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Perseverance: Psychospiritual and Genetic Perspectives

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Perseverance: Psychospiritual and Genetic Perspectives

Abstract

Perseverance constitutes a quality that motivates humankind to press onward usually in the face of significant adversity and resistance. Perseverance is also important in the Christian life. The apostle Paul, using athletic training metaphors, frequently urges his readers to persevere in the faith, even describing his own life as a fight and a race (2 Tim.4:7). Yet, certain groups of people seem to possess a greater measure of perseverance than others have. We are therefore led to ask, "Can our ability to persevere be, in God's providence, at least partly genetically influenced?"

Keywords


research, perseverance, spiritual, personality, genes, nature and nurture

Disciplines

Biological Psychology | Christianity | Genetics and Genomics

Comments

Co-presented at the annual meeting of the American Scientific Affiliation in Azusa, California on July 23, 2016. The presentation was based upon a senior research project conducted by biology major Arielle Johnston during the 2015-16 academic year.



Perseverance: Psychospiritual and Genetic Perspectives

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Perseverance



Def: Internal trait that motivates us, despite challenges

- ▶ Perseverance is important in our Christian life
 - ▶ “Perseverance of the saints”: Unique to believers
 - ▶ Paul: Athletic metaphors
 - ▶ Example: 2 Timothy 4:7-8

Early psychology & perseverance

- ▶ Wm. James' challenge
- ▶ Freud: Naturalistic perspective → drive theory
- ▶ F. & G. Allport: Personality traits = neurological structures (nature) + environmental factors (nurture)
→ trait theory
- ▶ Currently: "The Big Five" personality factors (McCrae & Costa, 1987)

“The Big Five” personality factors

- ▶ Neuroticism
- ▶ Extraversion
- ▶ Openness
- ▶ Agreeableness
- ▶ Conscientiousness (includes perseverance)

Measurement of perseverance



- ▶ Duckworth et al. (2007)
- ▶ Grit = “perseverance and passion for long-term goals” (p. 1087)
- ▶ Short Grit Scale (Grit-S) questionnaire
- ▶ Collective results = high correlation between grit and Big Five Conscientiousness

Biology & perseverance



- ▶ What is the biological basis of perseverance?
- ▶ How malleable is our perseverance?
- ▶ Do we have a genetic predisposition to persevere?

Biology & perseverance

Experiences influence neuronal development:

- ▶ Reorganizing neural pathways
- ▶ Increasing and strengthening synapses
- ▶ Neurogenesis in the hippocampus
 - ▶ Involved in learning and memory

Genes are regulated in response to experiences

Changes at the level of the gene:

- ▶ Neurotransmitter binding alters gene expression
- ▶ Emotional stress increases cortisol levels
 - ▶ At low levels stress it is motivating
 - ▶ At high levels it inhibits neurogenesis, impairs memory formation

Long-term behavioral effects

Epigenetic effects are less malleable:

- ▶ Severe or persistent experiences modify chromatin
 - ▶ DNA is chemically modified
 - ▶ Histone modification
- ▶ Genes are stably turned on/off to change our behavior

Is there a genetic component to our behavior?

Differences in gene sequences appear to affect behavior

- ▶ DRD4 – Novelty-seeking behavior and ADHD
- ▶ COMT – Cognition and emotional processing

Thus the interaction of genetics and experience impacts our behavior

Does aldosterone affect behavior?

- ▶ Aldosterone: Mineralocorticoid that regulates blood pressure via sodium retention at the kidney
- ▶ Research suggested a connection to athletic ability
- ▶ Aldosterone receptors (MR) also in the hippocampus
- ▶ Might aldosterone affect athletic ability by acting on the brain?

Does aldosterone affect behavior?

- ▶ Mice lacking MR in the forebrain display impaired learning (Berger et al., 2006)
- ▶ MR variants in *women* affect their optimism and sense of hopelessness (Klok et al., 2011)
- ▶ Variant rs5534 was associated with negative memory bias after a significant adverse life event (Vogel et al., 2014)

Study: Does the aldosterone receptor (MR) affect perseverance?

- ▶ If rs5534 is associated with negative memory bias, could this impact perseverance?
- ▶ 116 Dordt students gave DNA samples and filled out a questionnaire to measure perseverance
- ▶ DNA was tested for their variant of rs5534
- ▶ Did genotype correlate with perseverance?

No correlation between genotype and Grit-S score (1-5)

Genotype:	AA	AG	GG
Total	8	105	3
Grit average	3.48	3.35	3.54

Surprising finding

Genotype	AA	AG	GG
Expected	32	58	27
Observed	8	105	3

- ▶ Far more heterozygotes than expected
- ▶ Is there a selection effect? At what level?

Is there a selection effect?

- ▶ Dordt students are not a “random sample”
- ▶ Is there selection for (private) college students?
- ▶ How would the results compare with:
 - ▶ People not in college?
 - ▶ Students at a secular institution?
 - ▶ Christians
 - ▶ Non-Christians

Genetics and Christian faith

- ▶ Could God in his providence use genetics to influence Christian faith and life?
- ▶ Lewis & Bates (2013) claim a genetic basis for “religiosity”
 - ▶ Need for community
 - ▶ Existential certainty

Caveats to this study

1. Unknown effect of the sequence variant on protein levels/function
 - ▶ Protein sequence is not affected
 - ▶ No evidence for changes in protein levels
 - ▶ This variant might be linked to a separate, functional variant

Caveats to this study

1. Unknown effect of the sequence variant on protein levels/function
2. Many environmental conditions impact private Christian college attendance:
 - ▶ Finances
 - ▶ Educational background
 - ▶ Competing interests

Summary

- ▶ Our behaviors are affected by our genes and our environment
- ▶ Variants of the aldosterone receptor have a nonrandom distribution in Dordt students
- ▶ We wonder whether our spiritual walk is also influenced by our genes
- ▶ Further studies with other subjects are needed to elucidate possible causes