

Feature Commentary**CLINICAL MENTORING: STUDY GROUPS FOR DIPLOMATES & OTHER MDT PRACTITIONERS***TODD EDELSON, PT, DPT, Dip. MDT*

Robin McKenzie regularly emphasized the importance of sharing knowledge and passing on skills and information. As a former Diploma tutor in MDT private practice for more than twenty-five years, I felt well-positioned to extend myself to help strengthen our community of practitioners.

Step 1: A Diplomat-Only Study Group

The first study group I developed was among my former Diploma students. I sketched out what a study group might look like, identified goals and objectives, and then, in early 2013, floated the idea out to this community of more than twenty individuals around the world.

What developed is a thriving monthly study group, with participants who meet once a month by conference call and internet to buckle on our critical thinking caps, discuss difficult and perplexing cases, problem-solve and share a collegial exchange of ideas.

Additionally, the study group provides an opportunity for networking and referrals across the United States, sharing of pertinent literature and enjoying each other's company. Over its first three years, the group has experienced the birth of two children, job promotions and the release of a book, "A World of Hurt," co-authored by Melissa Kolski, PT, OCS, Dip. MDT.

Now into our third year, the core group of five Diplomates rotates clinical leadership responsibility on a monthly basis. One week in advance of the scheduled meeting, participants receive an initial evaluation (with clinical review notes documenting the course of treatment) from the person presenting the case, allowing time for each participant to review the case. The cases are presented on a rotating basis for several reasons: each participant has the opportunity to hone their presentation and leadership skills, each participant can get feedback on difficult cases in their respective practices and each leader can introduce new ideas to the group.

In addition to clinical discussions, the topics of practice management, mentoring of students and patient handling skills have been broached. MDT World Press readers can get a sense of the value of the study group by reading feedback provided by group participants:

Melissa Kolski, PT, OCS, Dip. MDT

"For three years we have met with Todd and three to four other Diploma practitioners. It has been an invaluable experience of clinical problem solving and reasoning. Monthly, I appreciate the experience of talking through cases. Presenting has become a helpful way to return to the fundamentals of MDT and explore other clinician's clinical pearls. It is so nice to throw ideas around with like-minded clinicians. Since we are East Coast / Midwest, we also have had some good referral opportunities between us."

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Kay Scanlon PT, DPT, OCS, Dip MDT

"What does our online study group do for me? I look forward to our 1-hour meeting for inspiration, education and reflection each month. Thinking about this, there are three main points that come to mind when I try to summarize the benefits obtained in this process."

1. *I work in isolation, like many of us who are in solo practices. Day in and day out, I hear: “It’s my SI joint”, “My doctor says my pain is due to arthritis”, “it’s a facet problem”, or that all too common one: “I’ve been told I need to strengthen my core!” It can be tough to downplay all this rhetoric you are bombarded with on a daily basis and return to your mechanical reasoning at times. Having the study group meeting once a month helps me **focus on classification** rather than become distracted by all the chatter from patients. It also reinforces the analogies and examples we provide to patients to help them understand their problem.*
2. *I **take away something from every discussion** we have. Sometimes, I’ll have a patient walk in the door the very next week similar to the case we discussed on our group. Sometimes, I can reach a solution more rapidly that I may have previously, but more often I am able to recognize something a bit unusual that I may have missed in the past.*
3. *This study group **builds confidence!** It is not always easy to present a case you have struggled with in front of your peers. Having to provide sound clinical reasoning, accept constructive comments and summarize a case in clear, concise language is confidence building in and of itself. We do this with our patients every day, but sometimes need to step it up and do the same with our MDT peers.*

I would encourage anyone wishing to learn and improve their understanding of MDT to consider forming a study group such as ours. Setting a consistent time each month allows participants to prepare and block time out for self-study. Send the case to your study partners ahead of time so they have a chance to review and formulate questions. Find a few like-minded individuals and start your own group. You won’t be sorry you did!”

Kristel Maes, PT, DPT, Dip MDT

“The Diploma program has given me the confidence and skills to treat my patients effectively, efficiently and according to the latest research. Finishing the Diploma program was like the last day of summer camp, and you wonder how things will go afterwards. Three years ago, Todd Edelson started a Diploma study group and, although I was the latecomer in the group, I have had significant benefits from these monthly online meetings. As few Diplomates get the privilege to work onsite together, we oftentimes are isolated on our islands and have no audience to bounce off our intriguing patient cases. Being able to present our patient cases and get some insight into treatment plans has helped continue to develop my clinical reasoning skills.”

Marie-Louise Merckx-Quinn, PT, DPT

“Being part of the McKenzie Diploma study group has allowed me to continue to grow, learn and be passionate about MDT. With a peer group that has one common body of knowledge and reasoning skills, I can ask for advice, be humble, and be challenged on a monthly basis. Simultaneously, this peer group with similar and different challenges in their work environments has grown over the years into a close-knit circle of colleagues, where knowledge, critical thinking and clinical reasoning is encouraged and stimulated. Thank you for allowing me to be part of this group, and continuously ‘sharpen the saw!’”

Step 2: An MDT Practice Study Group

With the success of the online, Diplomate study group, and fielding a regular stream of calls from healthcare practitioners requesting an opportunity to ‘shadow’ in either my New York or New Jersey clinic, the notion of on-site study groups became realistic. After discussion with the McKenzie Institute USA branch’s Executive Director, Stacey Lyon, we tested the ideas of holding study groups for Part B and above clinicians in Manhattan and Northern New Jersey. Kicking off in March 2016, 15 participants from as far south as the Philadelphia area, as far west as the Pennsylvania border, and as far north as Kingston, NY – each 100 miles away – arrived at my offices. The attendees were hungry to associate, and it was a pleasure to host them.

