Preventing Chronic Pain through Multidisciplinary Approaches: An Overview

It takes a team to do anything of lasting value

John C Maxwell

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SAN DIEGO STATE
UNIVERSITY

Overview

- Evolution of multidimensional models of pain

- Challenges and opportunities in multidisciplinary prevention of chronic pain

Pain Defined

Aristotle

Pleasure and pain are 'passions of the soul'. Pain is not regarded as a sensation but is thought of as an emotion
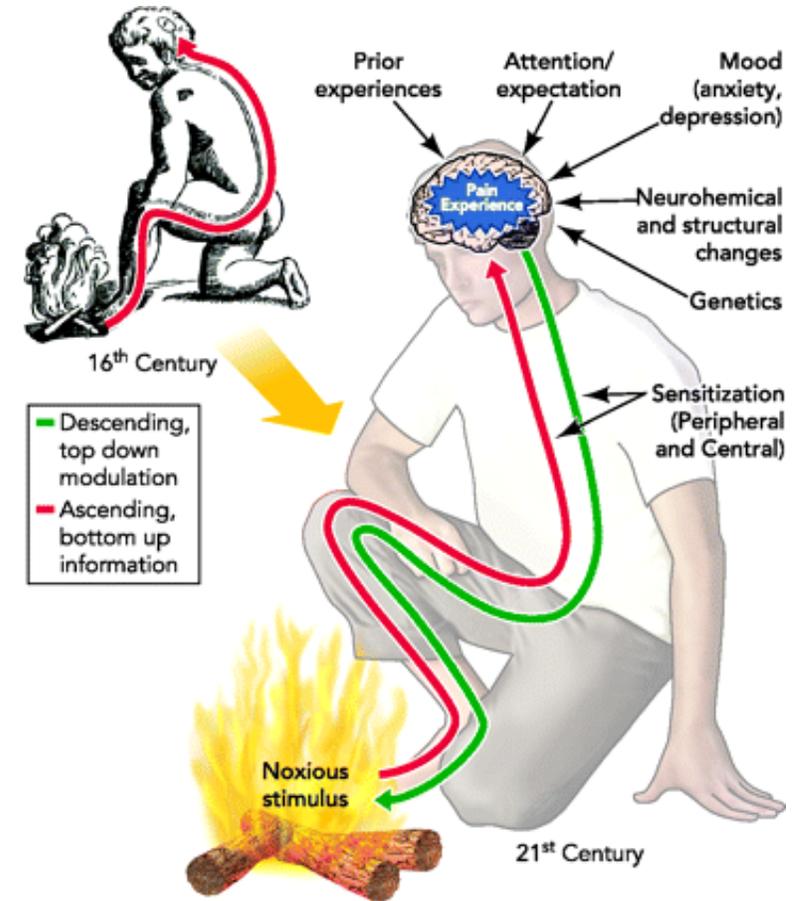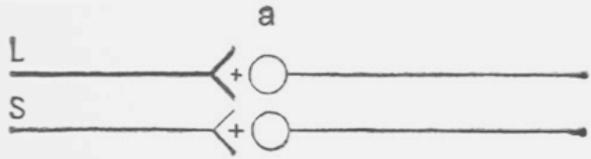
16th Century

Pain Defined

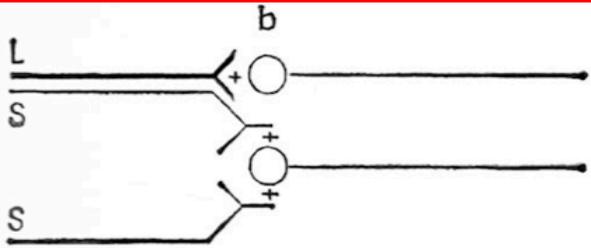**International Association for the Study of Pain**

An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage
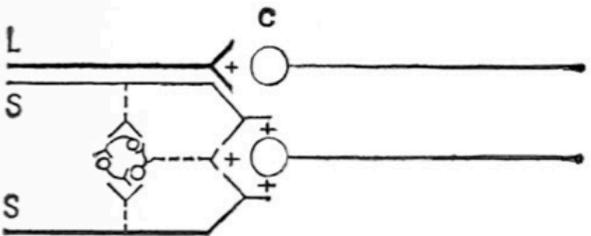
Evolution of Pain Theories

19thC: Von Frey's specificity theory: large and small fibres transmit touch and pain specifically, to specific touch or pain centres in the brain

19thC: Goldscheider's Summation theory: small fibres converge onto a dorsal horn cell, and touch is carried on large fibres

1943: Livingston's reverberatory circuit model: dorsal horn cell bombarded by self-exciting neuron circuit transmits abnormally patterned volleys to brain
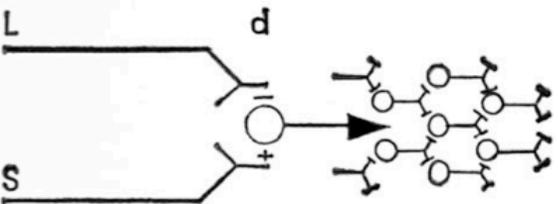
1959: Noordenbos' sensory interaction theory: large fibres inhibit, small ones excite central transmission neurons; comprises multi-synaptic afferent system.

Contemporary Pain Models: Neuromatrix Theory
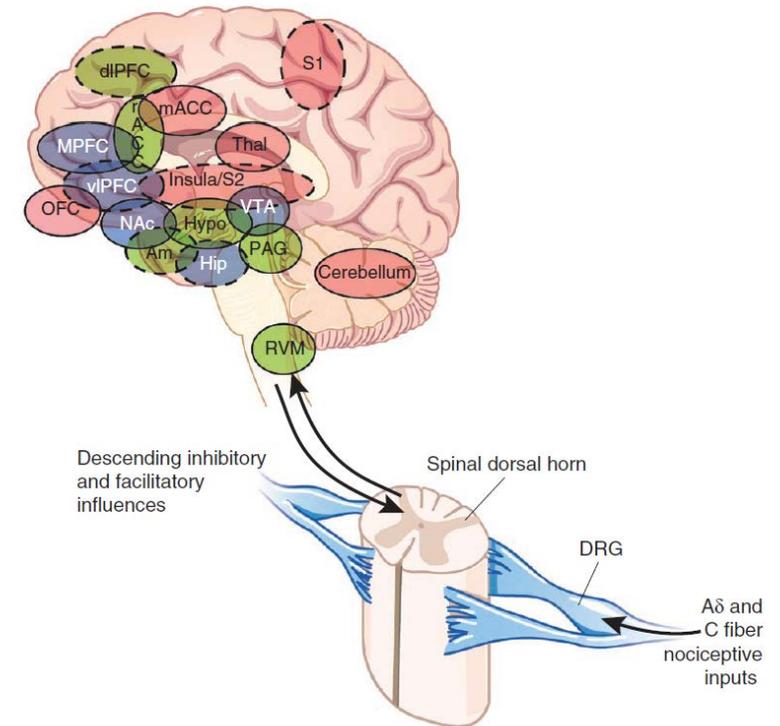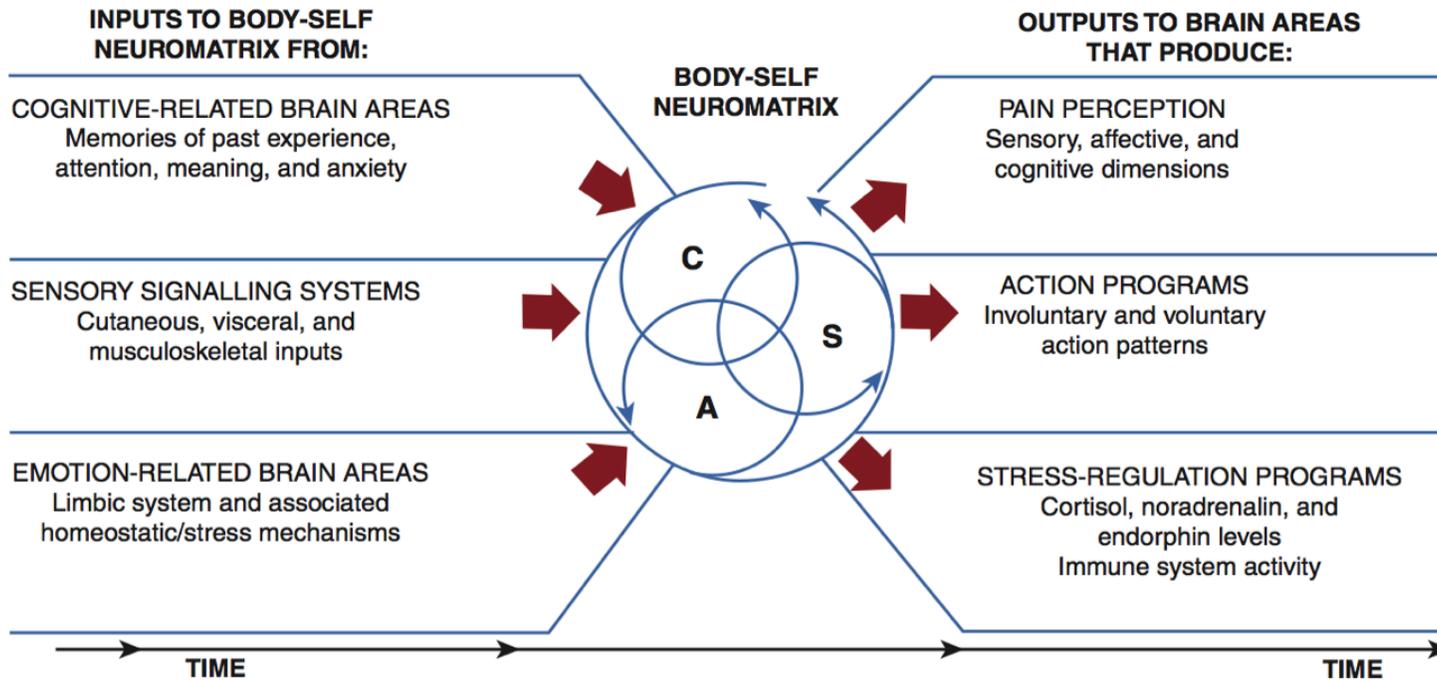
Biopsychosocial Model of Pain

