

Causation and Mechanism

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STS Work in Progress Seminar

26th February 2009

Philosophical accounts of mechanism

- Machamer, Darden and Craver, 2000
- Glennan, 2002
- Bechtel and Abrahamsen, 2005
- Woodward, 2002

Philosophical accounts of mechanism

- Machamer, Darden and Craver, 2000
 - “Mechanisms are entities and activities organized such that they are productive of regular changes from start or set-up to finish or termination conditions”
- Glennan, 2002
- Bechtel and Abrahamsen, 2005
- Woodward, 2002

Philosophical accounts of mechanism

- Machamer, Darden and Craver, 2000
- Glennan, 2002
 - “...a mechanism for a behaviour is a complex system that produces that behaviour by the interaction of a number of parts, where the interactions between parts can be characterized by direct, invariant, change-relating generalization.”
- Bechtel and Abrahamsen, 2005
- Woodward, 2002

Philosophical accounts of mechanism

- Machamer, Darden and Craver, 2000
- Glennan, 2002
- Bechtel and Abrahamsen, 2005
 - “A mechanism is a structure performing a function in virtue of its component parts, component operations, and their organization. The orchestrated functioning of the mechanism is responsible for one or more phenomena.”
- Woodward, 2002

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 - “...a necessary condition for a representation to be an acceptable model of a mechanism is that the representation (i) describe an organized or structured set of parts or components, where (ii) the behaviour of each component is described by a generalization that is invariant under intervention, and where (iii) the generalizations governing each component are also independently changeable, and where (iv) the representation allows us to see how, in virtue of (i), (ii) and (iii), the overall output of the mechanism will vary under manipulation of the input to each component and changes in the components themselves.”

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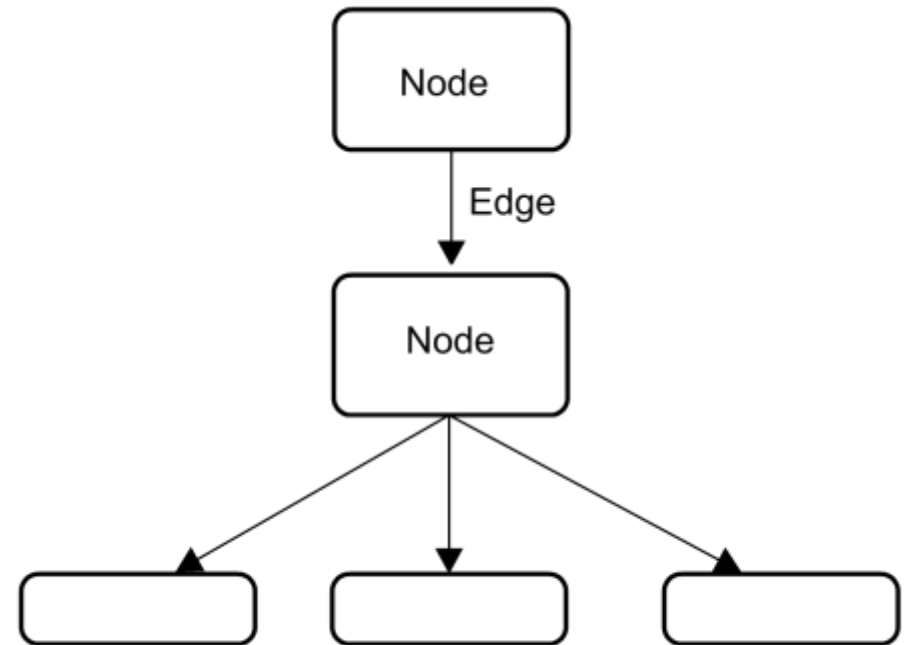
Philosophical accounts of mechanism

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- All 'bottom-up' accounts

What is a mechanism?

- Nodes are the entities
- Edges are the causal activities of their nodes
- Nodes and edges are interleaved
- Nodes and edges are organized together in some way to do something



Problem list...

1. Medical vs philosophical mechanism
2. Complexity and mechanism
3. Construction of mechanism
4. Case variability, type vs token causation and mechanism
5. Causal evidence and mechanism

Problem list redux...

- Medical and philosophical conceptions of mechanism differ
- This difference is predicated on issues of complexity
- 3 specific manifestations
 1. Integration of other forms of causal evidence with mechanism
 2. Case variability, type vs token causation and mechanism
 3. Construction of mechanism

Complexity and mechanism

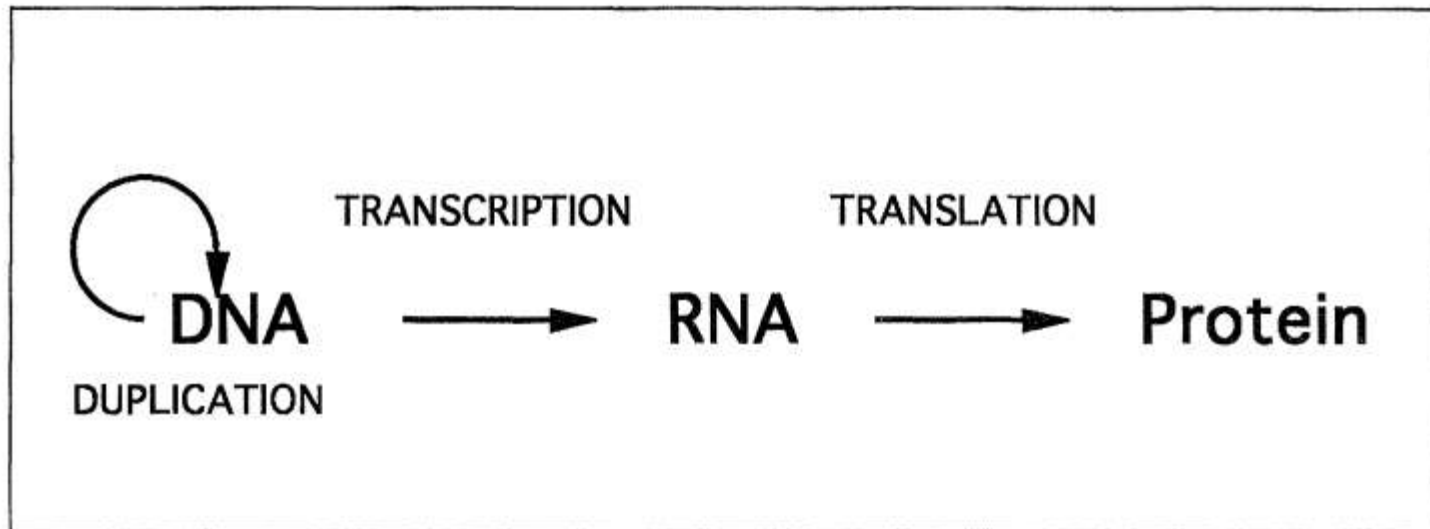


Figure 3. Watson's central dogma diagram (redrawn, based on Watson 1965).

