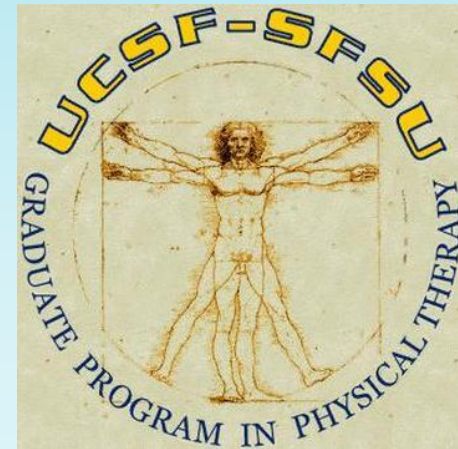


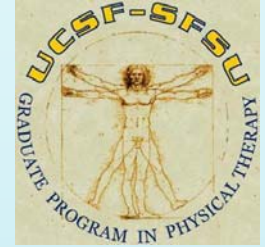
# The Impact of Manual Therapy as a Supplement to Postural Education and Therapeutic Exercise for Patients with Shoulder Impingement Syndrome: An Evidence Based Review

Jennifer Fine, PT, MS

Spring Symposium 5/3/08



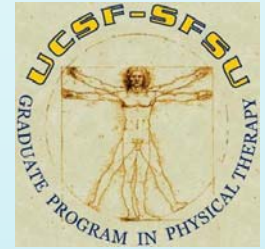
# Introduction & Significance



- Shoulder pain
  - Incidence = 9.5-11.2 per 1000 patients (primary care) (Senbursa, 2007)
    - Rotator cuff tendinopathy in 85%
    - Signs of impingement in 74%
  - Prognosis (Morrison, 1997)
    - 2/3 of pts. with SIS had satisfactory outcomes
- \$7 billion dollars (Meislin, 2005)



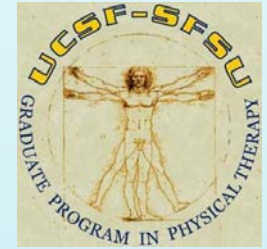
# Relevance to Physical Therapy



- Treatment options
  - Anti-inflammatory medications
  - Transcutaneous drugs
  - Surgical
  - Therapeutic exercise
  - Manual mobilization
  - Soft tissue mobilization
- Which conservative treatment approaches are validated by good research?



# Primary Question

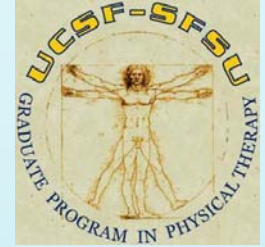


- For patients with SIS, does *manual therapy* add benefit to a traditional postural re-education and therapeutic exercise program?
- Variations in amount of “hands-on” time spent with therapists seen in clinics
- Foreground (Intervention)
  - **P** = Patients with shoulder impingement syndrome
  - **I** = Manual therapy
  - **C** = Traditional postural re-ed and ther ex program
  - **O** = Decreased pain, increased ROM, increased function



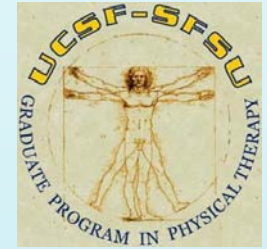
# Null Hypothesis

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- $H_0$ : For patients with primary shoulder impingement syndrome, manual therapy as an adjunct to postural re-education and therapeutic exercises will have **no additional effect** in terms of:
  - a) Pain severity
  - b) ROM
  - c) Strength
  - d) Functional abilities
  