Physiological

Psychological

Social/ Environmental

PAIN
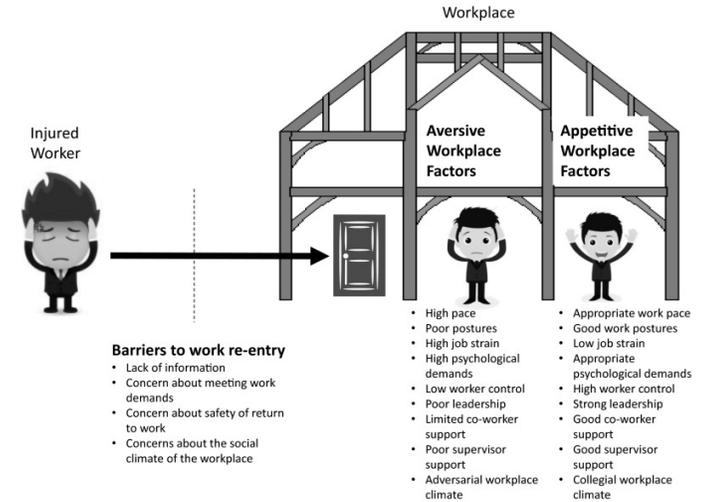
Kristman, *J Occup Rehabil* (2016)
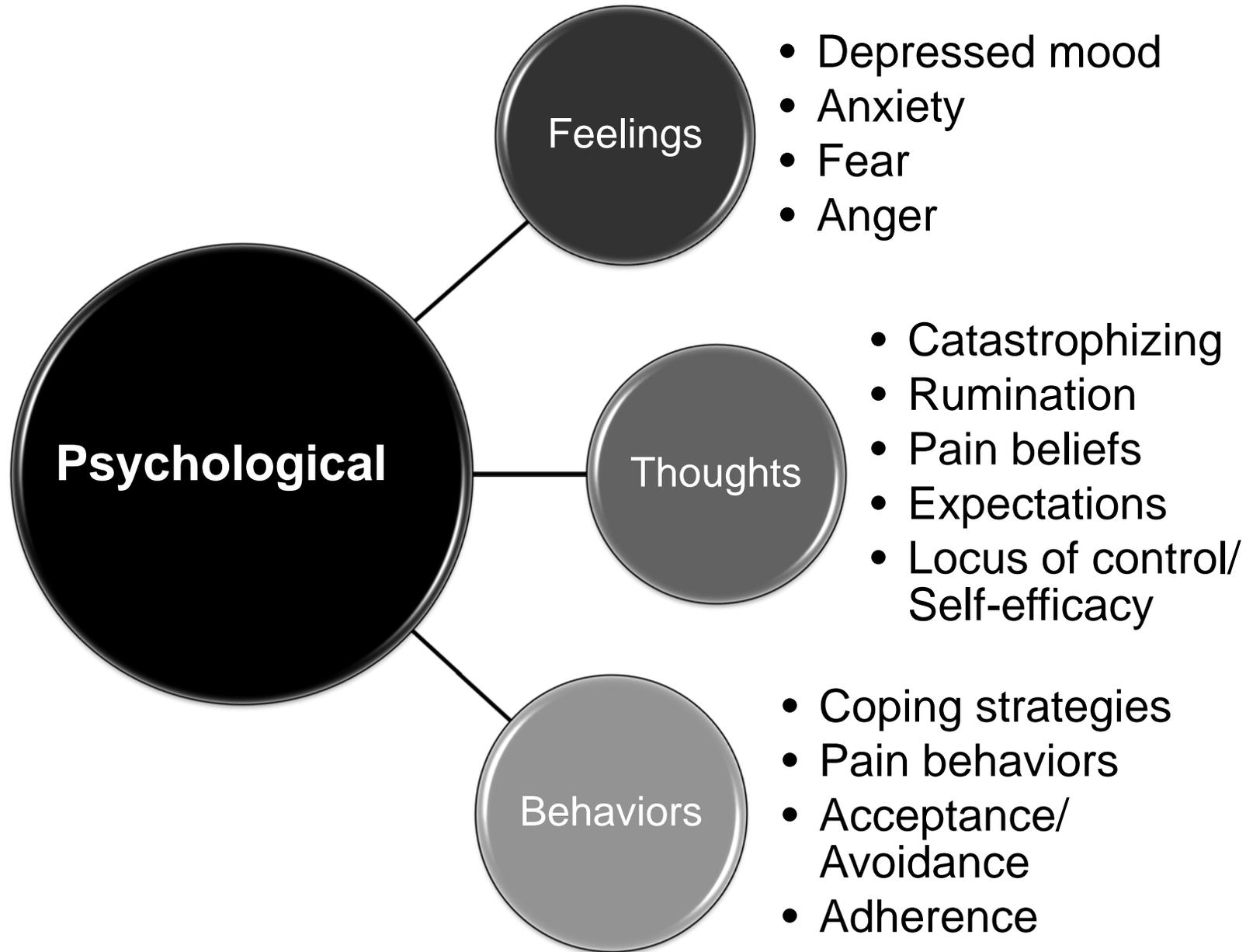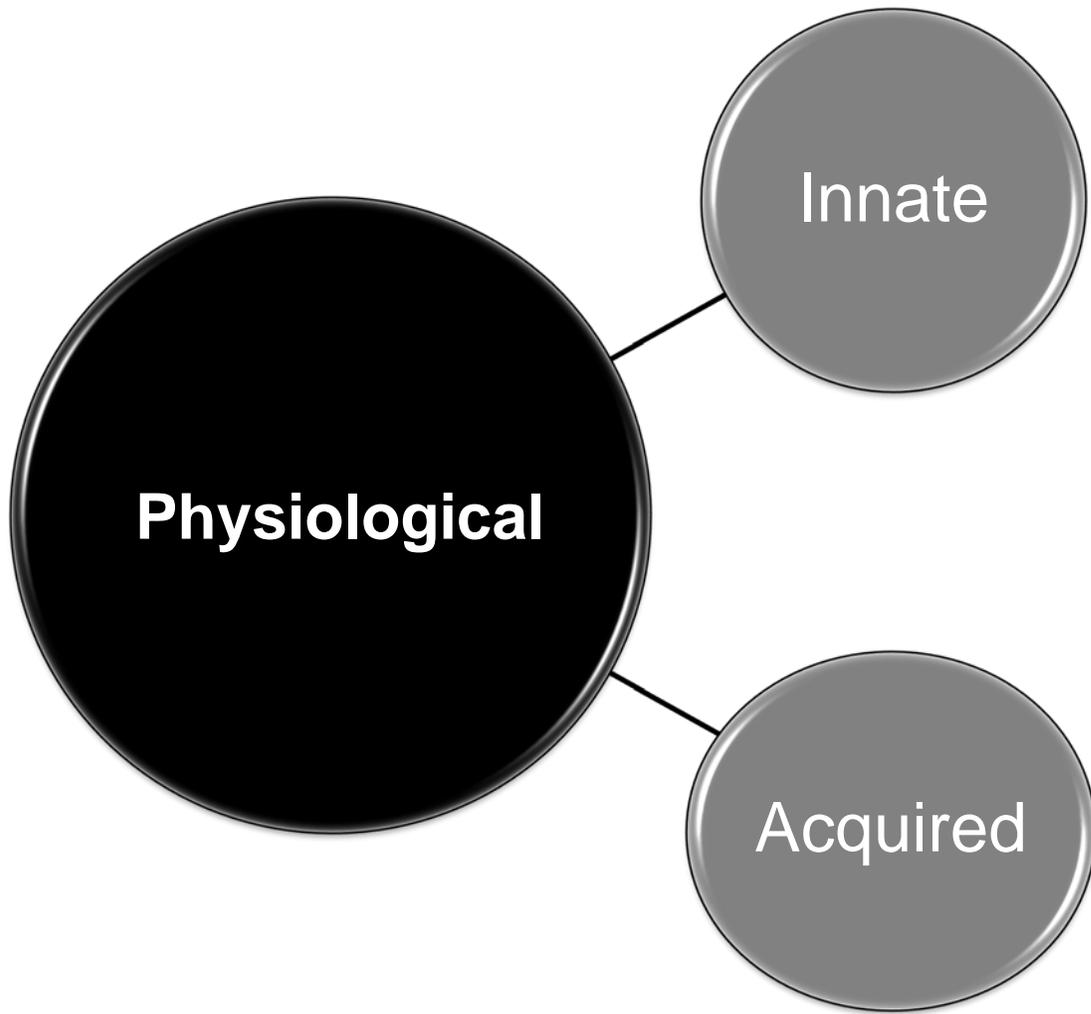
Physiological

Innate
- Sensorimotor processing
- Cognitive-Affective
- Musculoskeletal
- Cardiorespiratory
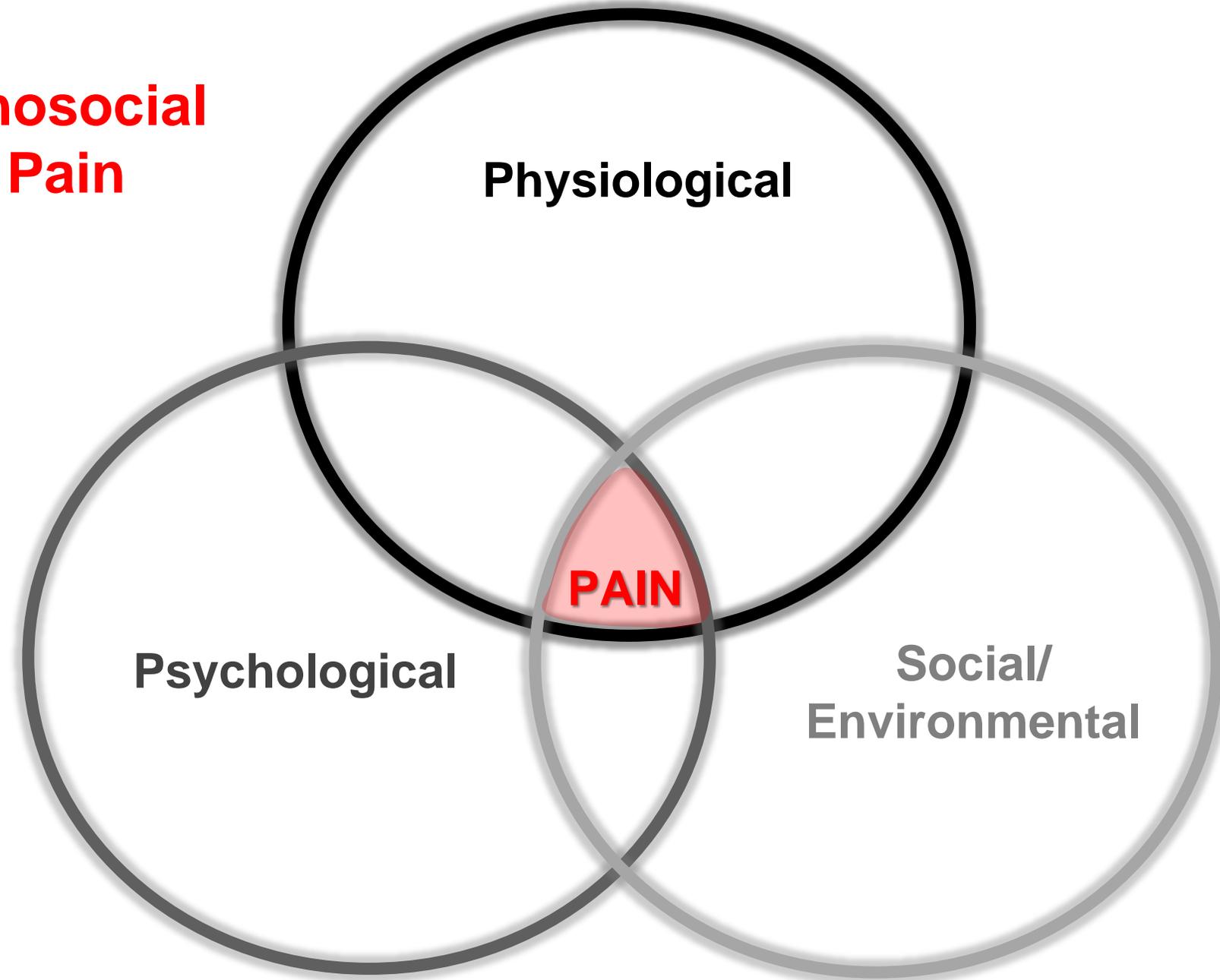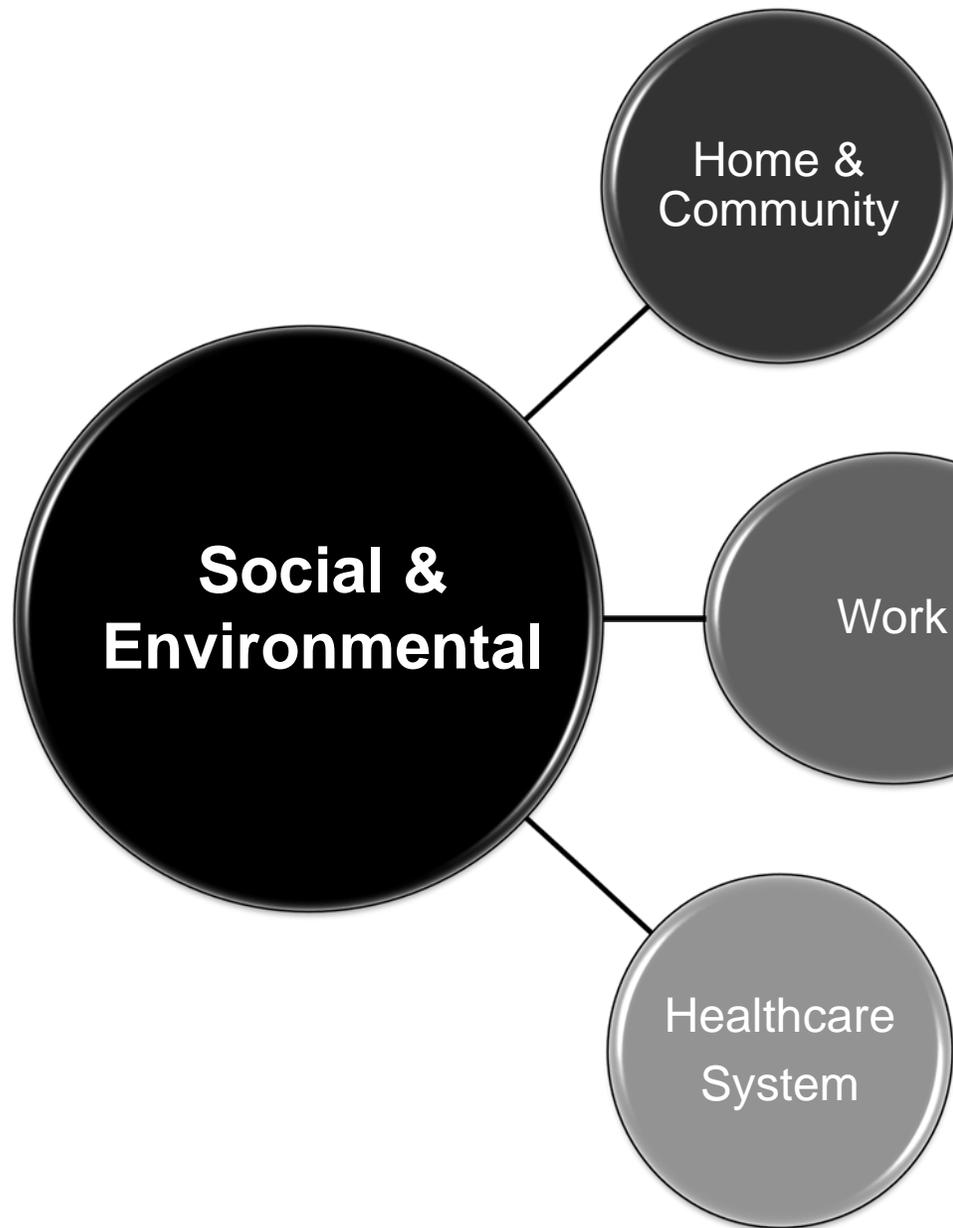- Immunologic
- Metabolic/Endocrine

