecological problem. 2) In evolutionarily novel environments, this adaptation generates arbitrary gendered outcomes, leading to the paradoxical case of larger sex differences in more gender equal societies.

Some cross-cultural datasets show that countries with the highest levels of legal and political gender equality also show the largest sex differences in diverse measures such as personality traits, mate choice preferences, and subject or career choice (e.g. Falk & Hermle, 2018). This 'paradoxical' finding has been taken as evidence that legal gender equality 'frees' women and men to express different, evolved, traits (Schmitt, 2015). We argue, instead, that this pattern is similar to the complex relationship between vitamin D, skin cancer risk, and latitude discussed in the target article: it all makes sense if you consider cultural evolution and its power to shape the phenotypic landscape more broadly.

Humans are a cooperatively breeding species inhabiting diverse ecological niches (Sear, 2016). For instance, forager groups differ in the proportion of both direct care (Kramer & Veile, 2018) and calories provided by fathers (Marlowe, 2001). They also vary in reliance on forms of subsistence which are less compatible with care for very young infants (e.g. open sea hunting; Marlowe, 2007). Furthermore, it is likely that humans have adopted diverse mating systems across our evolutionary history. As such, the ability to acquire gendered behaviour flexibly is likely essential.

Tight hormonal control of specific sex-typed behaviours is absent in humans. Instead, hormones such as testosterone (among other behavioural effects) appear to bias the process by which behaviour is acquired, by facilitating a tendency to copy the behaviour of own-gender groups (Hines, 2020). It's important to note that this apparent 'own-gender' bias can itself be understood as a more simple 'copy self-similar others' bias (Meltzoff, 2007; Wood et al., 2013), where children select those 'others' from amongst the available categories within their culture. It may also be reinforced by a tendency to copy one's playmates in societies where children are segregated by sex and/or gender (Wood et al., 2013).

Where the cultural learning of locally adaptive gendered behaviour guides individuals into one of a few niches, patterns of sex differences might be relatively easy to predict. Research on spatial cognition, for instance, has demonstrated that patterns of geographical mobility in hunting and trading may be responsible for adult sex differences in spatial cognition in some cultural contexts (Twe and Himba: Vashro et al., 2016) but not others (Tsimane: Trumble et al., 2016). When populations undergo changes, however, predicting the effects of these changes will be complex. While the introduction of schooling and concomitant reduced differences in mobility patterns amongst Twa children *reduced* sex differences in spatial cognition (Davis et al., 2021), long term

settlement in the Agta *increased* sex differences in child domestic labour (Page et al., 2021). Given that both of these changes could be thought of as making a population more 'WEIRD', we see here that predicting the effects of a construct such as 'development' or 'gender equality' on sex differences is complex.

Populations with high gender equality indices would mostly be characterised as 'WEIRD' societies in the target article. They represent very different ecologies from those we mention above. Consider industrialised labour markets; not only are gender roles less constrained by physiology than in foraging societies, but the number of roles and behavioural and social niches an individual can occupy is vast (Smaldino et al., 2019). The search for locally adaptive behaviour is less constrained and therefore more complex. Where decisions are difficult, social learning will play more of a role (Morgan et al., 2012) and choices may be arbitrary. We therefore expect individuals to be more influenced by factors such as gender in industrialised societies than in foraging and subsistence societies, even when those industrialised societies are relatively gender egalitarian (see Anker, 1998 for discussion of gendered labour in Nordic countries). The dramatic shift in computing from being a female profession to a male-dominated one in the US and UK (Abbate, 2017) illustrates that the association of gender with behaviour in such societies is malleable and can be arbitrary.

The target paper also argues that typical units of analysis for group comparison effects, such as nation states, or racial groups, are unlikely to capture the actual cultural clustering in a population. This is likewise true for studies of variation in sex differences. However, in addition to the possibility that lower-level clusters are critical, we note that industrialised countries exist within higher-level clusters created by shared media culture (TV, advertising, social media etc.). For instance, the outputs of film industries in Hollywood and Bollywood (which are highly gendered in both similar and different ways, e.g. Ghaznavi et al., 2017) are both consumed across large, sometimes overlapping, swathes of the global population.

Our proposition here is in some ways similar to Wood & Eagly's (2012) argument that a society's division of labour drives stereotypes and thereby children's learning. While the actual distribution of adult roles might be observable in small groups, however, children in industrialised nations likely have their perceptions of appropriate behaviours shaped more by visual media than by the social roles of the adults around them. We have already demonstrated that, during market integration, globalised media alter preference for sexually-relevant traits, reducing idealised female body and waist size (Boothroyd et al., 2020; Swami et al., 2010) even where ecological pressures such as nutritional stress should direct preferences in the opposite direction (Jucker et al., 2017). Given that high gender equality indices are associated with economic development, access to visual media (particularly advertising) might be at its most potent in shaping gendered preferences (Fisher & Jenson, 2017) when structural inequality is relatively small.

In other words, we support the claim in the target article that cultural clusters "explain intergroup differences better than genes do." By considering gender as a "self-organizing trajectory of environmental experience" like those described in the target article, we believe this insight can make sense of the 'paradoxical' relationship between gender equality indices and sex differences in behaviour and personality.