Reproduced without permission from Machamer, Darden and Craver, 2000: 16

Complexity and mechanism

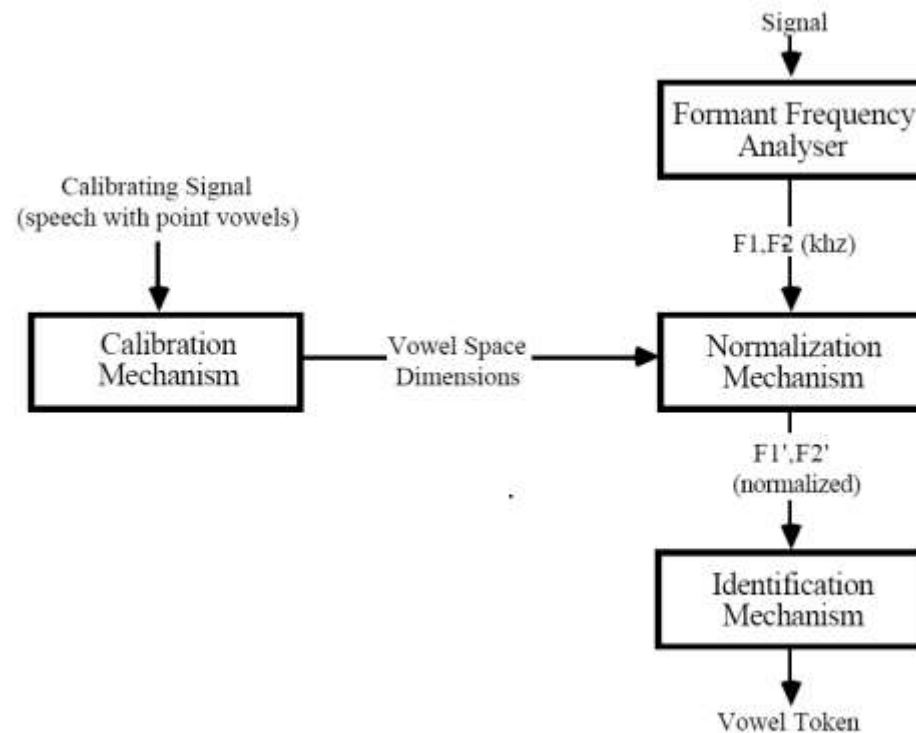
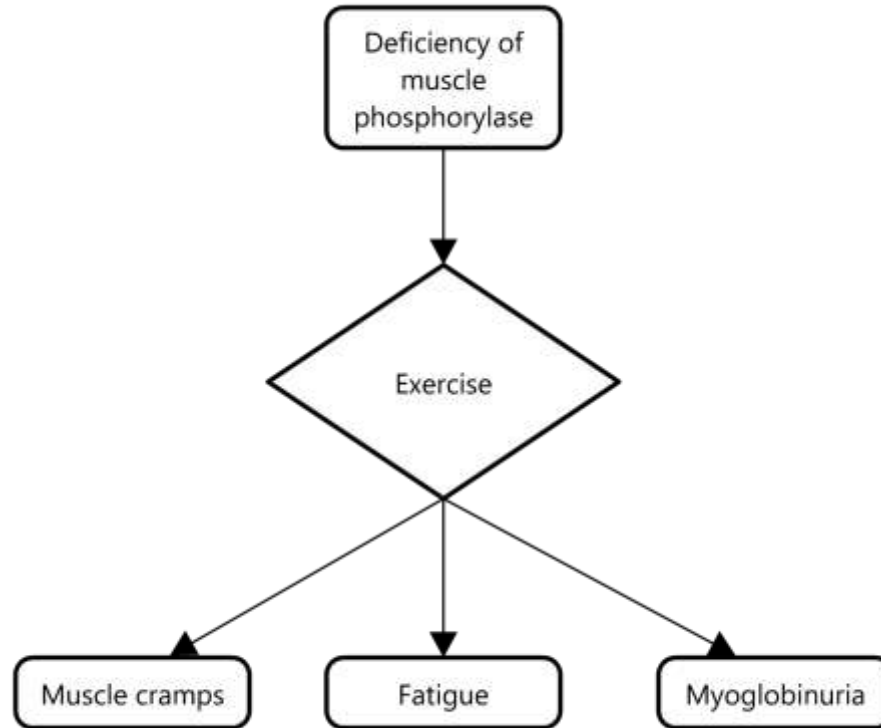