- $H_i$ : Significant benefit

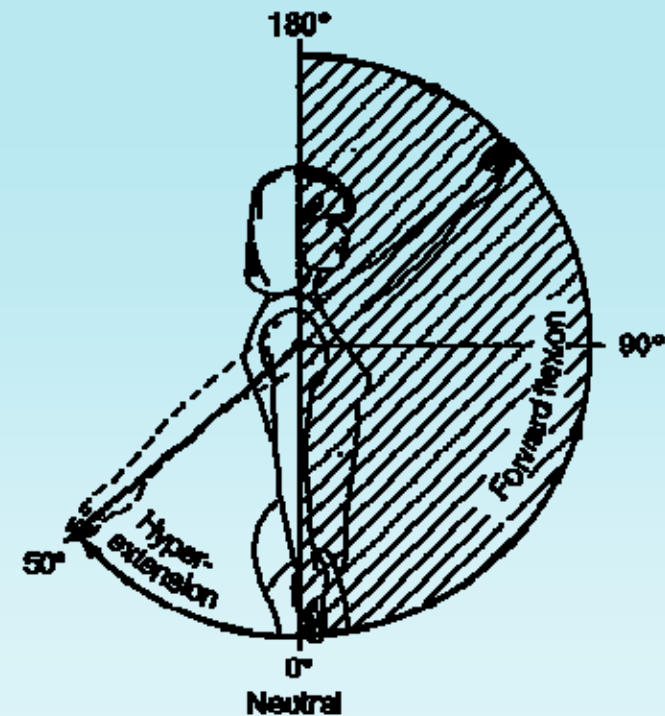
# Theoretical Construct



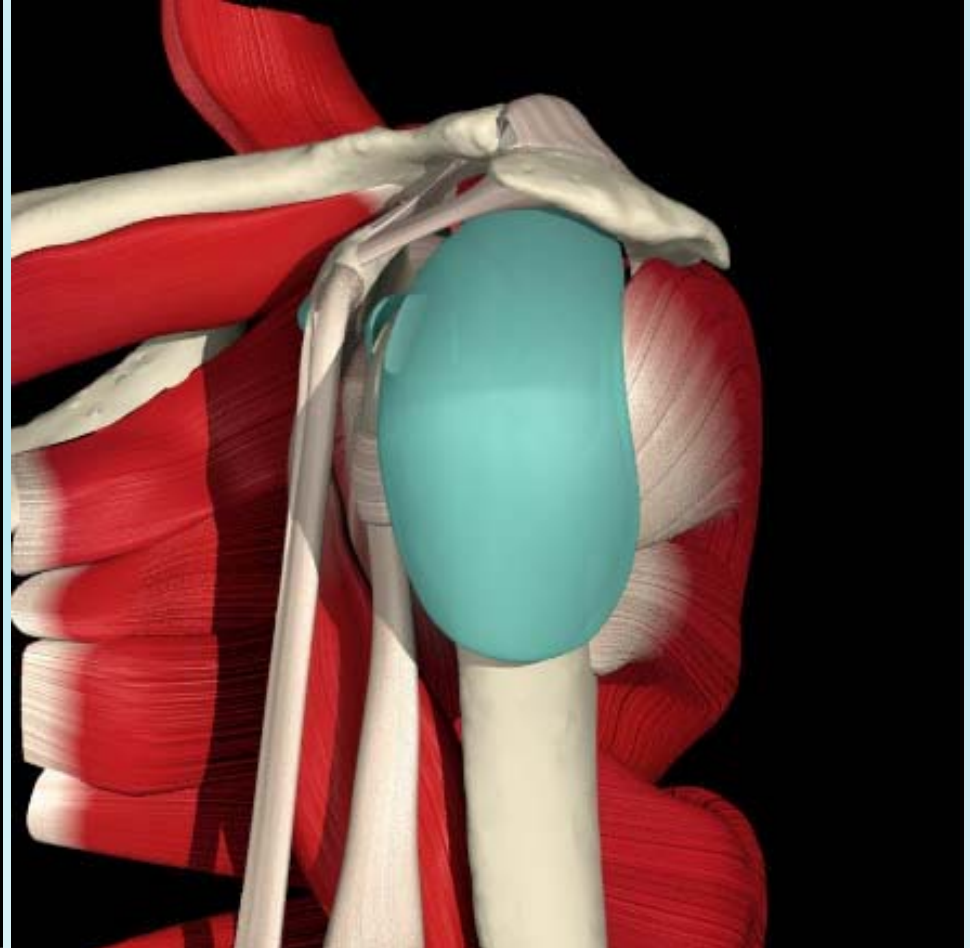
- Large ROM vs. stability
- Disruptions in relationship → impingement

(Levangie 2001, Ludewig 2000, Lewis 2005)

- Muscular imbalances
- Postural deviations
- Joint mobility impairments
  - Capsular length insufficiency

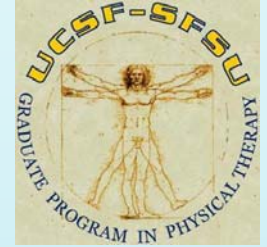


# Subacromial Space



Interactive Shoulder © 2000 Primal Pictures Ltd.

# Theoretical Construct: Interventions

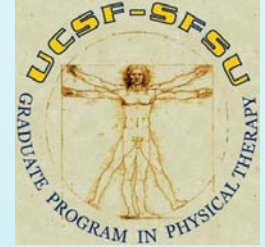


- **Therapeutic exercises** (Desmeules, 2003; Ludewig, 2000; McClure 2004)
  - Active or assisted exercises aimed at improving ROM, strength, or dynamic neuromuscular control of joint motion
  - Restore normal kinematics and muscle activity patterns
  - Strengthen and modify muscle imbalances
- Passive motion within a pain-free range  
→ sports specific training (Hertling, 1996)



# Theoretical Construct: Interventions

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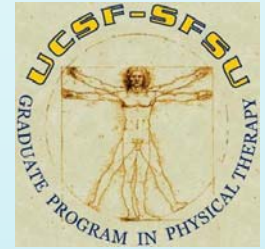


- Manual therapy
  - The use of manually and/or mechanically applied movement techniques to improve joint motion
    - Joint mobilization or manipulation using graded passive movements (GH, AC, SC, or ST joints)
    - Soft tissue mobilization (STM)
    - Transverse friction massage
    - Proprioceptive neuromuscular facilitation (PNF) techniques
    - Passive range of motion (PROM) or stretching techniques

