

A Team Science Approach to Advance the Understanding of Low Back Pain (LBP)

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Epidemiology of LBP

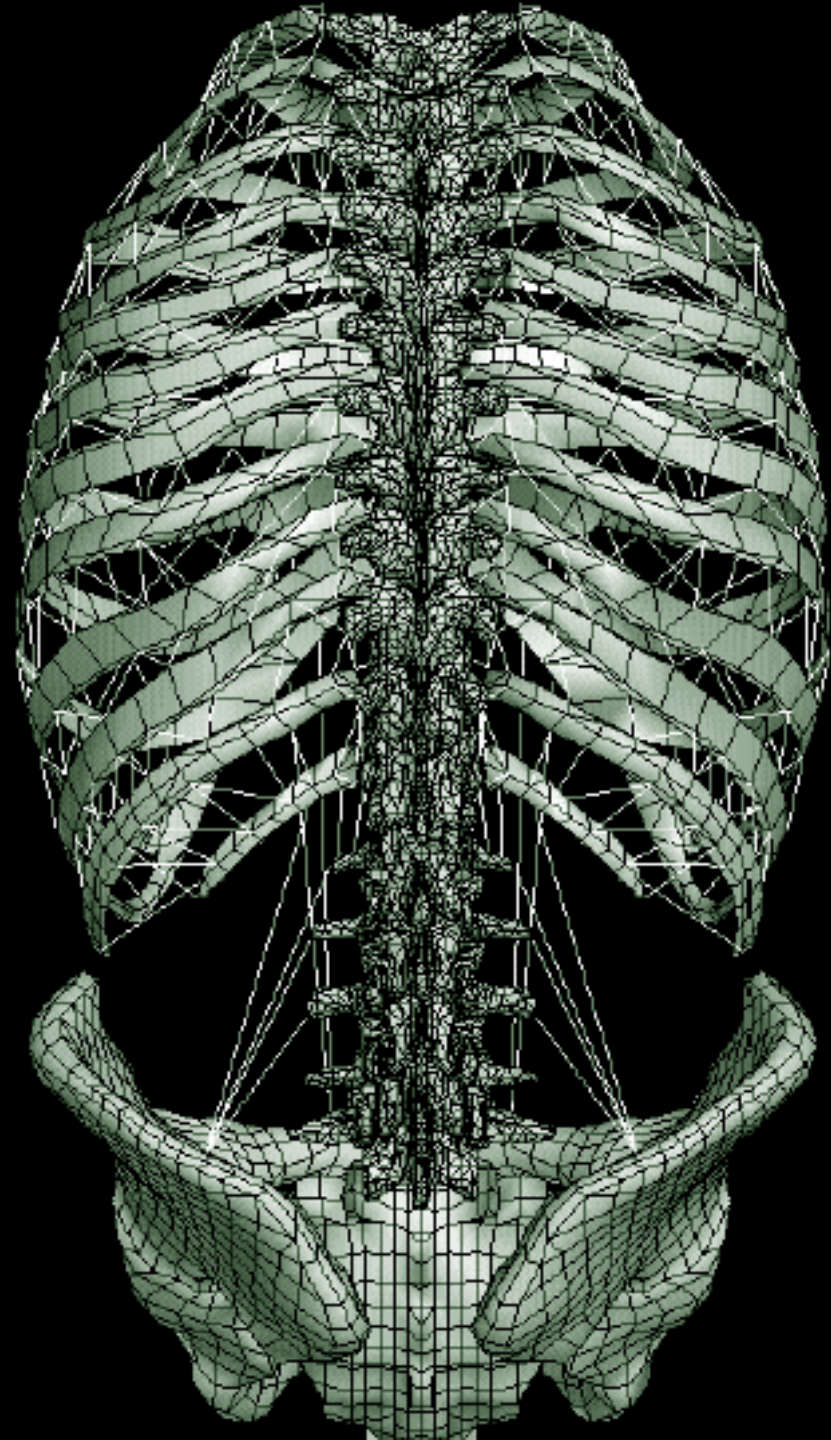
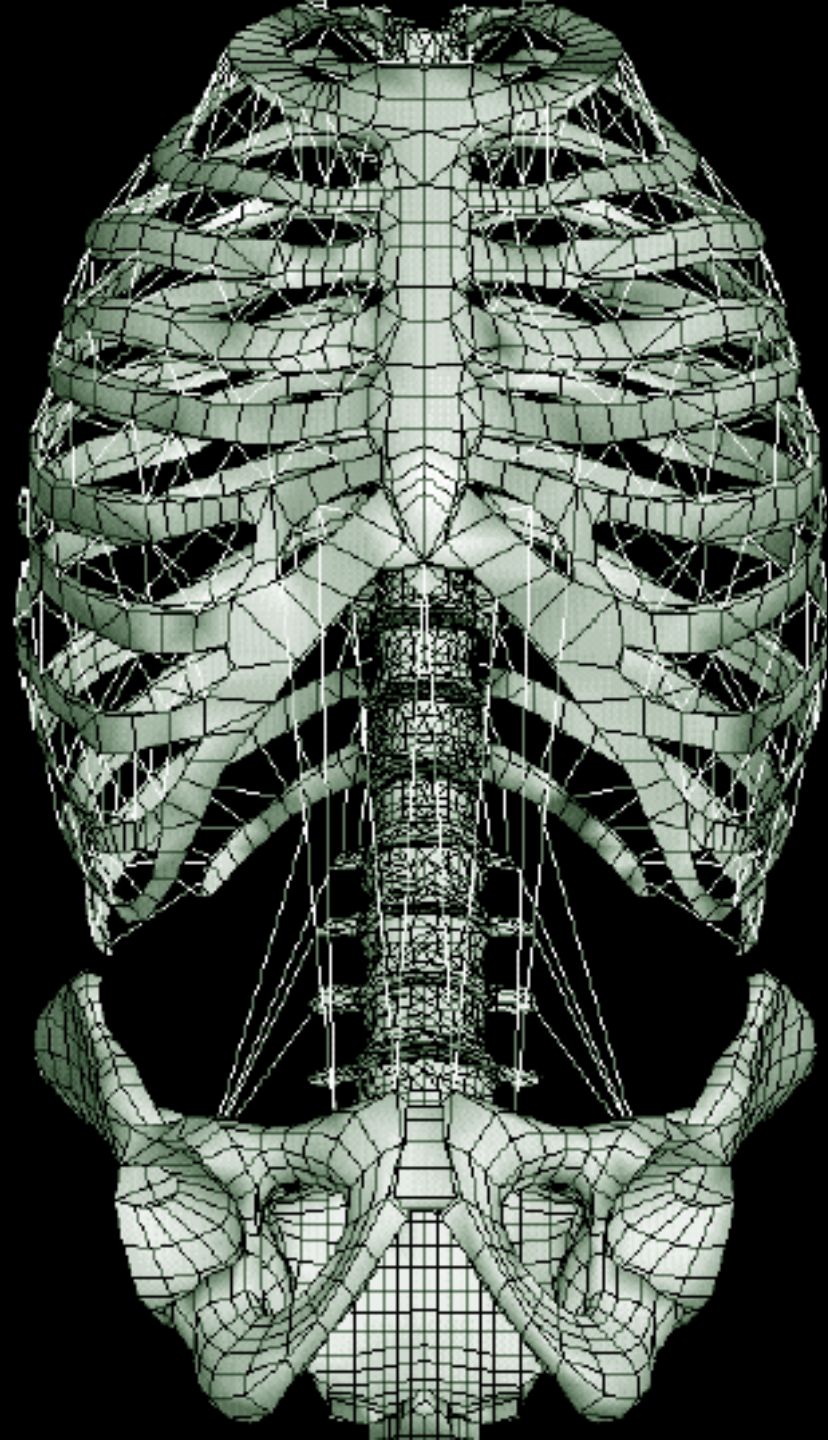
- 80% of individuals will experience at least one disabling LBP incidence in their lifetime
(Frymoyer, 1990)
- LBP is the second most frequent cause of a visit to a physician after a common cold
(Cypress, 1983)
- LBP is the largest contributor to disability in the modern society (Vos, 2012)
- 85-88% have no pathoanatomic diagnosis on standard clinical testing (Bigos & Battie, 1990)

