

Griswold D., Gargano F., Learman KE. A randomized clinical trial comparing non-thrust manipulation with segmental and distal dry needling on pain, disability, and rate of recovery for patients with non-specific low back pain. *J Man Manip Ther.* 2019; 27(3):141-151.

Review Submitted By: Matt Fung PT, DPT

**Objective:** The purpose of this study was to compare segmental and distal dry needling (DN) without needle manipulation to a semi-standardized non-thrust manipulation (NTM) targeting the symptomatic spinal level for patients with non specific low back pain (NSLBP).

**Methods:** RTC. Participants were recruited from one clinic and one university site between December 2014 and May 2018. Inclusion criteria: 18-70 years old, with chief complaint of reproducible LBP present for at least six weeks, and scored  $\geq 20\%$  on the Oswestry disability index (ODI). Exclusion criteria: examining clinician was unable to provoke patient's symptoms along the lumbar paraspinal muscles and with passive accessory intervertebral movement (PAIVM) of the lumbar spine. Participants were also excluded if they reported  $<2/10$  on NPRS 24hr average, had any red flags revealed during the patient history or examination with significant nerve root compression, had a medical history of a transmittable blood disease, demonstrated signs of CRPS, were seeking litigation for their pain, were unable to speak English, and/or have been diagnosed with fibromyalgia.

Two physical therapist with an average of 9 years conducted the examination and provided treatment consistent with study methods and treatment procedures.

**Dry needling group:** Segmental DN involved needling the paraspinal levels and then distally into peripheral nerve innervation fields of the lower extremity. Two needles were placed along the bilateral lumbar paraspinal muscles at the symptomatic levels, a level above and a level below. Needles were then inserted into both lower extremities targeting peripheral nerve distributions. No manipulation of the needle was performed.



**NTM:** Semi-standardized approach targeting the symptomatic level of the lumbar spine. The technique and grade of the NTM was at the discretion of the clinician and based on the findings from the clinical examination. NTM was standardized to include three bouts performed for 45s with 45s in between.

**Results:** The results of the two-way mixed model ANOVA suggest there was no statistically significant group significant group\*time interaction for PSFS, ODI, NPRS, and PPT. There were no

significant between-group differences for any of the dependent variables for visits two, four, or six. The two-way mixed model ANOVA demonstrated significant within group main effect for PSFS, ODI, NPRS, but not for PPT.

**Conclusion:** This is the first study to compare NTM to DN for patients with NSLBP. The results indicated no between-group differences for patients with NSLBP who received segmental and distal DN without needle manipulation or semi-standardized NTM targeting the symptomatic spinal level.

Both groups attained clinically and statistically meaningful changes in pain and disability at all time points.

Relevant Findings:

- Clinicians may consider various applications of DN including segmental and distal needling for treating NSLBP.
- Basic DN technique without manipulation may be considered for patients who do not tolerate manipulation of the needle when applied segmentally and distally for NSLBP.
- Semi-standardized NTM and segmental and distal DN without needle manipulation produce meaningful changes in pain and disability. Both can be effective treatment options for patients with NSLBP.

**Commentary:** This study reaffirmed that there are many different ways we as therapist can go about treating NSLBP. I believe we need to continue to perform thorough evaluations to assist us in categorizing and providing patient specific treatment and exercises for best patient outcomes. The HEP in this study appeared to be comprehensive including mobility and stability exercises with a relatively high compliance rate, which may have led to the decreases in pain and disability.

From my experiences thus far, the dry needling techniques that I have observed have incorporated some manipulation of the needle in an attempt to elicit a twitch response. This method of segmental needling with distal insertion along the peripheral pathways was enlightening and a technique I may consider if/when I become dry needling certified.

**Citation:** Graaf VAVD, Dongen JMV, Willigenburg NW, et al. How do the costs of physical therapy and arthroscopic partial meniscectomy compare? A trial-based economic evaluation of two treatments in patients with meniscal tears alongside the ESCAPE study. *British Journal of Sports Medicine*. June 2019. doi:10.1136/bjsports-2018-100065.

**Review Submitted By:** Jon Lester

**Objective:** The primary objective was to determine the cost-effectiveness of physical therapy compared to arthroscopic partial meniscectomy (APM). Secondary objective was to determine if PT was non-inferior to APM.

