4-2-2012

A Standardized Evidence-Based Model of Orthopaedic Physical Therapy Practice: A Quest for the Holy Grail?

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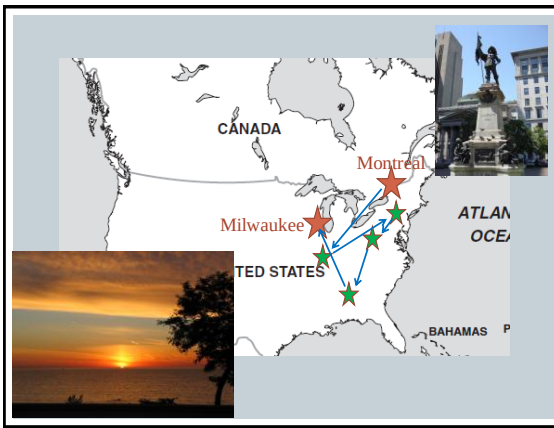
A Standardized Evidence-Based Model of Orthopedic Physical Therapy Practice: A Quest for the Holy Grail? 5th Annual Ann Putnam Kaleckas Lecture. Northwestern University Feinberg School of Medicine. April 2, 2012.

A STANDARDIZED EVIDENCE-BASED MODEL OF ORTHOPAEDIC PHYSICAL THERAPY PRACTICE: A QUEST FOR THE HOLY GRAIL?

Guy G. Simoneau, PhD, PT, ATC

Professor, Physical Therapy Department

Editor



EVIDENCE LEADING TO A STANDARD MODEL OF PRACTICE

- **Does using evidence improve delivery of care (less $$$) and outcomes**
- **The various forms of evidence that are needed – with a quick glance to specific examples**
- **Delivery of information as a part of the puzzle**
- **(Without threatening individuality of care to refine treatment based on patient and clinical expertise)**

"One bum knee meets 5 physical therapists" … and gets 5 different answers!!

The Wall Street Journal, September 1994

"One bum back meets 5 physical therapists" … and gets ?? different answers!!

But, is it really necessary to agree on what is wrong and how the condition should be treated?

Or, is part of being a professional for each of us to decide what we think is best for the patient?

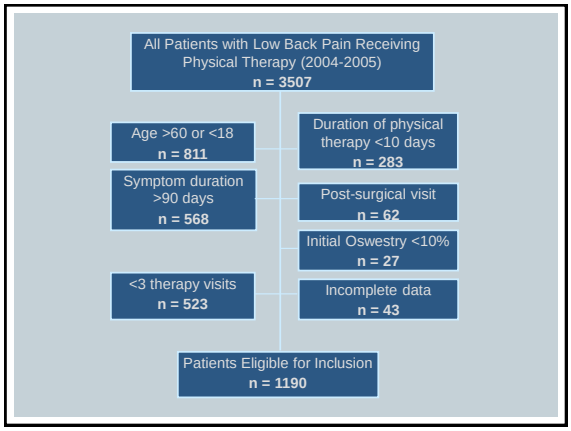
WHAT HAPPENS WHEN WE USE EVIDENCE?

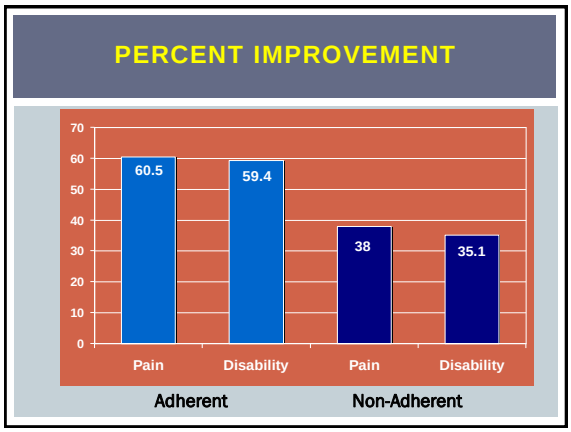
Does Adherence to the Guideline Recommendation for Active Treatments Improve the Quality of Care for Patients With Acute Low Back Pain Delivered by Physical Therapists?