(Hertling, 1996; Threlkeld, 1992; Desmeules, 2003; Maitland, 1983; McClure, 2007; Decicco, 2005; Sharman, 2006)

# Expected Findings

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## ■ Physiological

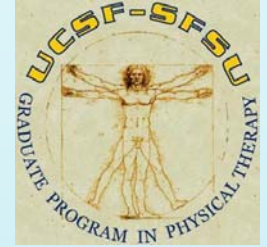
- Improved tissue extensibility
- Improved joint arthrokinematics
- Induced relaxation
- Modulated pain
- Reduced soft tissue inflammation & restriction

## ■ Clinical

- Decreased pain
- Decreased guarding
- Increased rotator cuff strength
- Increased ROM
- Increased functional abilities

(Maitland, 1983, 2005; Threlkeld, 1992)

# Search Methods



## ▪ Search Sources

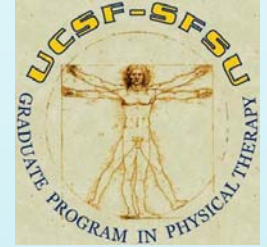
- PubMed
- Cochrane Database of Systematic Reviews
- Physiotherapy Evidence Database (PEDro)
- TRIP Database
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- OVID Online
- Hooked on Evidence

## ▪ Keywords

- "Shoulder Impingement Syndrome" [Mesh]
- "Shoulder Joint" [Mesh]
- "Musculoskeletal Manipulations" [Mesh]
- "Manipulation, Chiropractic" [Mesh]
- "Manipulation, Osteopathic"[Mesh]
- "Manipulation, Orthopedic" [Mesh]
- Graded Passive Movement
- Joint Mobilization
- Physiotherapy/Physical Therapy



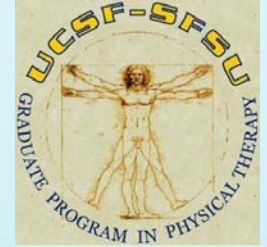
# Inclusion Criteria



- **Levels of evidence 1a through 3b**, according to Straus et al
- **Subjects**
  - Males and females > 18 years old
  - Dx or classification of SIS or rotator cuff tendonitis or tendinosis by a physician, chiropractor, or PT
- **Clinical Signs and Symptoms:** Functional limitations, anterior or anterior-lateral shoulder pain, near full shoulder ROM with painful arc, pain at end range passive shoulder elevation, pain with resisted isometric rotator cuff contractions, and positive impingement special tests such as Neer or Hawkins-Kennedy
- **Intervention**
  - PT or chiropractor
  - Combination of therapeutic exercise, postural education, or manual therapy
- **Outcomes:** Pain, ROM, strength, or functional abilities (ADL's, work status, DASH or other functional outcome measure)
- **Language:** Published in **English**

# Exclusion Criteria

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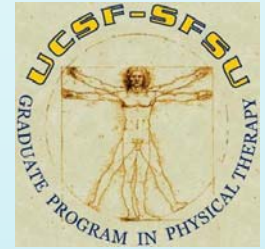


- Pathology resulting from trauma (MVA)
- Complete rotator cuff tears
- History of shoulder surgery
- Case reports or expert opinion (Levels of evidence, 4 and 5)
- Not published in English



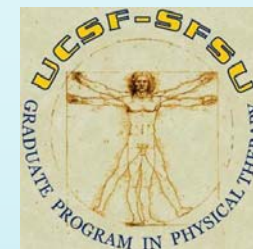
# Results

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- 12 studies found to answer primary question
  - 6 studies met inclusion criteria
    - 3 RCT's
    - 3 systematic reviews
      - Agreement with 2<sup>nd</sup>, independent reviewer
    - 6 studies excluded
- 35 studies found to answer secondary questions

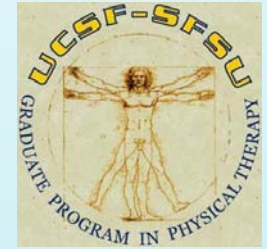
# Description of Studies (Handout)



Author (Year)	N	Patient Population	Blinded ?	Level of Evidence
Bang, Deyle (2000)	52	30M/22F 43 ( $\pm$ 9.1) 4 sites	Y	RCT – 2b
Conroy, Hayes (1998)	14	8M/6F 52.9	Not Stated	RCT –2b
Senbursa, Baltaci, Atay (2007)	30	49.5 (7.9), 48.1(7.5)	Y	RCT – 2b
Desmules (2003)	511	7 RCT's, 8 studies total 2 trials met my inclusion criteria	N/A	Systematic Review - 2a lack of homogeneity
Michener (2004)	599	8 studies total 2 trials met my inclusion criteria	N/A	Systematic Review – 2a lack of homogeneity
Green (2007)	66	26 studies total 2 trials met my inclusion criteria	N/A	Systematic Review – 1a