Epidemiology of LBP

- Most of the acute LBP individuals recover within 6 weeks irrespective of treatment
(Nachemson et al., 1987)
- The remaining 10% accounts for 80% of the disability costs (Frymoyer, 1990)
- Total costs approaching \$100 billion annually in the USA (Webster & Snook, 1994; Frymoyer & Cats-Baril, 1991; Dagenais 2008; Katz 2009)

Epidemiology of LBP

- LBP is a multifactorial problem
 - Psycho-social
 - Individual/demographic
 - Biomechanical



Cholewicki (1992)

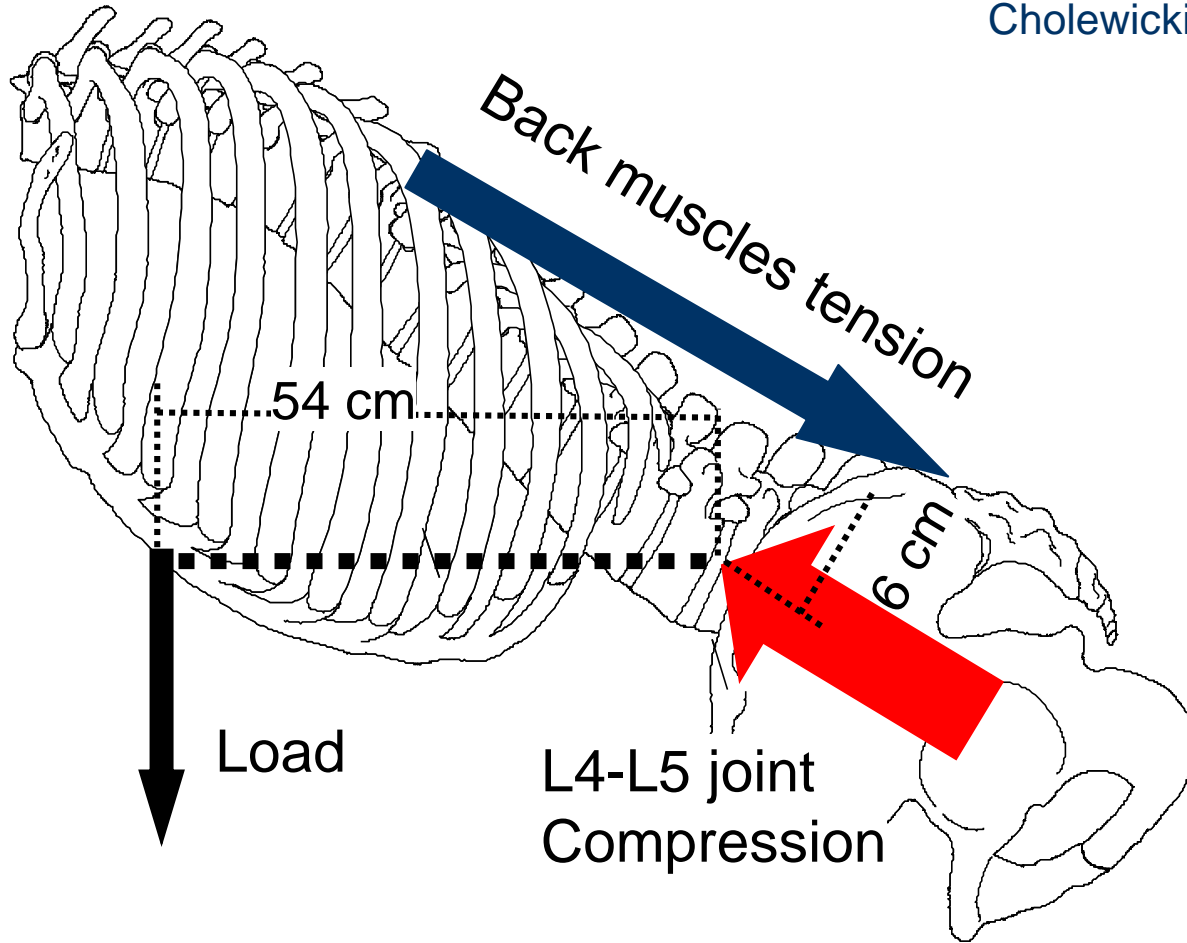
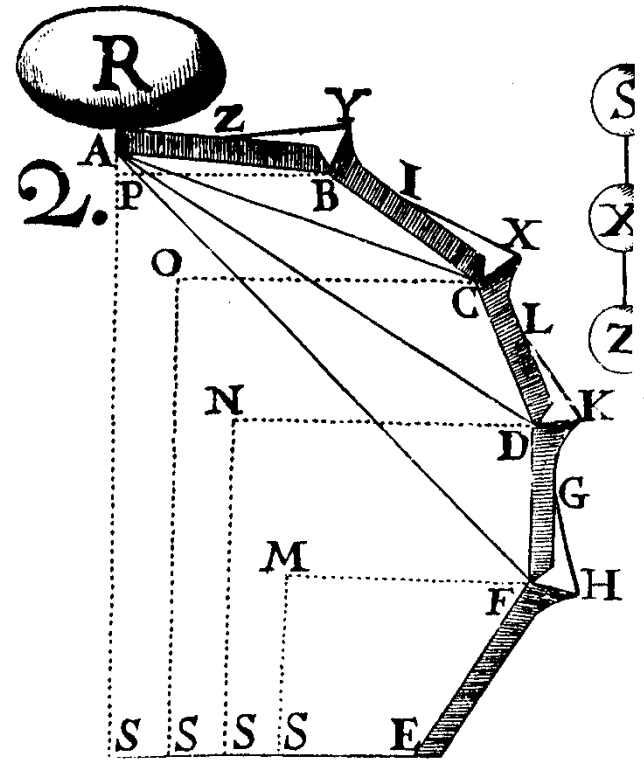
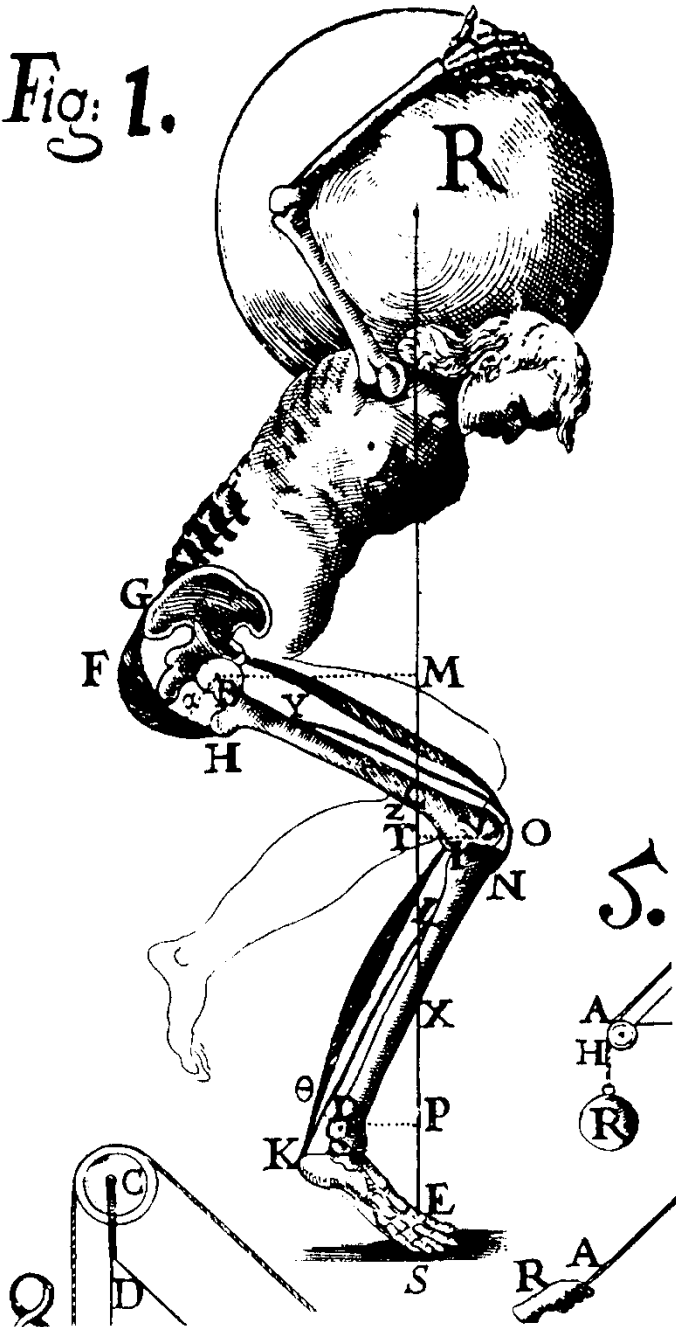