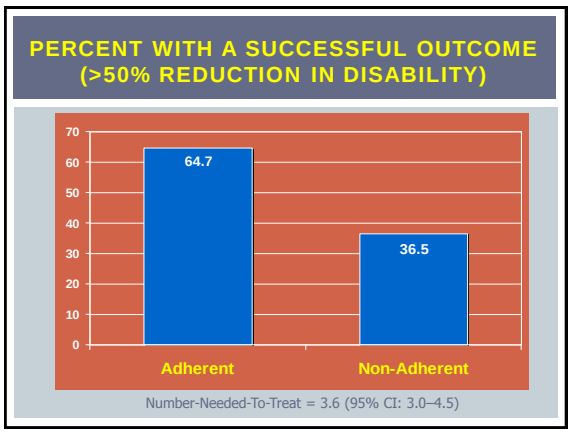
Julie M. Fritz, PhD, PT, ATC,† Joshua A. Cleland, PhD, DPT, FAAOMPT,‡ and Gerard P. Brennan, PhD, PT**

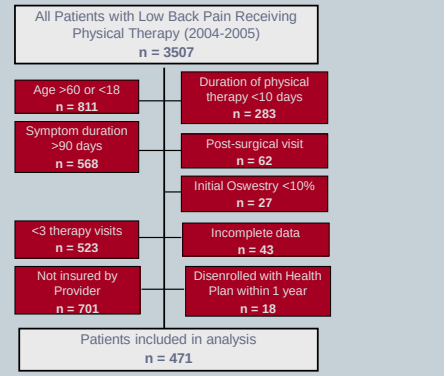
… use of patient education and exercise therapy for the treatment of acute back pain … staying active …

Medical Care • Volume 45, Number 10, October 2007


All Patients with Low Back Pain Receiving Physical Therapy (2004-2005)
n = 3507
Age >60 or <18
n = 811
Symptom duration >90 days
n = 568
<3 therapy visits
n = 523
Duration of physical therapy <10 days
n = 283
Post-surgical visit
n = 62
Initial Oswestry <10%
n = 27
Incomplete data
n = 43
Patients Eligible for Inclusion
n = 1190


PERCENT IMPROVEMENT
70
60
50
40
30
20
10
0
60.5
59.4
38
35.1
Pain
Disability
Pain
Disability
Adherent
Non-Adherent


PERCENT WITH A SUCCESSFUL OUTCOME (>50% REDUCTION IN DISABILITY)
70
60
50
40
30
20
10
0
64.7
36.5
Adherent
Non-Adherent
Number-Needed-To-Treat = 3.6 (95% CI: 3.0–4.5)



Fritz et al, Spine, 2008

RESULTS

	All Subjects (n=471)	Adherent (n=132)	Non-Adherent (n=339)
Number of Visits	5.5 (2.5)	4.6 (2.0)*	5.9 (2.2)*
Duration of care (days)*	28.5 (19.5)	25.4 (16.2)*	29.7 (20.6)*
Prescription medication	54.1%	46.2%*	57.2%*
Diagnostic procedures	21.0%	14.4%*	23.6%*
Injections	13.2%	9.1%*	15.9%*
		$1692	$2829

1 year follow-up

* $P < 0.05$

WHAT HAPPENS WHEN WE USE EVIDENCE

Based on this example it could be argued that application of scientific evidence is important to improve care of patients and reduce cost of health care

Autonomy in Physical Therapy: Less Is More

Julie Fritz, PT, PhD, ATC[1]
Timothy W. Flynn, PT, PhD, OCS, FAAOMPT[2]

J Orthop Sports Phys Ther • Volume 35 • Number 11 • November 2005

WHAT HAPPENS WHEN WE USE EVIDENCE

So, what kind of evidence exist to help my clinical practice?