# EBM Statistics

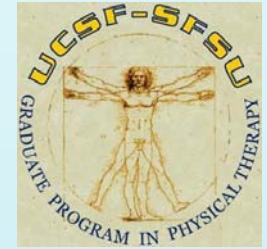
Bang et al. (2000)



	EER	CER	ARR	NNT	Effect Size
<b>Pain – Abd AROM</b>	0.70	0.30	0.40	3	0.79 (0.20, 1.4)
<b>Pain – Composite</b>	0.70	0.35	0.35	3	0.73 (0.14, 1.3)
<b>Composite Strength</b>	0.19	0.07	0.13	8	1.1 (0.50, 1.7)
<b>Composite Function</b>	0.35	0.17	0.18	6	0.73 (0.15, 1.3)

# EBM Statistics

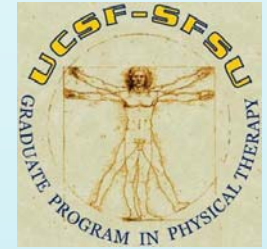
## Conroy et al. (1998)



	<b>EER</b>	<b>CER</b>	<b>ARR</b>	<b>NNT</b>	<b>Effect Size</b>
Max 24 hr Pain	0.75	0.05	0.70	2	1.2 (-0.07, 2.5)
Subacromial Compression Test Pain	0.56	0.20	0.36	3	0.78 (-0.43, 2.0)
Abduction	0.32	0.21	0.12	9	0.28 (-0.89, 1.5)
Elevation	0.30	0.11	0.19	6	0.38 (-0.79, 1.6)
ER	0.32	0.14	0.18	6	0.31 (-0.86, 1.5)
IR	0.51	0.31	0.20	6	0.27 (-0.90, 1.4)

# EBM Statistics

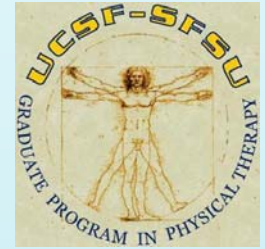
## Conroy et al. (1998)



	<b>EER</b>	<b>CER</b>	<b>ARR</b>	<b>NNT</b>
Reach to Ext Occipital Protuberance	0.71	0.57	0.14	7
Reach OH 135°	0.71	0.71	0	Inf.
Reach to Spinous Process	0.29	0.29	0	Inf.

# EBM Statistics

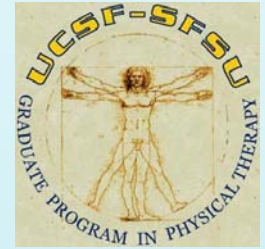
## Senbursa et al. (2007)



	EER	CER	ARR	NNT
Pain	0.70	0.55	0.16	7
IR	0.18	0.16	0.02	61!
ER	0.12	0.25	-0.13	-8!
Neer	0.73	0.87	-0.13	-8!

# Results – Desmules et al. (2003)

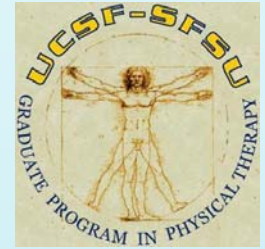
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- Broader inclusion criteria
  - Adhesive capsulitis (1)
  - Surgical interventions (3)
  - Symptoms not specific to SIS (1)
  - Intervention of ther ex only (1)
- No pooling of data possible
- 4 studies supported favorable physiotherapy effects (including 2 meeting my criteria)
- 2 studies supported manual therapy over exercise alone

# Results – Michener et al. (2004)

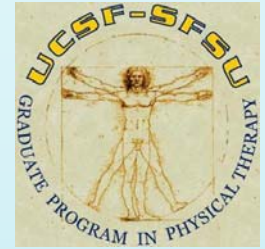
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- 2 studies included for manual therapy category, 2 studies for therapeutic exercise only
- No pooling of results
- Therapeutic exercise is an effective intervention vs. none/placebo
- Moderately strong evidence for upper quarter joint mobilization being more effective than ther-ex alone
- Grade B recommendation for ther-ex combined with upper quarter joint mobs aimed at improved mobility or pain reduction
- Need prediction of which patients will respond to exercise and mobilization