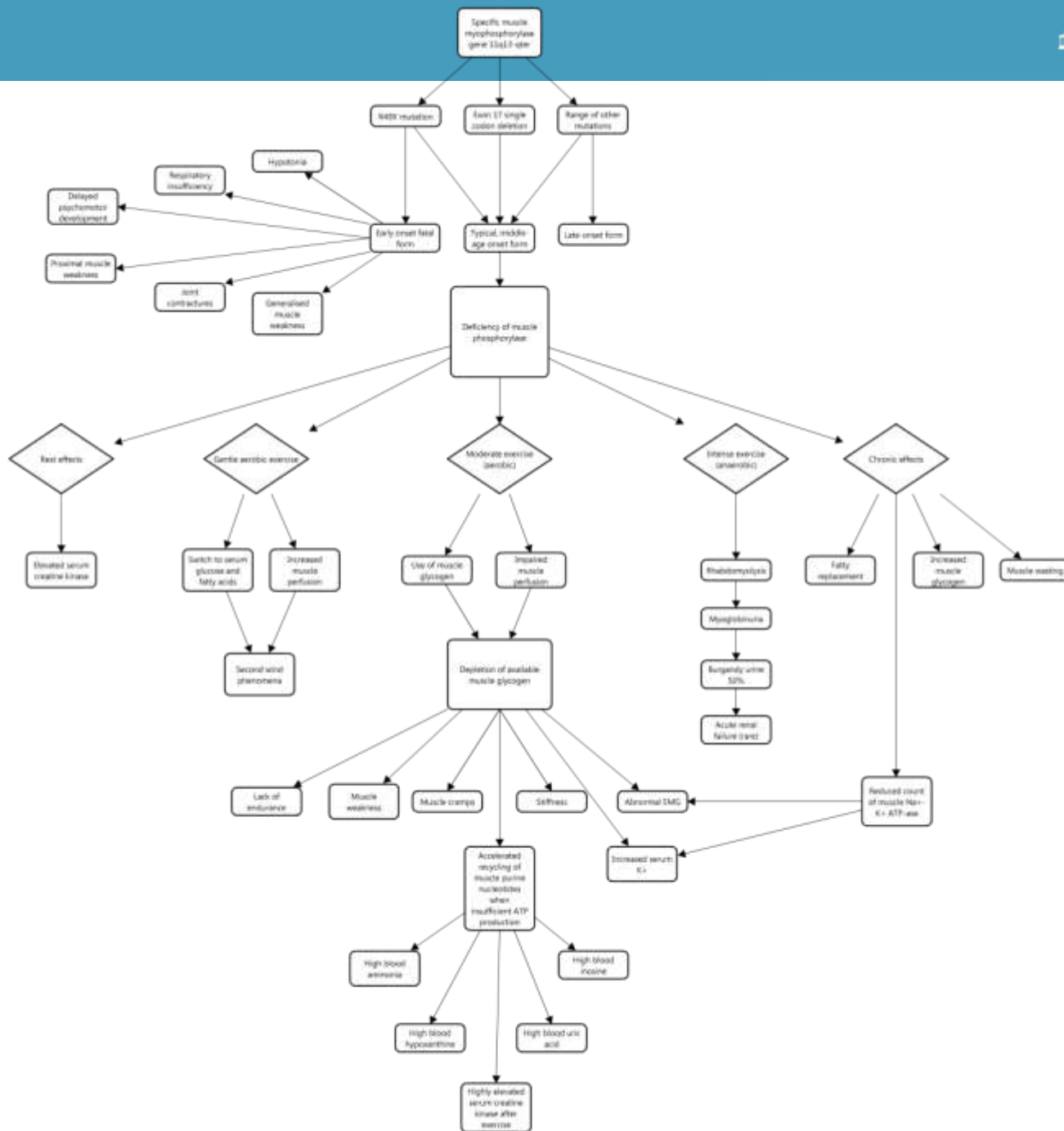
Fig. 3: The Gerstman Vowel Normalization Model

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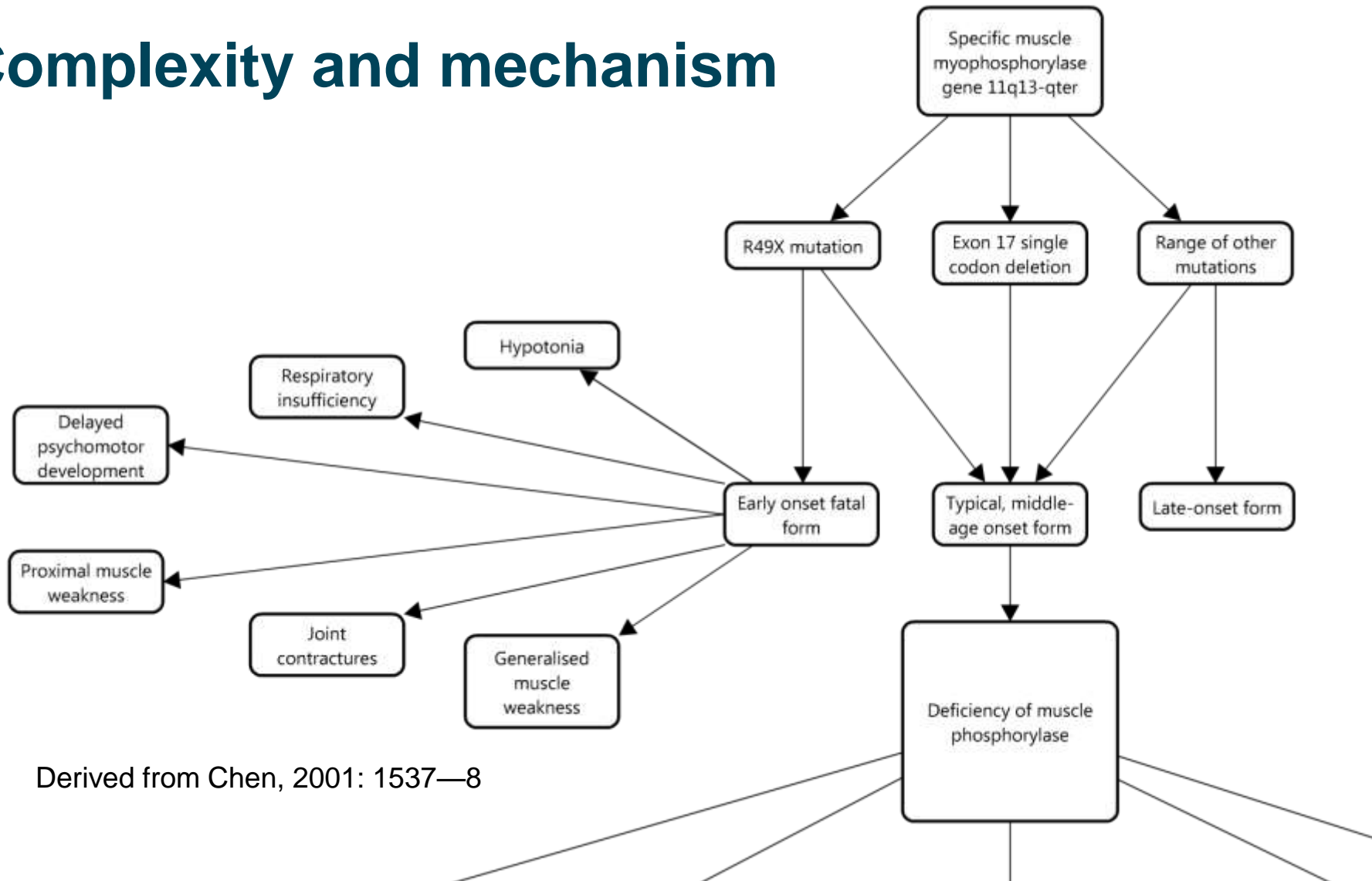
Complexity and mechanism