The format of the local study groups is similar to the online study group. We use a case study to stimulate the clinical reasoning process from evaluation through treatment and discharge. A formal discussion of force progression and the hands-on application of techniques are integral parts of the program. The participant has the opportunity to not only refine techniques, but also to understand when and why a particular technique should or should not be used.

Most of the participants in the study group stated they worked in isolation, whether or not there were other physical therapists in the clinic. They had the feeling that there was nobody in their work setting who spoke a common language. Others expressed that even just one meeting was helpful in attaining the Credential in Mechanical Diagnosis and Therapy (Cert. MDT). Everyone expressed great interest in continuing with the study group, and we subsequently grew to 18 participants in May. We will continue on a bi-monthly basis.

Key Points for Study Group Success:

- Must have an expert in the room
- Must have structure to the session
- Must have a leader
- Use electronic media to publicize and receive responses
- Refreshments

I would encourage Diploma-level therapists with the inclination and capacity to share their knowledge and skills to form study groups and continue to stimulate MDT practice, professionalism, collegiality and networking. Many thanks to Stacey Lyon and the staff at the USA branch of the McKenzie Institute International for their support in these endeavors.

BRANCH SPOTLIGHT

25th Anniversary of the Benelux Branch

Lieve Moyaert, MSc, PT, MT, Dip. MDT
Benelux Branch Board Member

In 1991, the McKenzie Institute Benelux was founded. The Benelux Branch became a union between Belgium, the Netherlands and Luxemburg. To celebrate the 25th anniversary of the Branch, Benelux board members organized a symposium for all MDT Certified Clinicians and clinicians who were simply interested in Mechanical Diagnosis and Therapy.

On September 21st, everyone was invited to the High Tech Campus in Eindhoven, the Netherlands. The program started at 2:00 pm with a nice welcome by the President of the Benelux Branch, Hanneke Meihuizen. The first speaker, Adri Apeldoorn, followed, speaking about the influence of Centralization and Directional Preference on spinal control in patients with nonspecific low back pain. He also elucidated his recent research that was published in the Journal of Orthopaedic and Sports Physical Therapy (JOSPT).



The next speaker was Henk Tempelman, a Benelux Branch Faculty member. He discussed the disc model. After 35-years, perhaps this model needs a facelift? Based on literature, he suggested that the model be used only as a model and not as an absolute truth as often we cannot be sure which structure is responsible for the symptoms. Using the disc model, one could suggest that we are talking about an intervertebral disc. Additionally, research in symptomatic discs shows that we cannot predict the movement of disc material. The perfect example of this is a patient with a posterior derangement who responds with 'Better' on repeated flexion.



After a nice dinner and a little break, the program continued with presentations by Stijn Van Merendonk and Mike Stewart. Van Merendonk is an expert in motivational interviewing. He explained the power of motivation. To empower our patient in self-care is essential when we work with the MDT system. Mike Stewart then spoke about the hidden influence of metaphors in rehabilitation. He explained to the clinicians that, at times, words can be more powerful than the techniques used.

The main purpose of the evening's program was for the Benelux Board to show to MDT therapists the importance of Centralization and Directional Preference. Next to these typical MDT subjects, there was room for a critical point of view on the disc model. The Board also wanted to make clear that MDT isn't only about mechanics. Coaching and teaching our patients is a big part of what we do and in this communication is key!

A CLINICIAN'S PERSPECTIVE

The Athlete and Asymptomatic Shoulder Changes Seen on MRI

Kristi M. Maguire, PT, Dip. MDT

In the past decade, with improvements in imaging to investigate soft tissue, there has been growing evidence of significant changes in the bone, ligament, tendon and muscle that do not have pain associated with these changes. The prevalence of musculoskeletal pain in the general population is 18.6–31% for one-month prevalence and 6.7–66.7% for lifetime prevalence (Luime JJ et al., 2004). However, there are relatively few studies that have investigated this prevalence. There are even fewer studies available that have specifically looked into the prevalence of shoulder pain in the elite athlete. One study found involved 257 Brazilian swimmers who were participating in the 2014 swimming championship. 20% of the swimmers reported current musculoskeletal pain. Of these swimmers, 60% reported at least one injury in the previous year. The shoulder was the most commonly affected region in this population. Of this joint, the most common diagnosis was tendonopathy (IJSPT 2015).

There is a growing body of evidence that in the asymptomatic population of both the elite athlete and non-athlete there is a high frequency of significant pathology found on MRI. Fredericson et al., 2009, found in asymptomatic elite volleyball players, 50% had shown moderate changes to the labrum and 8% with severe changes. In these same athletes there were changes demonstrated in the rotator cuff with 25% moderate changes and 17% with severe changes. Fredericson et al., (2009) also investigated swimmers and found more changes noted in the labrum with 83% having moderate changes. There were 67% with moderate ligament changes. At the three to four-year follow-up, only one swimmer and one volleyball player reported shoulder problems during the study period (p. 107). These authors concluded, "Asymptomatic elite athletes demonstrate MRI changes of the shoulder (swimmers and volleyball players) and wrist (gymnasts) similar to those associated with abnormalities for which medical treatment and sometimes surgery are advised" (p. 108).

Similar changes were found in elite baseball players. Conner et al., 2003, reported on asymptomatic shoulders of overhead athletes with a five-year follow-up study. Dominant and non-dominant shoulders were compared. These authors found 40% of the dominant shoulders with partial or full thickness tears of the rotator cuff with but 0% in the non-dominant arm. There was also evidence of Bennett lesions in 25% of the dominant arms. The authors concluded that "MRI alone should not be a basis for operative intervention in this patient population" (p. 724).