THE GOOD NEWS

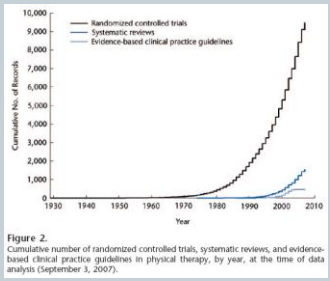
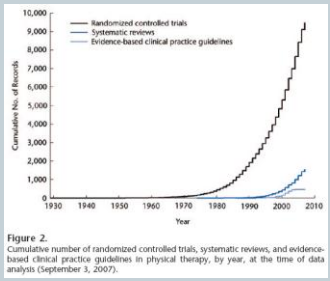


Figure 2.
Cumulative number of randomized controlled trials, systematic reviews, and evidence-based clinical practice guidelines in physical therapy, by year, at the time of data analysis (September 3, 2007).

Christopher G Maher, Anne M Moseley, Cathie Sherrington, Mark R Elkins, Robert D Herbert

Physical Therapy Volume 88 Number 9

THE BAD NEWS



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Physical Therapy Volume 88 Number 9

4 BASIC TYPES OF CLINICAL EVIDENCE

- **Diagnosis**
  - Accuracy & precision of diagnostic tests including the history and physical examination
- **Prognosis**
  - Power of prognostic markers
- **Therapy**
  - Efficacy of therapeutic, rehabilitative, and preventive regimens
- **Harm**
  - Potential for harm with our treatments

DIAGNOSIS

Which test is more likely to give me an accurate diagnosis?
How accurate is a positive test?
How accurate is a negative test?

DIAGNOSIS REQUIRES UNDERSTANDING PROBABILITY STATISTICS

- Sensitivity (with 95%CI)
- Specificity (with 95%CI)
- Likelihood ratios
  - +LR (with 95%CI)
  - -LR (with 95%CI)

SpPin
HIGH specificity
Positive
Rules IN

SnNout
HIGH sensitivity
Negative
Rules OUT

DIAGNOSIS FOR ANTERIOR CRUCIATE LIGAMENT TEAR

Test	Sensitivity	Specificity
Lachman test	85% (83-87)	94% (92-95)
Pivot shift	24% (21-27)	98% (96-99)
Anterior drawer (chronic condition)	92% (88-95)	91% (87-94)
Anterior drawer (acute condition)	49% (43-55)	58% (39-76)

Benjaminse A, Gokeler A, van der Schans CP. Clinical diagnosis of an anterior cruciate ligament rupture: a meta-analysis. *J Orthop Sports Phys Ther.* 2006;36(5):267-288

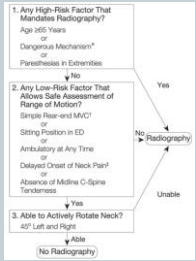
DIAGNOSIS RESEARCH REQUIRES AN INTENT

- **Rule out a condition***
  - Screening "bad" injuries

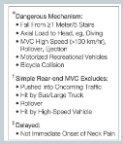
Cervical spine fracture

*Or seek additional tests if the test is positive

CANADIAN C-SPINE RULE



Sensitivity 1.0 (95%CI .98 to 1.0)
Specificity .43 (95%CI .40 to .44)



Stiell IG, Wells GA, Vandemheen KL, et al. The Canadian C-spine rule for radiography in alert and stable trauma patients. *JAMA* 2001;286:1841-1848.

DIAGNOSIS RESEARCH REQUIRES AN INTENT

- **Rule in a condition**
  - To provide more effective treatment

Shoulder anterior instability

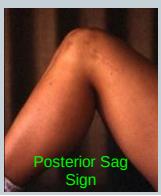
ANTERIOR INSTABILITY

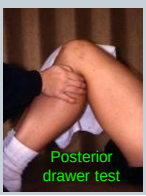
- Using apprehension (not pain) as + sign

Test	Sensitivity	Specificity	Positive Likelihood Ratio	Negative Likelihood Ratio
Farber et al (2006) Apprehension test	72%	96%	20.2	0.29
Farber et al (2006) Relocation test	81%	92%	10.4	0.20
Speer et al (1994) Relocation test	67%	99%	67	0.33
Lo et al (2004) – pain or app (anterior release)	64%	99%	58.6	0.37
Gross & Distefano (1997) - pain (anterior release)	92%	89%	8.3	0.09

