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Fatal Flaws in the Twin Study Paradigm: A Reply to Hatemi and Verhulst

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In this reply I emphasize three points: Hatemi and Verhulst's (2013) failure to address the main argument regarding the fatal flaws in twin studies and their wrong framing of my article as focusing on gene-environment interaction; their critical concession to my argument about the inability of twin studies to test the most plausible alternative biological explanation to twin study results; and the conflation between environmental effects and genetic effects in the definition of the genetic factor in twin studies.

1 Avoiding the Alternative Biological Explanation to Twin Studies

In the second section of my article entitled "An Alternative Explanation to the Twin Studies," I propose a clear and simple alternative to the assumptions and interpretations of twin studies, classic models as well as extended ones. The alternative explanation is that individuals with identical genomes (e.g., MZ twins) react more similarly to the same particular environmental effects compared with individuals with nonidentical genomes (e.g., DZ twins), but the genomes do not determine the traits themselves and equally enable a wide range of possible reactions and phenotypic expressions for the exact same genome. As such, comparing MZ and DZ co-twins can neither prove nor refute that there are genetic effects shaping political behavior or attitudes. The remainder of my article then builds on this alternative biological explanation to illuminate the meaning of the results of twin studies and their other problems as well as how they relate to current puzzles in behavioral genetics. This alternative explanation is unfortunately not addressed in the authors' reply.

Hatemi and Verhulst lead their paper in the wrong direction following their opening statements: "In his essay, Doron Shultziner claims that the larger correlation between monozygotic (MZ), relative to dizygotic (DZ) twins, on political traits, is not due to MZ twins being more genetically similar, but is a result of MZ co-twins selecting into more similar environments, or responding to environments more comparably than DZ co-twins." *My argument is exactly the opposite*. I argue that the greater similarity among MZ twins *is simply because MZ co-twins are more genetically similar* than DZ co-twins *and therefore* this tells us nothing about the role of genes in shaping particular traits. I explicitly write, "The most logical explanation of the results of twin studies is that individuals with identical genomes (e.g., MZ twins) react more similarly to the same particular environmental effects compared with individuals with nonidentical genomes (e.g., DZ twins) under equivalent conditions." This point is very clear and is reiterated and interwoven in my other arguments about twin studies. Moreover, nowhere did I claim that the larger correlations between MZ twins are "a result of MZ co-twins selecting into more similar environments," as Hatemi and Verhulst note. In fact, I do not even discuss this argument in the article. The one thing that is partly correct in the authors' opening statement is the last sentence noting that I argue that this greater correlation is due to MZ twins "responding to environments more comparably than DZ co-twins." It is this last part that the authors neglect in their response.

Hatemi and Verhulst also argue that my explanation is "commonly referred to as gene-environment (GE) interplay." This framing of my argument is simply incorrect. Questions about

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assumed interactions between the genetic factor and the environment in twin studies are separate issues altogether from whether comparisons of MZ and DZ co-twins can reveal anything meaningful about the role of genes in shaping political behavior and attitudes. The authors raise second-order issues relative to the proposed alternative explanation. The problems and limitations of classic twin studies, and their more advanced extensions, can only be properly understood when considering this alternative biological explanation.

Hatemi and Verhulst argue that the explanation is not new. I consulted and carefully sought answers from a number of experienced geneticists and biologists in preparing this article. I did not find that this argument was raised before, in twin studies or elsewhere. Research revealed that this argument and alternative explanation is novel. The authors do not cite any paper that refutes the alternative explanation and null hypothesis that I propose.

2 Hatemi and Verhulst's Critical Concession

In my article, I argue that twin studies are unable to disclose dispositions for having a political trait. The authors respond by blaming me for criticizing twin studies for what they are "not designed or intended to examine" (appendix). They argue that the classic twin design "focuses on covariance and not causality" and that in twin studies "causality does not have the same meaning as is typically used in political science." In doing so, the authors contradict themselves and published work which explicitly states that twin studies prove there is a genetic cause for having certain political characteristics and not others ("political genotypes" that shape "political phenotypes") or what the authors themselves term as "main effects," that is, an indication or support for a *genetic cause* for having particular traits such as certain political behavior (e.g., voting) or political attitudes (e.g., liberal positions).