Derived from Chen, 2001: 1522

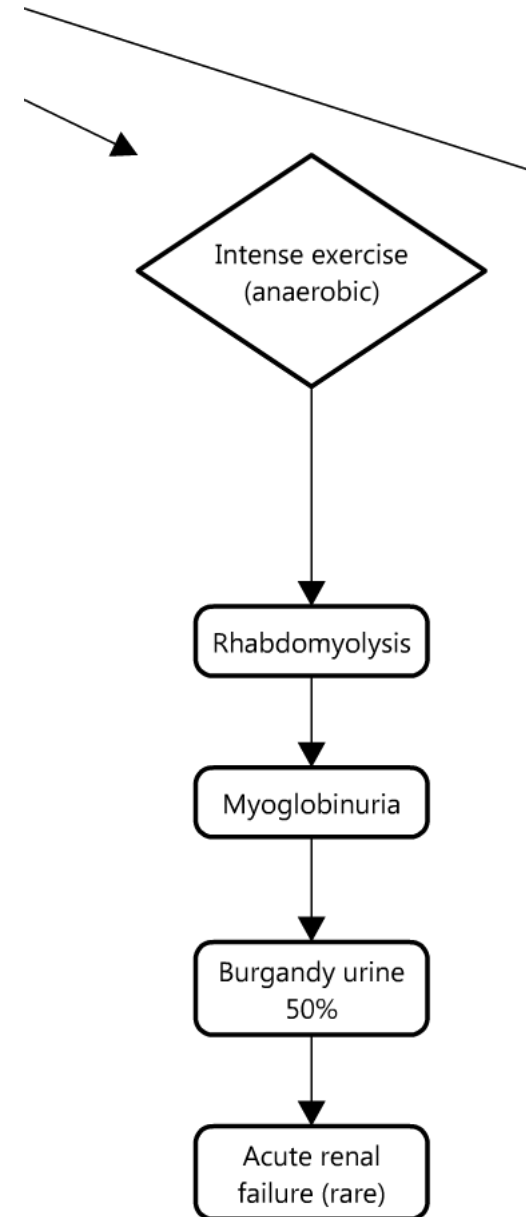


Complexity and mechanism



Derived from Chen, 2001: 1537—8

Complexity and mechanism

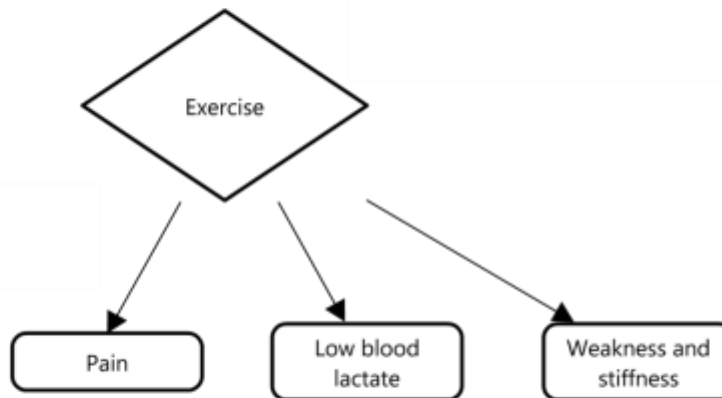


Derived from Chen, 2001: 1537—8

Complexity and mechanism

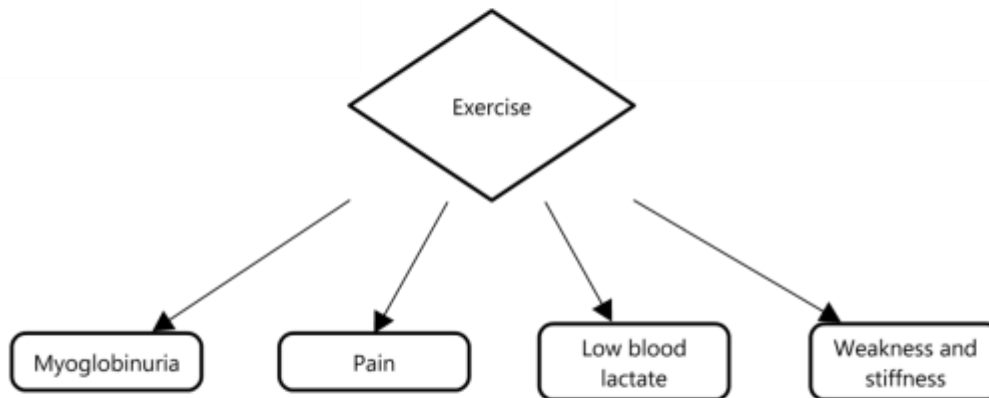
- “Strength” measures should
 - Differentiate between elective and obligate gappiness
 - Degree of evidential support
 - Allow the inclusion of probabilistic edges