# Results – Green et al. (2007)

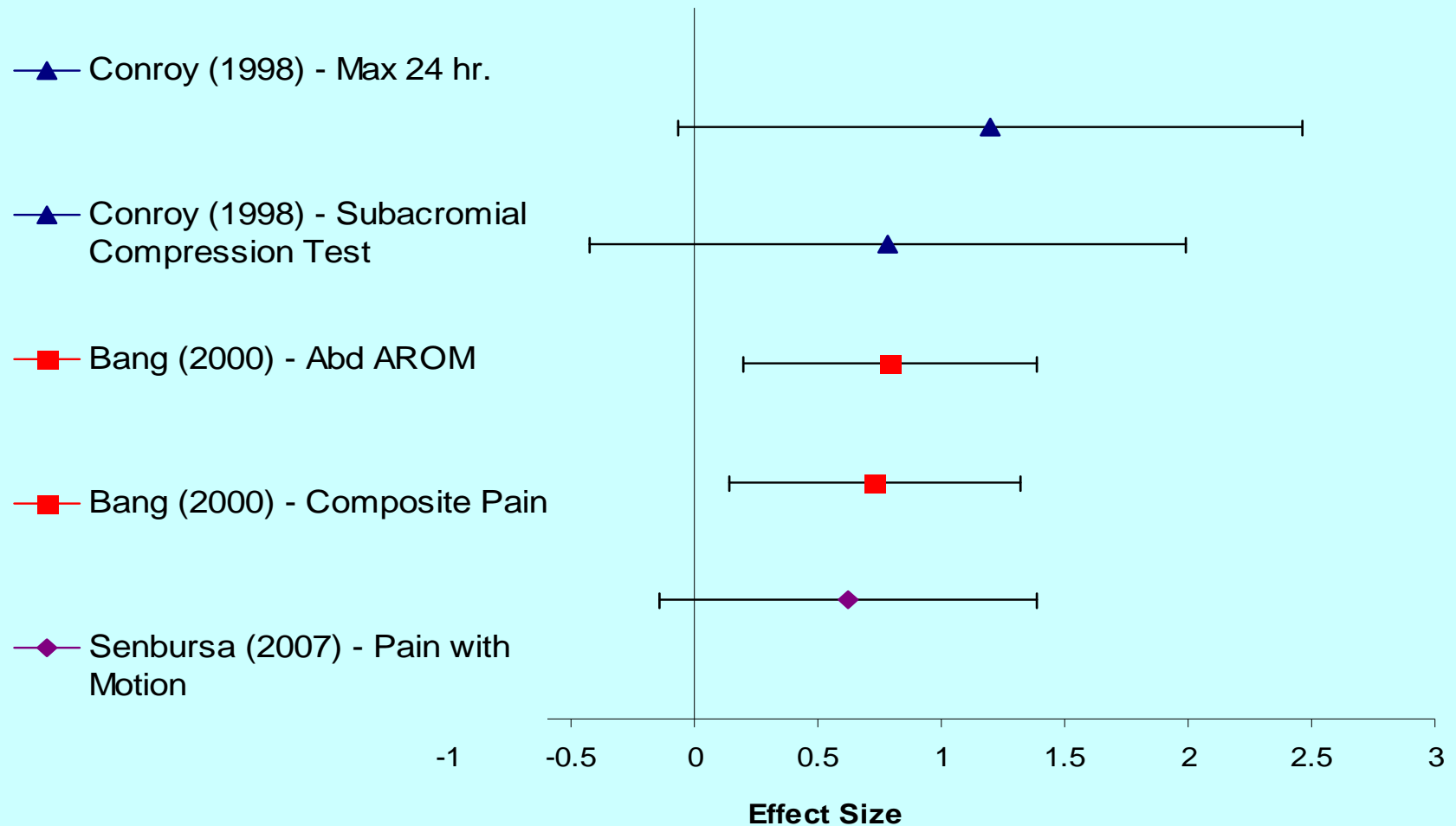
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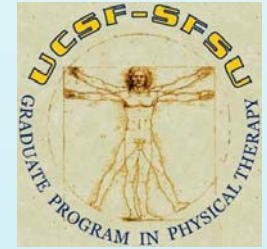


- 3 trials included for manual interventions versus exercise comparison
- 1 included for adhesive capsulitis
- Found significant decreases in pain
  - Different scales, therefore WMD not pooled
- Demonstrated benefit for ROM, strength, and fx

# Integrated Pain Results

Avg Weighted Effect Size = 0.75 (0.01, 1.49)