**Methods:** 321 participants (45-75yo) were selected for the study's subject pool. MRI was utilized to confirm non-obstructive meniscal tear in all subjects. Randomization determined each subject to receive either 16 sessions (2x/week) of PT or APM ~4 weeks after diagnosis. Both groups received the same HEP to perform, however only subjects with significant atrophy/swelling were allowed to receive formal PT care in the APM group. The International Knee Documentation Committee (IKDC), EuroQol five-dimensional five-level questionnaire (EQ-5D-5L), and Quality-adjusted life years (QALYs) were utilized to determine the effect of the two treatment groups. Cost measures were also tracked to determine the cost-effectiveness of each intervention. Costs included intervention and other healthcare costs, paid help at home, informal care, work absenteeism and presenteeism and unpaid productivity costs. Non-inferiority of PT compared to APM was determined via utilizing various data points for each outcome measure (similar to a MDC or MCID). They estimated the proportion of subjects to be within a "non-inferiority region" based on outcome measures to explore the probability of PT being non-inferior to APM. They determined that the percentage of pairs should be above 95% and the probability of non-inferiority above 0.95 to determine non-inferiority. Outcome measures were collected at baseline, 3, 6, 9, 12, 18 and 24 months.

**Results:** For IKDC and QALYs, there were no significant differences found when comparing the PT and APM groups, although both groups improved over time. At 24 month follow-up the PT groups intervention costs were significantly lower (€408) than the APM group (€1964). Mean societal costs followed a similar trend, with the PT group (€3935) showing significantly less cost than the APM group (€5991). For the IKDC, the was an incremental cost-effectiveness ratio of 449, which means that one point decrease on the IKDC in the PT group as compared with the APM group was associated with a societal cost saving of €449. Similarly, an incremental cost-effectiveness ratio of 61,584 showed that one QALY point decrease in the PT group compared to the APM group was associated with a societal cost saving of €61 584. The results also showed that the probability that PT is non-inferior to APM is 0.97 for the IKDC and 0.89 for QALYs.

**Table 3** Mean cost in € per participant in the PT and APM group and mean cost differences between groups during the 2-year follow-up

Cost category	PT (n=161) mean (SEM)	APM (n=158) mean (SEM)	Cost difference crude, mean (95% CI)	Cost difference adjusted*, mean (95% CI)
Intervention costs	488 (10)	1964 (73)	-1476 (-1682 to -1370)	-1468 (-1680 to -1347)
Other healthcare costs	1527 (145)	1238 (205)	289 (-301 to 689)	347 (-276 to 726)
Primary care	407 (49)	734 (185)	-326 (-950 to -81)	-309 (-954 to -1347)
Secondary care	1114 (126)	499 (51)	615 (393 to 928)	655 (436 to 935)
Medication	6 (1)	5 (1)	1 (-2 to 4)	1 (-2 to 4)
Paid help costs	29 (12)	151 (60)	-122 (-333 to -42)	-134 (-358 to -49)
Informal care costs	290 (58)	573 (140)	-282 (-648 to -62)	-216 (-489 to -8)
Absenteeism costs	225 (48)	337 (51)	-112 (-238 to 12)	-83 (-200 to 35)
Presenteeism costs	424 (73)	328 (60)	96 (-77 to 265)	118 (-44 to 285)
Unpaid productivity costs	952 (169)	1402 (218)	-449 (-988 to 49)	-369 (-845 to 79)
Total	3935 (334)	5991 (504)	-2056 (-3343 to -1002)	-1803 (-3008 to -838)

**Conclusions:** Total societal and intervention costs were significantly lower in the PT group compared to the APM group, with an adjusted cost difference mean of 1468 and 1803, respectively. The probability that PT is non-inferior to APM was 0.97 and 0.89 for the IKDC and QALY, respectively.

**Commentary:** The findings of this study provide a great avenue for patient education for patients with non-obstructive meniscal tears. Not only is the probability for PT to be non-inferior to APM quite high for both knee function and QOL measures, but the cost of intervention and societal costs favor PT considerably. For most patients, costs of care can be a major factor when deciding the correct path for their management. By utilizing the results of this study via the avenue of our education, an informed patient can make a more well rounded decision when deciding between surgery and conservative treatment. The literature on APM in fails to demonstrate a clinically important benefit of APM, showing that conservative care would likely benefit a large portion of this population. When determining how to approach educating a patient on the risks/rewards of PT vs APM, having evidence to support the cost effectiveness of PT is yet another piece of the puzzle that we can provide to guide their choices.

Rathleff, M. S., Graven-Nielsen, T., Hölmich, P., Winiarski, L., Krommes, K., Holden, S., & Thorborg, K. (2019). Activity Modification and Load Management of Adolescents With Patellofemoral Pain: A Prospective Intervention Study Including 151 Adolescents. *The American Journal of Sports Medicine*, 47(7), 1629–1637. <https://doi.org/10.1177/0363546519843915>

**Review Submitted By:** Casey Moler

**Objective:** To investigate the effects of a treatment strategy for adolescents that focuses on activity modification and load management.

