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Baseline Examination Factors Associated With Clinical Improvement After Dry Needling in Individuals With Low Back Pain

STUDY DESIGN: Quasi-experimental.

OBJECTIVES: To explore for associations between demographic, patient history, and physical examination variables and short-term improvement in self-reported disability following dry needling therapy performed on individuals with low back pain (LBP).

BACKGROUND: Dry needling is an intervention used with increasing frequency in patients with LBP; however, the characteristics of patients who are most likely to respond are not known.

METHODS: Seventy-two volunteers with mechanical LBP participated in the study. Potential prognostic factors were collected from baseline questionnaires, patient history, and physical examination tests. Treatment consisted of dry needling to the lumbar multifidus muscles bilaterally, administered during a single treatment session. Improvement was based on percent change on the Oswestry Disability Index at 1 week. The univariate and multivariate associations between 33 potential prognostic factors and improved disability were assessed with correlation coefficients and multivariate linear regression.

RESULTS: Increased LBP with the multifidus lift test (r_{pb} = 0.31, P = .01) or during passive hip flexion performed with the patient supine (r_{pb} = 0.23, P = .06), as well as positive beliefs about acupuncture/dry needling (rho = 0.22, P = .07), demonstrated univariate associations with Oswestry Disability Index improvement. Aggravation of LBP with standing (r_{pb} = −0.27, P = .03), presence of leg pain (r_{pb} = −0.29, P = .02), and any perception of hypermobility in the lumbar spine (r_{pb} = −0.21, P = .09) were associated with less improvement. The multivariate model identified 2 predictors of improved disability with dry needling: pain with the multifidus lift test and no aggravation with standing (R^2 = 0.16, P = .01).

CONCLUSION: Increased LBP with the multifidus lift test was the strongest predictor of improved disability after dry needling, suggesting that the finding of pain during muscle contraction should be studied in future dry needling studies.

LEVEL OF EVIDENCE: Prognosis, level 1b.
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KEY WORDS: *clinical prediction rule, lumbar spine, Oswestry, trigger point*

Despite recent advances in imaging and surgical technology, low back pain (LBP) remains one of the most common and costly medical conditions in the world.[12,58] Because specific pathoanatomical pain determinants are rarely identified, most patients are diagnosed with nonspecific LBP.[13] Studies examining nonoperative therapy effectiveness often consider nonspecific LBP to be a homogeneous disorder, which has been proposed as a potential reason for the equivocal results often reported by many randomized clinical controlled trials and systematic reviews.[23,24,35,46,47,50] These equivocal results have led to more recent attempts to classify patients with nonspecific LBP according to the intervention most likely to give them the greatest clinical benefit.[18,27] For example, clinical prediction rules have been developed to identify subgroups of patients likely to respond to spinal manipulation therapy,[6,15,16] lumbar stabilization exercise,[28,44] and lumbar traction.[20]

An emerging body of evidence has examined the potential benefits of acupuncture[8,24,36,37,39,54] and dry needling[24,54,55] in the treatment of LBP. While acupuncture and dry needling both involve the insertion of solid needles (without medication) into tissues, they are very different interventions in terms of philosophy and practice. Traditional acupuncture is used to treat a variety of medical conditions and involves the stimulation of points located in "channels" or "meridians."[5] Conversely, dry needling focuses on the

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TABLE 1 Study Selection Criteria

Inclusion Criteria	Exclusion Criteria
• Back pain located between the 12th rib and buttocks • Between the ages of 18 and 60 years • Oswestry Disability Index score of at least 20/100 points • Read/speak English	• Neurogenic pain defined by either a positive ipsilateral or contralateral straight leg raise test (reproduction of symptoms at 45° or less) or reflex, sensation, or strength deficits in a pattern consistent with nerve root compression • Prior surgery to the lumbosacral spine • Medical red flags of a potentially serious condition, including cauda equina syndrome, major or rapidly progressing neurological deficit, fracture, cancer, infection, or systemic disease • Prior spinal manipulation to the lumbosacral spine or trunk/muscle stabilization exercises performed in the previous 4 weeks • Osteoporosis • Currently under treatment from anticoagulants or history of bleeding disorders

treatment of neuromusculoskeletal conditions and involves inserting needles into areas of muscle that are perceived to have motor abnormalities (myofascial trigger points), in an attempt to relieve pain, reduce muscle tension, and restore normal muscle function.[14,33]