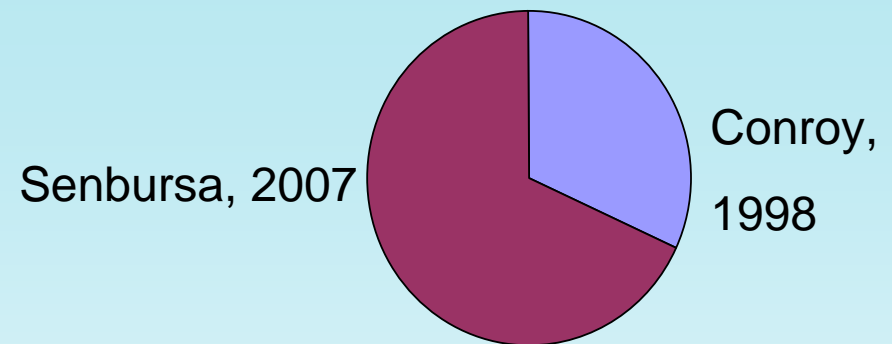


# Integrated ROM Results

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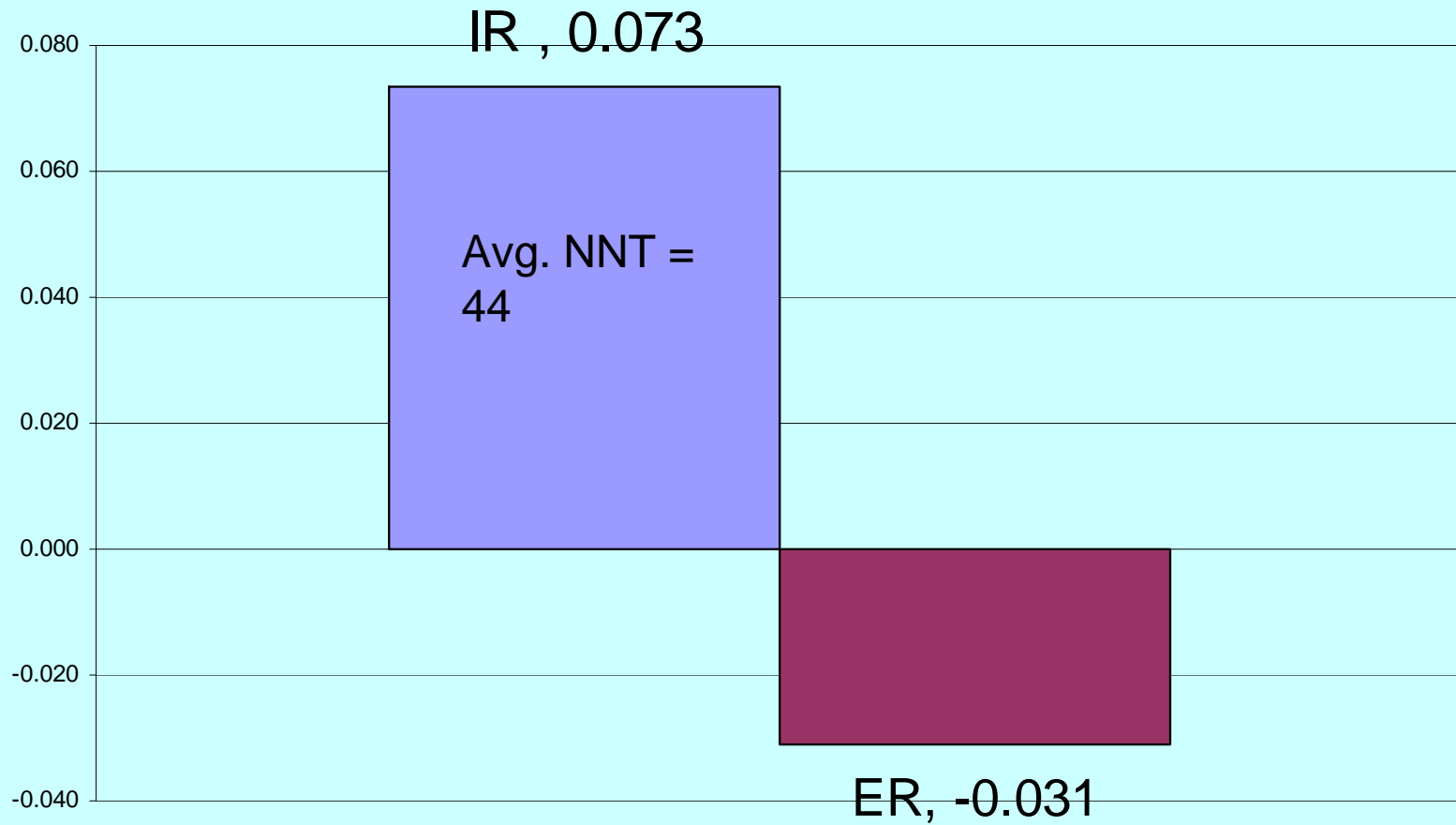
- 2 studies measured ROM (IR and ER)
  - Conroy (1998)
  - Senbursa (2007)
    - No SD given, therefore can not calculate effect size
- Only Conroy (1998) reported Abd & Elev