Acquired
- Sensorimotor processing
- Cognitive-Affective
- Musculoskeletal
- Cardiorespiratory
- Immunologic
- Metabolic/Endocrine

Risk for chronic pain

Hardware at birth
- Gender, genotype and epigenetic profile

Environmental influences
- Acute injury or disease at critical developmental periods
- Stressful life events

Gene × environment interactions
- Personality and psychology (for example, pessimism, neuroticism, anxiety, catastrophizing, reward bias)

Innate mechanisms

Acquired mechanisms
Priming

Brain vulnerable networks
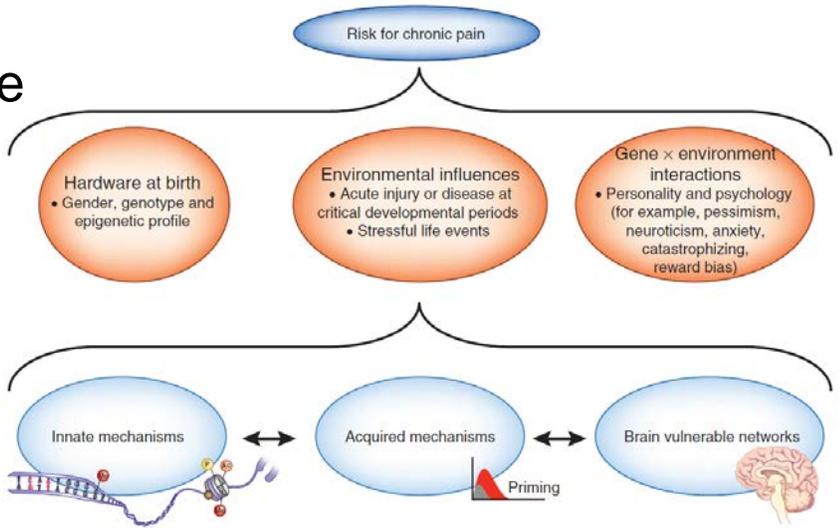
Denk et al. *Nat Neurosci* 2014

Physiological

Psychological

Social/
Environmental
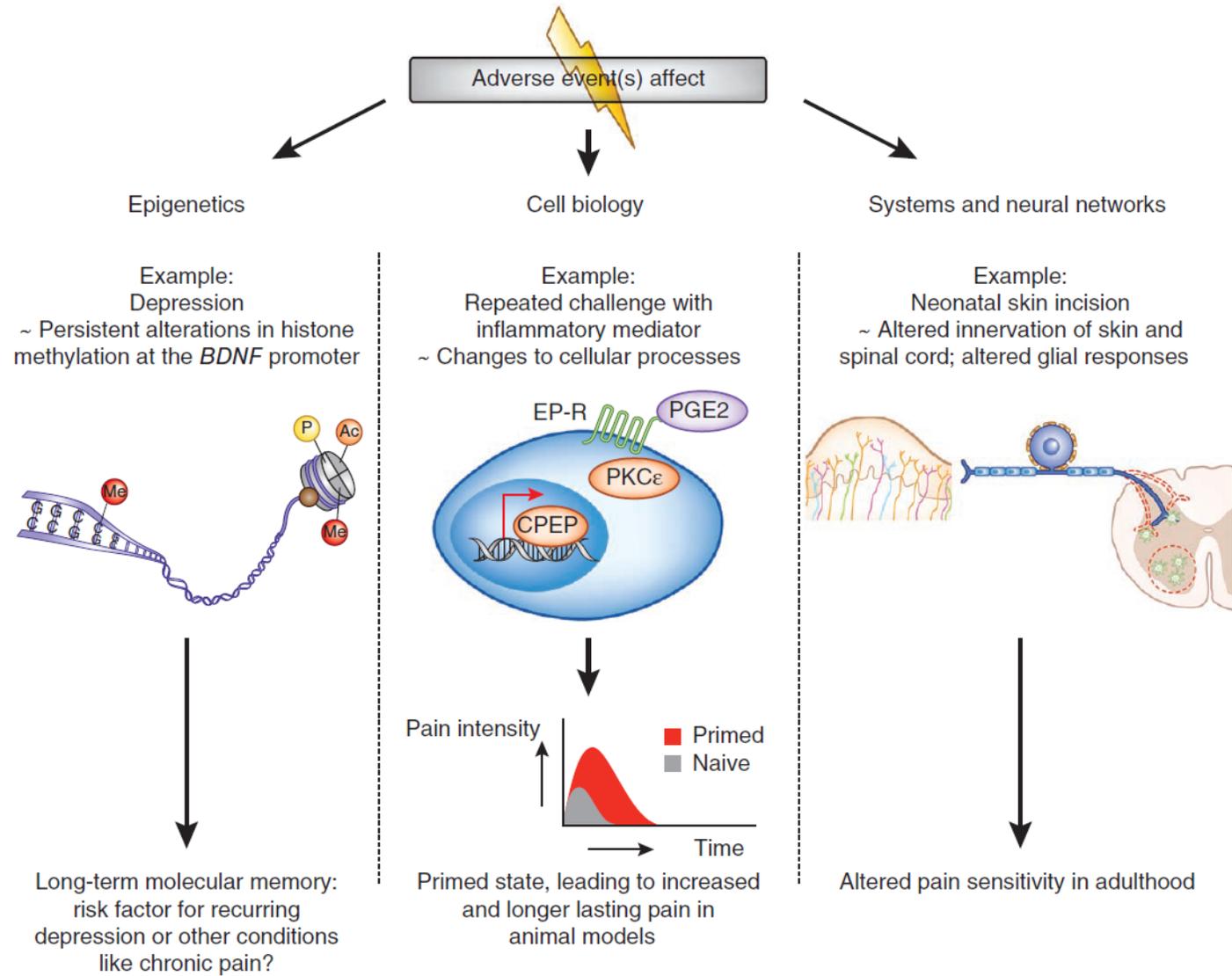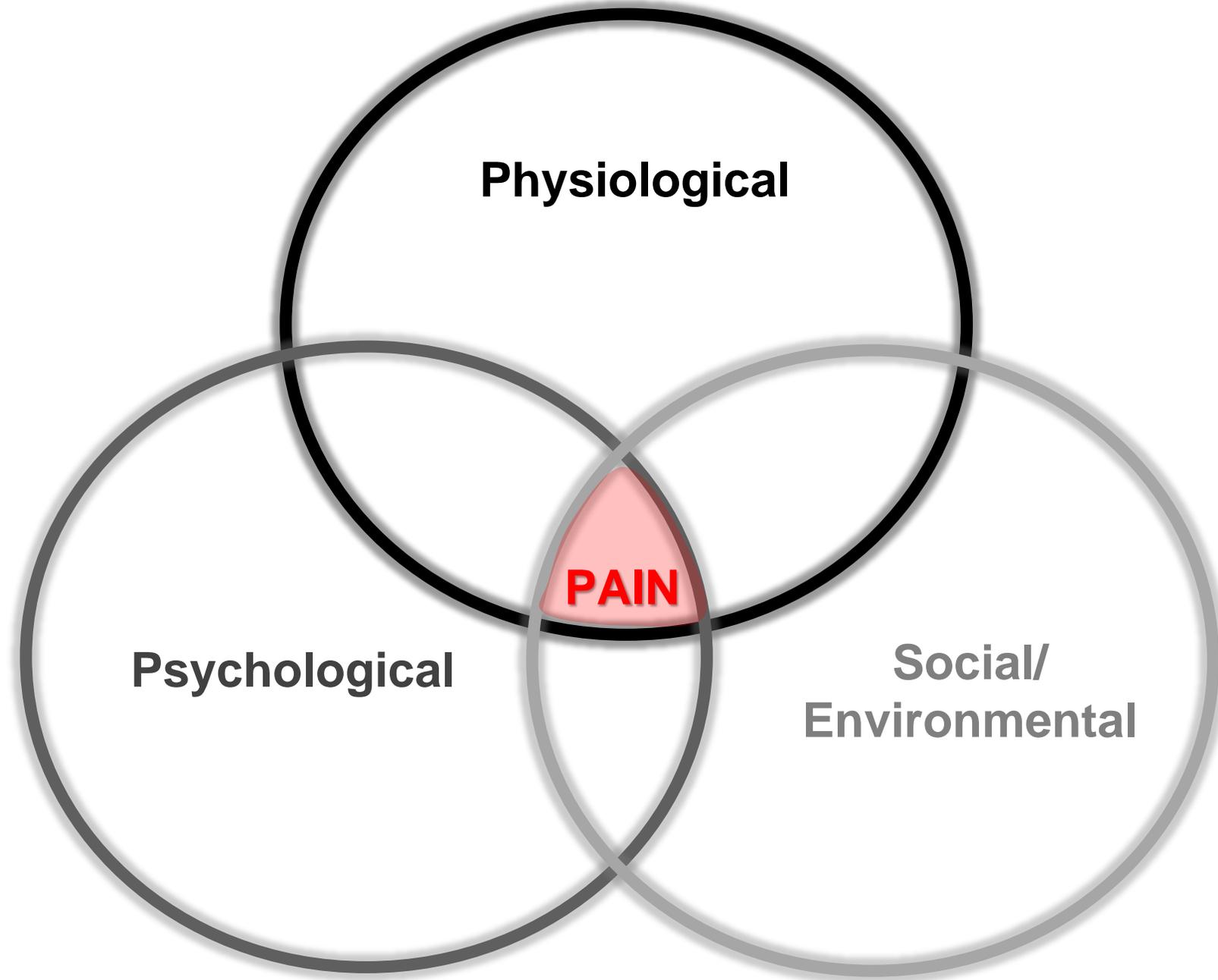
PAIN