Studies to date investigating the effectiveness of dry needling for LBP have found mixed results. The most recent Cochrane Review[24] found that acupuncture and dry needling may be helpful in the treatment of chronic LBP, but the treatment effect estimates were small. Similarly, a recent meta-analysis of randomized controlled trials of acupuncture and dry needling[54] found mixed, but limited, evidence that dry needling was superior to a placebo, based on a single study of LBP. It is possible that dry needling is highly effective in some patients and not effective in others. This would seem to match the experience of many clinicians and be similar to what has been found for other interventions for LBP.[6,15,20,44] However, no data currently exist to help clinicians and researchers select the patients with LBP who are most likely to benefit from dry needling. Therefore, the purpose of this study was to find out what associations may exist between demographic, patient history, and physical examination variables and short-term improvement in self-reported disability following dry needling therapy performed on individuals with LBP.

METHODS

Participants

Participants were all Department of Defense beneficiaries who responded to recruiting advertisements from Joint Base San Antonio, TX. Participant selection criteria are listed in **TABLE 1** and were aimed at including individuals who would seek health care for routine LBP without any contraindications to dry needling. The study protocol was approved by the Institutional Review Board of Brooke Army Medical Center. All participants provided consent prior to study enrollment.

Potential Predictors From Demographic and Patient History Information

All demographic and historical information was collected by self-report. Demographic information included age, sex, smoking status, physical activity level, height, and weight. Information regarding the participant's LBP included symptom location, frequency, and duration; aggravating and relieving factors (bending, sitting, standing, walking, lying down); prior treatment history; and self-reported depression status (current or previous experience of and/or receiving treatment for depression). Additionally, participants completed several self-report questionnaires, including (1) an 11-point numeric pain-rating scale to rate subjective intensity of both back and leg pain[7]; (2) a modified Oswestry Disability Index (ODI) questionnaire to measure LBP-specific disability[19]; (3) the Fear-Avoidance Beliefs Questionnaire to measure participants' beliefs about the relationship between physical activity, work, and their LBP[57]; and (4) treatment expectations[32] using a 5-point Likert-type scale to assess participants' beliefs that acupuncture/dry needling will improve their LBP.

Potential Predictors From Physical Examination

A standardized physical examination was performed on each participant, including all tests and measures associated with the treatment-based classification system,[18,27] by a physical therapy student specifically trained in such assessment. Lumbosacral range of motion for flexion, extension, and side bending was measured using a standard inclinometer.[21] Aberrant movements (painful arc, instability catch, difficulty returning from flexion, reversal of lumbopelvic rhythm) were noted as present or absent during lumbar flexion testing.[3,29] A repeated-motion exam was performed by having standing participants perform 10 repetitions of bending as far as possible into flexion and extension, followed by sustained prone extension. Changes in symptoms were documented in terms of intensity (more or less pain) and location (centralization or peripheralization).[20] Passive straight leg raise range of motion[28] and hip range of motion (internal rotation, external rotation, and flexion)[16] were similarly measured with an inclinometer and assessed for pain provocation.

Segmental mobility was assessed by having the examiner apply manual pressure on each lumbar spinous process in a posterior-to-anterior direction. At each segment, intervertebral motion was judged to be normal, hypomobile,

or hypermobile, and pain as present or absent.[29] The prone instability test was then performed and considered positive if participants reported less pain with posterior-to-anterior pressure when they held their legs off the ground as opposed to resting with their feet touching the floor.[29] The active straight leg raise test was performed with the participant supine and considered positive when a participant reported less difficulty in raising the leg when the examiner manually stabilized the pelvis.[41] The multifidus lift test (MLT)[26] was used to assess lumbar multifidus muscle function at the L3, L4, and L5 levels by having prone participants lift their abducted arm off the table while the examiner palpated for activity in the contralateral lumbar multifidus muscles.