**Percent of Total Sample for Weighting**

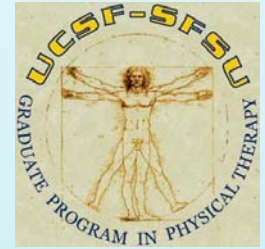


# Integrated ROM Results

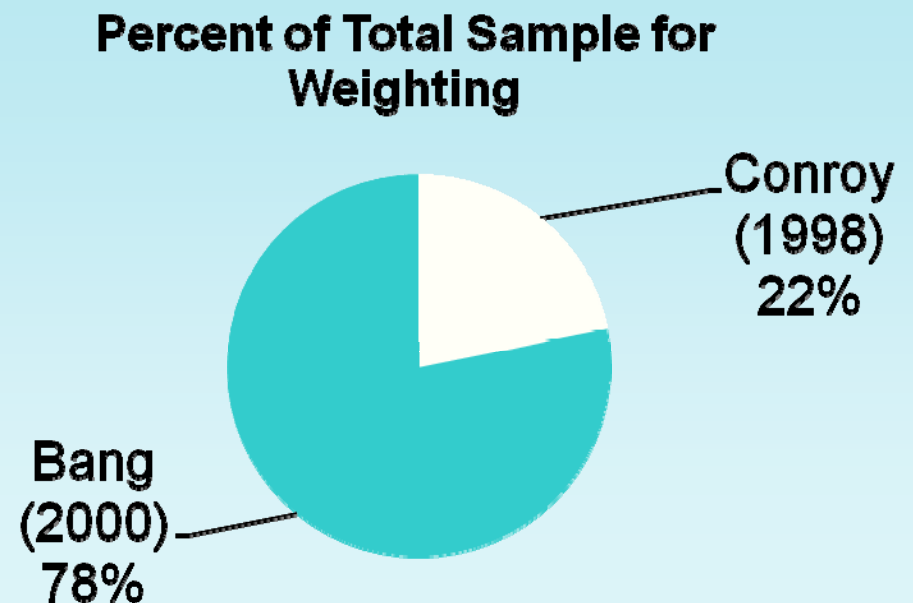
Weighted Average Percent Change ARR



# Integrated Functional Outcomes

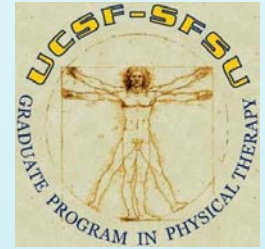


- Bang (2000) used 6 point, 9 item functional questionnaire
- Conroy (1998) used 3 point, 3 item scale
- Weighted averages
  - $ARR = 0.15$
  - $NNT = 9$



# Integrated Strength Results

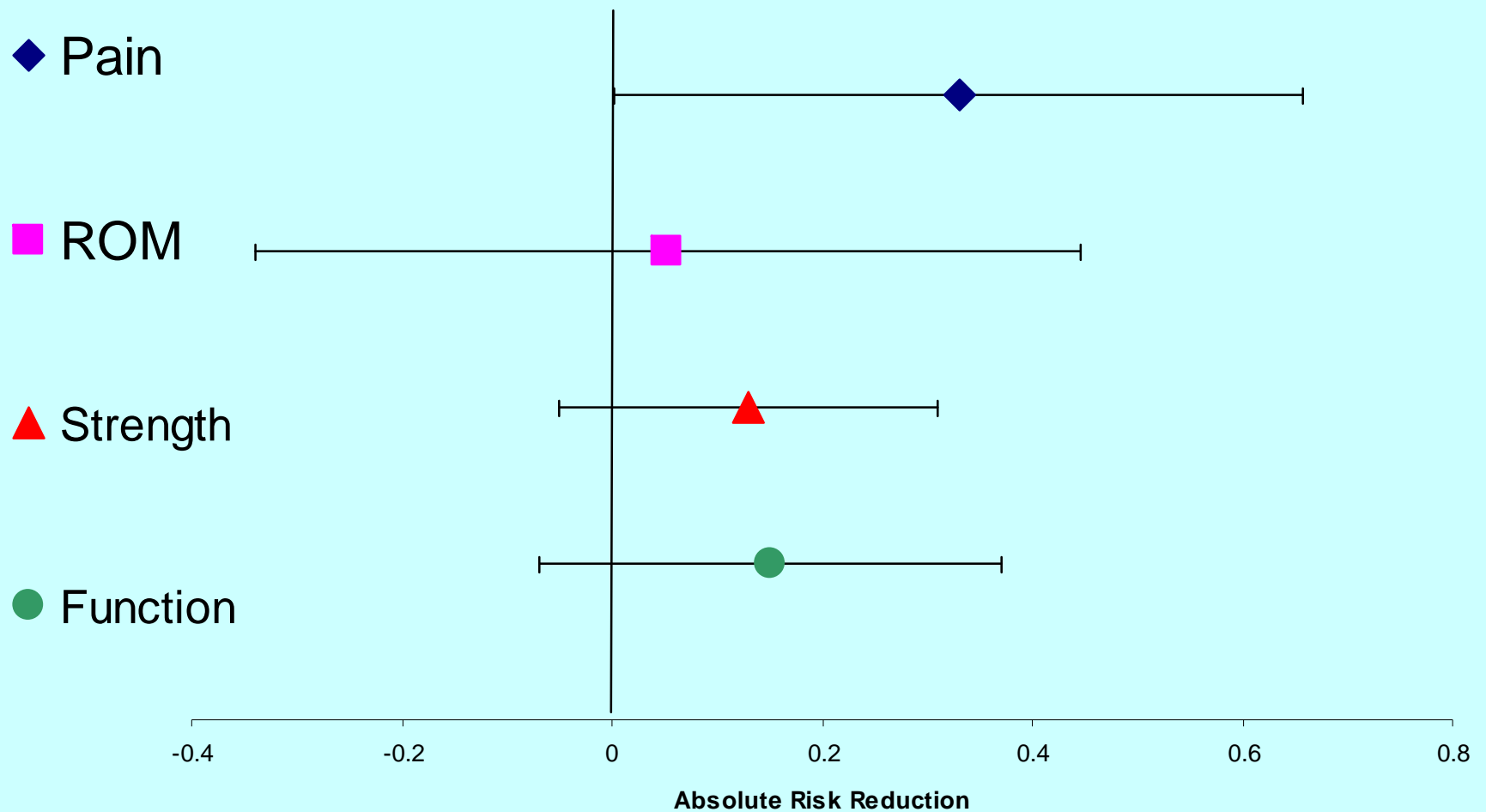
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- Only 1 study, Bang (2000), reported direct strength outcomes
- Large Effect Size
  - 1.1 (0.50, 1.7)