Miniaci et al., 2002, assessed elite asymptomatic baseball pitchers as well comparing the throwing arm to the non-throwing arm. They found Grade 1 changes in the rotator cuff to be 79% in the throwing arm and 86% in the non-throwing arm. When comparing the infraspinatus between the two shoulders, there was evidence of Grade 1 changes at 86% and Grade 2 changes at 14% in the throwing arm. The non-throwing arm had 79% Grade 1 changes only. The labrum in the throwing arm had abnormal changes seen in 79%, with 55% having signal changes, and 45% having tears. The non-throwing arm demonstrated similar changes with 79% abnormalities seen and 64% with signals changes and 36% with tears. These authors concluded that "Due to the presence of signal changes and abnormalities in pain free shoulders, MRI may have little role in the assessment of the symptomatic shoulder of professional pitchers" (p. 72).

Although this paper was focused on asymptomatic elite athletes and positive changes on MRI, there are significant pathologic changes also seen in the non-athletic population typically demonstrating greater and more common incidence of changes with age (Reilly P et al. and Gill T et al.). Advances in imaging have led to improved detection of these changes as well as the extent of the tear (Shaffer and Huttman, 2014). Over the years, this has also led to advances in surgical techniques. However, Shaffer and Huttman report "Despite improved recognition and surgical treatment, successful management of the thrower with a torn cuff remains elusive" (p. 101). Therefore, the authors conclude that non-operative management of overhead athletes should be first choice because of the fact there is a high asymptomatic prevalence of cuff changes. These authors go on to report that there is a frequent positive response to conservative management and, unfortunately, there is the current reality that surgery does not assure successful return to sport or even full resolution (p. 104). They suggest a reasonable period of conservative management to be around three months, but could also take longer especially with a more extensive tear (p 104).

There are relatively few studies that have assessed the return to sport from a post-operative intervention. If the source of pain is in the rotator cuff, there are two options for surgical intervention: debridement and

cuff repair (Shaffer & Huttman, 2014). Payne et al, (1997) reported on 40 athletes with partial tears who underwent subacromial decompression and debridement of partial tears. The group with a traumatic onset of pain reported 86% satisfied with the outcome and 64% return to sport at pre-injury level. However, the group with insidious onset of shoulder pain reported 66% satisfied and a 45% return to pre-injury athletic activity (Shaffer and Huttman, 2014).

These same authors reviewed return to sport after cuff repair and found that overhead athletes have not shown uniformly good results (p 105). Unfortunately, there is little data available that has investigated outcomes after cuff repair in overhead athletes. Mazoue et al., 2006, studied this group of athletes and found a 12% chance of return to baseball. Therefore, operative management involving cuff repair should be carefully considered, and only considered if conservative management has failed (p. 108).

There are also studies on diagnostic accuracy of orthopedic special tests, which have consistently demonstrated lack of specificity and sensitivity. A systematic review of these individual tests by Hegedus et al., 2015, found that "The diagnostic accuracy of the Neer test for impingement, the Hawkins-Kennedy test for impingement and the Speed test for labral pathology is limited" (p. 80).

There is growing evidence that shoulder pain with ROM, strength and functional deficits can have a pure cervical or even thoracic origin, in which all dysfunction of the shoulder is fully resolved with cervical and/or thoracic movement. The IMC Database in Tallahassee, FL (2016) rates this prevalence at 30%. This diagnosis is found with proper use of Mechanical Diagnosis and Therapy's (MDT) response based assessment. This assessment process also reveals the diagnosis of shoulder derangement that is characterized by rapid changes in shoulder deficits. The IMC Database (2016) reports a 67% prevalence of shoulder derangement. These diagnoses and rapid changes are determined without the use of imaging.

Based on the review of imaging on asymptomatic shoulders of elite athletes, imaging could, then, create an unintentional increase in unnecessary interventions if decisions are made based on what a picture reveals. This could cause a direct increase in cost due to unnecessary interventions including unnecessary imaging. In fact, Donelson et al, 2016, found a 51.5% cost savings when patients who sought 'Mechanical Care,' which utilized McKenzie's MDT response based assessment, as opposed to community care. Perhaps with issues in imaging and special tests, the MDT response based assessment offers a reasonable and sensible solution to resolving musculoskeletal problems that are capable of change without imaging.

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LITERATURE REVIEWS

Summary and Perspective of Recent Literature

Brian McClenahan, PT, DPT, MS, FAAOMPT, Dip. MDT

Werneke M, Edmond S, Deutscher D, Ward J, Grigsby D, Young M, McGill T, McClenahan B, Weinberg J, Davidow A. (2016). Effect of Adding McKenzie Syndrome, Centralization, Directional Preference, and Psychosocial Classification Variables to a Risk-Adjusted Model Predicting Functional Status Outcomes for Patients with Lumbar Impairments. *JOSPT*; 46:726-741.

STUDY'S PUBLISHED CONCLUSION

The small added prognostic capabilities identified when combining McKenzie or pain-pattern classifications with the SCL-BPPM classification did not significantly improve prediction of functional status outcomes in this study.

At first glance, it would appear that MDT classification along with psychosocial classification has no importance when attempting to determine prognosis in patients. However, it is important to first understand the study's design.

WHAT IS THIS STUDY TRYING TO DO?

This study is attempting to determine what independent factors best explain or predict a patient's functional outcome at discharge from physical therapy services. Multiple models were developed in a series examining the predictive power of patient characteristics, therapist characteristics and the effect of adding MDT, Pain Pattern, and Psychosocial classification categories, as well as, a combination of the aforementioned classification paradigms. All eight models (Table 5) were compared in a head-to-head manner. These statistical comparisons allowed the determination of which model had the greatest 'predictive power' (i.e. R^2_{value}) for predicting a patient's functional outcome following treatment.

The 'predictive power' of a model is represented as an R^2_{value} . The greater the R^2_{value} , the stronger the predictive ability of a model for the given dependent variable. The dependent variable we are concerned about is the functional status of the patient at discharge. The functional status of the patient is assessed by Focus On Therapeutic Outcome's (FOTO) lumbar measure. This measure is psychometrically reliable, valid and responsive and has been described in detail elsewhere [1-5]. FOTO uses a 0-100 functional scale to express a patient's overall level of function (0 = 'essentially bed ridden' vs 100 = 'participating in collegiate sports').