Furthermore, in acknowledging that twin studies cannot test whether individuals have a disposition for a certain trait, the authors make a critical concession that helps demonstrate my point. If they admit that twin studies cannot test whether the individuals tested can just as easily have opposite political traits, one must wonder what the twin studies do show. If the authors agree that twins, and individuals in general, can just as easily have opposite political traits for the same genotype, what can we learn from comparing pairs of twins? What do these results mean? The authors do not appear to see that the crucial issue is not the interaction of genes with the environment, but simply that MZ co-twins will always *tend to* respond more alike to similar environmental effects, compared to a parallel experiment with DZ co-twins. These obvious results cannot prove that there is a genetic basic for political traits, and no twin study model can solve this fatal logical flaw. In admitting that twin studies do not and cannot test this null hypothesis, the authors demonstrate my argument and the futility of twin studies in political science. Their lengthy reply about gene-environment interplay and measurements is irrelevant in this context.

3 Is There a Genetic Factor in Twin Studies?

I also argued that in twin studies "the genetic estimate itself actually consists of a total and complete conflation of an environmental effect on random genomes for which we know nothing about." Hatemi and Verhulst spend a good portion of their paper arguing that complete conflation is impossible, and only a maximum 0.7071 conflation is possible. Their simulations found that conflation is small and the results are still valid. I use this opportunity to recap my argument and to question the very definition of the genetic factor in twin studies.

It should be recalled that in most twin studies we know nothing about the genetic makeup of the twins involved, except for the different ratios of genetic similarity (by descent) between MZ (100%) and DZ (~50%) co-twins. This is insufficient genetic information to deduce meaningful conclusions about trait dispositions, let alone genetic political preferences. Furthermore, the genetic factor in twin studies is not actually genetic in the regular sense, such as specific genes or genetic structures. In twin studies the genetic factor is defined as *degrees of similarity in expressed traits* that are then compared to the different genetic ratios between MZ and DZ twins. This leads to distorted results because "the trait differences themselves are already affected by environmental factors that have not been separated" from genes. Namely, *the genetic factor is actually an environmental effect on pairs of*

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twins whose particular genomes we know nothing about. Measurement is primarily one of the expressed traits compared to genetic ratios, whereas the particular traits are already an outcome of the environment. I termed this nonexistent separation between genetic and environmental effects as a total and complete conflation in the *definition of the genetic factor in twin studies*.

4 Closing Remarks

Hatemi and Verhulst failed to address the main argument of my article regarding the fatal flaws in twin studies. They ignored the alternative biological explanation I presented that MZ co-twins will always tend to be more similar in all sorts of traits given their more similar genotypes compared to DZ co-twins, but this can neither prove nor refute the claim that political attitudes or behavior have a genetic cause. Hatemi and Verhulst misframed my article as criticizing the issue of gene-environment interaction, whereas my article dealt with a far more basic observation about a theoretical (not methodological) problem in twin studies. Hatemi and Verhulst strengthen my argument in conceding that twin studies cannot and are not meant to test the most plausible alternative explanation to twin study results that I raise. The conflation between environmental effects and genetic effects in the definition of the genetic factor are a resulting problem of the twin studies that should be stressed in light of the broader theoretical problem, and in relation to the missing heritability puzzle in genetics.

The method of comparing pairs of twins has become marginal in biology and genetics. Even the scholars who pioneered this method argue that there is no need for it anymore. The best research pertaining to twin studies today focuses on MZ co-twins who show different traits despite being brought up in the same environment. Such research has the potential to disclose epigenetic, environmental effects, and life experiences that, for example, cause sickness in one twin while the co-twin is unaffected (e.g., Silva et al. 2011; Miller 2012).

The willingness to accept explanations from the life sciences in political science is a new and positive development in my view. I have used biological and evolutionary theory in explaining complex political processes such as democratic progress (Shultziner 2010, Chapters 2–3) and in exploring political structures prior to sedentary life (Shultziner et al. 2010). Yet I find and worry that the new biopolitics or genopolitics literature is leading political science in a wrong direction. Hatemi and Verhulst believe that they are advancing the life sciences in political science, but in seeking the same goal one must be honest and warn otherwise.

References

Miller, Peter. 2012. A thing or two about twins. *National Geographic*. http://ngm.nationalgeographic.com/2012/01/twins/miller-text.

Silva, S., Y. Martins, A. Matias, and I. Blickstein. 2011. Why are monozygotic twins different? *Journal of Perinatal Medicine* 39(2):195–202.

Shultziner, Doron. 2010. *Struggling for recognition: The psychological impetus for democratic progress*. New York: Continuum Press.

Shultziner, D., T. Stevens, M. Stevens, B. A. Stewart, R. J. Hannagan, and G. Saltini-Semerari. 2010. The causes and scope of political egalitarianism during the Last Glacial: A multi-disciplinary perspective. *Biology & Philosophy* 25(3):319–46.

Verhulst, Brad, and Peter K. Hatemi. 2013. Gene-environment interplay in twin models. *Political Analysis* 21:368–89.

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