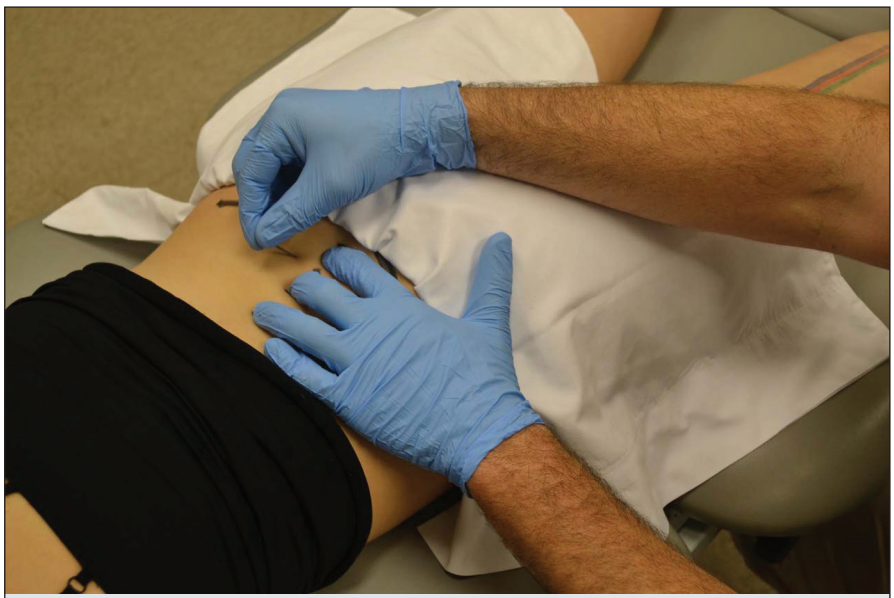

FIGURE 1. Dry needling technique. The participant was prone, with spinal processes for L1 through L5 marked with a skin pen for consistency. One needle on each side of spinal levels L3, L4, and L5 was inserted into the lumbar multifidus muscle to the depth of the vertebral lamina.

Dry Needling

All participants underwent a single session of dry needling therapy performed by 1 of 2 experienced physical therapists who were fellowship trained in orthopaedic manual therapy, trained in dry needling, and blinded to the baseline assessment outcomes. The needling procedure started with systematic manual palpation of the lumbar multifidus muscles. This was performed to determine the presence or absence of perceived trigger points, operationally defined as a palpable and painful nodule in the muscle tissue and considered present when active or latent,[14] and to guide needle placement. The needling technique included insertion of a sterile, disposable 0.30 × 0.50-mm or 0.30 × 0.60-mm acupuncture needle (Seirin Corporation, Shizuoka, Japan) into the lumbar multifidus muscles at the L3, L4, and L5 spinal levels bilaterally (**FIGURE 1**). The "clean technique" was used throughout the treatment procedure, which included hand washing, latex-free examination gloves, and skin-surface preparation with an alcohol swab.[2] Palpation of the L3, L4, and L5 lumbar paraspinal muscles was performed to assess for tender areas and/or palpable nodules within the muscles (trigger points) immediately prior to treatment. Needles were then inserted approximately 1 cm lateral to the spinous process at each segmental level. The needles were directed into the lumbar multifidus muscle with a 15° inferomedial angle to the depth of the lumbar lamina. Treatment was further localized to any trigger points identified during the palpation examination. Each segment was treated once, for each side, with needle insertion lasting approximately 5 seconds using "sparrow pecking" (in-and-out motion) and "coning" (small redirections of needle angle) techniques in an attempt to elicit a local twitch response.[31] No additional treatment or advice was given during the study period.

Determination of Clinical Outcome

Approximately 1 week after the dry needling treatment, all participants returned for reassessment by the same examiner who performed the initial assessment. The ODI was readministered and participants were questioned about whether they experienced any lingering or delayed-onset adverse symptoms after their dry needling treatment. Short-term improvement in self-reported disability was quantified as percent improvement on the ODI ([initial ODI score – final ODI score]/initial ODI score). The threshold of minimally important clinical change in ODI scores has been previously established to be approximately 30% relative to baseline.[42]

Data Analysis

Thirty-three potential prognostic factors were selected from participant demographics and the historical and physical examinations, based on their theoretical potential relationship with improved disability following dry needling (**TABLES 2** and **3**). The univariate associations between these factors and percent improvement on the ODI following dry needling were assessed using correlation analysis (point biserial correlations for dichotomous variables, Spearman rho correlations for ordinal variables, and Pearson product-moment correlations for continuous variables).

