Not nature nor nurture: Doing good is in your genes, environment, and personality

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Background

Differential susceptibility hypothesis

Certain gene variants, characterized as **susceptibility variants,** make an individual more vulnerable to their environmental context

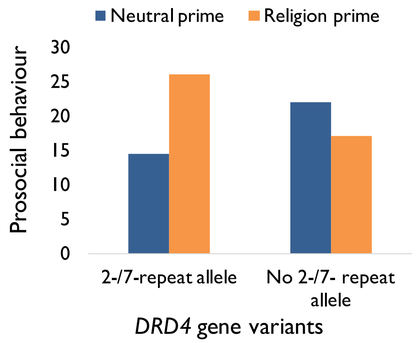

Figure 1: Religion prime increased prosocial behaviour for those with susceptibility variants (2-/7- repeat alleles), but not for those without the susceptibility variants. From Sasaki et al. (2013).

Gaps in the literature

- Inconsistent findings with respect to DA-related genes and pro- and anti- social behaviours
- Past research on the topic generally considers one gene at a time, assumes a one gene-one behaviour relationship: **inaccurate and low statistical power**

Research Goal

(1) How can a MGCS be used to predict individual differences in prosocial behaviour?
(2) How do factors like personality impact this gene-environment (GxE) interaction?

Abstract

The purpose of this review was to examine the literature on dopamine genes, genetic risk scores, prosocial behavior, and personality traits, and the relationship between them. Findings from both positive and negative GxE interaction studies support the validity of the differential susceptibility hypothesis as a framework for understanding variation in prosocial behaviour. Results also support a quantitative approach to behavioural genetics via a MGCS that reflects the additive contribution of individual dopamine gene variants. It was also found that this gene-environment interaction may be mediated by certain personality traits. Based on the literature, a dopamine-based MGCS scoring system was developed, and a proposed study is outlined. Overall, the results highlight the importance of considering the polygenic nature of complex behavioural traits in psychological research.

Methodology

Results

How to address inconsistent findings?

- More longitudinal studies
- Consider sex-specific gene expression and ethnic heterogeneity in samples
- **Consider influence of multiple genes on a phenotype as opposed to individual genes**

Multilocus genetic composite score (MGCS)

- Instead of looking at one gene at a time, we should consider **multiple genes** and **add up the effect of each** to obtain a **single score** that reflects the additive contribution of each dopamine gene variant
- Identified **five** dopamine gene polymorphisms and their respective susceptibility variants that are plausible candidates for the MGCS (*DRD1, DRD2, DRD4, COMT*, and *DAT1*)

- **Susceptibility variants:** Variants that are characterized by **low dopamine signaling** levels
- **Non-susceptibility variants:** Characterized by high dopamine signaling levels

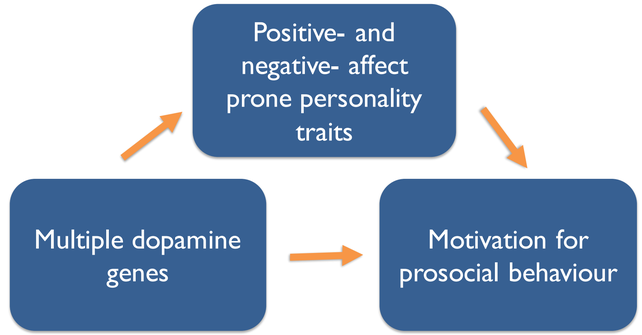

Figure 2: Mediational path diagram among MGCS, personality traits, and prosocial behaviour

Conclusion

- Important to consider the **polygenic** nature of complex behavioural traits
- Implications for **personalized medicine and therapy**
- Still a lot unknown about what contributes to individual differences in prosocial behaviour
- **Proposed study:**
  - (1) Test the utility of a MGCS in predicting individual differences in prosocial behaviour in different situational contexts (reward, punishment, and neutral primes)
  - (2) Determine how this GxE interaction is mediated by a) personality traits Extraversion, Neuroticism, and Openness to Experience; and b) culture

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