**Methods:** 151 adolescents aged 10 to 14 years with patellofemoral pain that met the following criteria were studied:

1. insidious onset of anterior or retropatellar knee pain for >6 weeks
2. Provoked by at least 2 of the following positions or functions: prolonged sitting or kneeling, squatting, running, hopping, or stair walking
3. Tenderness on palpation of the patella or pain with stepping down or double-legged squatting
4. Worst pain experienced during the previous week reported as >30 mm on a 100-mm visual analog scale

All participants participated in a 12-week intervention (3 4-week blocks) which included 4 supervised sessions with a physical therapist with adolescents and parents in attendance. The first 4 week focused on reducing load, avoiding all knee aggravating activities, bridges and isometric exercise. The 2<sup>nd</sup> four week block progressed HEP with 4 NWB exercises every other day with resistance. The remaining 4 weeks was a return to sport guided program with resistance and BW exercises. All components of the intervention period used the activity ladder (see Figure 1.) for progression and was implemented at the start of block 2. Primary outcome was a 7-point global rating of change, ranging from “much improved” to “much worse.” Adolescents were considered to have a successful outcome if they reported “much improved” or “improved.” The primary endpoint was

#### "THE ACTIVITY LADDER"

- 1. Easy walking / cycling (Lowest level)
- 2. Fast walking / medium to hard cycling
- 3. Slow running
- 4. Stair climbing
- 5. Running and jumping at medium speed
- 6. Running and jumping at high speed (highest level)

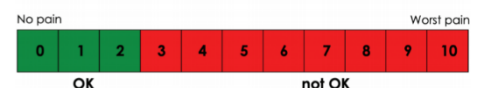


Figure 1

at 12 weeks, with additional follow-up at 4, 24, and 52 weeks. Secondary outcomes included the Knee injury and Osteoarthritis Outcome Score (KOOS), hip and knee torque, sports participation, satisfaction with treatment, and use of painkillers.

**Results:** At 12 weeks, 86% (95% CI, 78%-91%) were deemed to have a successful outcome (improved or much improved), with a slightly lower proportion at 6 months 77% (95% CI, 68%-83%) and 81% (95% CI, 73%-88%) at 12 months. 68% of the participants reported that they were back playing sport after 3 months, with 79% at 6 months and 81% at 12 months. Hip and knee torque increased by 20% to

33%. The majority were satisfied with the treatment (90%) and would recommend it to a friend (95%).

**Conclusion:** A treatment strategy focusing on activity modification and load management was associated with high rates of successful outcome among adolescents with PFP at 12 and 52 weeks. These short- and longer-term outcomes were supported by improvements in symptoms and objective measures of hip and knee torque.

**Commentary:** This article was of interest to me as the structural approach to the intervention was well done. The intervention, included only 4 supervised sessions over a 12-week period, therefore is extremely easy and relevant to implement in clinical practice as best available evidence on this particular age group. The supplemental material were patient friendly and will definitely be something I would give out to my patients and use from an educational stand point. This article will help me in the future be more specific and really allow the adolescents and their parents understand the rehabilitation progression and improve their knowledge on how to self-manage patellofemoral pain. I've posted the intervention period description here however highly recommend looking up this article and using the supplemental information for HEP, patient education, and instructional hand-outs.

TABLE 1  
Overview of Content During the 3 Blocks in the Intervention Period<sup>a</sup>

	Block 1 (Weeks 1-4)	Block 2 (Weeks 5-8)	Block 3 (Weeks 9-12)
Educational components	Factors contributing to PFP Risk of PFP Load and sport Rationale for treatment	Importance of adherence Proper exercise form Monitor and progress	Progression to sport Monitor and progress Continued exercises
Modalities to gradually decrease or increase knee joint loads	Activity modification Double-limb bridge Static holds 10 x 30 s (daily)	Hip and knee exercises	Weightbearing hip and knee exercises
Specific tools introduced	The activity ladder Pain monitoring	The activity ladder Pain monitoring	Graded return to sport, after step 6 has been reached on "activity ladder"

**Viana, R. B., Naves, J. P. A., Coswig, V. S., de Lira, C. A. B., Steele, J., Fisher, J. P., & Gentil, P. (2019). Is interval training the magic bullet for fat loss? A systematic review and meta-analysis comparing moderate-intensity continuous training with high-intensity interval training (HIIT). *Br J Sports Med*, 53(10), 655-664.**

**Review Submitted by:** Cameron Holshouser, PT, DPT

**Objective:** To compare the effects of interval training and moderate-intensity continuous training (MOD) on body adiposity in humans, and to perform subgroup analyses that consider the type and duration of interval training in different groups.