The multivariate relationships between the prognostic factors and percent improvement in ODI score were then evaluated using forward stepwise multiple linear regression analysis. Prognostic factors that were significantly ($P<.10$)[10,25,28] correlated with percent im-

TABLE 2 Demographic and Historical Information (n = 68)

Variable	Descriptive Statistics*	Correlation Coefficient†	*P* Value†
Age, y	41.5 ± 9.4	...	...
Sex, % women	43	...	...
ODI score (0-100)			
Baseline	31.5 ± 11.5	...	...
1-wk follow-up	23.4 ± 13.5	...	...
FABQ work (0-42)	17.5 ± 9.2	0.01‡	.95
FABQ physical activity (0-24)	16.2 ± 3.9	0.11‡	.38
NPRS for back (0-10)§	5.0 ± 1.7	0.06‡	.66
Duration of symptoms, mo	10.2 (102.0)‖	0.0¶	.91
Activity level, %		0.03¶	.81
Very active	5		
Active	19		
Average	57		
Inactive	19		
Belief acupuncture/dry needling will help current condition, %		0.22¶	.07#
Neutral	50		
Agree	50		
Disagree	0		
Number of prior episodes, %		−0.21¶	.10
0	27		
1	3		
2-9	13		
>10	52		
Leg pain, % yes	36	−0.29**	.02#
Depression, % yes	17	−0.19**	.12
Aggravation with standing, % yes	75	−0.27**	.03#
Aggravation with flexion, % yes	74	0.06**	.61
Aggravation with sitting, % yes	74	0.13**	.30
Aggravation with walking, % yes	50	0.02**	.86
Easing with standing, % yes	7	−0.02**	.86

Abbreviations: FABQ, Fear-Avoidance Beliefs Questionnaire; NPRS, numeric pain-rating scale; ODI, modified Oswestry Disability Index.
**Descriptive statistics for continuous variables are mean ± SD unless otherwise indicated.*
†Correlation coefficients and associated P values estimate the strength of the relationship of each variable with percent improvement on the ODI.
‡Pearson product-moment correlation.
§Reports the average of the worst, best, and current scores for pain over the last 24 hours.
‖Value is median (interquartile range).
¶Spearman rho correlation.
#Statistically significant (P<.10).
***Point biserial correlation.*

provement in ODI score were eligible for entrance into the model. The most parsimonious subset of predictor variables was then identified by both entering and removing factors in a stepwise fashion, with a significance value of less than .05 for model entry and greater than .10 for removal. The goal was to end up with a multiple linear regression model that significantly fit our data ($P<.05$) and that consisted of variables that each significantly contributed to the model ($P<.05$).

RESULTS

Seventy-two individuals with LBP were recruited and enrolled. Four of the 72 participants were lost to follow-up, thus data from 68 participants were available and included in the analysis (**FIGURE 2**). Overall, ODI scores improved by a mean ± SD of 25.3% ± 33.3%, with changes ranging from 30% worsening to 100% improvement. The amount of improvement in ODI scores exceeded the threshold of minimal clinically important change of 30%[42] for 26 of the 68 (38.2%) participants. Individual changes in percent change in ODI score for each participant are displayed in **FIGURE 3**. No participants reported serious adverse events or had to discontinue the study due to study-related procedures. A minority of participants reported minor transient side effects after dry needling: 9 participants (13.2%) reported fatigue, 5 participants (7.4%) reported dizziness and/or light-headedness, and 5 participants (7.4%) reported nausea.

Descriptive statistics and correlations with percent improvement in ODI score are listed for demographic and history information in **TABLE 2** and for physical examination variables in **TABLE 3**. Three demographic and history variables and 3 physical examination variables demonstrated significant univariate correlation with percent ODI improvement ($P<.10$). The strongest correlations with percent improvement in ODI score were pain with the MLT ($r_{pbis} = 0.31, P = .01$) and the presence of leg pain ($r_{pbis} = -0.29, P = .02$).

The 6 variables demonstrating significant univariate correlation with percent ODI improvement were entered into the multiple linear regression analysis. Results of the linear regression model are displayed in **TABLE 4**. Of the 6 variables entered, 2 variables were retained in the multivariate model (beta coefficient $P<.05$). Pain with the MLT and pain not aggravated by standing were predictive of improvement in ODI score, resulting in an adjusted R^2 of 0.16. After controlling for the other variables in the model, the unstandardized beta coefficients listed in **TABLE 4** suggest that individuals who experience pain with the MLT will have a 29% larger improvement in ODI score than individuals who do not experience pain with the MLT. Conversely, individuals whose pain is aggravated by standing will experience a 23% smaller improvement in ODI score than individuals whose pain is not aggravated by standing.