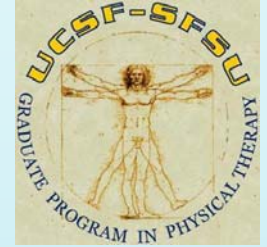
# Integrated Results

## Absolute Risk Reduction



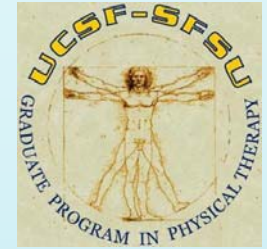
# Harm and Adverse Events

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- No adverse events were reported in any of the studies
- Low drop-out rate

# Cost Benefit Analysis

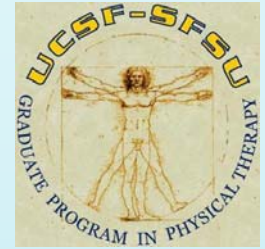


- No cost data given in any study
- Assume cost of \$100 per 30' visit
  - Conroy:
    - 9 visits total both groups
    - 15 min. additional Rx time
    - \$50 additional/visit \* 9 visits = \$450
  - Bang:
    - 6 visits total, 30' for both groups (more HEP for MT group) = \$0
  - Senbursa:
    - Ther ex group = 1 visit vs. Manual Therapy = 12 visits
    - 11 additional visits\*\$100/visit = \$1100
- Example: Weighted Avg. Rx Cost = \$420
  - Pain = \$420/33% = \$12.70/% improvement

Wt. Avg.	ARR	NNT
Pain	0.33	4
ROM	0.053	19
Strength	0.13	8
Function	0.15	9

# Discussion

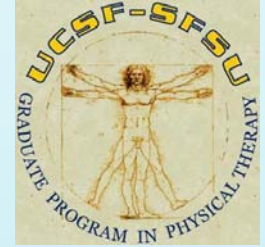
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- Inadequate grade and level of evidence to confidently answer primary question (3 RCT's, 3 systematic reviews)
- Studies began to answer primary question
  - Difficult to integrate outcomes
    - Different outcome measures
    - Small number of studies/sample sizes (n=94 total)
- Can not accept or reject  $H_0$

# Discussion

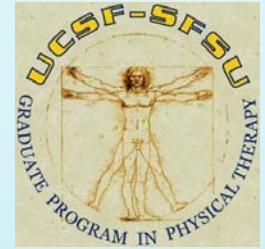
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- Pain versus AROM
  - Lack of data reported in the 3 RCT's
    - Senbursa – no flex or abd reported
    - Bang – no AROM outcomes
    - Conroy - modestly significant increases in ROM
      - 12 to 20% ARR
      - Smallest sample size
  - Both groups performed physiologic stretching (Conroy, 1998)
  - Joint mobs performed mid-range
  - Increased strength/timing of RC muscles
  - Psychological effects (Blackburn, 2007; Hough, 2007)

# Discussion

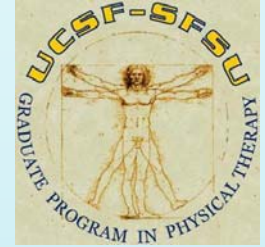
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- Research Gaps
  - Strength, ROM, & pain correlated to functional abilities (return to work, recreation, QOL)
  - Cost/Benefit Analysis
  - Broad inclusion criteria for “Manual Therapy”
- Recommendations for Future Research
  - Use standardized functional outcome measures
  - Differentiate between joint mobilization vs. soft tissue mobilization
  - Increase sample sizes and number of facilities

# Conclusions & Practice Implications

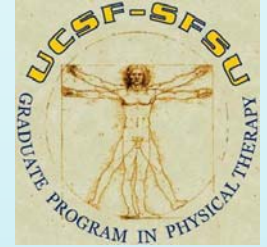
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- Moderate strength of recommendations
  - Continue using manual techniques in combination with postural re-ed and therapeutic exercise to:
    - Decrease pain
    - Increase strength and function
  - Limited use for increasing AROM
  - Hands-on manual therapies may be most effective in relieving **pain** vs. other impairments

# Questions?

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- Thank you!
  - Nancy Byl, PT, PhD - advisor
  - Diane Allen, PT, PhD – statistics
  - UCSF/SFSU Faculty
  - DPT class of 2008