Multidisciplinary Models of Care for the Prevention of Chronic Pain

- **Pain Collaboration and Exchange Initiative**
  South Hampton UK

- **British Columbia Pain Initiative**
  Canada

- **Chronic Pain Collaborative Care Network**
  Nova Scotia, Canada

- **Chronic Pain Scotland Service**

- **Hunter Integrated Pain Service**
  New South Wales, Australia

- **STEPS model**
  Perth, Western Australia

- Risk stratification and targeted referral systems
- Interdisciplinary pain education for health care providers
- Minimum datasets for cost-benefit analyses
- Inter-professional collaboration using a biopsychosocial approach
- Virtual interdisciplinary networks and communities
- Community-based education programs with evidence based resources for prevention and self-management
- Telehealth and electronic technologies to promote access

Multidisciplinary Prevention and Management of Pain

- **Multidisciplinary** –professionals from different disciplines work with the same patient, but practice within their own professional boundaries and often with limited knowledge about each other's practice

- **Interdisciplinary** –professionals from different disciplines share skills and knowledge while working together toward shared goals for the same patient

- **Transdisciplinary** – professionals from a given discipline cross professional boundaries to implement skills and knowledge from another team member's discipline

Opportunities for Multidisciplinary Prevention

Tertiary Prevention

Chronic Pain → Tertiary Prevention → **Chronic Disability**

PAIN

DISABILITY

WORK

MEDICAL

Favours multidisciplinary — Favours usual

Favours multidisciplinary — Favours usual

Favours usual — Favours multidisciplinary

PHYSICAL

Favours multidisciplinary — Favours physica

Favours multidisciplinary — Favours physical

Favours physical — Favours multidisciplinary

Kamper, *Cochrane Rev (*2015)
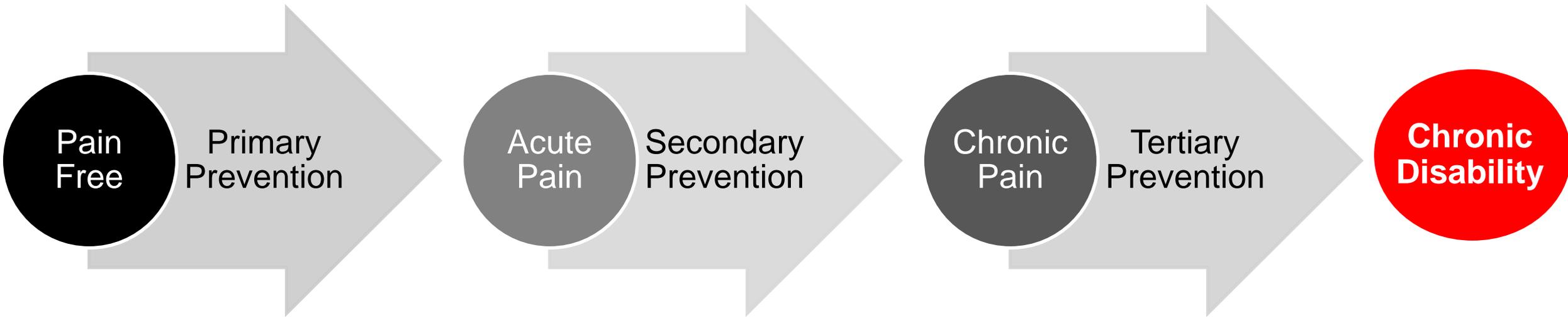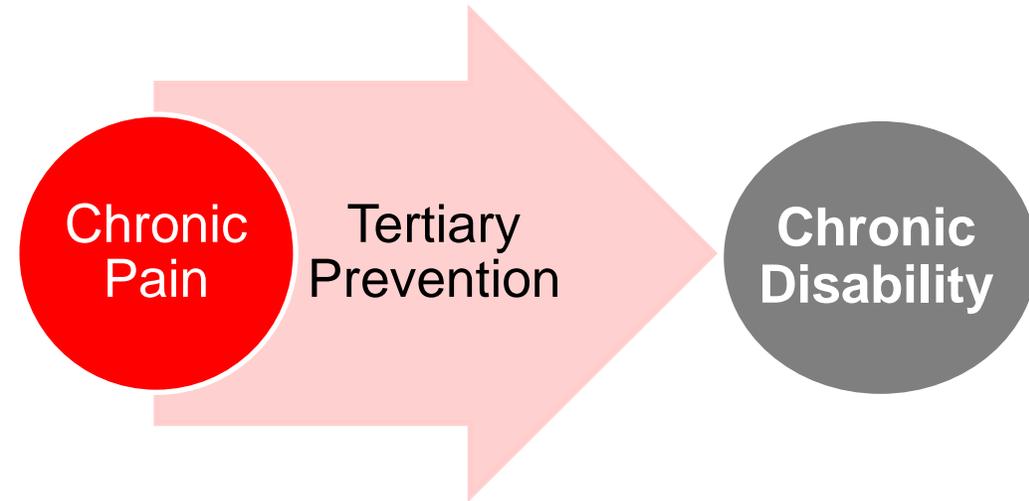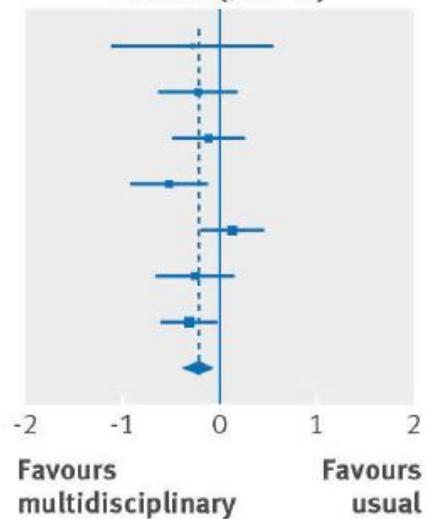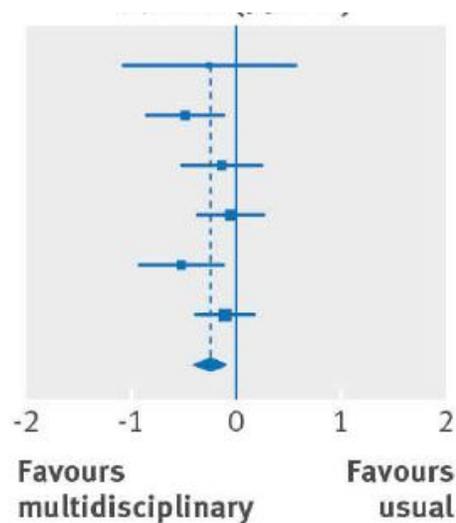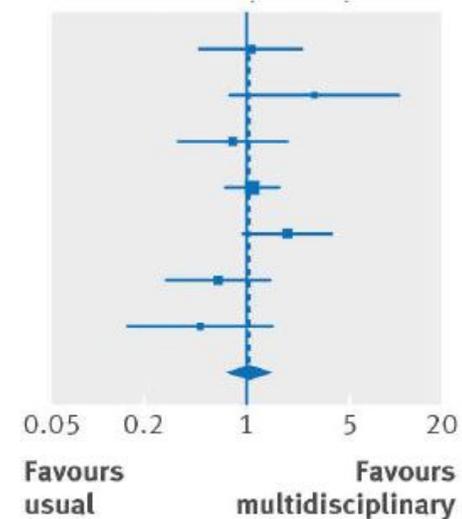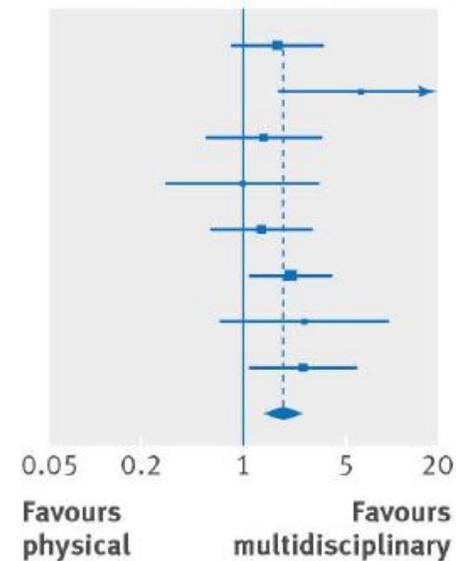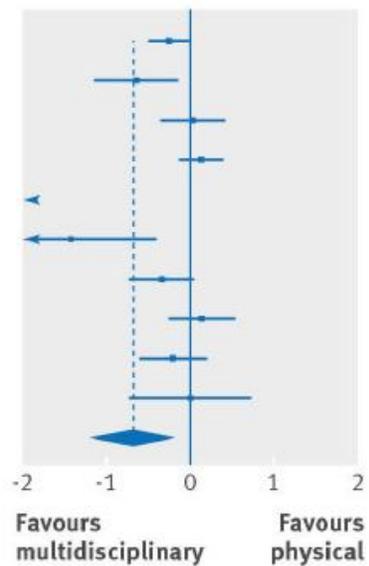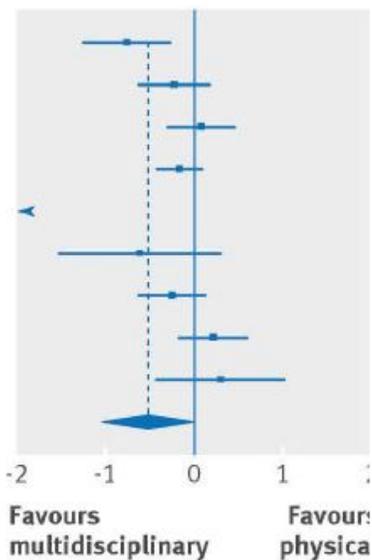
	Group	Pretraining[a]	Posttraining[a]	Follow-up[a]	Time effect[b]	Group effect[b]	Interaction effect[b]
Primary outcome							
Neck Disability Index (0–100)	Multidisciplinary	41.9 (40.7; 43.2)	24.3.(22.4; 26.2)	21.7 (19.7; 23.6)	<0.001	<0.001	<0.001
	General exercise	41.1 (39.8; 42.3)	36.7 (34.8; 38.6)	37.3 (35.4; 39.3)			
Secondary outcomes							
Tampa Scale for Kinesiophobia (13–52)	Multidisciplinary	28.0 (26.2; 29.7)	18.2 (16.6; 19.8)	16.8 (15.3; 18.2)	<0.001	<0.001	<0.001
	General exercise	28.2 (26.5; 30.0)	28.3 (26.7; 29.8)	29.1 (27.7; 30.6)			
Pain Catastrophizing Scale (0–52)	Multidisciplinary	20.4 (19.0; 21.9)	13.4 (12.9; 14.8)	12.2 (10.9; 13.5)	<0.001	<0.001	<0.001
	General exercise	20.8 (19.4; 22.2)	20.2 (18.8; 21.6)	21.2 (19.9; 22.5)			
Numerical Rating Scale (0–10)	Multidisciplinary	6.0 (5.7; 6.2)	2.1 (1.8; 2.3)	2.1 (1.8; 2.3)	<0.001	<0.001	<0.001
	General exercise	6.1 (5.9; 6.3)	5.3 (5.1; 5.6)	5.6 (5.3; 5.8)			