POSTERIOR CRUCIATE LIGAMENT TEAR

- Rubenstein et al, Am J Sports Med, 1995
- Performed multiple clinical tests for PCL laxity in 39 patients (78 knees), 19 with a torn PCL
- Gold standard was MRI





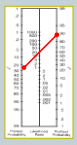
POSTERIOR CRUCIATE LIGAMENT TEAR

Test	Sensitivity	Specificity	Positive Likelihood Ratio	Negative Likelihood Ratio
Posterior drawer	90%	99%	90.0	0.10
Posterior sag sign	79%	100%	79.0	0.21
Quadriceps active drawer	54%	97%	18.0	0.47
Reverse pivot shift	26%	95%	5.2	0.78
KT-1000	86%	94%	14.3	0.15

- All tests had higher specificity than sensitivity, therefore each is better as a rule in test
- The posterior drawer test has a high +LR, and small –LR, making it an excellent diagnostic test

CPR FOR DIAGNOSIS OF CERVICAL RADICULOPATHY

- Upper limb tension test A
- Involved C-spine rotation < 60°
- Distraction test
- Spurling test A



23% to 90%

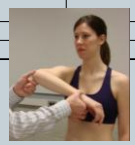
Criteria for a Positive Test	Sn 95 CI	Sp 95 CI	LR+ 95 CI	Post-test Probability
Two positive tests	0.39 (0.16–0.61)	0.56 (0.43–0.68)	0.88 (1.5–2.5)	21%
Three positive tests	0.39 (0.16–0.61)	0.94 (0.88–1.0)	6.1 (2.0–18.6)	65%
All four tests positive	0.24 (0.05–0.43)	0.99 (0.97–1.0)	30.3 (1.7–538.2) *	90%

Wainner RS, Fritz JM, Irrgang JJ, Boninger ML, Delitto A, Allison S. Reliability and diagnostic accuracy of the clinical examination and patient self-report measures for cervical radiculopathy. *Spine*. 2003 Jan 1;28(1):52-62.

HAWKINS KENNEDY

- Tendinitis

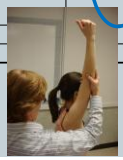
Test	Sensitivity	Specificity	Positive Likelihood Ratio	Negative Likelihood Ratio
Calis et al (2000) (Stage 1)	95.2%	30.7%	1.37	0.16
MacDonald et al (2000) (not stated)	87.5%	42.6%	1.53 (1.17, 1.99)	0.29 (0.10, 0.88)
Park et al (2005) (Any severity)	71.5%	66.3%	2.12	0.43



NEER (IMPINGEMENT)

- Tendinitis

Test	Sensitivity	Specificity	Positive Likelihood Ratio	Negative Likelihood Ratio
Calis et al (2000) (Stage 1)	71.4%	30.7%	1.03	0.93
MacDonald et al (2000) (not stated)	83.3%	50.8%	1.69 (1.24, 2.31)	0.33 (0.13, 0.83)
Park et al (2005) (Any severity)	68.0%	68.7%	2.19	0.47



IMPINGEMENT

- Item cluster for subacromial impingement
  - Positive Hawkins-Kennedy test
  - Painful arc (60-120 degrees) during active shoulder elevation
  - Positive (pain and/or weakness) with infraspinatus test: resisted ER with arm along the body
    - All 3 positive: +LR of 10.56
    - If 2 of 3 positive: +LR of 5.03
    - If all 3 negative: -LR of .17

Park et al, J Bone Joint Surg, 2005

IMPINGEMENT

- Item cluster for subacromial impingement
  - Hawkins-Kennedy +LR 1.63 -LR .61
  - Neer impingem LR 1.76 -LR .35
  - Painful arc R 2.25 -LR .38
  - Empty can (J 3.90 -LR .57
  - External rota R 4.39 -LR .50

    - 3 or more positive test: +LR of 2.93
    - Less than 3 positive tests: -LR of .34

Michener et al, 2009

OTHER DIAGNOSTIC PARADIGMS

- Classification systems
  - Low back pain – treatment based classification
  - Low back pain – movement impairment
  - ??? ???
- Diagnosis … but with impairment qualifiers
  - Patellofemoral joint pain, associated with
    - Hip weakness
    - Excessive foot pronation
  - Shoulder pain, associated with
    - Scapular dyskinesia

PROGNOSIS

- Physical Therapy Prognosis
  - What are my odds of getting better with conservative care?
  - How much time is needed for recovery of this injury given the offered treatment?
  - What are my chance of reinjury?
  - What prognostic factor predicts successful treatment?