In TABLE 5, you will see two R^2_{values} per model; One that is calculated initially with our available data for the study, and a second that is generated by PRESS (Prediction Error Sum of Squares). PRESS is used to avoid 'overfitting'. Overfitting is a problem that can occur in complex statistics when you have many variables to assess. As stated earlier, the purpose of the proposed models is to PREDICT functional changes for future patients. The model, however, is using a data set that has already been collected and, in the worst case scenario, the model generated would essentially 'memorize' the data points used and thereby have 100% prediction for the available data but have no utility with future data. PRESS is used to cross validate the initial findings of each model. To do this, PRESS uses the model's prediction equations on a completely separate collection of patient data and shows how similar the two findings are. To demonstrate validity, you want the model's predictions and PRESS' predictions to be fairly close, if not ideally identical. The findings demonstrate that the margin for error is small.

Only significant independent variables are included in the model to calculate the overall R^2 value. An independent variable's explained variance is represented as a beta coefficient. Beta coefficients are a way of representing to what extent a variable, such as age, has an ability to influence for better or worse a dependent variable relative to all variables measured. The beta coefficients reported in Table 5 indicate the amount of explained variance that each significant independent variable contributes to the predictive power of the model compared to a reference standard.

EXAMPLES:

Model 2 (FOTO and MDT Classifications) demonstrated an additional 2.8% in predictive ability compared to Model 1 (FOTO). Reducible Derangement is the reference standard for MDT classifications. Compared to a Reducible Derangement, Chronic Pain State in this model predicts that the patient will achieve 14.3 fewer points over the course of care. Mechanically Inconclusive is predicted to achieve 5.1 fewer points of functional gains by discharge compared to an individual classified as Reducible Derangement.

Model 7 included the addition of MDT classification and SCL-BPPM to FOTO's original model and resulted in an additional 3.6% predictive power. Again, Reducible Derangement is the reference standard for MDT classifications. Compared to a Reducible Derangement, Chronic Pain State in this model now predicts 13.4 fewer points of function at discharge. This highlights that the strength of each beta coefficient is dependent on all the variables calculated in the equation.

MDT clinicians consider classification essential to guiding treatment and setting long-term expectations (prognosis) for our patients. We found that classification categories were significant and generated large beta coefficients within all classification models examined (except for fear avoidance model) yet when comparing models in a head-to-head manner as we did in this study, the conclusion appears to contradict the data reported in Table 5.

IS THE CONCLUSION CORRECT?

We observed that the addition of classification variables added an extra 4% in R^2_{value} after controlling for patient and therapist characteristics (i.e. 44% vs 40%), but R^2_{values} were not statistically different between models. At first glance, if the reader only read the abstract, they are left with the impression that classification was not only statistically insignificant, but clinically unimportant.

Although the differences in R^2_{value} between models were not statistically different, that does not mean that classification was not important!!! The devil is in the details. Understanding the statistical complexity of the study design, knowledge of previous prediction models developed and published in the physical therapy literature, and careful interpretation of the data presented in Table 5 offers a different perspective.

IMPORTANT DATA FINDINGS from TABLE 5 (below)

- Model 7 (addition of MDT and SCL-BPPM) improved the original Model by 3.6%.
 - MDT Classification beta coefficients were generally larger values (i.e. -5.0, -13.4) than SCL-BPPM beta coefficient values of -3.3 and -3.2. Therefore, MDT is a greater prognostic variable than SCL-BPPM.
- Model 8 (addition of Pain Pattern and SCL-BPPM) improved the original Model by 3.9%.
 - Pain Pattern Classification beta coefficients were generally larger values (i.e. -8.1, -3.2) than SCL-BPPM beta coefficient values of -3.3 and -4.0. Therefore, Pain Pattern Classification is a greater prognostic variable than SCL-BPPM.
- Chronic Pain Syndrome (MDT Classification) had the greatest beta coefficient of all at -13.4 (Model 8).
- FABQ had NO statistical benefit in predicting outcomes.

Due to the original study's design of comparing models in a head-to-head fashion, it is correct that statistically a 3 - 4 % prediction (achieved by MDT / Pain Pattern / Psychosocial) is insignificant compared to a 40% prediction (achieved by FOTO's original baseline model).

We recommend for future studies to examine what variables added sequentially in a single model have the best predictive capabilities. If we look at this data from the perspective of what variables explain the largest amount of variance, things appear different. The DISCUSSION section of the article highlights these important facts and expands upon the clinical importance of interpreting classification beta coefficients.