Secondary Prevention
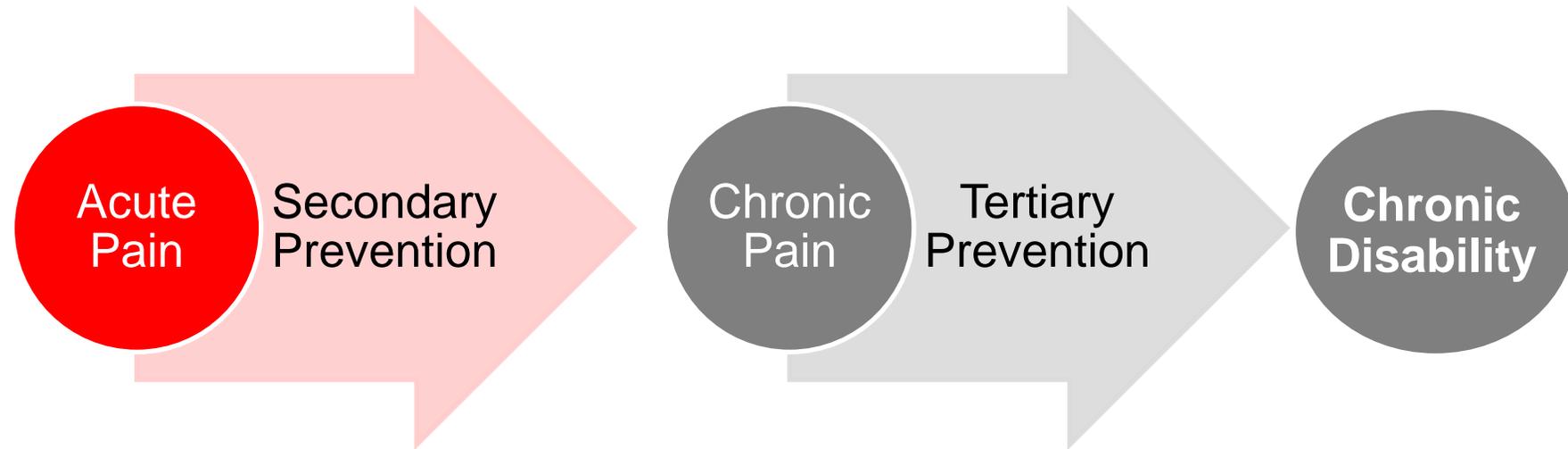
Transition from acute to chronic pain

Table 1 Examples of studies examining the emergence or incidence of chronic pain

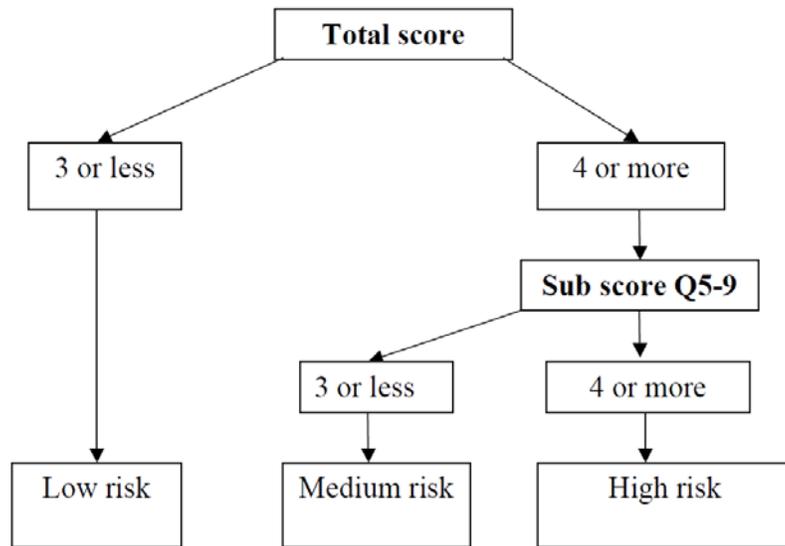|	Size of patient cohort	Condition or surgery	Incidence (%)
Diabetes	15,692	Total incidence of neuropathy	48
		Painful neuropathy	34
Postsurgical pain	159,000	Amputation	30–50
	479,000	Breast surgery	20–30
	Unknown	Thoracotomy	30–40
	609,000	Inguinal hernia repair	10
	598,000	Bypass surgery	30–50
	220,000	Caesarean section	10
Lower back pain	448	Pain 5 years after first presentation: prospective study	36.9
	180	Pain 12 months after initial consultation: prospective study	34
Neck pain	5,277	Incidence of chronic neck pain in cohort of patients reporting at least one episode of acute neck pain: prospective study	18

Acute Injury

Chronic Pain

Screening Tools for Low Back Pain (LBP) Risk Assessment

The STarT Back Tool Scoring System

	Disagree 0	Agree 1
1 My back pain has **spread down my leg(s)** at some time in the last 2 weeks	☐	☐
2 I have had pain in the **shoulder** or **neck** at some time in the last 2 weeks	☐	☐
3 I have only **walked short distances** because of my back pain	☐	☐
4 In the last 2 weeks, I have **dressed more slowly** than usual because of back pain	☐	☐
5 It's not really safe for a person with a condition like mine to be physically active	☐	☐
6 **Worrying thoughts** have been going through my mind a lot of the time	☐	☐
7 I feel that **my back pain is terrible** and **it's never going to get any better**	☐	☐
8 In general I have **not enjoyed** all the things I used to enjoy	☐	☐

9. Overall, how **bothersome** has your back pain been in the **last 2 weeks**?

Not at all	Slightly	Moderately	Very much	Extremely
☐	☐	☐	☐	☐
0	0	0	1	1

Total score → 3 or less → Low risk

Total score → 4 or more → Sub score Q5-9 → 3 or less → Medium risk

Sub score Q5-9 → 4 or more → High risk

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Funded by Arthritis Research UK

Screening Tools for LBP Risk Assessment

Karran, *BMC Medicine* (2017)

Prognostic Risk Stratification for Transdisciplinary Prevention of Chronic LBP

75208 adults registered from ten family doctor practices

70759 without back pain morbidity codes

4449 with back pain morbidity codes

1656 excluded by family doctors because did not meet inclusion criteria

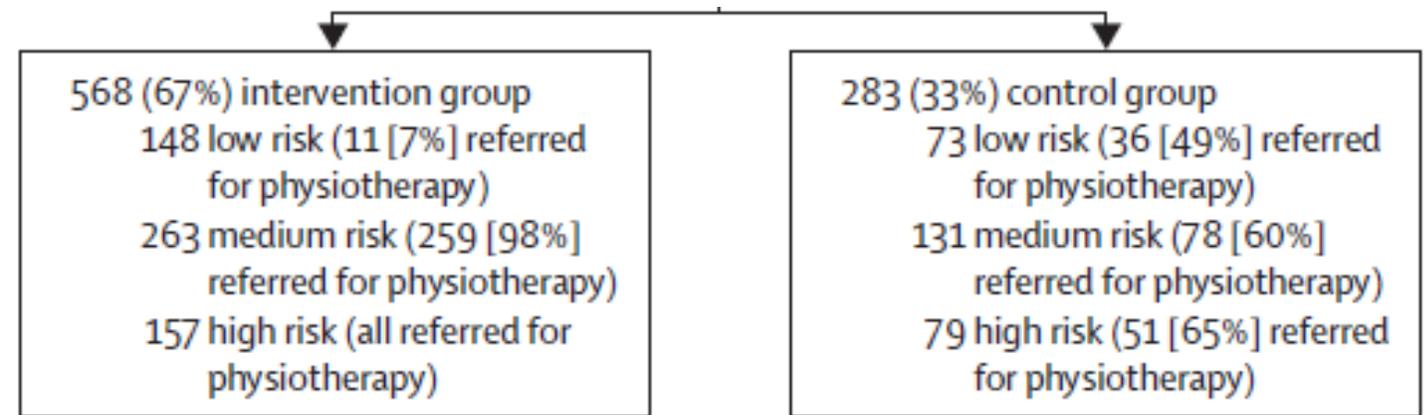2793 sent postal invitations to attend clinic for back pain

1220 did not respond

1573 attended and assessed for eligibility

503 did not consent
219 not eligible
112 unable to attend
58 already receiving treatment
32 language barrier
9 serious comorbidity
8 pregnant

851 randomly assigned

568 (67%) intervention group
148 low risk (11 [7%] referred for physiotherapy)
263 medium risk (259 [98%] referred for physiotherapy)
157 high risk (all referred for physiotherapy)

283 (33%) control group
73 low risk (36 [49%] referred for physiotherapy)
131 medium risk (78 [60%] referred for physiotherapy)
79 high risk (51 [65%] referred for physiotherapy)

102 did not have follow-up
13 withdrawals
89 did not respond to questionnaire

466 (82%) 4-month follow-up
118 (80%) low risk
217 (83%) medium risk
131 (83%) high risk

223 (79%) 4-month follow-up
60 (82%) low risk
106 (81%) medium risk
57 (72%) high risk

60 did not have follow-up
4 withdrawals
56 did not respond to questionnaire

26 did not have follow-up
2 withdrawals
24 did not respond to questionnaire

440 (77%) 12-month follow-up
110 (74%) low risk
202 (77%) medium risk
128 (82%) high risk

209 (74%) 12-month follow-up
57 (78%) low risk
96 (73%) medium risk
56 (71%) high risk

14 did not have follow-up
4 withdrawals
10 did not respond to questionnaire

568 assessed in intention-to-treat analysis

283 assessed in intention-to-treat analysis

568 (67%) intervention group
148 low risk (11 [7%] referred for physiotherapy)
263 medium risk (259 [98%] referred for physiotherapy)
157 high risk (all referred for physiotherapy)

283 (33%) control group
73 low risk (36 [49%] referred for physiotherapy)
131 medium risk (78 [60%] referred for physiotherapy)
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Hill, *Lancet* (2011)

Transdisciplinary model of psychologically informed physical therapy practice

Consideration of Physical Factors

Standard Practice

Core Philosophy:
Address physical impairments based on biomedical concepts

Primary Goal:
Reduce symptoms

Psychologically Informed Practice

Core Philosophy:
Incorporate patient beliefs, attitudes, and emotional responses into patient management based on biopsychosocial models

Primary Goal:
Secondary prevention of disability

Mental Health Practice

Core Philosophy:
Identify and treat mental illness

Primary Goal:
Minimize the impact of psychological disorder on well-being and function

Consideration of Psychological Factors

Evaluate and treat musculoskeletal impairments to optimize physical function

- **Motivational Interviewing**
- **Cognitive Behavioral approaches**
- **Mindfulness**
- **Relaxation techniques**
- **Goal setting**
- **Graded activity**