Construction of mechanism

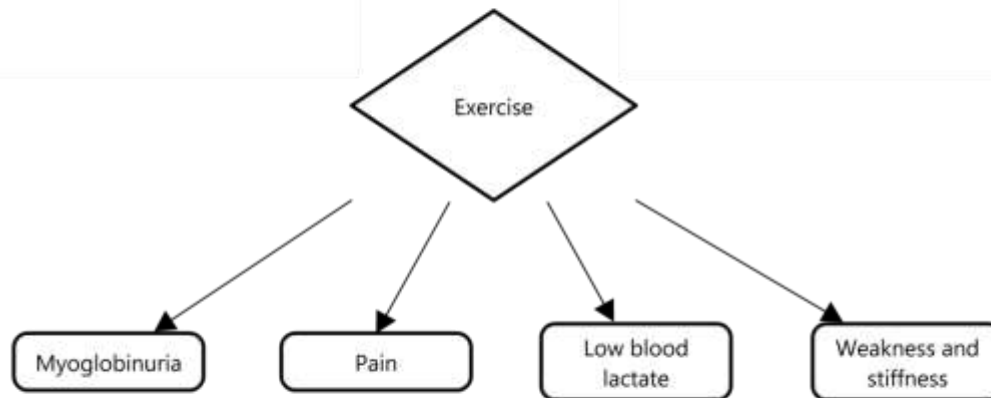


Derived from McArdle, 1951

Construction of mechanism

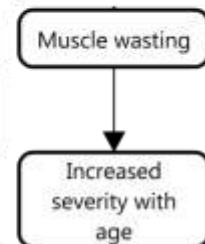
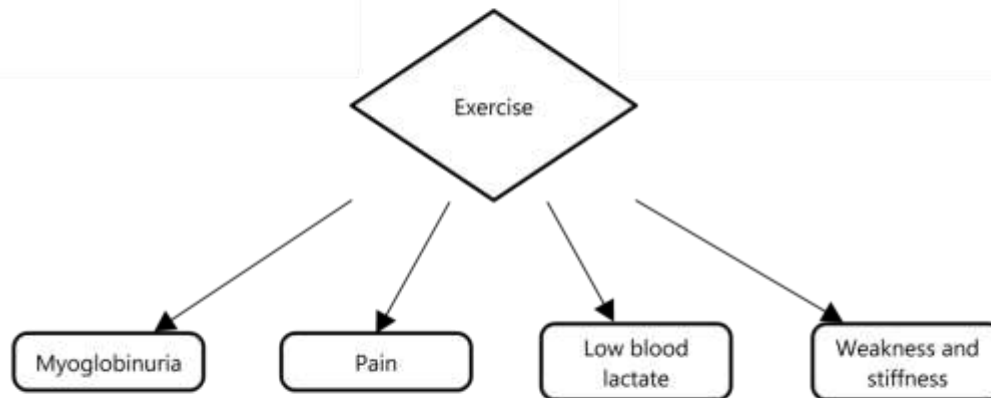


Construction of mechanism

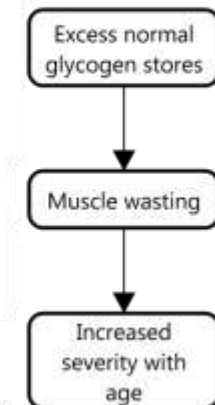
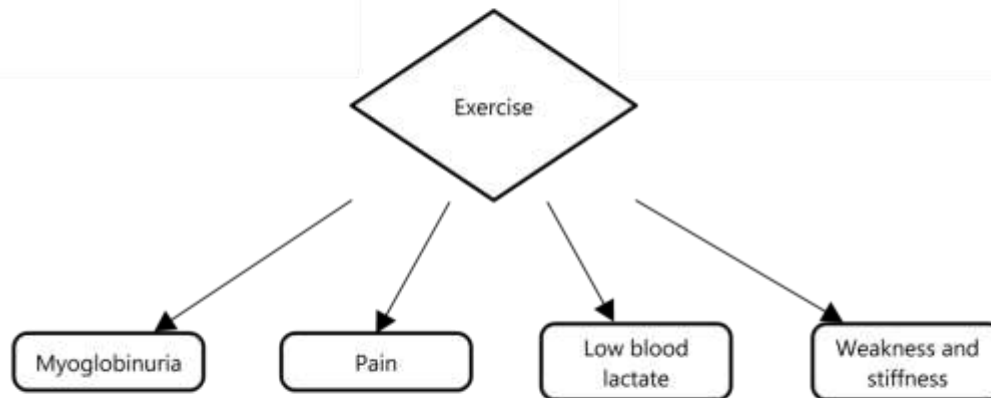