TABLE 5

MODEL	1	2	3	4	5	6	7	8
Dependent variable: FS at discharge (n = 723)								
R ²	0.398 (0.345, 0.451)	0.426 (0.374, 0.478)	0.428 (0.376, 0.480)	0.408 (0.356, 0.461)	0.398 (0.345, 0.452)	0.399 (0.346, 0.452)	0.434 (0.382, 0.485)	0.437 (0.385, 0.489)
Increase in R ² compared to basic model	...	2.8%	3.0%	1.0%	0.0%	0.1%	3.6%	3.9%
Sample validation predicted R ²	0.349	0.368	0.375	0.355	0.347	0.348	0.372	0.380
Variables ^a								
Intercept	68.5 (<.001)	71.5 (<.001)	71.9 (<.001)	72.6 (<.001)	677 (<.001)	66.8 (<.001)	74.9 (<.001)	75.6 (<.001)
Intake FS	0.5 (<.001)	0.5 (<.001)	0.5 (<.001)	0.5 (<.001)	0.5 (<.001)	0.5 (<.001)	0.4 (<.001)	0.4 (<.001)
Age groups								
18 to <45 y (reference)	...	...	...	...	...	...	...	...
45 to <65 y	-1.9 (.096)	-1.6 (.153)	-1.7 (.144)	-2.1 (.071)	-1.9 (.106)	-1.8 (.115)	-1.8 (.122)	-1.8 (.115)
65 to <75 y	-2.1 (.339)	-2.4 (.266)	-2.4 (.262)	-2.6 (.230)	-2.1 (.341)	-2.1 (.341)	-2.7 (.207)	-2.8 (.188)
≥75 y	-0.9 (.740)	-0.8 (.777)	-1.9 (.494)	-1.5 (.572)	-0.9 (.742)	-0.9 (.731)	-1.1 (.677)	-2.3 (.398)
Acuity								
0-21 d (reference)	...	...	...	...	...	...	...	...
22-90 d	-5.8 (<.001)	-5.1 (.001)	-5.0 (.001)	-5.9 (<.001)	-5.8 (<.001)	-5.8 (<.001)	-5.2 (.001)	-5.1 (.001)
>90 d	-9.6 (<.001)	-8.6 (<.001)	-8.8 (<.001)	-9.5 (<.001)	-9.6 (<.001)	-9.6 (<.001)	-8.6 (<.001)	-8.8 (<.001)
Surgical history								
No related surgery (reference)	...	...	...	...	...	...	...	...
≥1 related surgeries	-6.2 (<.001)	-6.3 (<.001)	-5.3 (<.001)	-6.2 (<.001)	-6.2 (<.001)	-6.1 (<.001)	-6.3 (<.001)	-5.4 (<.001)
Payer								
HMO/PPO (reference)	...	...	...	...	...	...	...	...
Medicare	-1.0 (.599)	0.1 (.973)	-0.0 (.998)	-0.7 (.732)	-1.0 (.599)	-1.0 (.602)	-0.5 (.881)	-0.1 (.976)
Medicaid	-6.3 (.137)	-4.7 (.262)	-5.5 (.183)	-6.3 (.132)	-6.2 (.139)	-6.3 (.136)	-5.0 (.231)	-5.7 (.168)
Workers' compensation	-2.7 (.224)	-1.1 (.616)	-1.4 (.527)	-1.9 (.387)	-2.8 (.208)	-2.8 (.203)	0.5 (.805)	-0.7 (.756)
Litigation, no fault, auto insurance, indemnity	0.3 (.927)	0.6 (.871)	-0.1 (.987)	-0.4 (.916)	-0.5 (.899)	-0.3 (.934)	0.1 (.960)	0.3 (.887)
Patient, other, no charge	3.7 (.147)	-2.7 (.284)	3.5 (.162)	-3.4 (.183)	-3.7 (.146)	-3.6 (.051)	-2.6 (.306)	-3.2 (.197)
Number of comorbidities								
None (reference)	...	...	...	...	...	...	...	...
1-2	-2.8 (.244)	-2.3 (.329)	-2.7 (.244)	-2.6 (.281)	-2.8 (.246)	-2.9 (.229)	-2.2 (.354)	-2.5 (.277)
3	-4.0 (.061)	-3.9 (.065)	-4.2 (.048)	-3.8 (.073)	-4.0 (.063)	-4.1 (.056)	-3.7 (.078)	-4.0 (.059)
≥4	-8.1 (<.001)	-7.9 (<.001)	-8.1 (<.001)	-7.0 (.001)	-8.1 (<.001)	-8.2 (<.001)	-7.1 (.001)	-7.1 (.001)
Therapist								
Therapist 1 (reference)	...	...	...	...	...	...	...	...
Therapist 2	-3.7 (.324)	-2.2 (.568)	-4.3 (.243)	-3.6 (.328)	-3.6 (.329)	-3.9 (.296)	-2.4 (.521)	-4.3 (.239)
Therapist 3	-4.5 (.120)	-3.8 (.176)	-3.5 (.214)	-4.9 (.084)	-4.5 (.119)	-4.4 (.123)	-4.1 (.153)	-3.9 (.164)
Therapist 4	-9.5 (.001)	-10.8 (<.001)	-10.7 (<.001)	-9.7 (.001)	-9.5 (.001)	-9.6 (.001)	-10.9 (<.001)	-10.8 (<.001)
Therapist 5	-4.3 (.007)	-5.3 (.001)	-6.0 (<.001)	-4.6 (<.001)	-4.3 (.007)	-4.4 (.006)	-5.4 (.001)	-6.1 (<.001)
Therapist 6	-2.0 (.797)	-2.1 (.780)	0.3 (.968)	-2.9 (.698)	-2.0 (.797)	-2.0 (.789)	-3.0 (.688)	-0.7 (.925)