TABLE 3 Physical Examination Information (n = 68)

Variable	Descriptive Statistics*	Correlation Coefficient†	*P* Value†
Lumbosacral flexion ROM, deg	93.3 ± 21.0	−0.10‡	.40
Lumbosacral extension ROM, deg	22.1 ± 10.3	−0.06‡	.61
Lumbar SB ROM asymmetry, deg	11.8 ± 9.3	−0.07‡	.56
Pain with lumbosacral flexion ROM, % yes	54	−0.08§	.50
Aberrant motion with flexion ROM, % yes	21	−0.11§	.35
Pain with lumbosacral extension ROM, % yes	62	−0.05§	.70
Pain with lumbar SB ROM, % yes	46	0.01§	.96
Back pain with hip flexion, % yes	40	0.23§	.06‖
Positive MLT, % yes	68	−0.19§	.12
Pain with MLT, % yes	17	0.31§	.01‖
Positive PIT, % yes	39	0.15§	.25
Positive SLR, % yes	18	−0.11§	.37
Positive ASLR, % yes	15	0.19§	.13
Any trigger points at L3-L5, % yes	87	0.19§	.13
Any hypermobility with L3-L5 PA pressure, % yes	9	−0.21§	.09‖
Any hypomobility with L3-L5 PA pressure, % yes	29	−0.02§	.87
Back pain with L3-L5 PA pressure, % yes	88	0.13§	.29
Distal pain (leg or buttock) with L3-L5 PA pressure, % yes	21	0.18§	.14

Abbreviations: ASLR, active straight leg raise; MLT, multifidus lift test; PA, posterior to anterior; PIT, prone instability test; ROM, range of motion; SB, side bending; SLR, straight leg raise.
**Descriptive statistics for continuous variables are mean ± SD unless otherwise indicated.*
†Correlation coefficients and associated P values estimate the strength of the relationship of each variable with percent improvement on the modified Oswestry Disability Index.
‡Pearson product-moment correlation.
§Point biserial correlation.
‖Statistically significant (P<.10).

DISCUSSION

Previous studies investigating the effectiveness of dry needling for LBP have reported mixed results and small treatment effects.[24,54] Similar to other interventions for LBP,[6,15,20,44] it is possible that dry needling may be effective in some patients but not in others. Currently, no data are available regarding the clinical characteristics of individuals who may benefit from dry needling treatment. Therefore, we examined the possible associations between demographic, patient history, and physical examination variables and short-term clinical outcome following dry needling therapy performed on individuals with LBP. Six variables from participant demographics and the historical and physical examinations were associated with improvement in self-reported disability 1 week after dry needling treatment. Additionally, 2 of the variables (pain with the MLT and no aggravation with standing) demonstrated a multivariate relationship with improved disability. However, the explained variability of this model (adjusted $R^2 = 0.16$) was quite small and could be clinically insignificant or merely indicate a slightly improved prognosis in general.

The MLT has been recently advocated as a method of assessing the function of the lumbar multifidus muscle. The test is purported to be a reliable and valid measure of lumbar multifidus muscle function.[26] Although the results of the MLT (positive test indicated by little to no palpable muscle contraction) were not associated with improved disability in the current study, increased LBP during the test demonstrated bivariate and multivariate associations with short-term improvement in self-reported disability following dry needling. If the pain experienced during the MLT originated from the lumbar multifidus muscle, this finding would be consistent with the traditional understanding that active or latent trigger points are painful upon active contraction, and dry needling has been shown in numerous studies to cause local hypoalgesia.[4,49,56] Therefore, an explanation for this finding may be that pain during the MLT helps to identify a painful site within the lumbar multifidus that improves following dry needling.