# Risk Stratified Transdisciplinary Management for Prevention of Chronic LBP

Hill, *Lancet* (2011)
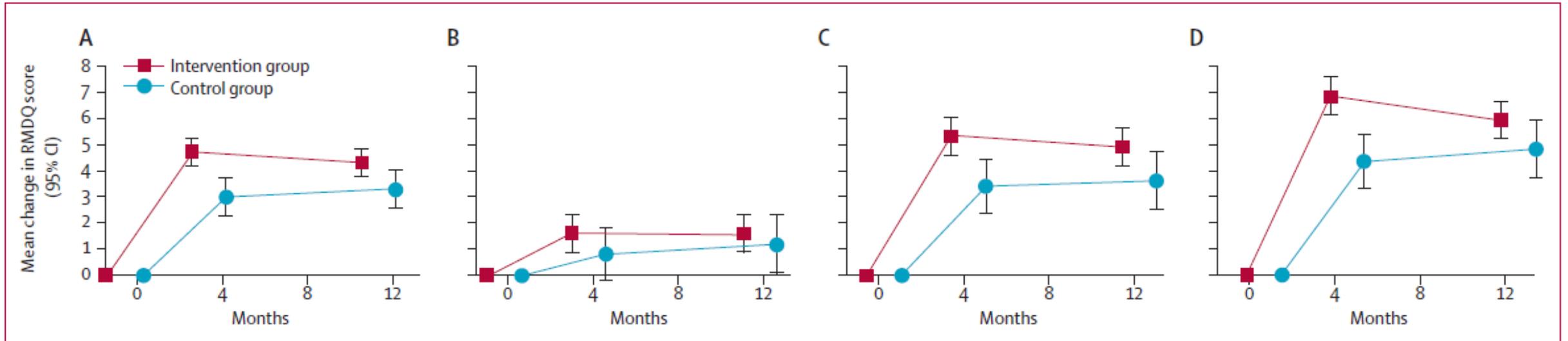
Prognostic Risk Stratification for Multidisciplinary Prevention of Chronic Whiplash Associated Disorders (WAD)

Stratification	Treatment prescription	
Neck Disability Index	Pain (VAS)	**Analgesic Meds**
Impact of Events Scale (IES)	Thermal pain thresholds	• NSAIDs
Thermal pain thresholds	Pressure pain thresholds	• Opioids
Pressure pain thresholds	Sympathetic vasoconstrictor response	• Anticonvulsants/ Antidepressants
Sympathetic vasoconstrictor response		
	Cervical range of movement	
	Craniocervical flexion test	**Physical Therapy**
	Balance	
	Cervical proprioception	
	Impact of Events Scale (IES) >26	**Cognitive Behavioral Therapy**
	General Health Questionnaire (GHQ 28) >30	

Sterling *Pain* (2012); Jull, *Pain (*2013)

Risk Stratified Multidisciplinary Management for Prevention of Chronic WAD
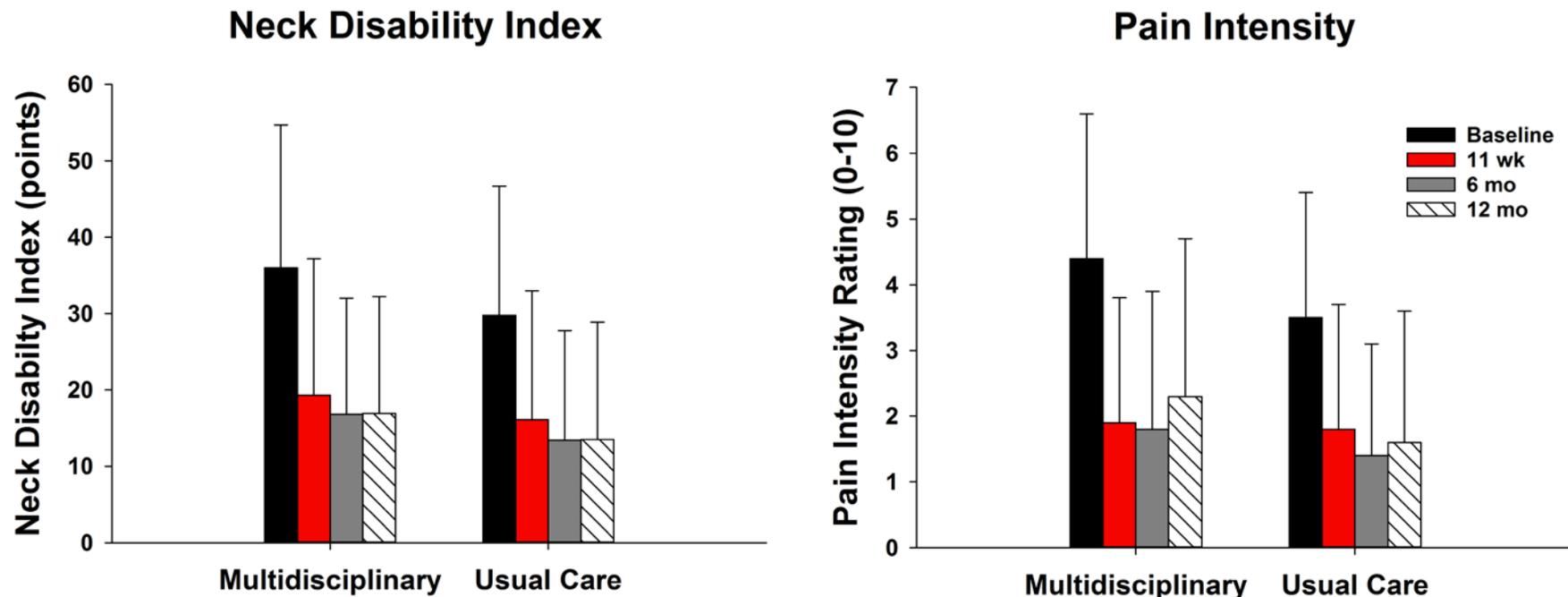
Primary Prevention
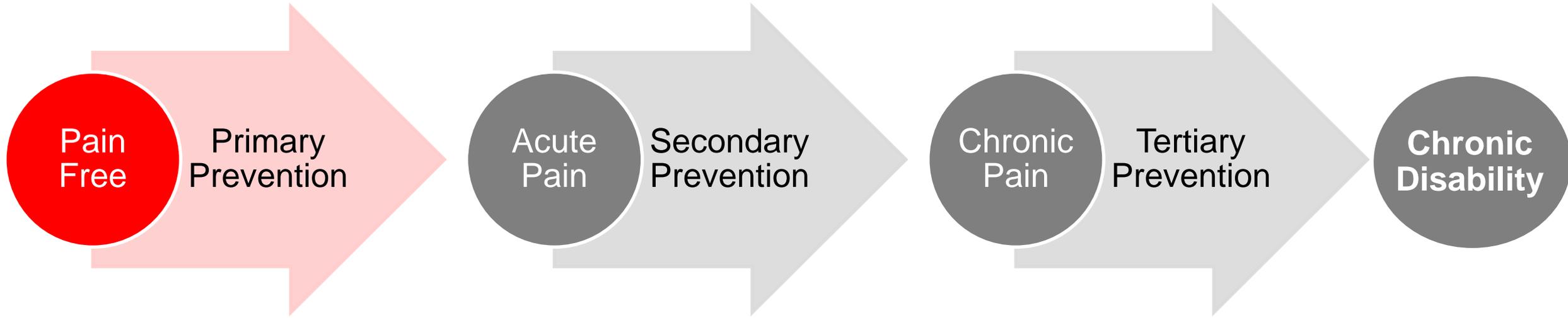
Risk Factors for Incident Low Back Pain

The Spine Journal 14 (2014) 2299–2319

Clinical Study

Incidence and risk factors for first-time incident low back pain: a systematic review and meta-analysis

Jeffrey B. Taylor, DPT[a,*], Adam P. Goode, DPT, PhD[b], Steven Z. George, PT, PhD[c], Chad E. Cook, PT, PhD, MBA[d]

[a]Department of Physical Therapy, High Point University, 833 Montlieu Ave., High Point, NC 27262, USA
[b]Department of Community and Family Medicine, Duke University, Durham, NC 27707, USA
[c]Department of Physical Therapy, University of Florida, 355 Tigert Hall, Gainesville, FL 32611, USA
[d]Department of Physical Therapy, Walsh University, 2020 East Maple St, North Canton, OH 44720, USA

'This review provides consistent evidence that there is no ''smoking gun'' for LBP prevention as the identified risk factors were not replicated across different studies, weakly predictive of incidence, and many were not modifiable…

The current state of evidence suggests futility in investing significant effort into preventative care practices for LBP, and instead, these resources may be better used for effective secondary prevention approaches.'

Risk Factors for Incident Neck Pain

Risk factors for the onset of non-specific neck pain: a systematic review

Sionnadh Mairi McLean,[1] Stephen May,[1] Jennifer Klaber-Moffett,[2] Donald Macfie Sharp,[2] Eric Gardiner[2]

Essay

'This review summarised the findings of 15 prospective studies from 14 independent cohorts investigating the predictive nature of around 50 physical, psychological, socio-demographic and clinical factors for the onset of non specific neck pain.