Increased severity with age

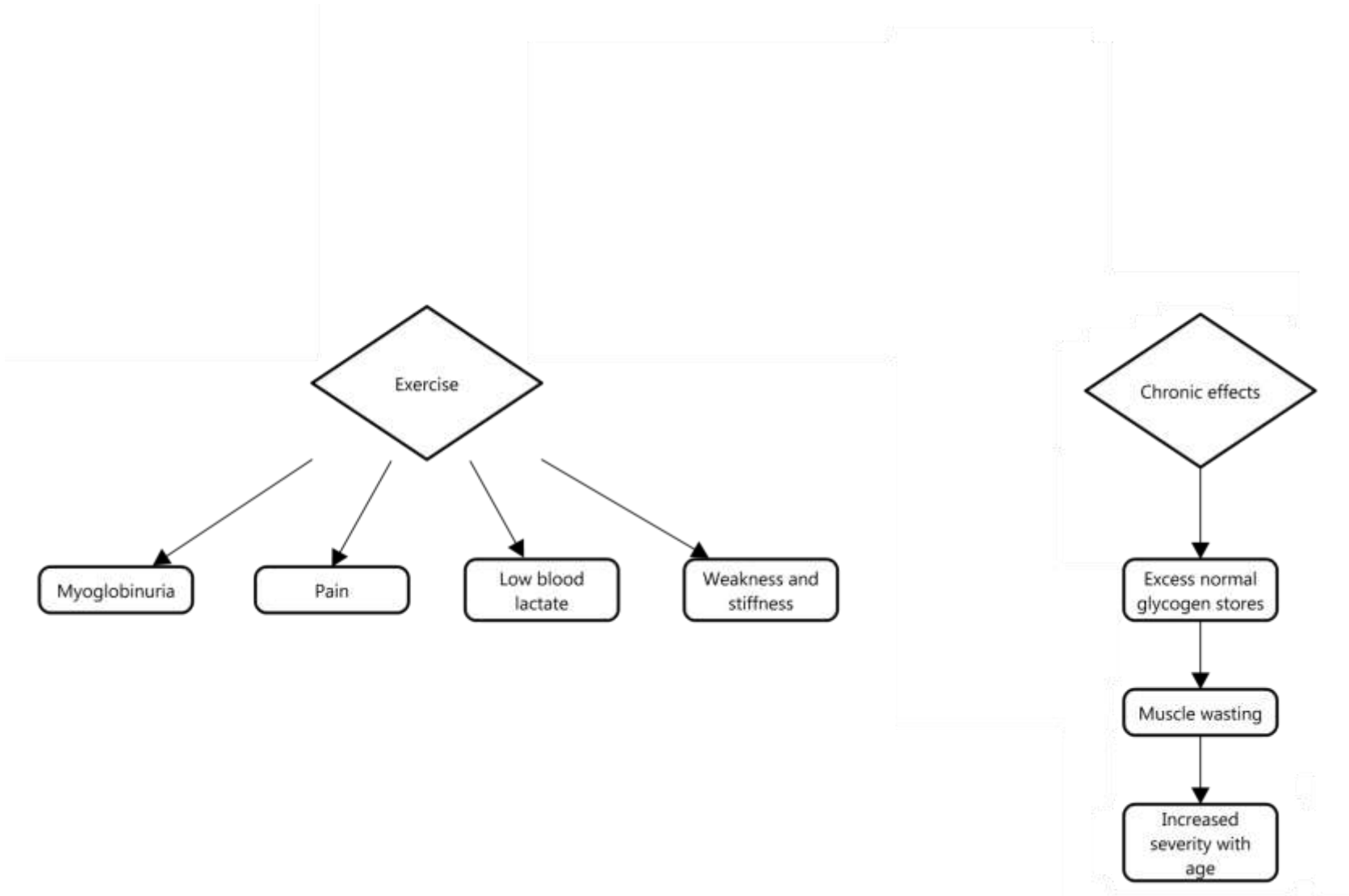
Construction of mechanism



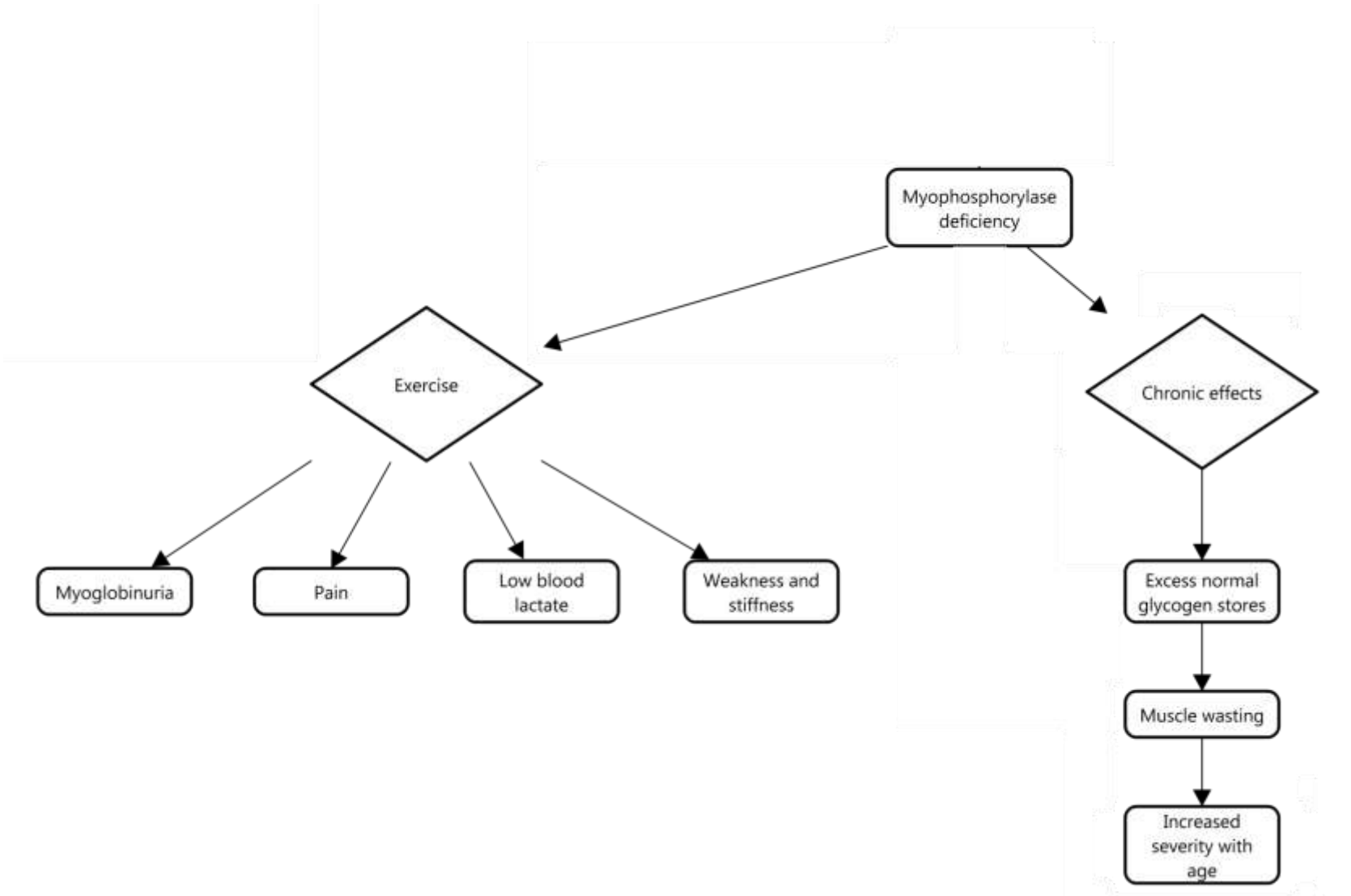