The site of myofascial pain and the presence of trigger points are more commonly identified via palpation. In the current study, we examined whether the identification of trigger points with pal-

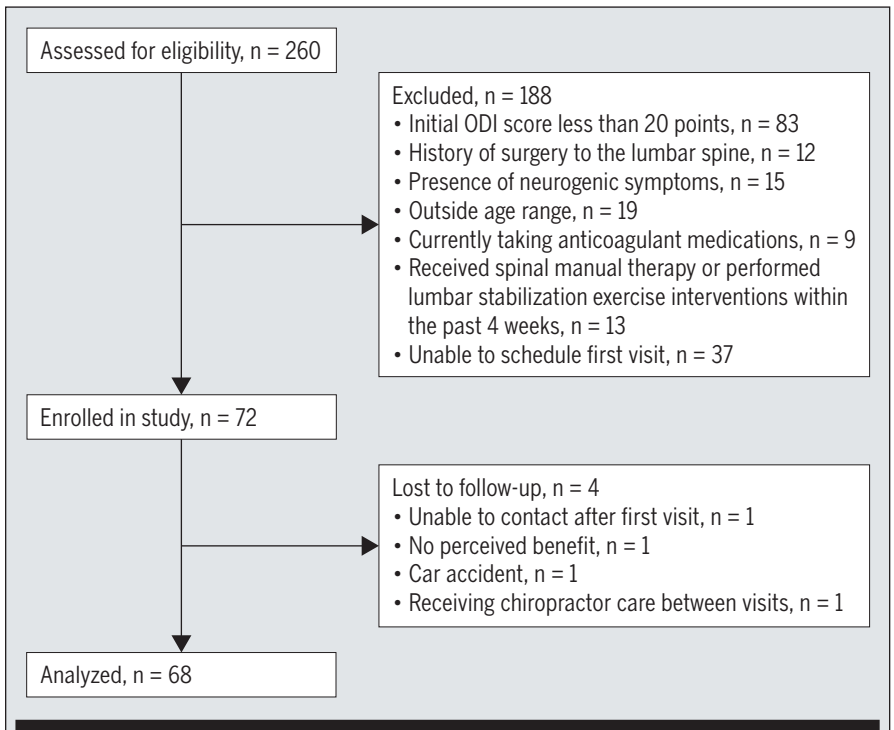

FIGURE 2. Flow of participant recruitment and exclusion. Abbreviation: ODI, modified Oswestry Disability Index (0-100).

pation was associated with short-term improvement in self-reported disability. Although the magnitude of the association approached that of other variables (r_{pbis} = 0.19), it did not reach statistical significance (P = .13). The lumbar multifidus is a deep muscle and not easily assessed with surface palpation. Thus, it is possible that the identification of trigger points in this deep muscle is a less valid indicator of potential improvement after dry needling than pain elicited during muscle contraction. Although the treating examiners were both very experienced manual therapists, they commonly noted the difficulty of determining whether they would classify a trigger point as present or absent. Additionally, because trigger points were identified in 87% of individuals in the current study, the high prevalence rate might have adversely affected their ability to predict improved disability after dry needling.

In addition to pain with the MLT, the other predictor of short-term improvement in self-reported disability after dry needling was the lack of LBP provocation with standing. Although less intuitive, an explanation for this finding may also be related to myofascial pain during muscle contraction. Evidence suggests that the lumbar multifidus is contracted during quiet standing in asymptomatic individuals to a greater extent than when bending forward.[40] This pattern, however, becomes reversed in individuals with LBP, who may have minimal to no lumbar multifidus contraction during quiet standing and exhibit more contraction during forward bending.[40] Nonmuscular sources of LBP, on the other hand, have been postulated to cause more pain during standing. Low back pain that is due to lumbar stenosis, facet joints, and/or sacroiliac joint dysfunction is commonly thought to be worsened by standing and improved by sitting or bending forward.[1,38] Therefore, the variable of "aggravation with standing" might simply have identified individuals whose LBP tended to be nonmuscular in nature. Alternatively, "pain worsening when standing" has been found to be a negative prognostic indicator in individuals with acute LBP. Specifically, Coste et al[11] found that patients who reported worsening pain when standing were approximately 50% as likely to recover within 3 months. Therefore, it could be that "no aggravation with standing" predicts better outcome regardless of the type of treatment.

Due to the single-group design of this study, any of the variables demonstrating bivariate associations with clinical outcome may be related to improvement after dry needling or may merely be good prognostic indicators in general. Besides pain with the MLT, the presence of leg pain demonstrated the strongest association with clinical improvement. It is well documented that the presence of leg pain is associated with worse outcomes in patients with LBP.[9] Similarly, numerous studies have demonstrated the importance of treatment expectations to LBP improvement.[30] Therefore, it is not surprising that individuals in the current study who did not have leg pain or believed that acupuncture/dry needling would help their current condition were more likely to report clinical improvement after 1 week.

