

Manageable Mechanisms in Medicine

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Goals

- Explanation of Russo-Williamson Thesis and some of its critiques
 - Reformulation of these critiques as centering around “scope”
- Explanation of the Strevens account of *ceteris paribus* hedges
 - Two case studies
- An objection and two replies

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Russo-Williamson Thesis

“We argue that the health sciences make causal claims on the basis of evidence *both* of physical mechanisms and of probabilistic dependencies. Consequently, an analysis of causality *solely* in terms of physical mechanisms or *solely* in terms of probabilistic relationships does not do justice to the causal claims of these sciences” – Russo Williamson 2007

But wait, what do we mean by mechanisms?

“Exactly what constitutes such mechanisms will not concern us here—some view mechanisms to be processes transmitting conserved physical quantities; others claim that mechanisms are composed of chains of probabilistic or counterfactual dependencies, others that they are composed of chains of theoretical explanations”—Russo-Williamson 2007

But wait, what do we mean by mechanisms?

“A problem with exploring how mechanisms provide evidence is that ‘mechanism’ has recently been characterized in several ways...for present purposes these definitions are sufficiently similar. The heart (as a pump) the brain (as a ‘control center’) and the liver (as a detoxifying agent, among other things) are all mechanisms in the senses described above.” – Howick 2011

Howick's Critiques A

“The partial ignorance about the metabolic mechanism means that we cannot be sure what mechanisms are eventually activated by any drug (or its metabolites) that have been swallowed. More generally, the complexity of the human body makes it difficult to identify all relevant mechanisms activated by an intervention”—Howick 2011

Howick's Critiques B

“...it is difficult to predict how mechanisms will behave under interventions”

—Howick 2011

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All about scope

The underlying worry here is that if mechanisms are large enough to account for the environmental changes that bring about these paradoxical effects, that is, ambitiously attempt to include information about all possible confounders, then they are so large that it is nearly impossible to have knowledge of all the relevant conditions, to fill in all the gaps. To capture all the relevant factors, mechanisms have to be so large as to be exceptionally unwieldy and perhaps impossible to fully describe.

All about scope

“Few if any mechanistic models provide an ideally complete description of a mechanism. In fact, such descriptions would include so many potential factors that they would be unwieldy for the purposes of prediction and control and utterly unilluminating to human beings” –Craver 2006

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The “empty” account

In the Empty account, ceteris paribus hedges are expressed as follows:

If Φ , $F \rightarrow G$

If conditions Φ obtain, F brings about G .

The “boring” account

In the Boring account, ceteris paribus hedges are expressed as follows:

$\Sigma\Phi(\text{If } \Phi, F \rightarrow G)$

There exists some set of conditions Φ , such that if Φ obtains, F brings about G .

The Strevens account

In the Strevens account, ceteris paribus hedges are expressed as follows:

If M , $[(F+Z) \rightarrow G]$

If the mechanism M obtains, conditions Z and the property F bring about the result G .

The Strevens account

Even though the identification of the mechanism is less specific than if it were identified by a list of the individual properties that make it up, we can still refer to the mechanism and, I argue, make use of the ceteris paribus hedge in predicting and making changes in the world.

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Nutrition in Bangladesh

- Food
- Families
- No interference with the transportation of food
- No weather conditions that limit local agriculture
- Workers willing to provide the educational nutrition classes
- No political or labor disputes that mean that such workers are unavailable
- An accessible time and location for the classes
- Childcare for the classes
- Etc etc...

Nutrition in Bangladesh

...But the Strevens' account does allow us to express what happened, in that it allows us to point to a mechanism, or a coherent group of interrelated causes—one that is more than a stipulation of the existence of some relevant causes and less than an exhaustive list of all the causes involved...

Statins for Stroke

- Metabolization (a la Howick)
- Compliance/Adherence
- Interaction with diet/exercise changes

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Objection

- Reason for talking about mechanisms in medicine at all has to do with generalization
- My augmentation, which leaves some possible confounders outside the mechanisms and unspecified, means that mechanisms will do the job of generalization worse than if not augmented (though it might be more possible to know all their parts)
- Since generalization was the main reason for talking about mechanisms at all, my suggestion greatly weakens the importance of mechanisms in medicine

Two Replies

- Yes, and generalization will require more than just mechanisms, but instead a “tangle” of methodologically diverse evidence
- Yes, but generalization is not all mechanisms were good for; also providing explanations, justifying pursuit and suggesting hypotheses (and they can do all of this better while they are epistemically possible and manageable, that is, without including all possible confounders)

Selected Works Cited

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Thank you

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