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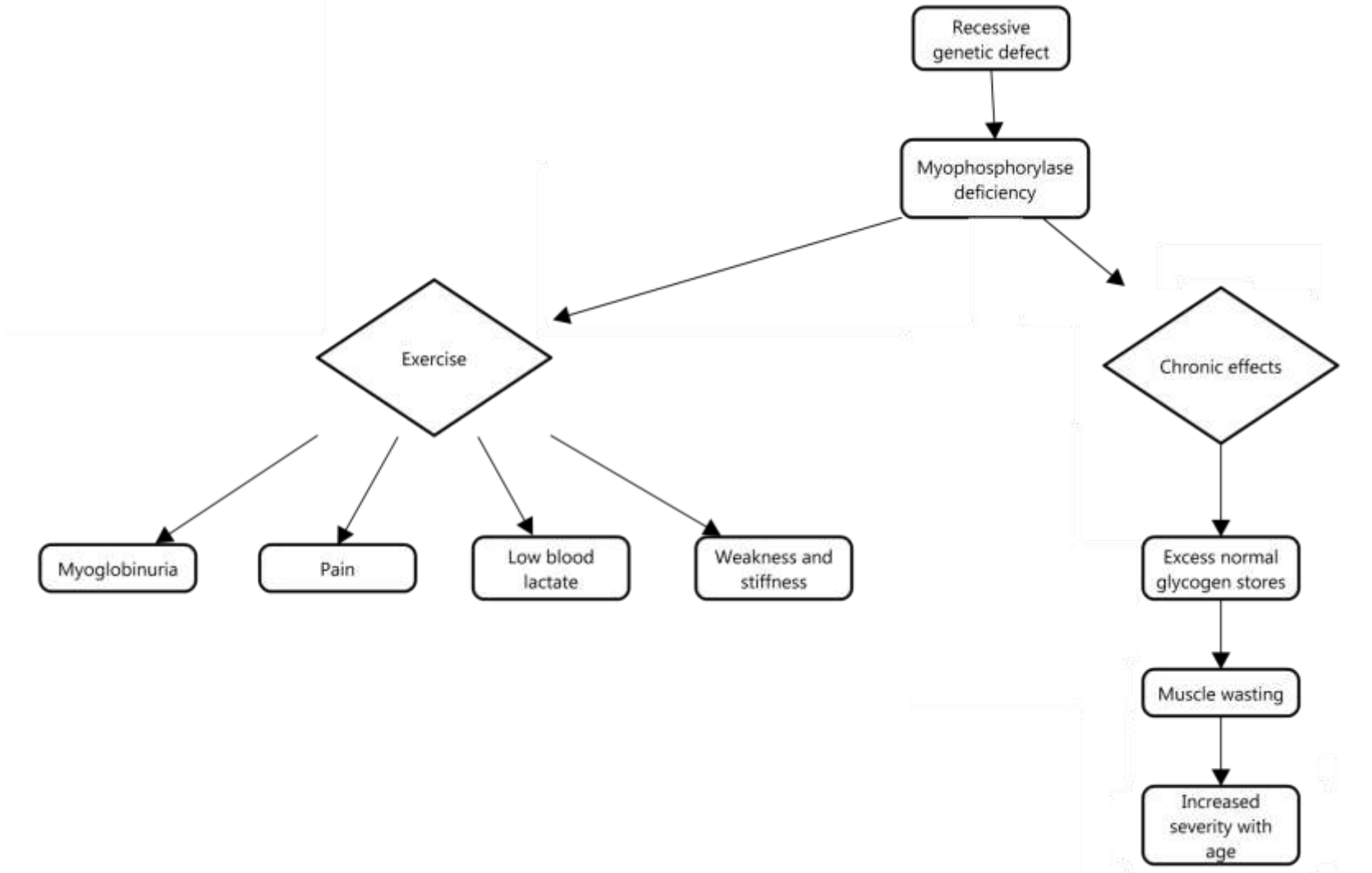
Construction of mechanism



