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Abstract Title: Cortisol and Risk Tolerance by Kyle Fluegge, M.A.
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Abstract

Motivation: When assessing health behavior, economists often examine a person's risk tolerance with financial gambles. Attempts to draw inferences from these experiments to health behaviors have been equivocal. From a health perspective, we define risk tolerance as the level of risk an individual is willing to take with his/her stock of health (i.e., smoking, drinking alcohol, obesity, physical inactivity, promiscuity, high-risk sports, etc.) in the present before perception of that risk leads to a belief that the cost to future health is greater than the present utility of the risky behavior.

Research question: Our investigation leads us to inquire how risk tolerance might subconsciously affect biomarkers (in this case, the hormone cortisol).

Methodology: Using a small sample of college-aged students, we measured risk tolerance at a single point in time and supplemented that with a time series of cortisol measures: baseline, during a stressor (i.e. build-up to revelation of who would play for high stakes gambles), and 30 minutes post-stressor. We used repeated measures analysis of variance to examine how cortisol levels changed when participants were given different amounts of money to begin the gambling experiments.

Results: Using MANOVA, we examined cortisol changes over time controlling for gender, smoke risk [a dummy variable to identify those participants who thought smoking cigarettes posed more physical risk than smoking marijuana], and the interaction of gender and smoke risk. We show that a lack of risk tolerance (i.e., risk aversion) when comparing a low stakes gamble to a high stakes gamble is associated with increases in cortisol from baseline to stressor (but not stressor to 30 minutes post stressor) when subjects were not given any money a priori ($p < .05$). Giving money to participants at the beginning of the experiment that they

could then lose later, however, did not significantly increase cortisol levels from baseline to stressor or stressor to 30 minutes post stressor among those same risk averse individuals, even though the mean level of risk tolerance shown as the stakes grew higher for set I (no money given *a priori*) and set II (money given *a priori*) was significantly different for *both* experimental setups ($p < .01$ and $p < .05$, respectively).

Discussion: In this small non-random sample, we saw significant differences in cortisol trends among risk-averse individuals that changed when given a financial endowment to begin the gambling tasks. When given the initial endowment, risk-averse participants had insignificant increases in cortisol from baseline to stressor relative to no endowment, yet the decline in cortisol from stressor to 30 minutes post stressor was not statistically different among the two endowment sets. This led to a steeper fall in cortisol levels among risk-averse individuals. Thus when given a “buffer” against financial risk, the spike in cortisol is attenuated. This effect was seen among individuals who thought smoking marijuana was physically riskier than smoking cigarettes. Translated to a health context, we can begin to understand what behaviors might be considered “buffers” against perceived health risks among similar behaviors.

Future Work: In ongoing work, we will be looking at cross effects (i.e., low stakes set with no money given *a priori* vs. low stakes set with money given *a priori*) as well as we seeking to explain whether there are similar differences in various other groupings of health behavior perceptions (i.e., eating unhealthy foods versus not exercising regularly, and being sexually promiscuous versus having unprotected sex).