Fig: 1.



Borelli (1608-1679)

Psycho-social factors in LBP

- Job dissatisfaction (Bigos et al., 1992)
- Poor social environment (Kerr et al., 2001)
- Poor support from supervisors or co-workers (Hoogendoorn et al., 2001)
- Depression (Carroll et al., 2004)
- Smoking (Battie et al., 1989; Feldman et al., 1999)

Treatment of LBP

- There are over 200 documented interventions for LBP (Haldeman 2008)

Motor control exercise for cl

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CLINICAL GUIDELINES

Nonpharmacologic Therapies for Acute and Chronic Low Back Pain: A Review of the Evidence for an American Pain Society/American College of Physicians Clinical Practice Guideline

Roger Chou, MD, and Laurie Hoyt Huffman, MS

Best Practice & Research Clinical Rheumatology 24 (2010) 181–191



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Treatment-based subgroups of low back pain: A guide to appraisal of research studies and a summary of current evidence

Steven J. Kamper, BAppSc, PhD, Physiotherapist^{a,*}, Christopher G. Maher, PhD, Professor of Physiotherapy^a, Mark J. Hancock, PhD, Physiotherapist, Lecturer^b, Bart W. Koes, PhD, Professor of General Practice^c, Peter R. Croft, PhD, Professor of Primary Care Epidemiology^d, Elaine Hay, MD, Professor of Community Rheumatology^d

Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane review and meta-analysis

Steven J Kamper senior research fellow^{1,2}, A T Apeldoorn research assistant³, R J E M Smeets professor of rehabilitation medicine³, P van Tulder evidence-based physiotherapy^{2,4}, J Guzman clinical assistant professor of health technology assessment⁴

Smith et al. BMC Musculoskeletal Disorders 2014, 15:416
<http://www.biomedcentral.com/1471-2474/15/416>

Stabilisation exercises for low back pain: A systematic review with meta-analysis

BMC Musculoskeletal Disorders
Open Access

Treatment of LBP

- Systematic reviews of clinical trials demonstrate small to moderate effect sizes and no differences in outcomes between various therapies for LBP (Chou & Huffman 2007)

CLINICAL GUIDELINES

Annals of Internal Medicine

**Nonpharmacologic Therapies for Acute and Chronic Low Back Pain:
A Review of the Evidence for an American Pain Society/American
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Roger Chou, MD, and Laurie Hoyt Huffman, MS

Treatment of LBP

- To date, “no classification system is supported by sufficient evidence to recommend implementation into clinical practice” (Kamper 2010)

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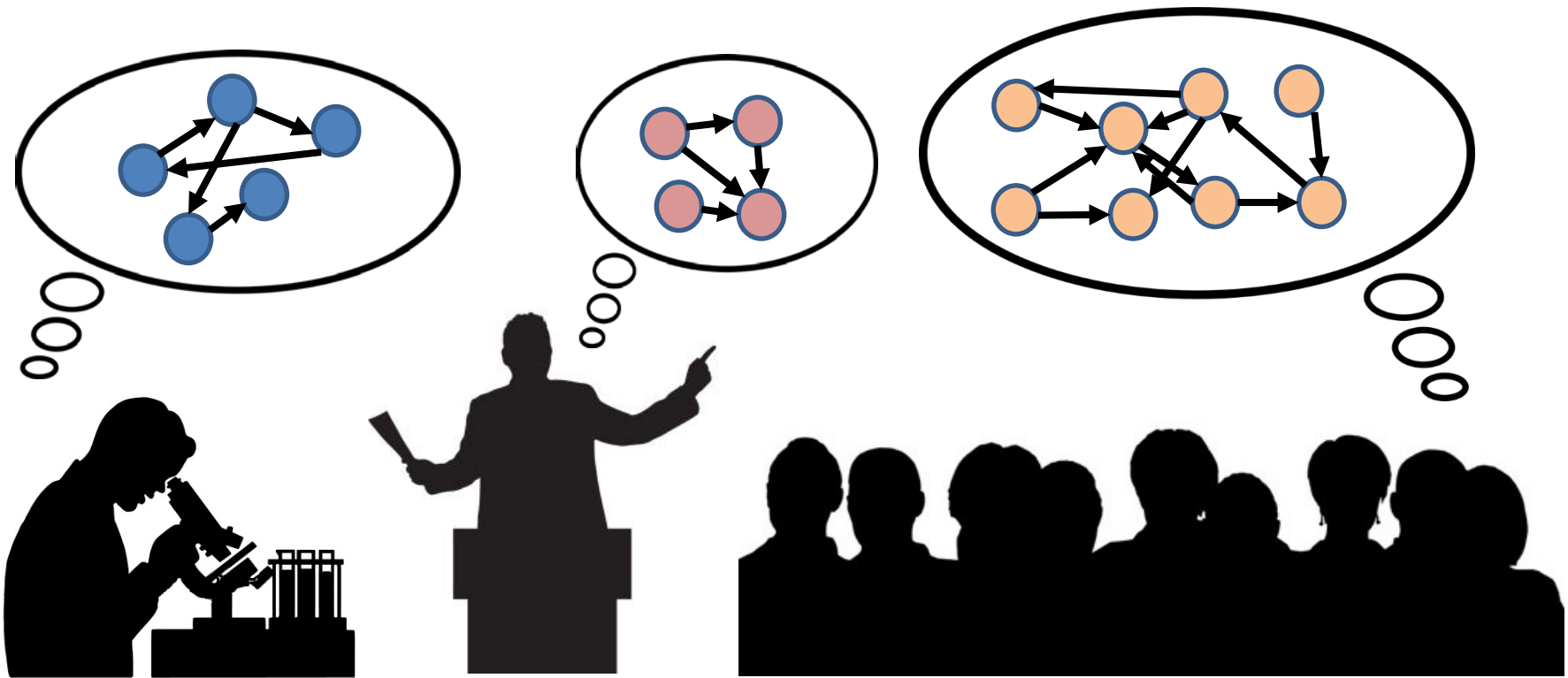
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Current state of LBP problem