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References:

- Abbate, J. (2017). *Recoding gender: Women's changing participation in computing*. MIT Press Ltd.
- Anker, R. (1998). *Gender and jobs: Sex segregation of occupations in the world*. International Labour Office.
- Boothroyd, L. G., Jucker, J.-L., Thornborrow, T., Barton, R. A., Burt, D. M., Evans, E. H., Jamieson, M. A., & Tovée, M. J. (2020). Television consumption drives perceptions of female body attractiveness in a population undergoing technological transition. *Journal of Personality and Social Psychology*, *119*(4), 839–860. <https://doi.org/10.1037/pspi0000224>
- Davis, H. E., Stack, J., & Cashdan, E. (2021). Cultural Change Reduces Gender Differences in Mobility and Spatial Ability among Seminomadic Pastoralist-Forager Children in Northern Namibia. *Human Nature*, *32*(1), 178–206. <https://doi.org/10.1007/s12110-021-09388-7>
- Falk, A., & Hermle, J. (2018). Relationship of gender differences in preferences to economic development and gender equality. *Science*, *362*(6412), eaas9899. <https://doi.org/10.1126/science.aas9899>
- Fisher, S., & Jenson, J. (2017). Producing alternative gender orders: A critical look at girls and gaming. *Learning, Media and Technology*, *42*(1), 87–99. <https://doi.org/10.1080/17439884.2016.1132729>
- Ghaznavi, J., Grasso, K.L. & Taylor, L.D. (2017). Increasingly violent but still sexy: A decade of central female characters in top-grossing Hollywood and Bollywood film promotional material. *International Journal of Communication*, *11*, 23–47.
- Hines, M. (2020). Human gender development. *Neuroscience & Biobehavioral Reviews*, *118*, 89–96. <https://doi.org/10.1016/j.neubiorev.2020.07.018>
- Jucker, J.-L., Thornborrow, T., Beierholm, U., Burt, D. M., Barton, R. A., Evans, E. H., Jamieson, M. A., Tovée, M. J., & Boothroyd, L. G. (2017). Nutritional status and the influence of TV consumption on female body size ideals in populations recently exposed to the media. *Scientific Reports*, *7*(1). <https://doi.org/10.1038/s41598-017-08653-z>
- Kramer, K. L., & Veile, A. (2018). Infant allocare in traditional societies. *Physiology & Behavior*, *193*, 117–126. <https://doi.org/10.1016/j.physbeh.2018.02.054>
- Marlowe, F. (2001). Male Contribution to Diet and Female Reproductive Success among Foragers. *Current Anthropology*, *42*(5), 755–760. <https://doi.org/10.1086/323820>
- Marlowe, F. W. (2007). Hunting and Gathering: The Human Sexual Division of Foraging Labor. *Cross-Cultural Research*, *41*(2), 170–195. <https://doi.org/10.1177/1069397106297529>
- Meltzoff, A. N. (2007). 'Like me': A foundation for social cognition. *Developmental Science*, *10*(1), 126–134. <https://doi.org/10.1111/j.1467-7687.2007.00574.x>
- Morgan, T. J. H., Rendell, L. E., Ehn, M., Hoppitt, W., & Laland, K. N. (2012). The evolutionary basis of human social learning. *Proceedings of the Royal Society B: Biological Sciences*, *279*(1729), 653–662. <https://doi.org/10.1098/rspb.2011.1172>
- Page, A. Hassan, A., Viguier, S., Dyble, M., Smith, D. & Migliano, A. (2021, March 26). *Livelihood diversity and childcare in a foraging population, the Agta of Palanan, Philippines*. Presented at the European Human Behaviour and Evolution Association, Krakow, Poland.
- Schmitt, D. P. (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 T. K. Shackelford & R. D. Hansen (Eds.), *The Evolution of Sexuality* (pp. 221–256). Springer International Publishing. https://doi.org/10.1007/978-3-319-09384-0_11
- Sear, R. (2016). Beyond the nuclear family: An evolutionary perspective on parenting. *Current Opinion in Psychology*, *7*, 98–103. <https://doi.org/10.1016/j.copsyc.2015.08.013>
- Smaldino, P. E., Lukaszewski, A., von Rueden, C., & Gurven, M. (2019). Niche diversity can explain cross-cultural differences in personality structure. *Nature Human Behaviour*, *3*(12), 1276–1283. <https://doi.org/10.1038/s41562-019-0730-3>
- Swami, V., Frederick, D. A., Aavik, T., Alcalay, L., Allik, J., Anderson, D., Andrianto, S., Arora, A., Brännström, Å., Cunningham, J., Danel, D., Doroszewicz, K., Forbes, G. B., Furnham, A., Greven, C. U., Halberstadt, J., Shuang Hao, Haubner, T., Choon Sup Hwang, ... Zivcic-Becirevic, I. (2010). The Attractive Female Body Weight and Female Body Dissatisfaction in 26 Countries Across 10 World Regions: Results of the International Body Project I. *Personality and Social Psychology Bulletin*, *36*(3), 309–325. <https://doi.org/10.1177/0146167209359702>
- Trumble, B. C., Gaulin, S. J. C., Dunbar, M. D., Kaplan, H., & Gurven, M. (2016). No Sex or Age Difference in Dead-Reckoning Ability among Tsimane Forager-Horticulturalists. *Human Nature*, *27*(1), 51–67. <https://doi.org/10.1007/s12110-015-9246-3>
- Vashro, L., Padilla, L., & Cashdan, E. (2016). Sex Differences in Mobility and Spatial Cognition: A Test of the Fertility and Parental Care Hypothesis in Northwestern Namibia. *Human Nature*, *27*(1), 16–34. <https://doi.org/10.1007/s12110-015-9247-2>
- Wood, L. A., Kendal, R. L., & Flynn, E. G. (2013). Whom do children copy? Model-based biases in social learning. *Developmental Review*, *33*(4), 341–356. <https://doi.org/10.1016/j.dr.2013.08.002>
- Wood, W., & Eagly, A. H. (2012). Biosocial Construction of Sex Differences and Similarities in Behavior. In *Advances in Experimental Social Psychology* (Vol. 46, pp. 55–123). Elsevier. <https://doi.org/10.1016/B978-0-12-394281-4.00002-7>