Therapist 7	-3.0 (.045)	-3.9 (.010)	-3.9 (.011)	-3.3 (.030)	-3.0 (.045)	-3.0 (.044)	-4.1 (.007)	-4.1 (.008)
Therapist 8	2.4 (.221)	0.2 (.921)	0.7 (.742)	1.3 (.491)	2.3 (.228)	2.2 (.265)	-0.6 (.773)	-0.3 (.879)
Therapist 9	6.6 (.069)	4.5 (.214)	3.6 (.323)	5.2 (.155)	6.6 (.070)	6.4 (.078)	3.3 (.363)	2.2 (.539)
Therapist 10	5.2 (.026)	2.9 (.211)	4.0 (.093)	4.1 (.079)	5.1 (.029)	5.0 (.031)	2.1 (.373)	3.0 (.206)
Therapist 11	17.4 (<.001)	15.0 (<.001)	14.5 (<.001)	16.1 (<.001)	17.4 (<.001)	17.4 (<.001)	14.1 (<.001)	13.4 (<.001)
Therapist 12	-1.5 (.421)	-2.8 (.137)	-2.4 (.216)	-1.9 (.305)	-1.6 (.402)	-1.6 (.401)	-2.9 (.117)	-2.7 (.156)
McKenzie classification								
Reducible derangement (reference)	...	...	...	...	...	...	...	...
Irreducible derangement		-5.0 (.009)					-5.0 (.008)	
Dysfunction		-0.7 (.834)					-1.2 (.727)	
Chronic pain syndrome		-14.3 (<.001)					-13.4 (<.001)	
Surgery		-0.8 (.756)					-1.1 (.660)	
Mechanically inconclusive		-5.1 (.008)					-5.0 (.010)	
Spinal stenosis		-2.5 (.514)					-3.1 (.415)	
Spondylolisthesis, hip, sacroiliac joint dysfunction, other		-7.0 (.009)					-7.2 (.008)	
Patient response classification								
DP/CEN (reference)	...	...	...	...	...	...	...	...
DP/Phon-CEN			-3.2 (.694)					-3.2 (.010)
DP/NC			1.6 (.810)					-1.3 (.510)
No DP/Phon-CEN			-8.1 (<.001)					-8.1 (<.001)
No DP/NC			-1.6 (.793)					-1.9 (.384)
SCL BPPM								
Low risk (reference)	...	...	...	...	...	...	...	...
Medium risk				-3.3 (.005)			-3.3 (.006)	-3.3 (.005)
High risk				-4.6 (.003)			-3.2 (.041)	-4.0 (.009)
FABQ-W								
Low fear of work (reference)	...	...	...	...	...	...	...	...
High fear of work					-0.4 (.726)			
FABQ-PA								
Low fear of physical activity (reference)	...	...	...	...	...	...	...	...
High fear of physical activity							-0.1 (.350)	

(permission granted from JOSPT to use this table)

PLACING THE RESULTS IN PERSPECTIVE

Predictive models for patient functional change are seeking the GOLD STANDARD of 50%. The gold standard would be able to explain 50% of the variation in patient outcomes from start to finish of an episode of care. However, this gold standard does not yet exist.

The highest predictive capabilities to date in published literature is FOTO at 35 - 40%. If you remember, combining MDT / Pain Pattern with psychosocial (SCL-BPPM) resulted in a 3 - 4 % prediction of outcomes. When you add MDT / Pain Pattern / SCL-BPPM to FOTO, you have a predictive capability of nearly 44%. That is a TREMENDOUS FEAT!

Considering that the variables used to account for FOTO's numbers have as little as 1% prediction, a variable that demonstrates 3% is on that scale BIG.

Reality = MDT Classification (~3%) is a BIG / STRONG variable in predicting outcomes.

Reality = Pain Pattern Classification (~3%) is a BIG / STRONG variable in predicting outcomes.

The literature is filled with studies demonstrating the importance of psychosocial variables. FABQ was demonstrated to contribute nothing to the prediction of functional outcomes for patients. The SCL-BPPM was shown to be a significant single variable at 1%. Compared to the single variable of MDT Classification or Pain Pattern Classification, psychosocial variables predictive ability is not nearly as important. Once again, this study supports previous findings that eliciting or failing to elicit Centralization / classifying or failing to classify as Derangement is a stronger predictor of patient outcomes than psychosocial variables.

Secondary findings observed trends in outcomes related to McKenzie level of postgraduate education / training and the treating therapist. Dip.MDT achieved significantly greater functional scale outcomes than those with Cert.MDT. However, the treating therapist was also a greater predictor of functional change than the level of MDT training. Essentially, clinician characteristics that drive them to pursue advanced training may have an increased desire to excel professionally and develop stronger therapeutic alliances with patients.

TAKE AWAY MESSAGE

This and other powerful literature supporting MDT published in peer-reviewed journals is the end result of the hard work and dedication of our MDT research group dedicated to collecting data on a daily basis in the clinic to scientifically expand upon the MDT literature and to report on the merits of what we observe during every day practice.

We, as clinicians, are learning every day a bit more about what is best treatment and why some treatments are more beneficial than others. If you want to be a force in molding where the profession is going, collect data then join your colleagues on FOTO. It will be a humbling experience and one that will challenge you to be the best clinician you can be.

Please feel free to contact me, Brian McClenahan, bmcclen@gmail.com, with any questions or let me know if you are interested in joining our MDT research group. Become active in research driven by clinical practice. Walk the walk. Don't just talk the talk!

LET THE SYSTEM BE YOUR GUIDE.

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Summary and Perspective of Recent Literature

Adrian Wozny, PT, Dip. MDT and Richard Rosedale, PT, Dip. MDT

Cook JL, Rio E, Purdam CR, Docking SI. (2016). Revisiting the continuum model of tendon pathology: what is its merit in clinical practice and research? *British Journal of Sports Medicine*; 50:1187-1191

In 2009, Cook and Purdam presented a model of load-induced tendinopathy with an emphasis on encouraging clinicians not to treat all tendon problems in the same way. The authors stated that both overloading and unloading can produce the same degenerative changes and there are various hypotheses that try to explain the process of tendon pathology. They asked the question of whether the various pathologies that have been described could be seen to be on one continuum. The authors presented a new model of tendon pathology which proposed three stages:

1. Reactive tendinopathy
2. Tendon dysrepair
3. Degenerative Tendinopathy

It was suggested, based on the available evidence at the time, that these changes form a continuum of tendon pathologies (Figure 1) and that these changes are reversible as long as the tendon is not in the degenerative tendinopathy stage, even though they still acknowledge the possibility of healing at this stage. The authors note that if degeneration is extensive or loads sufficiently high, rupture can occur.