- **Overall picture:** the effects of various therapies for LBP are small, short-term, and the differences between outcomes of various types of therapy are negligible

LBP knowledge is distributed over many areas of expertise



Collaborative/Participatory Modeling

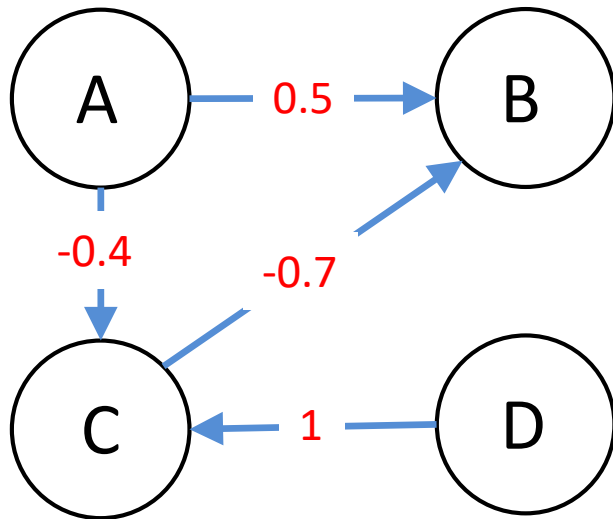
- Applies to the studies of very complex systems
- Allows for sharing and integrating knowledge
- Facilitates group decision-making process
- Helps in identifying problems and questions for further research
- Involves formal modeling/software which:
 - Allows quantitative analysis of content and structure
 - Models can simulate “what if” scenarios

Preliminary Study

- 27 participants: 5-Basic Science, 1-Epidemiology, 4-Chiropractic, 2-Spine Surgery, 2-Physical Medicine & Rehabilitation, 11-Physical/Exercise Therapy, and 2-Psychology.
- 27 mental models of LBP problem using Fuzzy Cognitive Mapping (FCM) (MentalModeler.org).
- Individual FCMs were aggregated to form a meta-model using Gephi software (Gephi.org).
- The effects of various intervention strategies on **Pain Disability** and **Quality of Life** were simulated ([Python](http://Python.org)).

Fuzzy Cognitive Mapping

Graphical representation of components and their relationships in a “mental model” of a system/problem

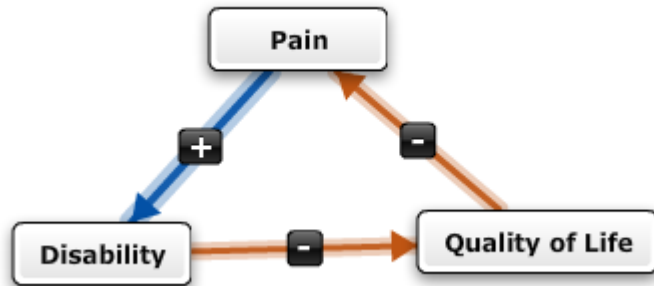


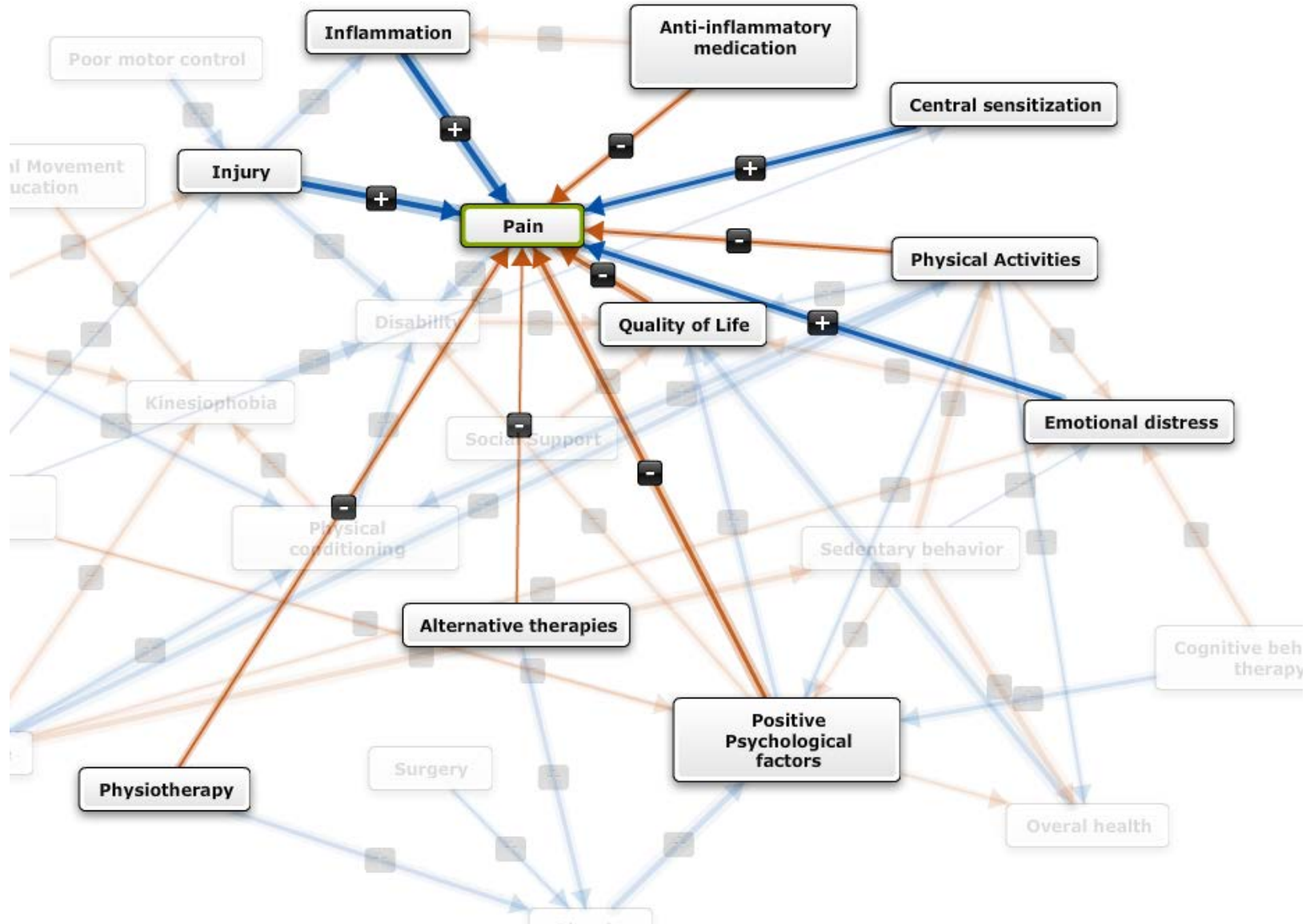
1. Identify components
2. Identify relationships
3. Assign strengths of the relationships (-1 to 1)