**Methods:** Systematic review and meta-analysis. Eligibility criteria: original articles, human trials, minimum exercise training duration 4 weeks, and directly or indirectly compared interval training with MOD as the primary or secondary aim.

**Results:** 41 and 36 studies were included in the qualitative analysis and meta-analysis, respectively. Within-group analysis showed significant reductions in total body fat percentage (%) (interval training: -1.50 (95%CI -2.14 to -0.86,  $p < 0.00001$ ) and MOD: -1.44 (95%CI -2.00 to -0.89,  $p < 0.00001$ )) and in total absolute fat mass (kg) (interval training: -1.58 (95%CI -2.74 to -0.43,  $p=0.007$ ) and MOD: (95%CI -2.18 to -0.08,  $p=0.04$ )). However, there was a significant difference between the groups in total absolute fat mass (kg) reduction (-2.28 (95%CI -4.00 to -0.56,  $p=0.0094$ )). Subgroup analyses comparing sprint interval training (SIT) with MOD protocols favor SIT for loss of total absolute fat mass (kg) (-2.33 (95%CI -5.71 to 0.73,  $p=0.01$ )). Supervised training, walking/running/jogging, age (<30 years), study quality and intervention duration (<12 weeks) favorability influence the decreases in total absolute fat mass observed from interval training programs; however, no significant effect was found on total body fat percentage. No effect of sex or body mass index was observed on total absolute fat mass or total body fat percentage.

**Conclusions:** Interval training and MOD both reduce body fat percentage (%). Interval training provided 28.5% greater reductions in total absolute fat mass (kg) than MOD.

**Commentary:** This article reported that moderate-intensity continuous exercise and high-intensity interval training both reduced body fat percentage. Yet, the HIIT and SIT training programs had better results in total absolute fat mass than MOD. High BMI has been linked to risk factors for many orthopedic pathologies and injuries. Patients often will bring up their desire to start exercising when starting physical therapy, and in some cases will have goals to lose weight. This article provides valuable information that we can use as reference when communicating to patients about a weight loss program. Most guidelines recommend 150-200 min/week, and up to 60 min/day, of moderate-intensity aerobic exercise (40-60%  $VO_{2max}$ , 55-70%  $HR_{max}$ ) to prevent weight gain or to reduce body mass a little bit (2-3 kg). It is usually recommended if you want to lose more weight (5-7.5 kg) you should exercise >420 min/week at moderate-intensity –

which may be difficult to achieve. However, interval aerobic training programs such as HIIT and SIT take far less time but require high HR and VO<sub>2</sub> max efforts (HIIT >80% HRmax and SIT “all-out effort”). Interval training may appear to be an attractive option for patients to address weight-loss because of the decrease time requirements. It is important to make sure patients who are planning on using interval training as means for weight loss are appropriate and not at risk for injury or cardiovascular risk. Overall, both continuous moderate intensity and interval high intensity training provide similar benefits. As far as recommending specific interval training protocols, there is high diversity in programs and one program cannot be determined ‘best’ based on this study.



**Albin, S., Koppenhaver, S., Marcus, R., Dibble, L., Cornwall, M., Fritz, J. (2019). Short-term effects of manual therapy in patients after surgical fixation of ankle and/or hindfoot fracture: a randomized clinical trial. Journal of Orthopaedic and Sports Physical Therapy, 49(5), 310-319.**

**Review Submitted By:** Erik Kreil, PT, DPT, CSCS

**Objective:** To identify short-term effects of manual therapy in individuals who underwent ORIF followed by prolonged immobilization, and who had already received treatment consisting of exercise and gait training.

**Methods:** Eligibility criteria: ORIF of either an ankle or hindfoot fracture, able to fully weightbear on operative leg, and have a limitation of weightbearing dorsiflexion ROM (between-limb difference must be greater than 5cm when measured using the ankle-lunge test). Exclusion criteria: any prior foot/ankle surgery or a deformity that would affect gait or balance, inability to attend prescribed visits, previous manual therapy for current condition, known nonunion/malunion, AVN, current syndesmotic screw placement, or additional fractures in an area likely to affect weight bearing. Participants were randomized to either a manual therapy or a control group using double-blind methods. Both groups received 3 treatment sessions in 7-10 days scheduled every 2-3 days. Manual therapy participants received individualized impairment-based treatment, whereas control group participants received light soft tissue and low grade mobilizations to tibiofibular joints. Outcome measures include: Ankle lunge test (measuring ankle DF ROM in weightbearing), Foot assessment platform (measuring midfoot mobility), MyotonPRO (measuring muscle stiffness), GAITRite system (measuring gait analysis), SLS test (measuring postural control), and Star Excursion Balance Test (measuring dynamic balance and global ROM/strength).