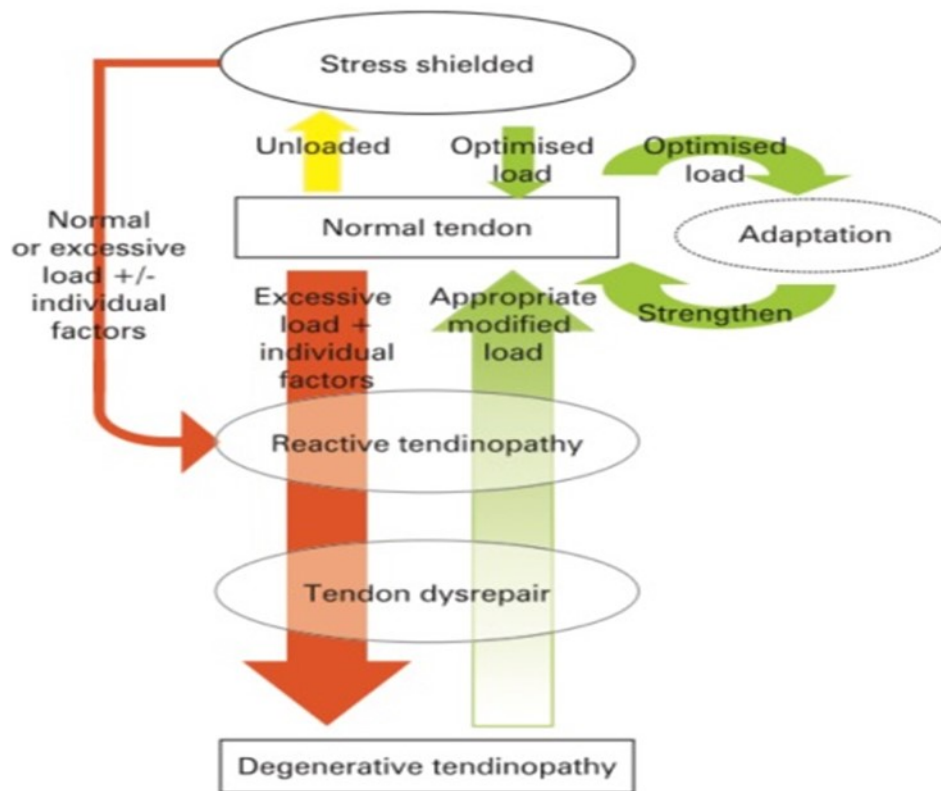


Figure 1 Pathology continuum; this model embraces the transition from normal through to degenerative tendinopathy and highlights the potential for reversibility early in the continuum. Reversibility of pathology is unlikely in the degenerative stage. Figure from Cook JL, Purdam CR. Br J Sports Med 2009; 43: 409-416.

The clinicians are then guided in clinical decision making by dividing the continuum model into two clear groups with implications for management (Figure 1):

1. **Reactive/early tendon disrepair**

Management entails identifying the 'abusive load' and then focusing on load reduction and modification, allowing the tendon to normalize and become less reactive.

2. **Late tendon disrepair/degenerative tendinopathy**

Progressively loading the tendon positively stimulates cell activity and matrix restructuring and offers pain relief. Eccentric exercise is especially "beneficial for pain, function and return to activity."

This brings us to the 2016 "revisit" by Jill Cook et al. "Revisiting the Continuum Model of Tendon Pathology: What is its Merit in Clinical Practice and Research?" They reflect on the original model and its relevance to sports medicine and attempt to answer some of the questions that have been raised in the literature since.

First of all, the authors summarise the main categories of tendon pathology models, of which the continuum model is one:

1. **Collagen disruption/tearing hypothesis**

This model is challenged as a primary event of disruption. Normal tendon cannot tear as a result of day to day loading unless there has already been changes in the collagen matrix.

2. **Inflammation**

Although changes in the level of inflammatory markers occur in response to cyclic load, there is not the support that inflammation is the primary event or 'key driver' of tendon pathology. So, this model is also challenged.

3. **Tendon cell response**

This model suggests that loading (sensed by the tendon call) is the key factor affecting the collagen fibers and adaptation that occur.

The authors state that "It is unlikely that any one model fully explains all aspects of the pathoaetiology of tendon pathology". It is a complex process, especially in regards to the relationship between structure, pain and function.

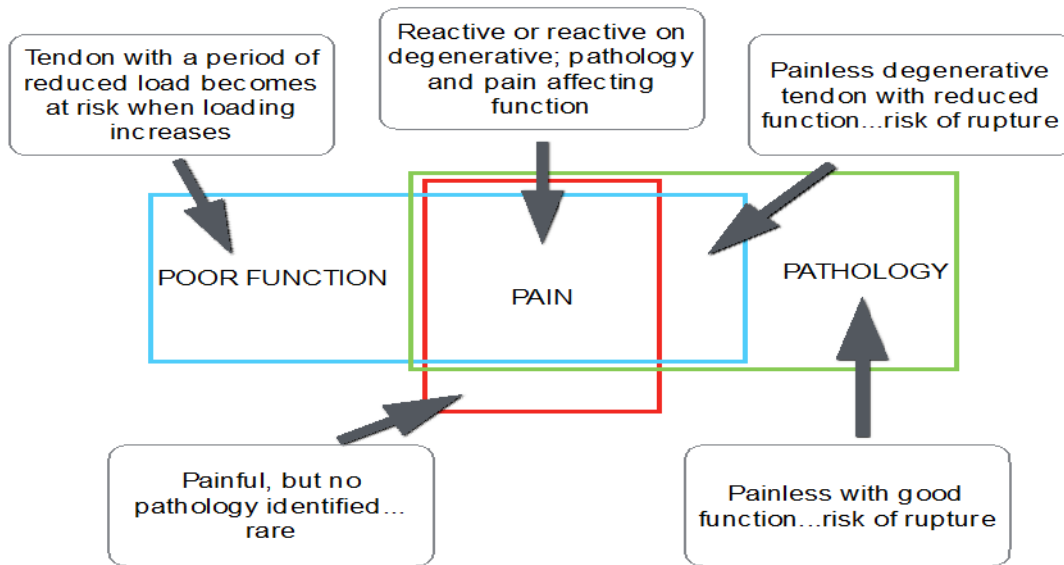
In revisiting the Continuum Model, the authors propose a hybrid of reactive and degenerative pathology, which is 'reactive-on-degenerative tendinopathy'.