Many of the variables have been investigated by only one study, making it impossible to be sure of their predictive nature. Many physical, psychological, socio-demographic and clinical variables have not been investigated.'
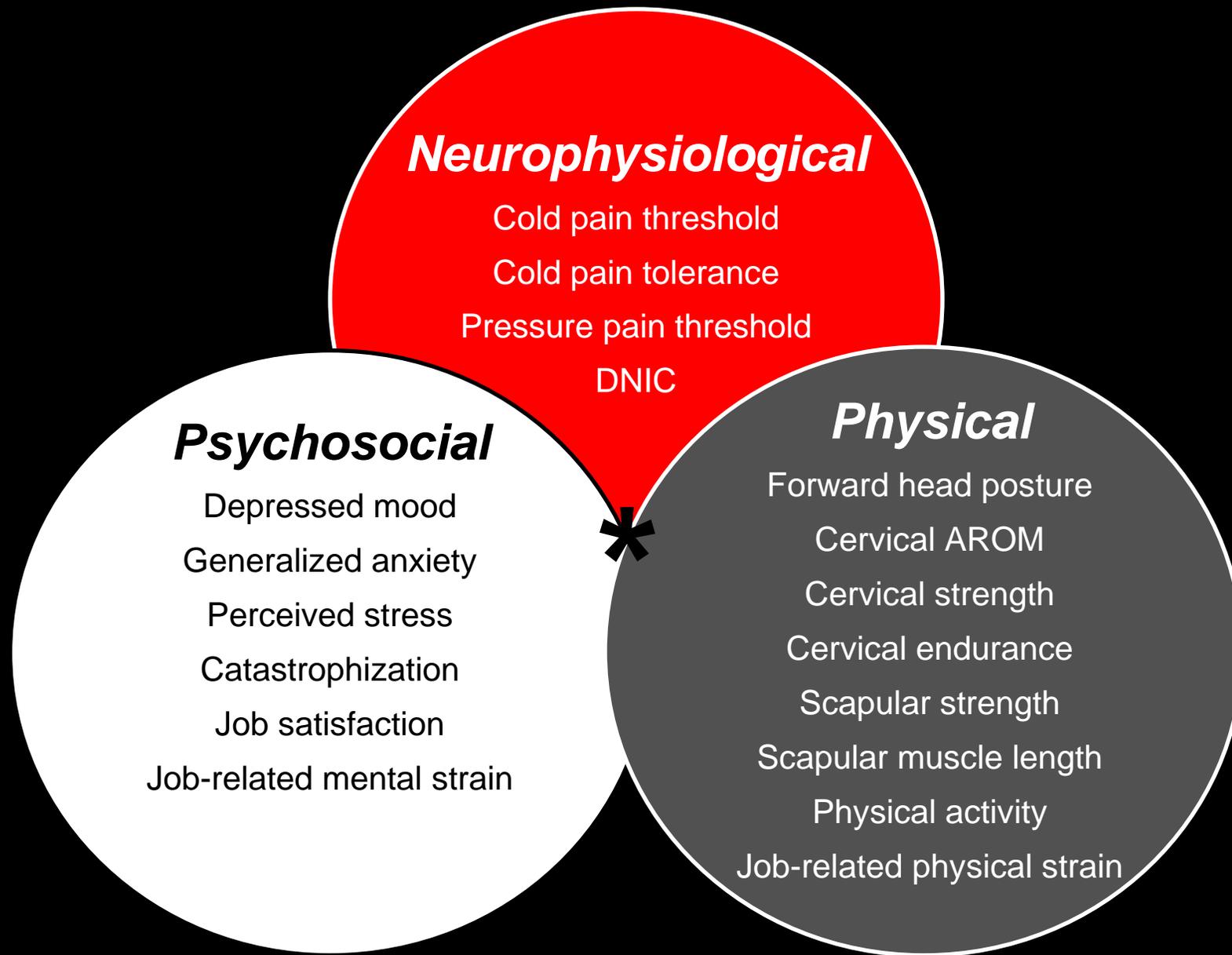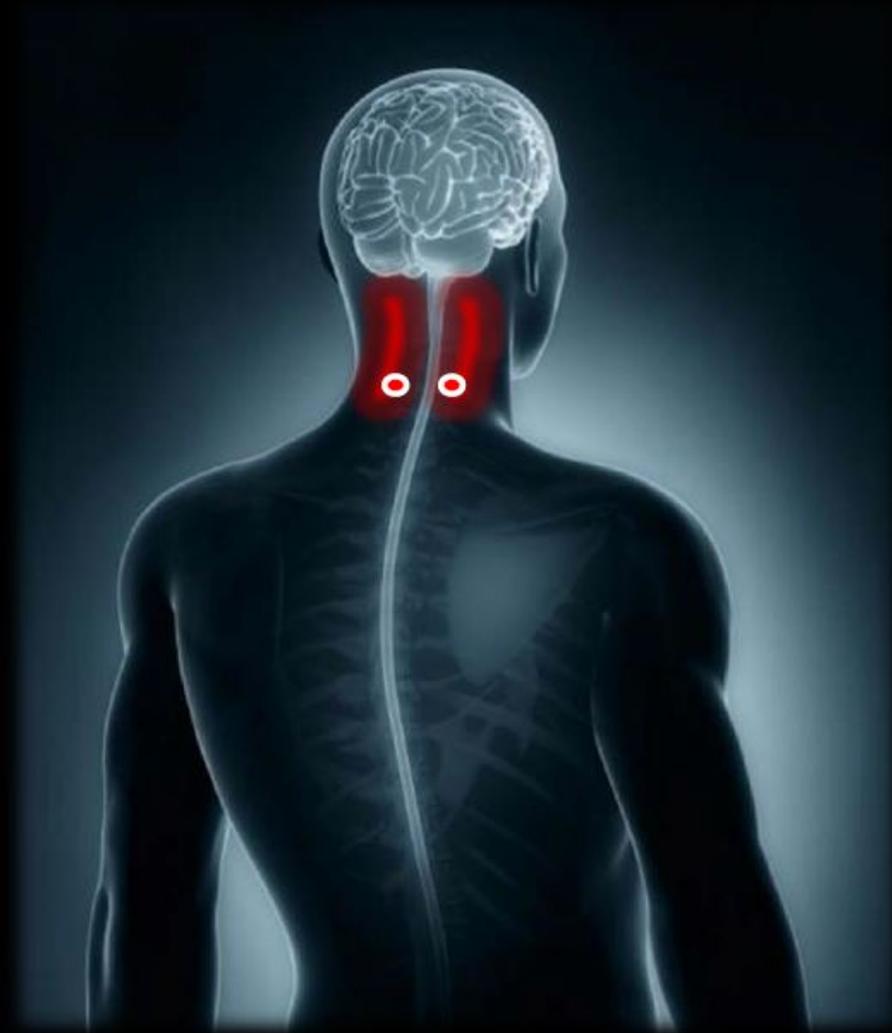
Multivariate predictors of incident chronic neck pain
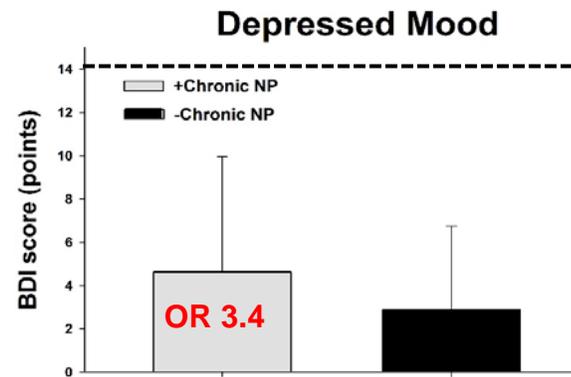
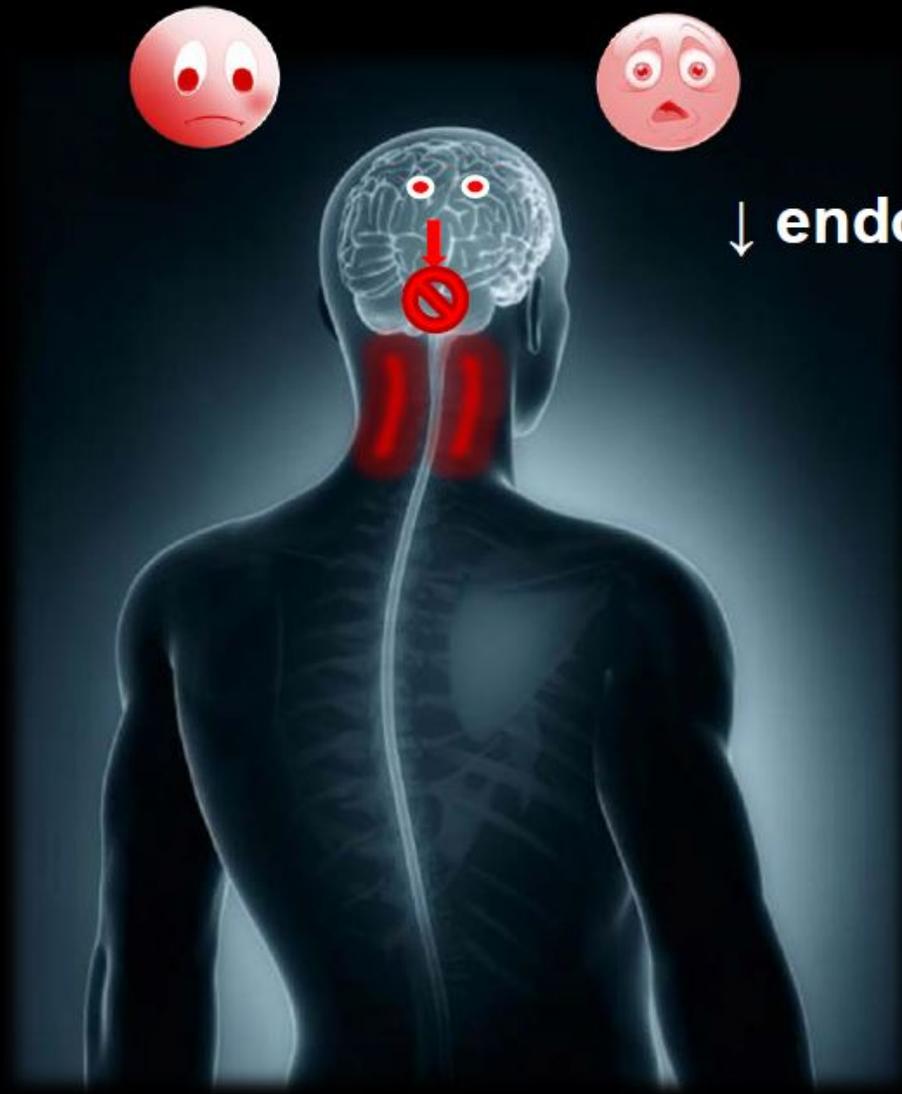↓ **physical activity**