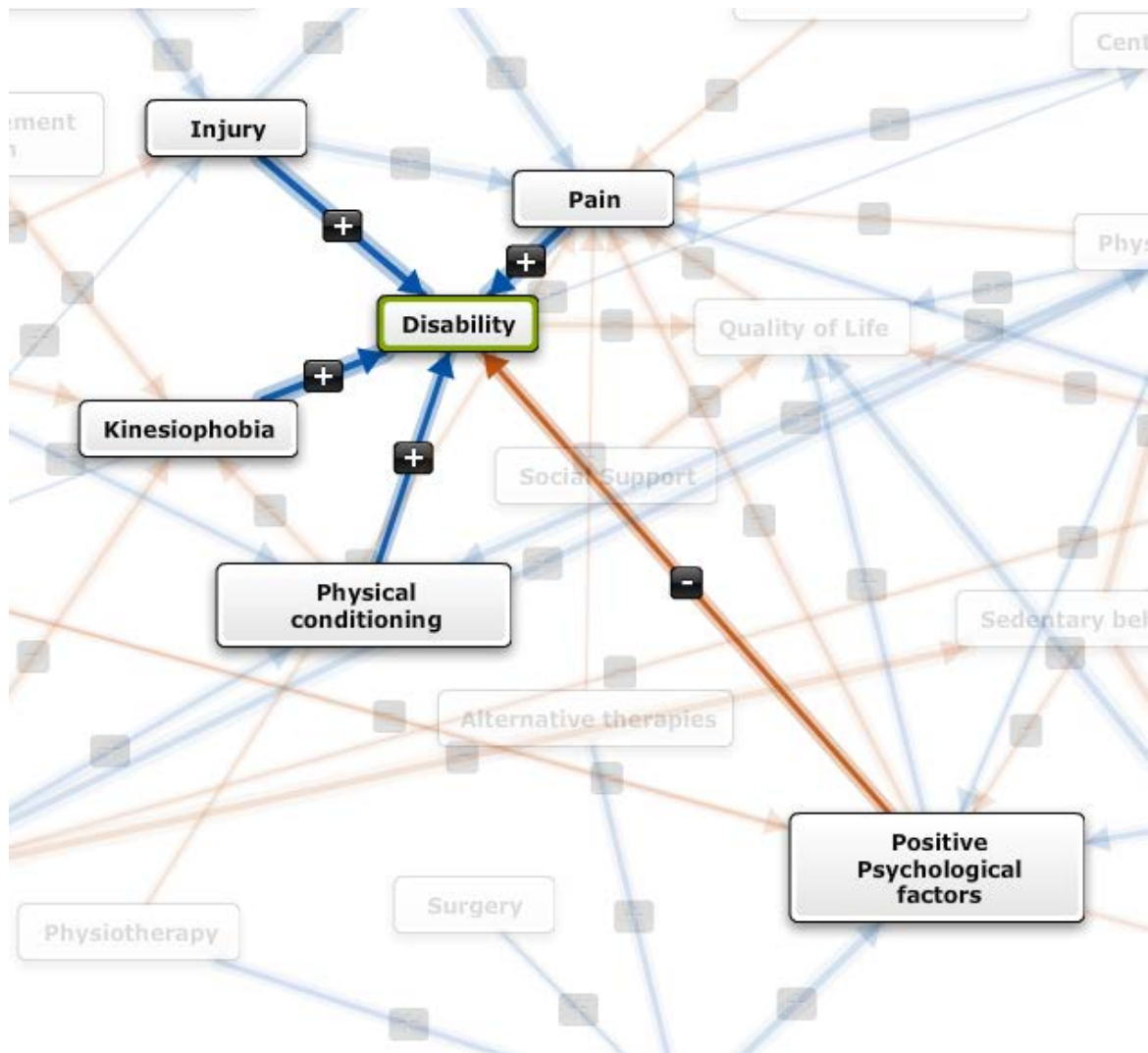
Pain

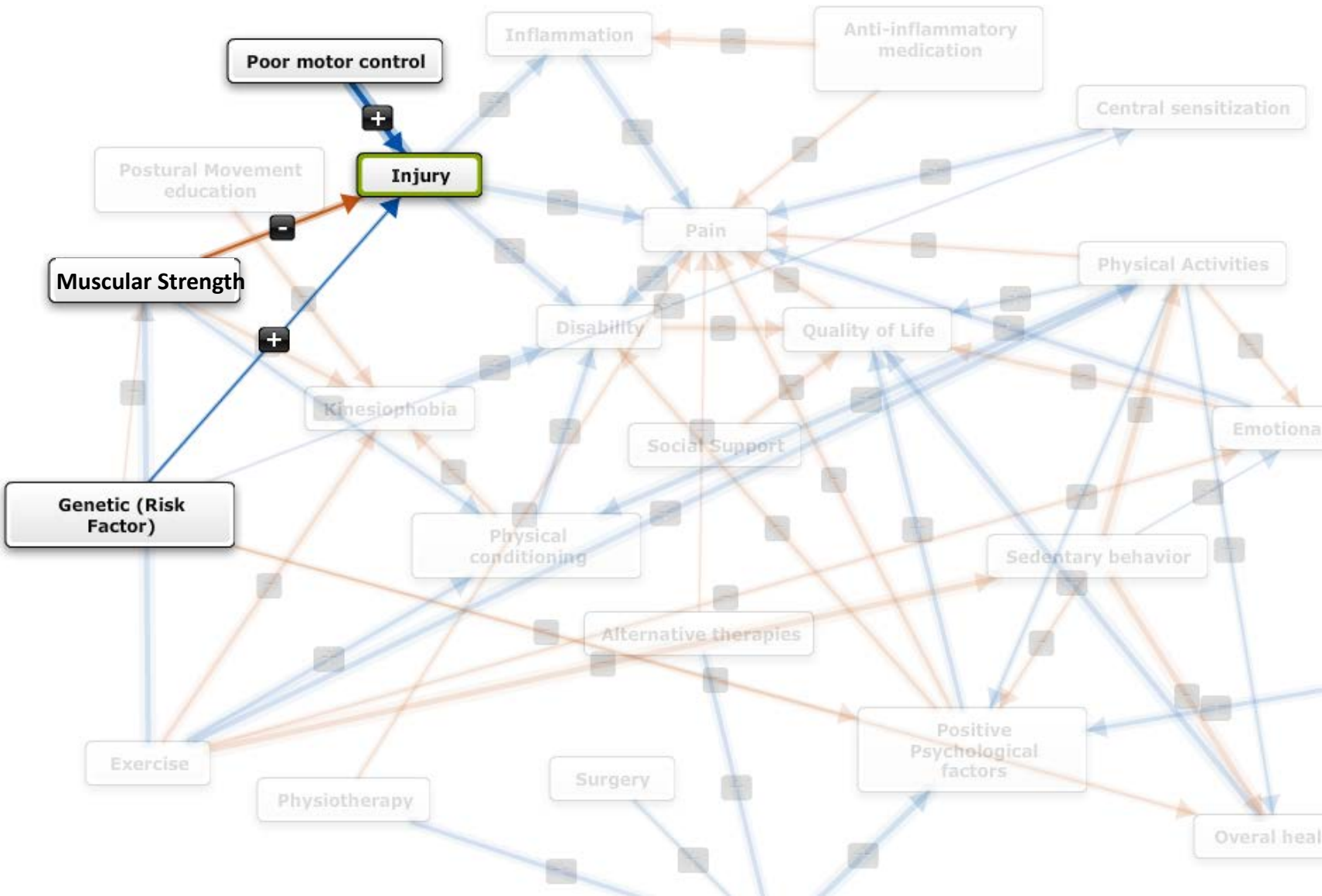
Disability

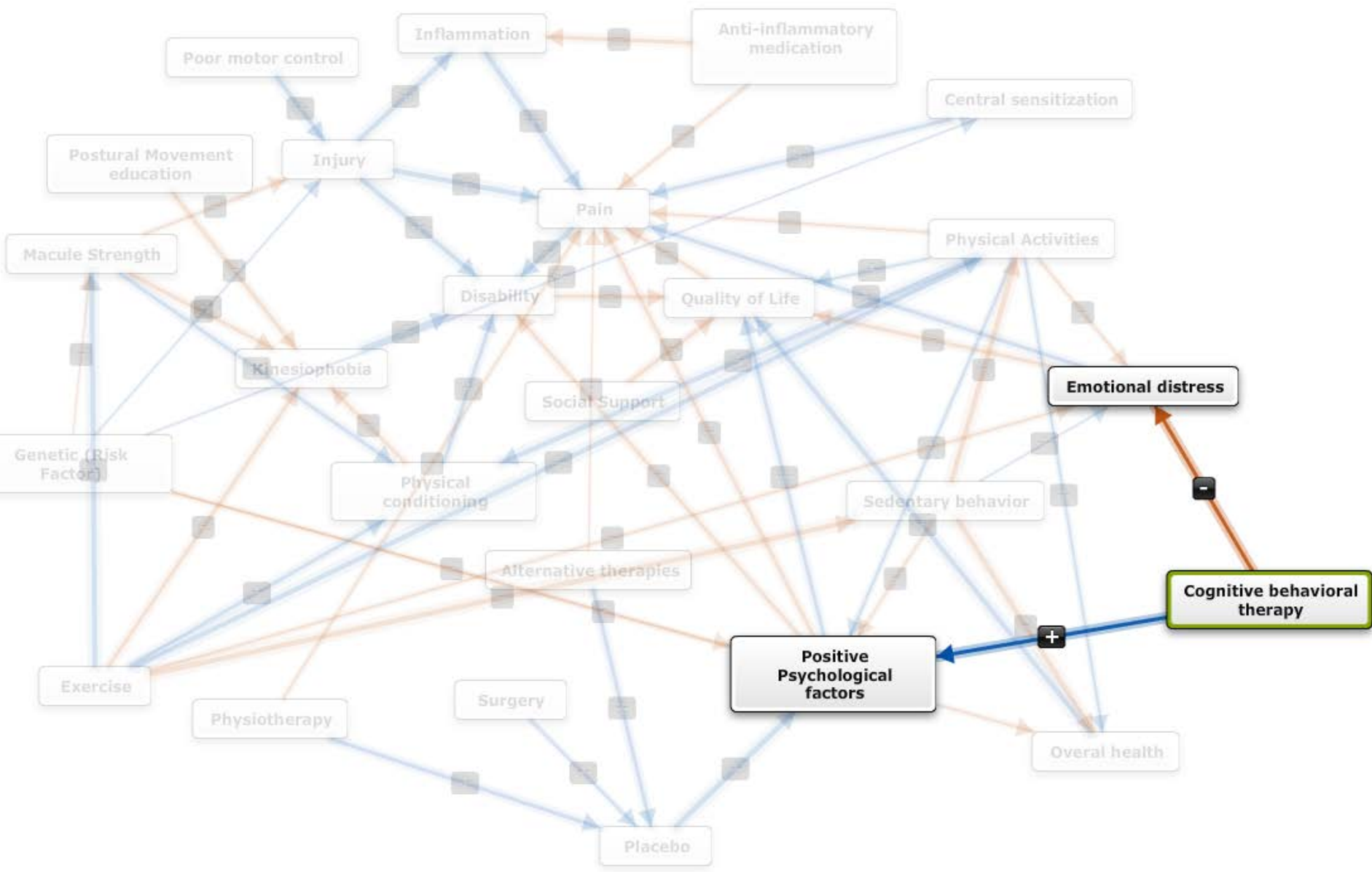
Quality of Life