JULES ROTHSTEIN

- "As physical therapists, not only do we need to know our literature on prognosis, but we need to *acquire additional* evidence, particularly when we want to change prognoses through the use of preventive intervention."
- "The dictionary fails to note that prognosis also is often what establishes (and enhances) a health care professional's credibility. As a young physical therapist, thanks to my ignorance and the lack of a body of published data, I usually would offer a two-word prognosis: "It depends." If a patient asked when to expect full range of motion, I might say, "It depends." If a persistent patient asked what it depended on, again I might deliver sage wisdom: "It depends on a lot of things." Only the patient's persistence determined how long I was allowed to sputter ambiguously."

Rothstein JM. What Will Be, Won't Necessarily Be (Editorial). *Physical Therapy* 84(3), March 2004.

WHO RESPONDS TO TREATMENT?

Predictors of Response to Physical Therapy Intervention in Patients With Primary Hip Osteoarthritis

Alexis A. Wright, Chad E. Cook, Timothy W. Flynn, G. David Baxter, J. Haxby Abbott

Physical therapy intervention defined as exercises and manual therapy

Physical Therapy Volume 91 Number 4 April 2011

CONSERVATIVE MANAGEMENT OF HIP OA?

- 5 predictors
  - Unilateral hip pain
  - Age less or equal to 58 years
  - Duration of symptoms less or equal to 1 year
  - Pain of greater or equal to 6/10 on a numeric pain rating scale
  - 40-m self-paced walk test time of less than or equal to 25.9 seconds

CONSERVATIVE MANAGEMENT OF HIP OA?

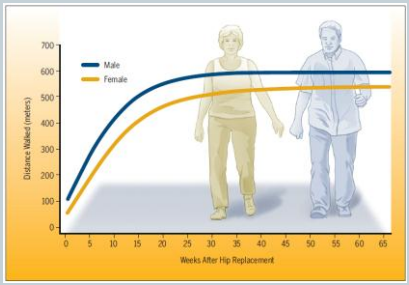
Table 3.
Number of Participants Receiving Physical Therapy in the Success and Nonsuccess Groups Who Were Positive for Each Predictor Variable[a]

No. of Predictor Variables Present	No. of Participants in the Physical Therapy Success Group	No. of Participants in the Physical Therapy Nonsuccess Group
≥4	1 (4.5%)	0 (0%)
≥3	9 (40.9%)	0 (0%)
≥2	21 (95.5%)	11 (23.9%)
≥1	22 (100%)	36 (78.3%)
0	0 (0%)	10 (21.7%)

[a] The 5 variables forming the multivariate logistic regression model were: (1) unilateral hip pain, (2) age of ≤58 years, (3) pain of ≥6/10, (4) 40-m SPWT score of ≤25.9 seconds, and (5) duration of symptoms of ≤1 year.

22 of 68 participants (32%) were considered to have success

WHAT IS THE RECOVERY RATE POST THA?



Kennedy et al, JOSPT, 2011

WHO REQUIRES ACL RECONSTRUCTION POST ACL TEAR?

HÅVARD MOKSNES, PT¹ • LYNN SNYDER-MACKLER, PT, ScD² • MAY ARNA RISBERG, PT, PhD³

Individuals With an Anterior Cruciate Ligament-Deficient Knee Classified as Noncopers May Be Candidates for Nonsurgical Rehabilitation

TABLE 4 Classification of Subjects at Screening and 1-Year Follow-up After Nonoperative Treatment

	True Coper at 1-Year Follow-up		
Potential Coper at Screening Examination	Yes	No	Total
Yes	15	10	25
No	19	8	27
Total	34	18	52

JOSPT 2008

HAMSTRING INJURIES: RECOVERY TIME?

