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Creating Future People: The Science and Ethics of Genetic Enhancement*

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If you were able to give your future children better than average odds at a productive and healthy life by screening and selecting embryos or editing genes for desirable physical and mental traits, would you do it? According to a 2023 survey, 34 % of Americans surveyed were "mostly willing" to use gene editing of embryos created through in vitro fertilization (IVF) to raise the likelihood that their offspring enters a "top-100 ranked college" and 43 % were also "mostly willing" to utilize embryo screening for genetic variants for high educational attainment (Meyer et al., 2023). Interestingly, people with "high educational attainment", a bachelor's degree or above, who presumably know something about trait heritability and genetics, tended to express greater likelihood of both gene editing and embryo screening than average but only by a few percentage points. This finding suggests that the majority of those with high educational attainment are fairly blasé about the future of their children and the kind of society they will create.

Americans, however, are fairly pragmatic compared to others who are less than enthusiastic about using gene editing for "enhancement" purposes. For example, among the Japanese general public, around 40 % of those surveyed agreed that gene editing of embryos for genetic diseases is appropriate (Kobayashi et al., 2022). However, only about 8 % agreed that gene editing should be allowed for couples to "have a child that possesses a specific desired trait," which would include (not stated in the survey) high cognitive ability.

Some have pointed out that relaxed natural selection, a result of modern medicine, agriculture and the welfare state, has led to accelerated accumulation of genetic mutations (Blau, 2023). Particularly concerning is the accumulation of mutations that affect brain functioning. Given below-replacement birth rates of the educated and accumulating mutations, it is not at all clear if future generations of humans in advanced societies will be able to expand the bounds of modern civilization or even maintain it. Although only between 10 % and 30 % of people favor embryo selection and gene editing for the purpose of genetic enhancement, perhaps this is sufficient to preserve civilization. But what kind of society will emerge from a population in which some people have been genetically enhanced and the majority remain non-enhanced?

Jonathan Anomaly considers the impact of genetic interventions by a few on the rest of society. Anomaly engages readers to consider the potential downstream social effects he has identified of utilizing gene editing and embryo selection for a range of physical and mental enhancement. The main questions Anomaly asks and attempts to address include (from *Preface*):

"Will parents left alone to make choices for their own private reasons solve the problem [of whether or not to genetically enhance]?"
"Will new laws or norms be needed to coordinate our actions?"
"What are the moral advantages of relying on free choice in comparison with different kinds of restrictions [such as social pressure or government imposed]?"

These questions and others arise, for example, in his examination of aesthetic enhancement. Physical appearance counts for something in Western consumerist society, as Anomaly points out. Tall or aesthetically pleasing people tend to make up the sociopolitical elite. Perhaps it will be possible to attain physical and aesthetic perfection through gene editing. If the technology is available and affordable, and if the choice to utilize gene therapy for aesthetic enhancement rested with parents, what might happen?

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Anomaly suggests that with aesthetic enhancement, the threshold or ideal would likely shift over time. He suggests a "red queen phenomenon" would arise (p. 61), in that one needs to run continuously just to stay in place. On one hand, beauty suggests general health, low parasitic and mutational load, and low oxidative stress (p. 58). Editing genes for beauty could change associated genes, for example those affecting intelligence (Dunkel et al., 2018). Anomaly also suggests that once a threshold is reached, it could be "fruitless", with respect to changes in associated genes as well as aesthetics, to attempt to go further (p. 64).

What would society in the future look like with an overabundance of beautiful people? (Or high-IQ people?) What will happen to those who were not genetically enhanced? Perhaps those who do not meet a threshold will face discrimination, or a future society will do what it can to accommodate the unenhanced. For example, society currently makes facilities accessible for the disabled and for most occupations, other than those based on aesthetics, applicants are (one hopes) judged on perceived competence.

In the case of aesthetic enhancement, individuals today pursue enhancement, chemically or surgically, to the extent they can afford it or tolerate it. As there appears to be no social benefit to enhancement beyond a basic level, perhaps it may be good to limit access to this kind of genetic enhancement. To impose legal restrictions would most likely mean those who are not wealthy and connected will be the ones excluded from access. At the same time open access to enhancement technology, while also subsidizing the cost for those who cannot afford it, means coercive taxation, by taxing those who do not plan to or want to use it. With respect to subsidizing potential costs, the required sums will be substantial, similar perhaps to those for gene therapy treatments (Wong et al., 2023). There are also issues of clearly identifying each and every contributor to enhancement technology and compensating those who hold the patents.[1]

Anomaly scrutinizes genetic enhancement of intelligence to the same degree as aesthetic enhancement. As with physical enhancements, there are significant tradeoffs at the individual and social levels. Having the government regulate access may lead to increased cognitive inequality.

In aggregate, as Anomaly points out, high-IQ countries have more wealth, higher social cooperation and trust, and less corruption than low-IQ countries. For individuals, high IQ predicts better average educational, occupational and health outcomes, more so than do other mental traits (p. 4). High-IQ people also tend to "support polices that reinforce political institutions that increase prosperity" (p. 7). Thus, thoughtful parents (the 10 % to 30 %) have good reasons to boost their children's IQ.

However, Anomaly points out, high IQ is associated with depression and traits such as sophistry, rationalization and political ideology which are heritable (p. 9, 26). Although innovative technologies may spring from high-IQ individuals, unscrupulous high-IQ individuals may use these technologies for personal gain at the expense of others. He cites Julian Savulescu's argument that we need to apply moral enhancement before venturing into cognitive enhancement. Furthermore, perhaps those with high IQ will look upon those with low IQ as people with reduced moral status. Those with high IQ will have greater opportunities to engage in society and at a higher level than those with low IQ. Therefore, goes the thinking, high-IQ people have higher moral status.[2] Anomaly suggests several possible solutions to avoid a potentially deep division between the enhanced and unenhanced. None of them are mutually exclusive, but they are likely to unleash further issues that, at the moment, appear to be intractable.

Because we know little about the downstream effects of enhancing IQ, one solution would be to not utilize gene editing and embryo selection at all; to ban it. However, seeing that it is becoming difficult even to maintain civilization at current levels, given the sub-replacement fertility of high-IQ people and high fertility rate of those with low IQ combined with generational accumulation of deleterious mutations, doing nothing is hardly an option. Thus, we owe it to the future to seriously reflect now on the issues Anomaly

[1] One could expect a similar level of "lawfare" between competing genetic enhancement companies that was seen between drug companies that developed and marketed COVID-19 vaccines. https://petrieflom.law.harvard.edu/2024/07/12/modernas-u-k-vaccine-patent-pledge-cut-short-by-boilerplate/; https://www.fiercepharma.com/pharma/gsk-takes-mrna-patent-fight-moderna-suing-over-vaccines-covid-rsv.

[2] The high IQ (cognitive elite) while pitying the low IQ cognitive underclass but not knowing what to do with them, will create a "custodial state," what Charles Murray and Richard Herrnstein characterized as a "high-tech and more lavish version of the Indian reservation," to keep them from "underfoot" as the rest of America goes about its business (Herrnstein & Murray, 1994).

raises, before gene editing and embryo selection technologies either mature or get outlawed before becoming truly useful.

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