Personality and Blood Chemistry Associations with Cardiovascular Health in Chimpanzees

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Introduction

Metabolic syndrome is directly related to the onset of diabetes and heart disease, while being indirectly associated with a multitude of other conditions, such as depression [2]. A wide array of chimpanzee personality models have been developed and linked to other psychological capacities, such as intelligence and subjective well-being [4]. Moreover, personality has been shown to be related to physical traits [5] and specific genes [1].

Since associations have been found between many aspects of human personality and cardiovascular risk factors and biomarkers [3], might we find similar relationships in chimpanzees? Controlling for environmental variables in humans will always be difficult; less so with captive chimps. We therefore analyzed associations between personality, blood biomarkers, and physical characteristics like BMI and blood pressure in chimpanzees.

Main Questions

- Are relationships between metabolic syndrome symptoms and personality, as seen in humans, to be found in chimpanzees?
- How do blood biomarkers associate with known risk factors?
- Can we uncover the causal relationships between risk factors, symptoms, and biomarkers?

Materials and Methods

- 196 chimpanzees were assessed
- Personality ratings were gathered using the 43-item Chimpanzee Personality Questionnaire
- Hematological biomarkers analyzed were triglycerides, glucose, total cholesterol, and lymphocytes, gathered across multiple time points during regular check-ups
- Physical characteristics controlled for were BMI, age, and sex
- Associations were tested with linear mixed-effect models

Results

All confidence intervals are at 95%. Significant positive associations were found between Openness (β=3.96, C.I.:[1.80, 6.12]) and blood pressure, as well as Extraversion (β=-7.76, C.I.:[-11.5, -4.02]) and blood pressure.

We also wanted to see if personality impacted physiology, so directly tested for associations between personality and blood biomarker levels.

Though we observed some marginal effects from other biomarkers, triglycerides showed the strongest relationships, with Agreeableness (β=-24.1, C.I.:[-36.3, -11.9]) and Openness (β=10.64, C.I.:[1.51, 19.7]).

Summary

- A biochemical system like that sampled from the chimpanzee (and human) blood stream offers us a window onto the function and dysfunction of an array of other systems.
- Insight from a chimpanzee personality perspective suggests that Extraversion, Openness to experience, and Agreeableness are related to cardiovascular disease symptoms.
- These results match up well with human data, contributing to a more robust understanding of general primate cardiovascular health.
- Agreeableness, associated with human "Type A" personalities, has a mixed history of being associated with cardiovascular health [3].
- Type A personality clearly relates to cardiovascular disease at some level, but it remains unclear whether the effect is behavioral, physiological, or even genetic.
- Chimpanzee and human metabolic health appear quite similar. Results from both species, applied with comparative perspective, stand to improve the health of humans and captive chimps, but a more nuanced analysis of these data is called for.

Where to go from here

- Complex physiological pathways are not easily described by linear regression.
- In order to grapple with the causal impacts of our variables on one another, we will use structural equation modeling to evaluate which relationships between personality, biomarkers, and physical manifestations are meaningful. A hypothetical model is shown in Figure 1.
- Additional data ought to be gathered from more primate species, and more path models ought to be tested so we can understand what symptoms and biomarkers are the best indicators of current and future health.

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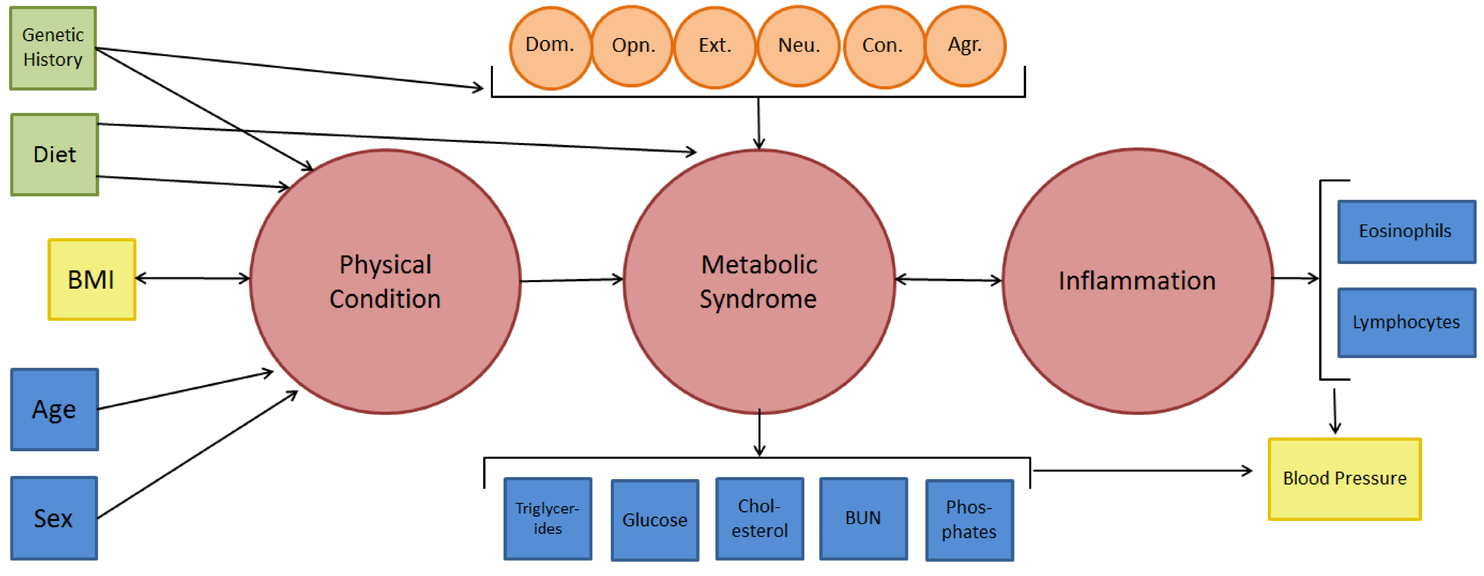

Figure 1: Proposed model of relationships among chimpanzee personality, blood biomarkers, and physical characteristics.