	High Speed Running	Extreme Stretch
Straight leg raise deficit*	40%	20%
Knee flexion strength deficit*	60%	20%
Pain	Moderate	Minor
Location of maximum pain**	12 cm	2 cm
Length of painful area	11 cm	5 cm

* Compared to the other side
** Distance from the ischial tuberosity

Biceps femoris Semi-membranosus

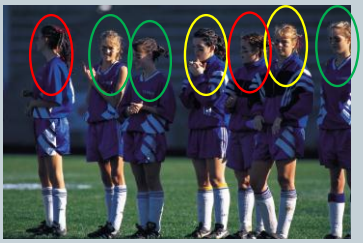
Askling et al, AJSM 2007

HAMSTRING INJURIES: RECOVERY TIME?

- Increased recovery time if:
  - > 1 day needed to walk pain-free following injury
    - More likely (adjusted odds ratio [AOR] 4.0; 95% CI: 1.3, 12.6) to take longer than 3 weeks to return to competition
  - History of hamstring injury
    - Elevated risk of a delayed return to competition (AOR, 4.2; 95% CI: 1.0, 18.0)

Warren et al, BJSM 2010

Who is at risk for ACL injury?



Powers, 2010

WHO WILL DO WELL POST WHIPLASH?

- 50% of people will continue to have problems at 12 months

WAD: PROGNOSTIC FACTORS OF POOR OUTCOMES

Variables with strong evidence of a significant effect*	Variables with moderate evidence of a significant effect†	Variables that just miss significance‡	Variables with strong evidence of no effect§
• High baseline neck pain intensity (>55/100 on VAS) • Presence of headache at intake • WAD grade 2 or 3 • WAD grade 3 (Fail-safe N > 5x no. of cohorts)	• Lower education • Catastrophizing • Female gender • History of previous neck pain • No seat belt used • Presence of neck pain at intake (Fail-safe N < 5x no. of cohorts)	• Older age (for pain as outcome) • Disturbed sleep (At least 3 cohorts, lower limit of 95%CI >0.9)	• Vehicle stationary • Frontal collision • Rear-end collision • Side or 'other' collision • Driver of vehicle • Front passenger • Unprepared • No head rest used (At least 4 cohorts, lower limit of 95%CI <0.9)

Walton et al: Risk factors for persistent problems following whiplash injury. JOSPT 2009, 39(5):334-350

PROGNOSTIC FACTORS OF POOR OUTCOMES FROM WAD

- Higher NDI (>30%)
- High pain scores
- Older age
- Cold hyperalgesia
- Post traumatic stress
- Kinesiophobia
- Greater decreased ROM

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

Sterling M: Physical and psychological factors maintain long-term predictive capacity post-whiplash injury, Pain 122:102-108, 2006

TREATMENT

- What technique is better to improve shoulder external rotation range of motion in individuals with adhesive capsulitis?
  - The Patient or Problem
  - The Intervention
  - Comparison Intervention
  - Outcome(s)

Johnson et al, JOSPT, 2007

TREATMENT

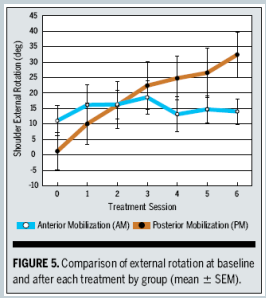


FIGURE 5. Comparison of external rotation at baseline and after each treatment by group (mean ± SEM).

LITERATURE REVIEW

Effects of Neuromuscular Electrical Stimulation After Anterior Cruciate Ligament Reconstruction on Quadriceps Strength, Function, and Patient-Oriented Outcomes: A Systematic Review

J Orthop Sports Phys Ther 2010;40(7):383-391. doi:10.2519/jospt.2010.3184

Kyung-Min Kim, Ted Croy, Jay Hertel, Susan Saliba

JOSPT
VOLUME 40 | NUMBER 7 | JULY 2010

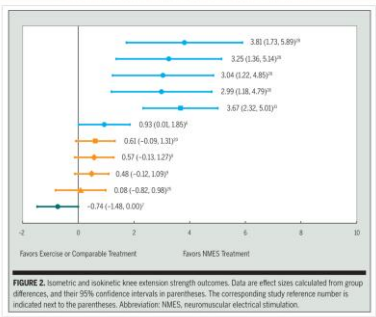


FIGURE 2. Isometric and isokinetic knee extension strength outcomes. Data are effect sizes calculated from group differences, and their 95% confidence intervals in parentheses. The corresponding study reference number is indicated next to the parentheses. Abbreviation: NMES, neuromuscular electrical stimulation.