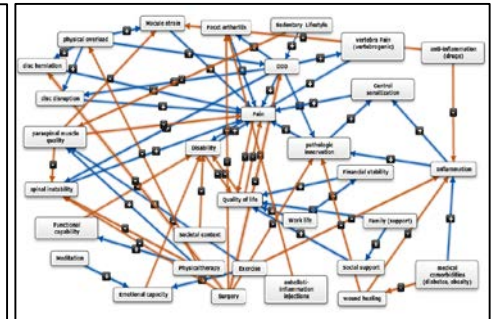
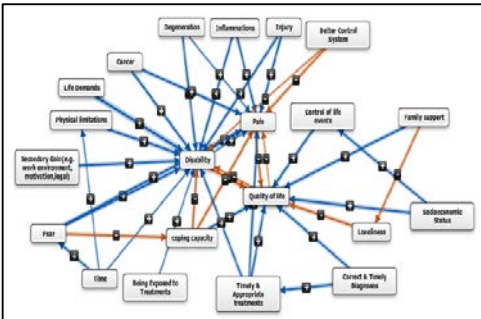
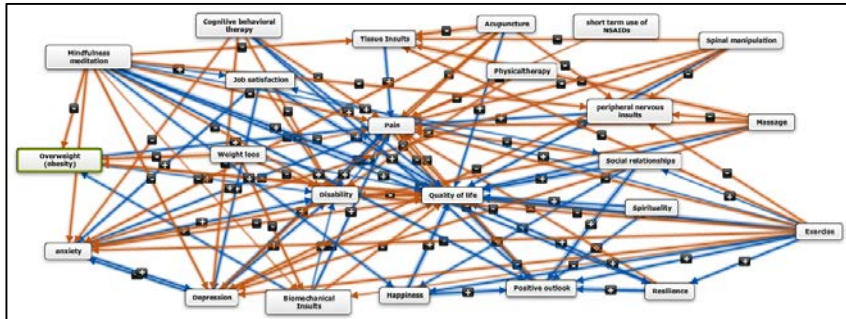
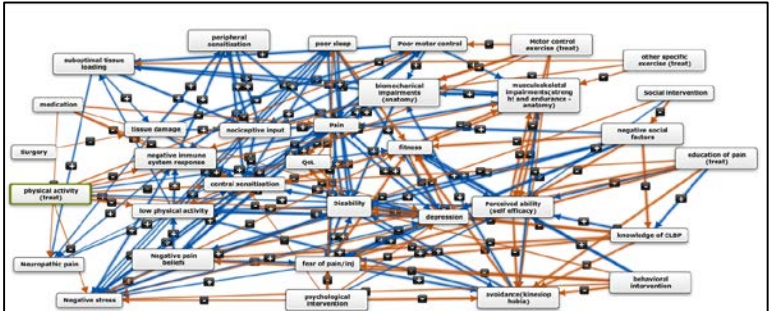
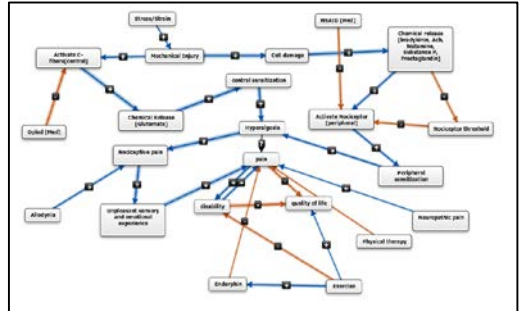