Where pain fits into the continuum is discussed. It falls into two categories in the revised Continuum Model:

1. Reactive tendon with first presentation of tendon pain following acute overload
2. Reactive-on-late disrepair/degenerative tendon pathology

The authors 'strongly' suggest that there is a local nociceptive driven pain, hypothesizing that either of the above situations may "increase expression of nociceptive substances and their receptors, stimulating the peripheral nerve and be interpreted as pain". They acknowledge a potential role for the central nervous system in influencing the pain experience, but suggest that local nociceptive driven pain is critical.

The figure on the following page is adapted from the paper summarises the complex interplay between structure, function and pain.



What is most valuable for clinicians is the analysis by the authors on how to optimise treatment by 'tailoring' it to the stage of tendon pathology. Exercise and 'load management' are at the core of treatment. Authors discuss those interventions in three ways:

1. Interventions treating pain.

Pharmaceutical and modality interventions can reduce pain in the short-term, but without addressing tissue capacity this may result in recurrence. Isometric exercises have a potential to reduce pain and improve strength. Loading programmes are deemed to have broader structural, cortical and functional benefits that may lead to a better outcome.

2. Interventions addressing function and load capacity.

This aspect has had little research to guide the clinician and it is acknowledged that it is difficult to quantify function and for the clinician to get a clear sense of the tendon load capacity. Hopefully, further research will elucidate on these issues.

3. Interventions targeting structure.

This is where the Continuum Model can provide a framework to understand the potential of the tendon to regain normal structure. It is important to understand that in the reactive stage, heavy loading with eccentric exercises may be highly provocative. At this stage, unloading is the key in order to allow the tendon to regain its normal structure. In the degenerative stage, interventions to change structure are not necessarily successful. Treatment should be aimed at building loading capacity and 'optimizing adaptation' in the healthy or in the reactive stage tissue rather than the degenerated portion of the tissue i.e. 'treat the donut, not the hole'. However, for long term tendon health and outcomes, treatment must progress to improve load capacity of the degenerated portion through progressive loading rehab.

In summary, it looks like we are far from having all the answers to the questions surrounding our understanding and management of tendon injury and pathology. It is not likely that any one model will be entirely comprehensive in accounting for all the complex changes that occur, especially in relation to pain and the implications for rehabilitation. For now, the paper's elucidation of these two overlapping phases and the need to manage these phases very differently gives us some guidance to target our interventions. To complete the picture as MDT clinicians, we are always looking towards the patient, their environment and tissue demands, their needs, their expectations and goals in order to tailor our management to achieve the best outcomes we can, putting the patient first.

BUSINESS & MARKETING CORNER**Marketing MDT Through Local Media***Timothy Mahoney, PT, DPT, Cert. MDT*

Two months ago I moved from New Jersey to start a new job in Charlottesville, VA: home of the University of Virginia, Thomas Jefferson's Monticello and the genesis of the Dave Matthews Band. With vineyards and breweries, picturesque hiking in the Blue Ridge Mountains, a lively music and arts scene, there's not much that Charlottesville doesn't have to offer, but no one here is utilizing the McKenzie Method.

When I took my job at Pantops Physical Therapy, I was the only Cert. MDT in a 25-mile radius, and Jamie and Jen Collins (owners) took this opportunity to create a marketing campaign to spread the word about my arrival. An email newsletter with my picture and a little background on what a Credentialed McKenzie Practitioner could offer was sent out to past and current patients, referring doctors, and some local media sources. Within two weeks of arriving in Virginia I was scheduled to be a guest on [Charlottesville Newsradio-WINA](#), on a weekend talk show called "[A Graceful Life](#)". I had never done anything like this, so I was simultaneously excited and terrified at the prospect of being on the radio, but mainly I was concerned about misrepresenting MDT. I didn't want to say anything stupid or sound overly confident. I wanted to present information to people in the way it was presented to me: using logic and common sense to explain simple, mechanical issues.

I reached out to MIUSA faculty member Yoav Suprun, a person as calm, cool, and collected as I've ever met, and someone I've begun to associate with MDT media coverage. He gave me some excellent advice, telling me "Keep it simple," and reminding me that people want to hear about things that they can relate to, like headaches, stiffness, difficulty turning your head, or pain in my knees that improves as I walk. These reminders were integral to my confidence when the time came to give the interview.

As with so many new things, I made a few mistakes and there were definitely moments to learn from, but overall it was a great experience. While we're not taking formal data right now as to referral sources, I have had a few new evaluations who requested me because of this radio interview, and that makes the challenge so worthwhile. I don't pretend to be a seasoned veteran in MDT, or to have all the answers, but I strive to continue learning from experiences like this one. Being the only Cert. MDT in the area also comes with the significant challenge of feeling isolated, but I am so lucky to be a part of a community where I can reach out to diplomats, faculty members, and clinicians worldwide who "speak the language" and know that I can rely on their sound advice.

I would strongly encourage anyone interested in educating their community, marketing their business, or just stepping out of their comfort zone to reach out to their local media sources. The MDT assessment is a unique resource to the community that deserves all the pomp and circumstance that we as clinicians are so hesitant to present. Be confident that while we may never have all the answers, a simple mechanical assessment can help a lot of people.

If you are interested in listening to a podcast version of my interview on "A Graceful Life," visit <http://wina.com/podcasts/timothy-mahoney/>.