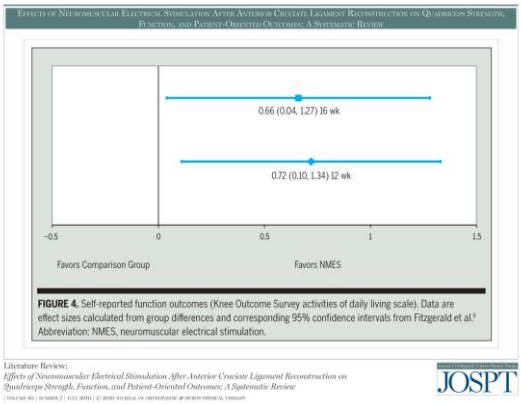


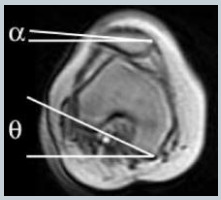
FIGURE 4. Self-reported function outcomes (Knee Outcome Survey activities of daily living scale). Data are effect sizes calculated from group differences and corresponding 95% confidence intervals from Fitzgerald et al.[3] Abbreviation: NMES, neuromuscular electrical stimulation.

Literature Review:
Effects of Neuromuscular Electrical Stimulation After Anterior Cruciate Ligament Reconstruction on Quadriceps Strength, Function, and Patient-Oriented Outcomes: A Systematic Review

JOSPT

MECHANISTIC STUDIES

Not only understanding IF it works but WHY it works!!



Powers et al, JOSPT, 2003

HARM

- Case reports
- Need to be systematically reported along with results of all diagnostic and intervention studies

LISA C. CARLESSO, PT, MSc[1] • JOY C. MACDERMID, PT, PhD[2] • LINA P. SANTAGUIDA, PT, PhD[3]

Standardization of Adverse Event Terminology and Reporting in Orthopaedic Physical Therapy: Application to the Cervical Spine

Carlesso et al, JOSPT, 2010

PUTTING IT ALL TOGETHER

A Potential Example for the Treatment of Acute Low Back Pain

PUTTING IT ALL TOGETHER

A Clinical Prediction Rule for Classifying Patients with Low Back Pain Who Demonstrate Short-Term Improvement With Spinal Manipulation

- Duration of symptoms < 16 days
- FABQ work subscale 18 or less
- Symptoms not distal to the knee
- At least one hip internal rotation PROM > 35^0
- Hypomobility at one or more lumbar levels with spring testing

Flynn et al, Spine, 2002

PUTTING IT ALL TOGETHER

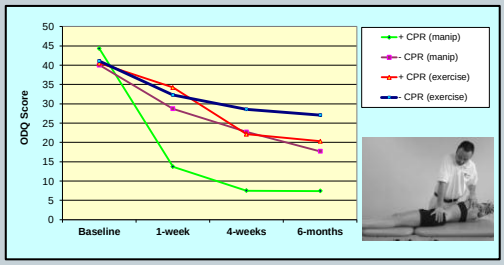
A Clinical Prediction Rule To Identify Patients with Low Back Pain Most Likely To Benefit from Spinal Manipulation: A Validation Study

Maj John D. Childs, PhD, PT; Julie M. Fritz, PhD, PT; Timothy W. Flynn, PhD, PT; James J. Irrgang, PhD, PT; Maj Kevin K. Johnson, PT; Maj Guy R. Majkowski, PT; and Anthony Delitto, PhD, PT

Annals of Internal Medicine, 2004

	Fits the Prediction Rule	Does Not Fit the Rule
Manipulation Treatment Group	MATCH	Unmatched
Exercise Treatment Group	Unmatched	Unmatched