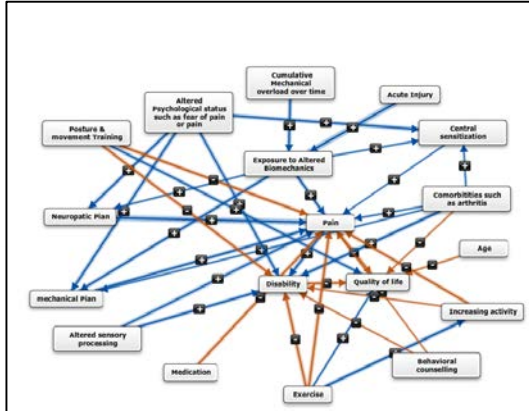
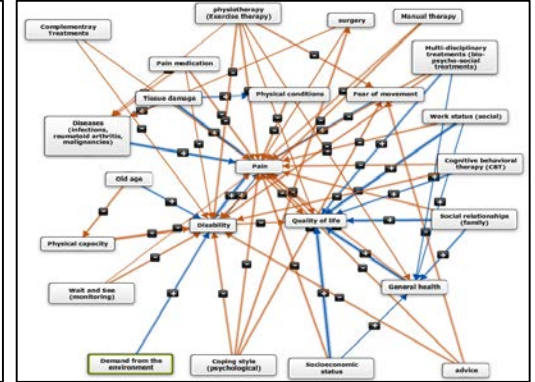
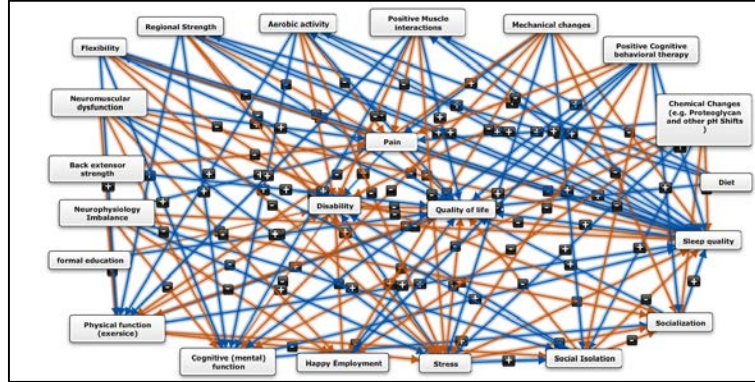
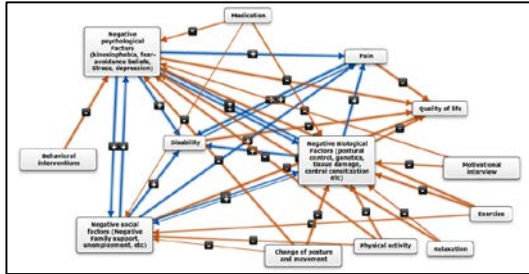