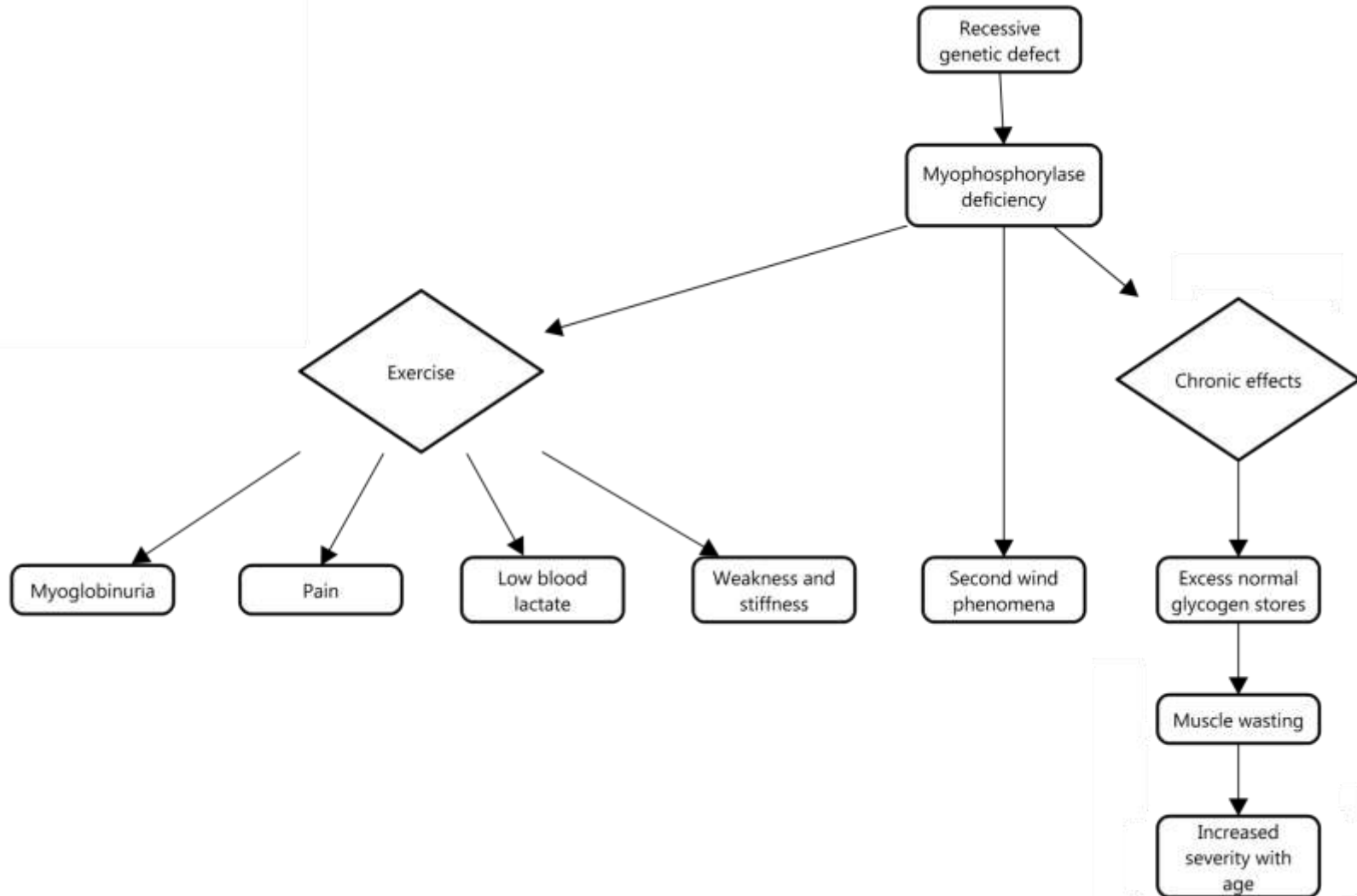
Construction of mechanism



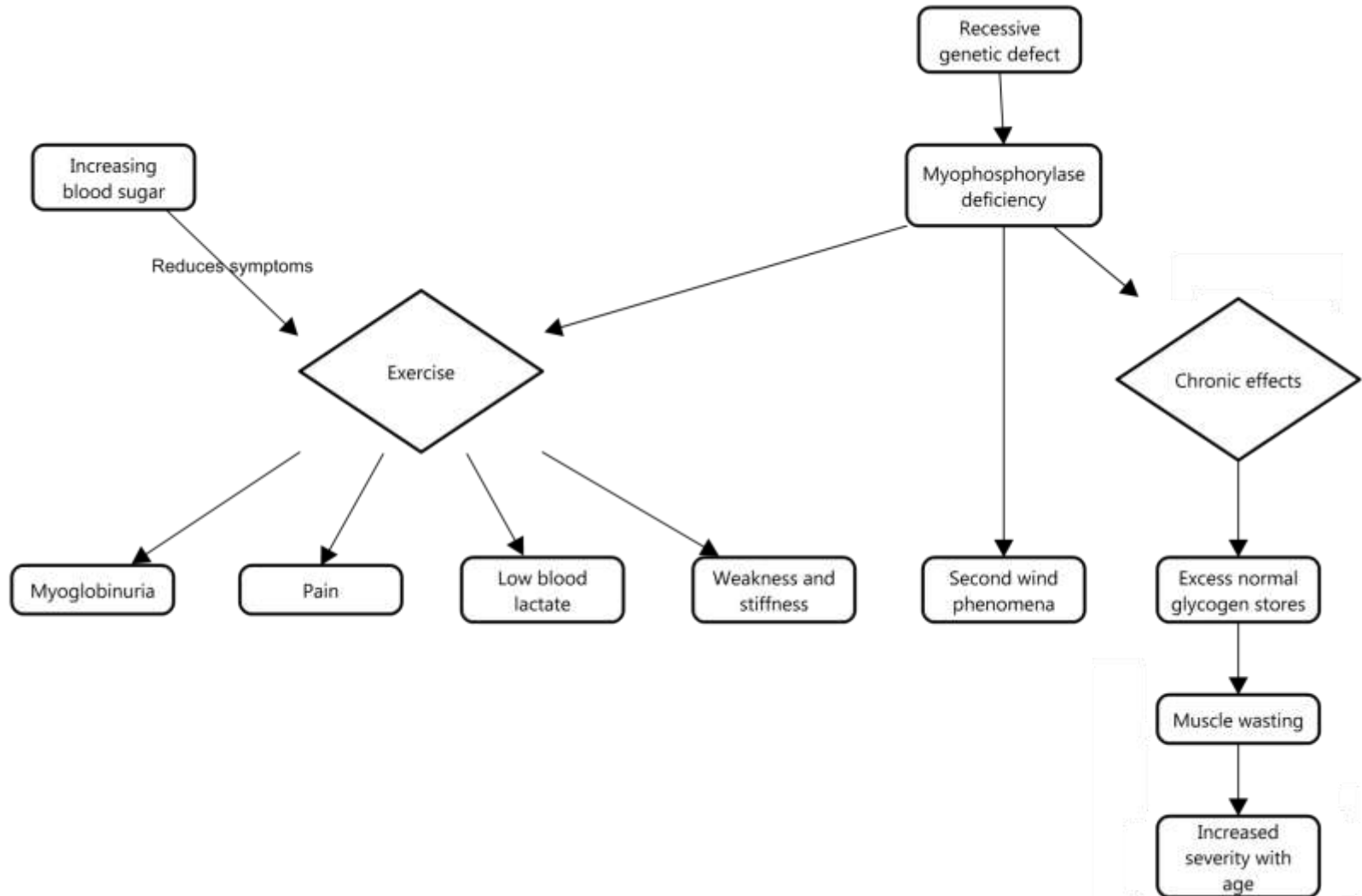
Construction of mechanism



Construction of mechanism



Construction of mechanism



Conclusions

- Philosophical mechanisms do not capture the richness and complexity of medical mechanisms
- I'd suggest that a degree of extension, along the following lines, is required
 1. Ability to encompass probabilistic information
 2. To indicate the 'strength' of causal edges
 3. Ability to describe and explain type/token causal problems
 4. To represent and differentiate causal background conditions
- But I'm wary of:
 1. Increasing conceptual complexity unnecessarily
 2. Duplicating other forms of network representations - Bayesian networks, for instance

Mechanism bibliography

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