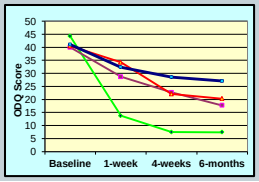
PUTTING IT ALL TOGETHER

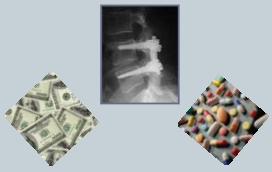


Childs et al, Ann Int Med, 2004

PUTTING IT ALL TOGETHER FOR PATIENTS AND SOCIETY

- **Outcome at 6 months**
  - Taken medication in last week? 27.8% 43.8%
  - Currently seeking treatment? 11.1% 43.8%
  - Missed work in last 6 weeks? 5.6% 24.0%





Childs et al, Ann Int Med, 2004

PRACTITIONERS AND THE EVIDENCE

- Study of 321 PTs in England & Australia
- "The basis of over 90% of each group's choice of treatment interventions reflected what was taught during their initial training."
- "Research literature ranked least in importance as a basis for choosing techniques, and review articles fared little better."

Turner P, Whitfield TW. Physiotherapists' use of evidence based practice: a cross-national study. *Physiother Res Int* 1997;2(1):17-29

PRACTITIONERS AND THE EVIDENCE

Integration of:

- best research evidence
- clinical expertise
- patient values

NOT Integration of:

- best research evidence
  - clinical expertise
  - patient values

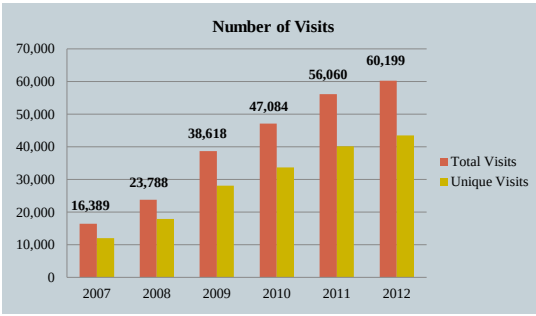
Childs et al, JOSPT, April 2012

DELIVERY AND ACCESS

Journal of Orthopaedic & Sports Physical Therapy

JOSPT INTERNATIONAL PARTNERSHIPS
FROM 2007 TO DATE

JOSPT WEBSITE TRAFFIC
AVERAGE MONTHLY VISITS/UNIQUE VISITORS PER MONTH



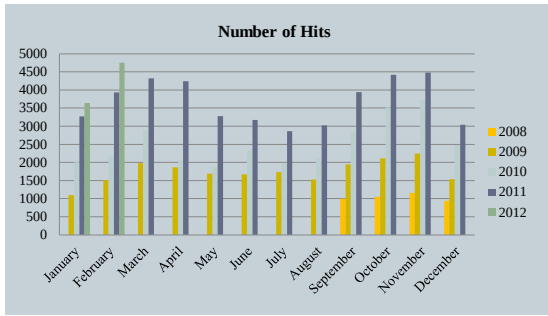
PHYSICAL THERAPY IMPACT

Impact factor 2.538

- Rehabilitation (5 of 43)
- Orthopaedics (9 of 61)
- Sports (11 of 81)

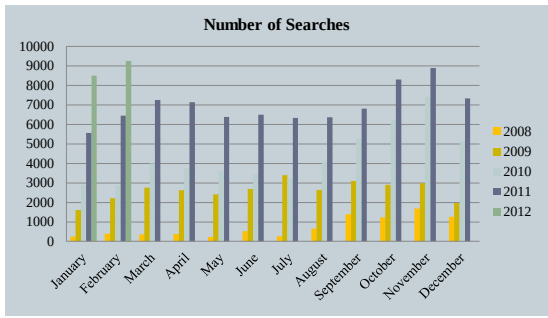
JOSPT HITS ON PUBMED LINKOUT

NUMBER OF TIMES USERS CLICKED JOSPT'S LINKS ON PUBMED



JOSPT SEARCHES ON CROSSREF

NUMBER OF TIMES USERS LOOKED FOR JOSPT DOIS



EDUCATION


THANK YOU!