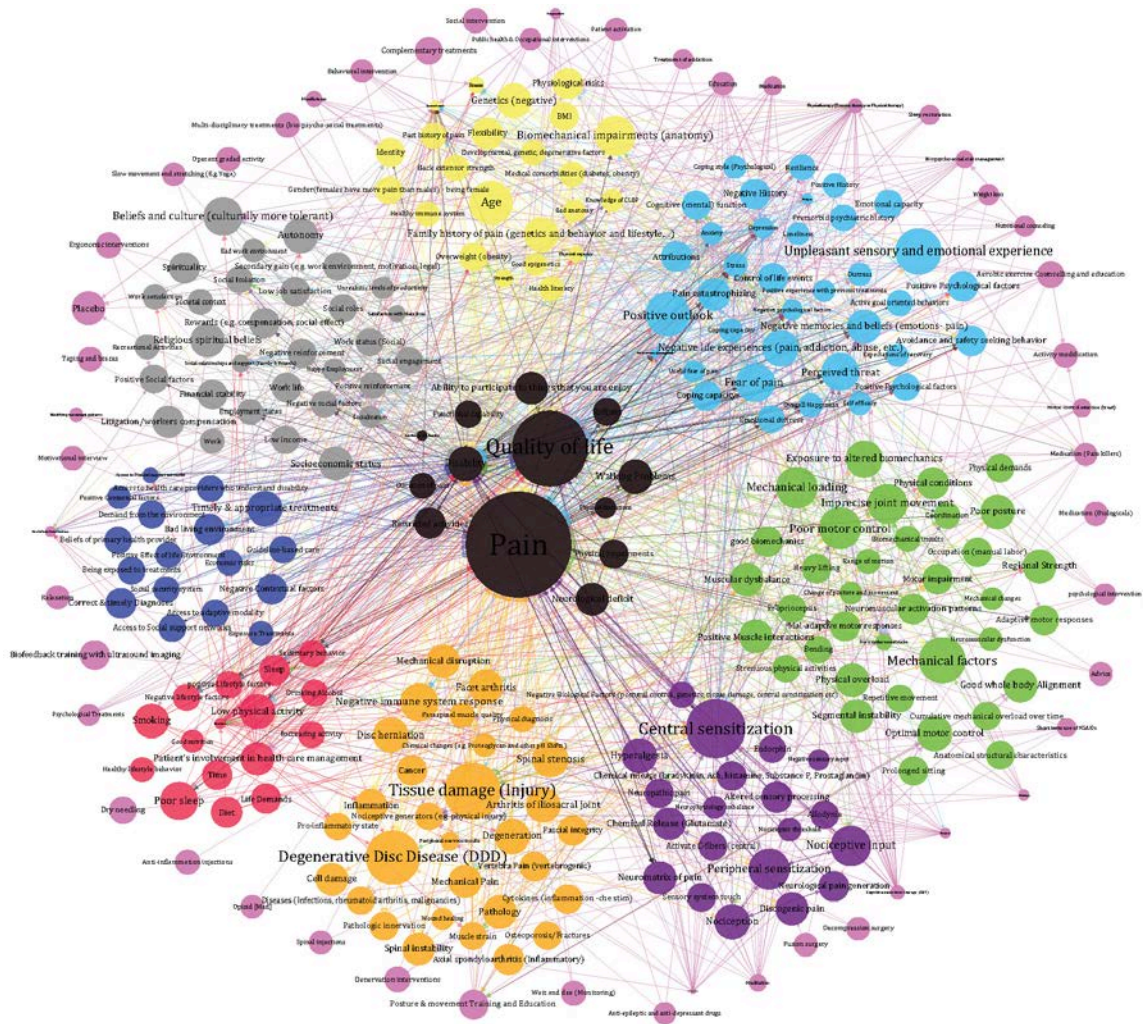
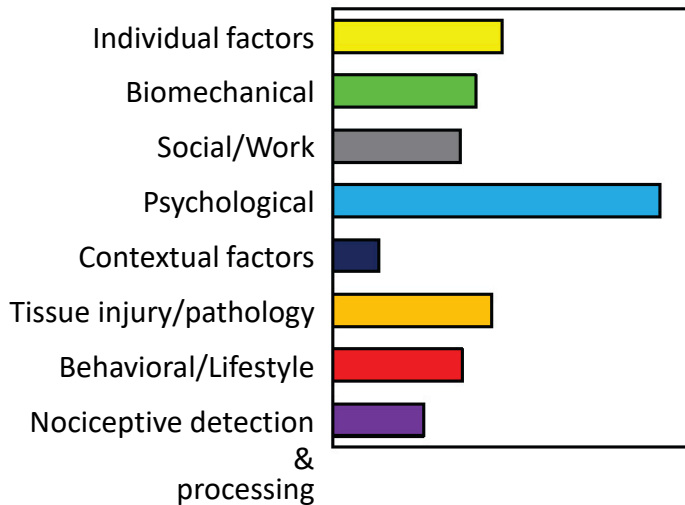






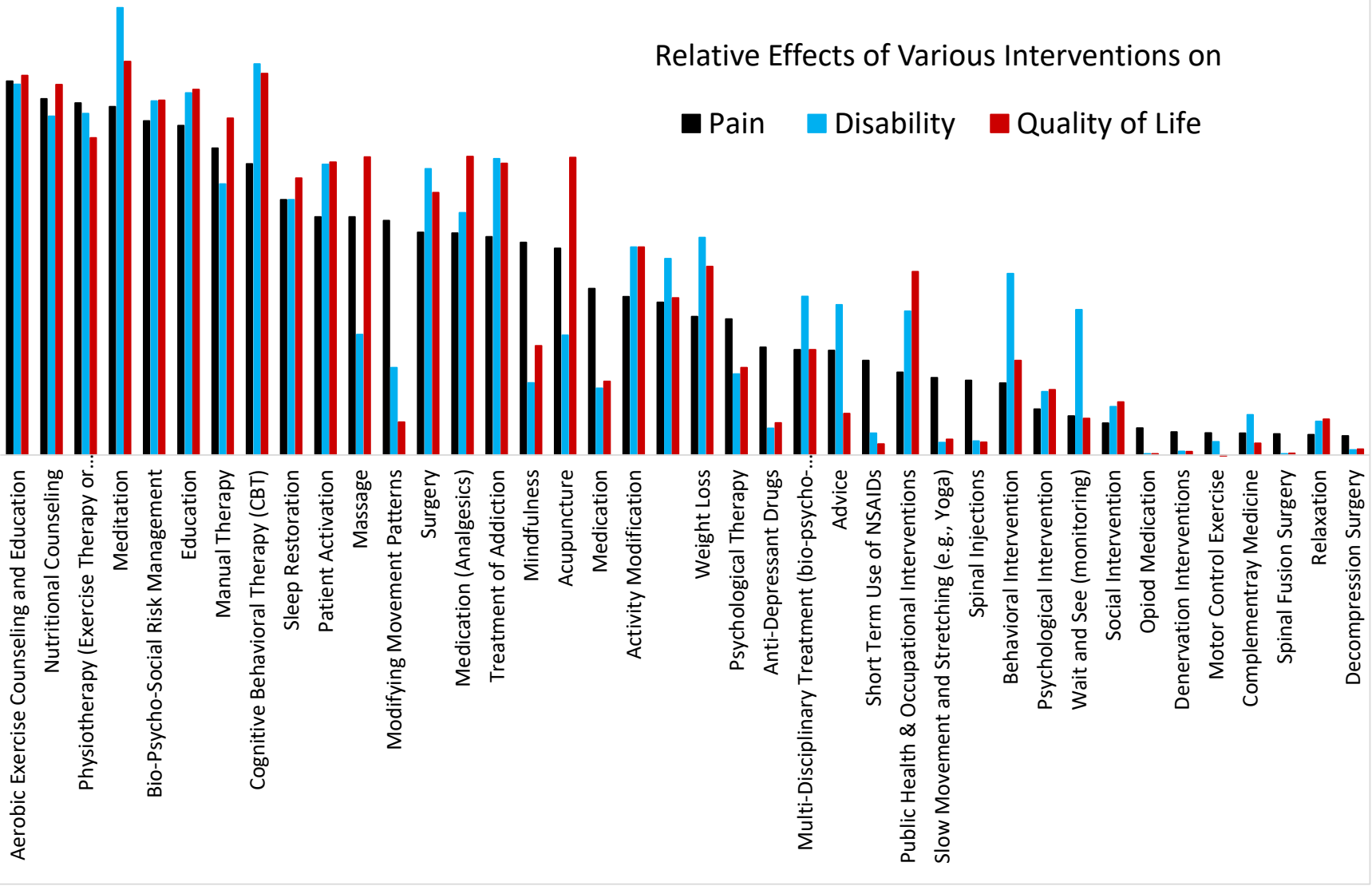


147 factors
 1,425 connections
 10 categories



Relative Effects of Various Interventions on

Pain
 Disability
 Quality of Life



My questions

- What is the likelihood of success in LBP research with traditional methods?
 - How much data?
 - How long, given that a minimum follow-up is 1 year?
- What is the best approach to find the solution?

Pain Medicine Policy Model

(Wakeland et al., 2015)