**Results:** Participants (40 manual group, 32 control group) had an average time period from injury to surgery of 12.9 days and an average period of 113.2 days from surgery to study enrollment. No significant differences were measured between groups in ROM, gait, or balance outcomes. Control group participants demonstrated an increase in muscle stiffness, while manual therapy participants demonstrated no change with this outcome. Both groups demonstrated statistically significant improvement in ankle lunge test outcome, which was the primary measure of this study.

**Conclusion:** Results of this study suggest that supplementing prior treatment with 3 sessions of impairment-based manual treatment is not superior to treatment consisting of proximal tibiofibular mobilizations and soft tissue massage, aside from not increasing muscle stiffness.

**Commentary:** There are many instances in which manual therapy may be indicated for foot/ ankle complex pathologies, however there are few quality studies measuring its benefit following prolonged immobilization following an ankle or

hindfoot fracture. We're often eager to put our hands on a patient when they've had a joint immobilized, but a clear benefit must be demonstrated and should parallel with appropriate expectations. The results of this study imply either that we should expect gains to be expressed after a longer period of time or no more significantly than when compared to other manual treatment, such as soft tissue massage and proximal tibiofibular joint mobilizations. A comprehensive manual treatment approach may be better suited for the individual.

**Citation:** Avman, Maya Abady, et al. "Is There an Association between Hip Range of Motion and Nonspecific Low Back Pain? A Systematic Review." *Musculoskeletal Science and Practice*, vol. 42, 2019, pp. 38–51., doi:10.1016/j.msksp.2019.03.002.

**Review Submitted By:** Jeff Peckins

**Objective:** To determine if there is an association between hip ROM and non-specific low back pain (NSLBP). Specifically, the study looked at hip kinematics and hip treatment potentially improving NSLBP.

**Methods:** The systematic review consisted of 24 studies that included NSLBP and hip kinematics including ROM, functional movement patterns, or tests of muscle length (such as the Thomas Test). Hip joint treatment was any intervention, including modalities and surgeries, targeted at the hip. Exclusion criteria were age < 18, specific LBP pathology such as fracture, and non-human populations. Risk of bias was assessed using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.

**Results:**

- Hip Flexion: Overall there was a slight limitation noted (5-10 deg) in those with NSLBP compared to healthy subjects, but not statistically significant. Many of these studies had high risk of bias.
- Hip Extension: Only 4/13 found a statistically significant decrease in ROM between those with and without NSLBP. The overall quality of evidence was very low for these studies.
- Hip Internal Rotation: Most of the studies noted a decrease in hip IR ROM in those with NSLBP, however only 5/14 showed statistical significance. The overall quality of evidence was very low for these studies.
- Hip External Rotation: The majority of studies found a hip ER impairment in those with NSLBP, however only 2/13 reached statistical significance. There was a high risk of bias and overall low quality of evidence in these studies.
- Hip Abduction and Adduction: Both directions demonstrated no association between hip ROM and NSLBP. There were only two studies on hip ADD, therefore conclusions are limited. The quality of evidence for these studies was again very low.

**Conclusion:** Low overall quality of evidence suggests there may be an association between loss of hip IR ROM in those with NSLBP compared to those without. All other directions appear to be overall not statistically significant.

**Commentary:** The absence of consistent differences in hip ROM in those with NSLBP and healthy individuals suggests that overall, hip ROM deficits may not play a large role in the presence of NSLBP. It is worth noting that only a certain proportion of those with NSLBP may have hip ROM deficits, therefore minimizing the overall differences. This means that a sub-group of those with NSLBP may have hip ROM loss that is contributing to their LBP, and I believe this is where a thorough examination of the patient is particularly important. The overall inclusion criteria

for NSLBP was very broad. Perhaps more homogeneity in patient populations based on acuity, severity, age, or gender may have highlighted specific sub-groups of those with NSLBP who are more likely to have meaningful hip ROM deficits.

A limitations of this systematic review was the large variances in how hip ROM was measured throughout the studies. An example of this is hip extension ROM being measured in prone actively or passively may vary dramatically depending on the strength of the patient. The inconsistency may have made it more difficult to demonstrate overall trends. This article highlights the high variability in hip ROM testing, and emphasizes that future research needs to determine the most valid and reliable measurement strategies.