↓ physical activity
muscle fatigue

↓ physical activity
muscle fatigue

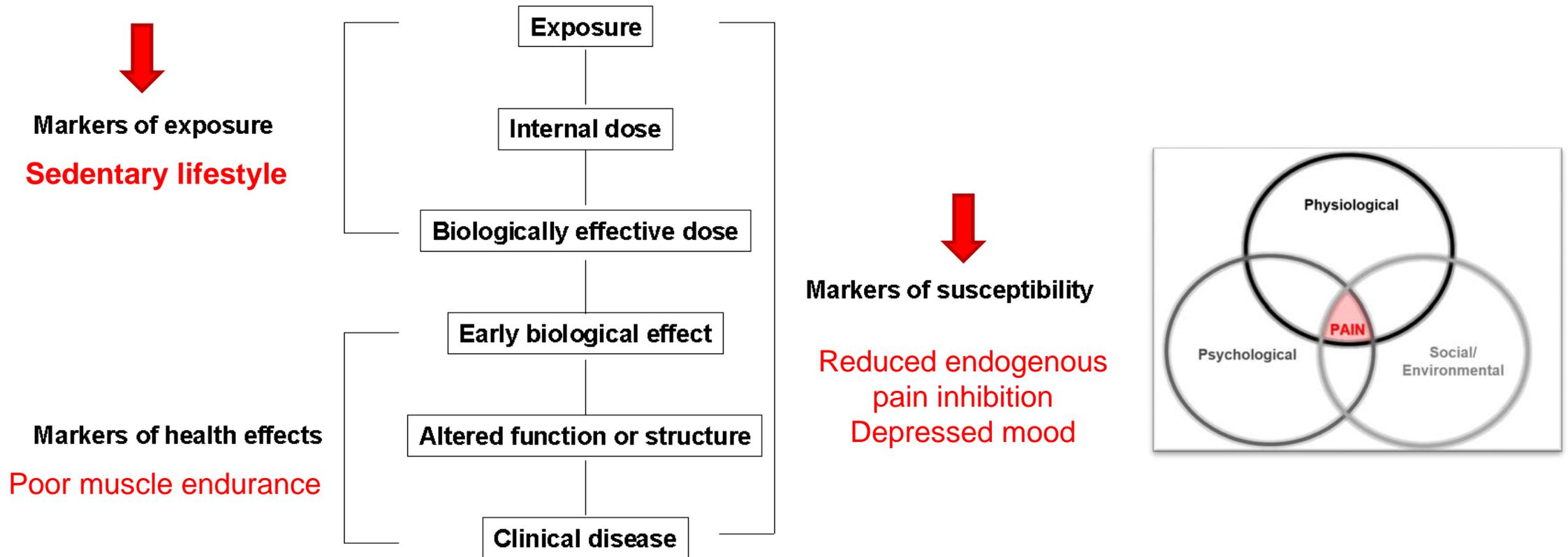↓ physical activity
muscle fatigue
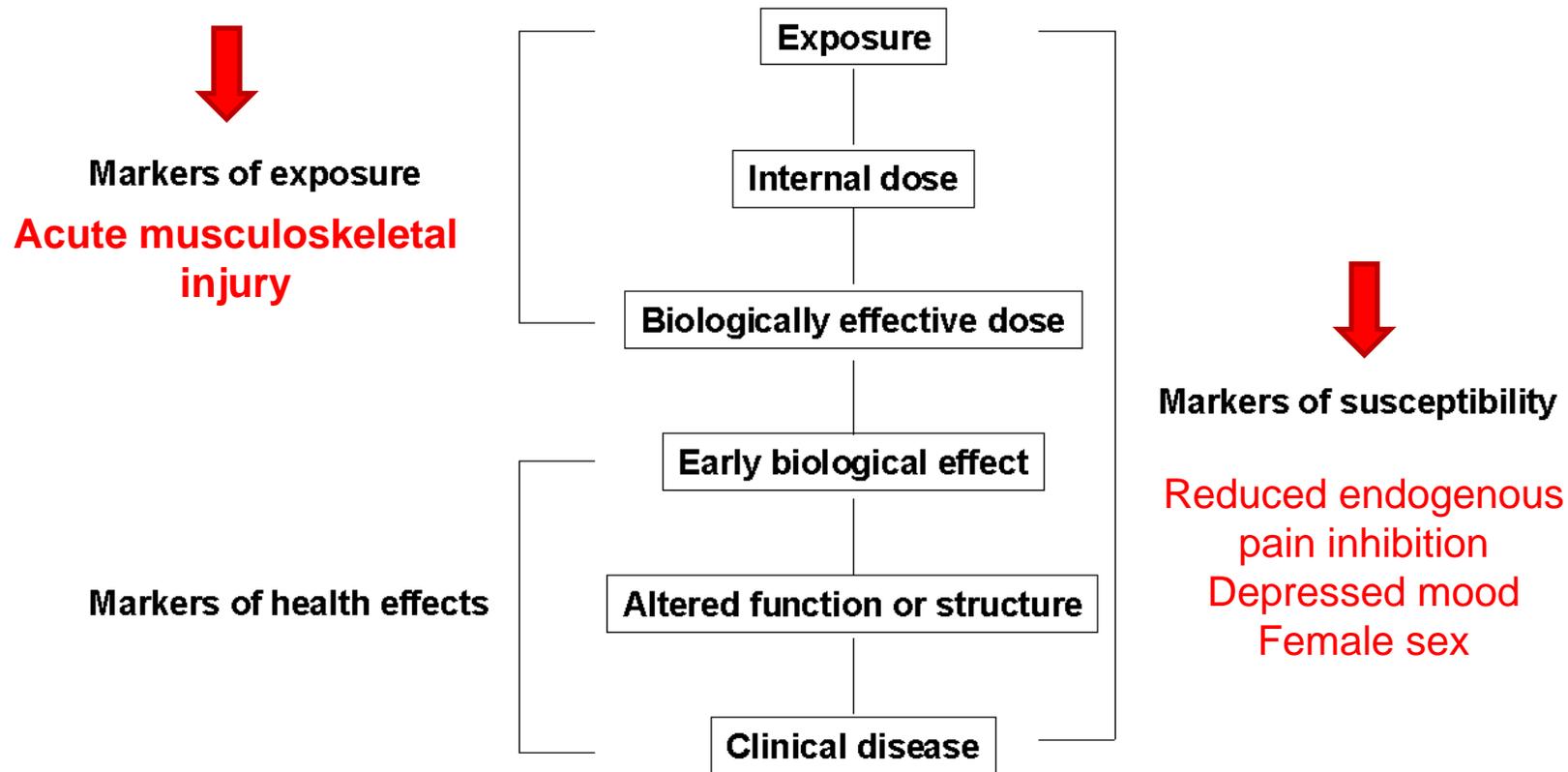↓ endogenous pain inhibition

Identifying biopsychosocial markers of *Exposure* and *Susceptibility* in pain prevention

Markers of exposure
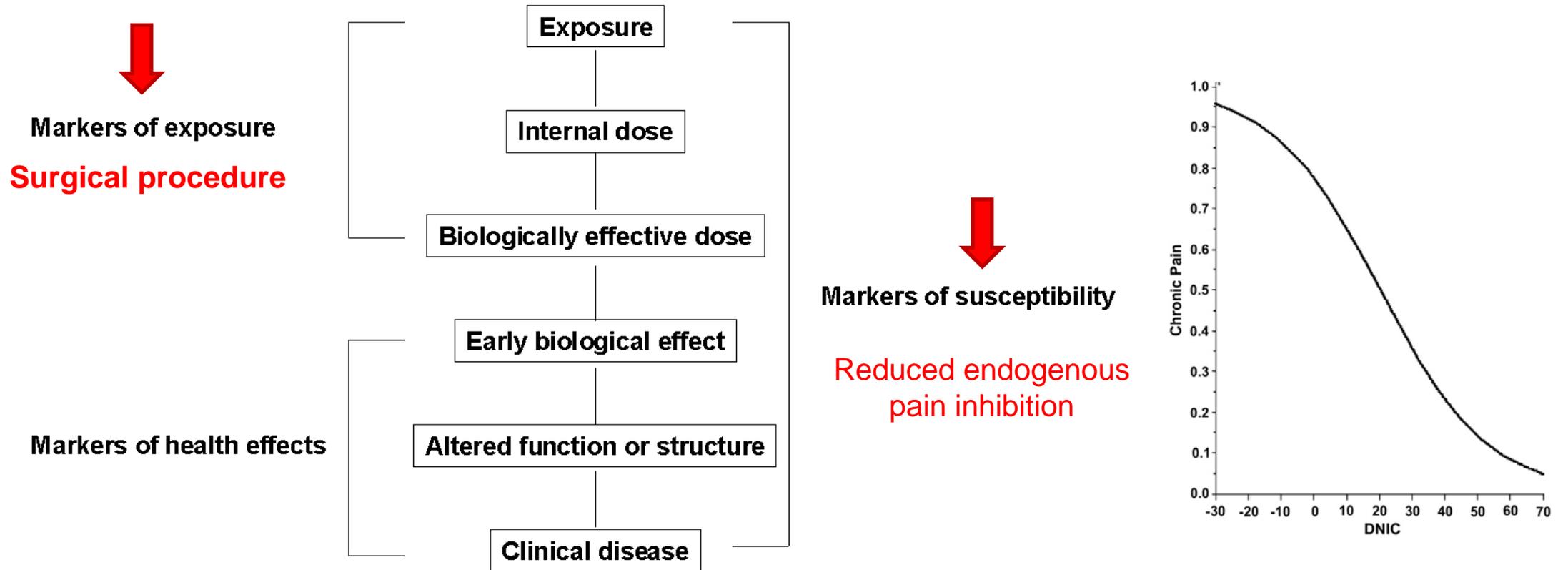
Sedentary lifestyle

Exposure

Internal dose

Biologically effective dose

Early biological effect

Markers of health effects

Poor muscle endurance

Altered function or structure

Clinical disease

Markers of susceptibility

Reduced endogenous
pain inhibition
Depressed mood

Physiological

PAIN

Psychological

Social/
Environmental

Identifying biopsychosocial markers of *Exposure* and *Susceptibility* in pain prevention

Holley *Pain* (2017)

Identifying biopsychosocial markers of *Exposure* and *Susceptibility* in pain prevention

Markers of exposure

Surgical procedure

Markers of health effects

Exposure

Internal dose

Biologically effective dose

Early biological effect

Altered function or structure

Clinical disease

Markers of susceptibility

Reduced endogenous pain inhibition

Endogenous pain modulation: A promising target for multimodal prevention of chronic pain?

- **Top-down cortical regulation**

- **Physical activity**

- **Pharmaceutical analgesic responses**
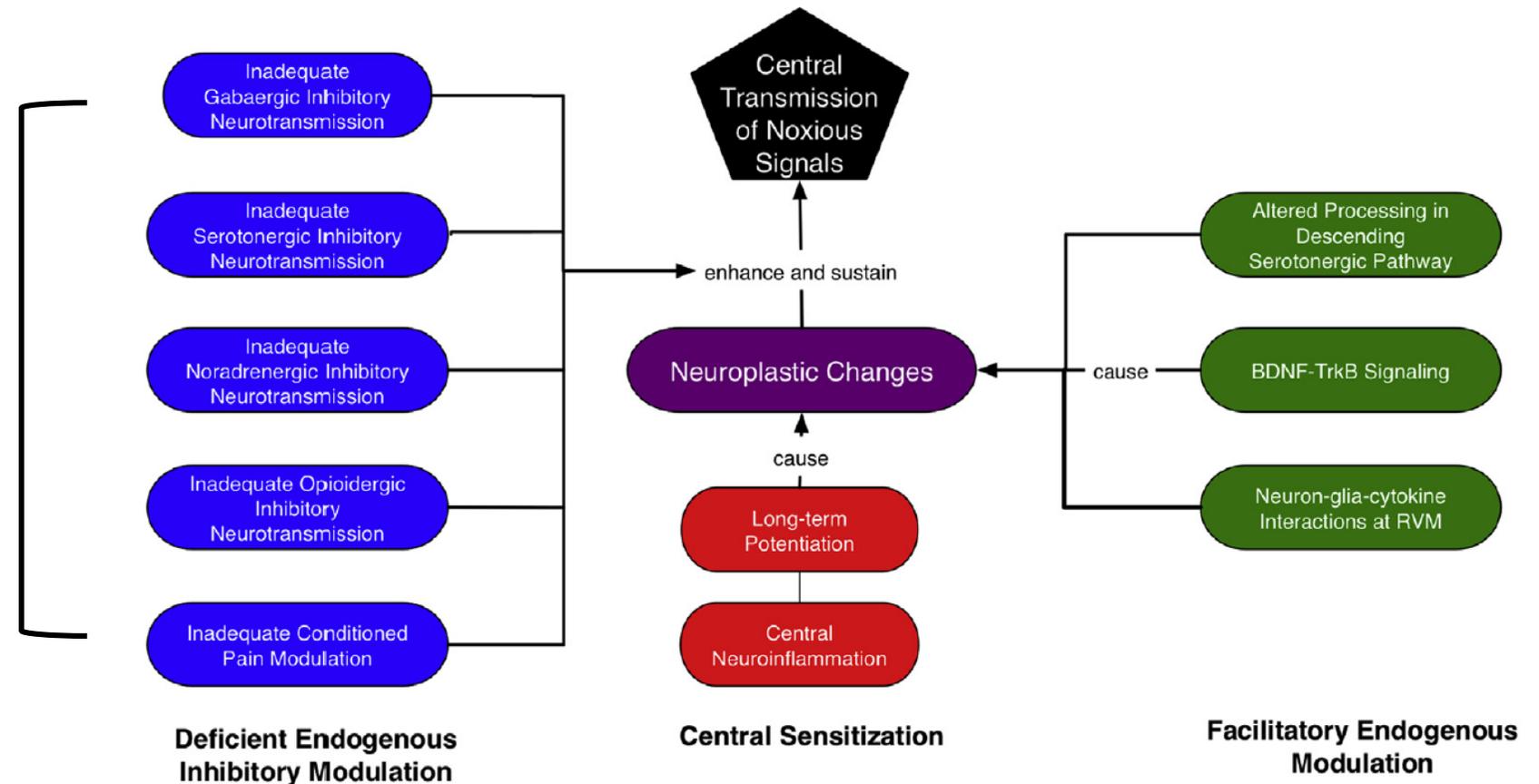
Conclusions

1. Multidimensional nature of pain is well recognized in contemporary pain models

2. Prognostic risk stratification has the potential to improve multidisciplinary approaches to the prevention of pain

   ➢ Optimal timing and mode to be determined

3. Multidisciplinary approaches should consider modifiable interactions between *susceptibility* and *exposure*

THANK YOU

Questions or Comments:
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