Reporting "back pain with hip flexion" was ascertained by having participants lie supine and by having the examiner maximally flex their knee and hip toward their chest. This movement likely stretches the lumbar paraspinal muscles, and, therefore, pain during such a maneuver may simply indicate the presence of myofascial pain. Although statistically significant, "any hypermobility with L3-L5 posterior-to-anterior pressure" was the variable most weakly associated with clinical improvement. The negative correlation coefficient indicates that individuals judged as "hypermobile" were less likely to improve. Although the meaning of this result is unclear, evidence suggests that individuals with this finding have better outcomes with lumbar stabilization strengthening exercises than with

spinal manipulation therapy.[22] Perhaps these individuals do best with active exercise interventions as opposed to passive manual therapy interventions like spinal manipulation or dry needling.

As part of the treatment-based classification system, variables from the baseline examination have been previously identified to predict improvement in self-reported disability with spinal manipulation,[6,15,16] lumbar stabilization exercise,[28,44] and lumbar traction.[20] It is noted that all of the baseline examination variables identified in the current study are different from those previously identified as predicting improvement with other interventions for LBP. This finding may indicate the existence of a subgroup of patients with LBP who respond uniquely to dry needling treatment or may merely be a chance finding. Further research is necessary before any conclusions can be drawn. It has been recommended that the identification of such clinical prediction rules should be reserved for conditions that are heterogeneous and for treatments that are associated with some degree of risk if improperly applied.[17] The identification of such subgroups using single-arm-trial study designs has been highly criticized due to the inability of such designs to differentiate between treatment-effect modifiers and more general prognostic indicators.[34,51] It was not the intent of the current study to derive a clinical prediction rule for dry needling treatment for LBP. Rather, our intent was to produce a preliminary investigation of the type of examination findings that may be helpful in identifying individuals with LBP who would respond favorably to dry needling. The single-group design used in the current study has been advocated for such hypothesis-generating phases of subgrouping research, which can then be followed by studies that more definitively identify "treatment modifiers."[34] Because LBP is considered to be a heterogeneous condition and dry needling inherently includes some level of risk of negative outcomes, future research should attempt to develop a clinical prediction rule for dry needling treatment for LBP, ideally within the context of a randomized controlled trial.

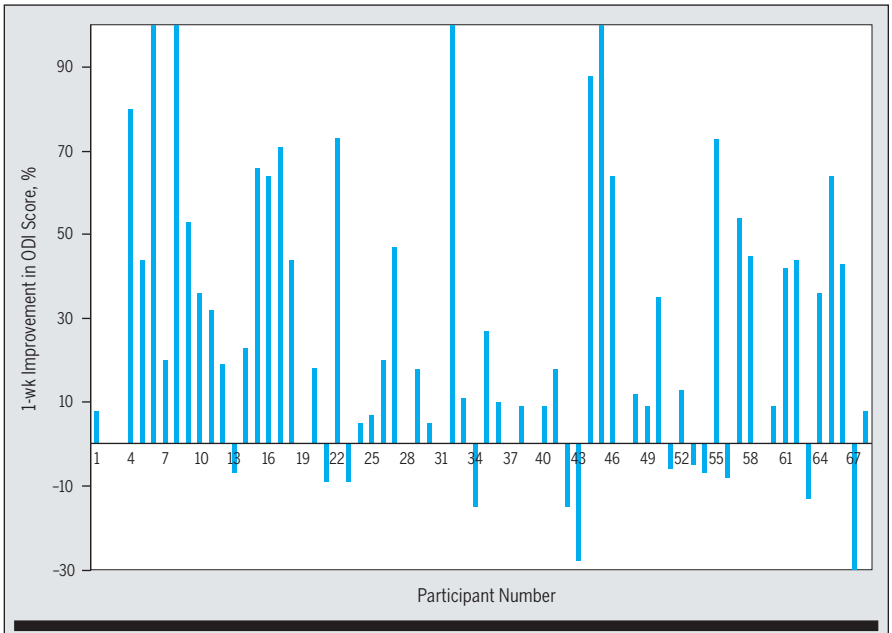

FIGURE 3. One-week improvement on the ODI for each study participant. Bars represent improvement in disability as a percentage of baseline. Abbreviation: ODI, modified Oswestry Disability Index (0-100).

TABLE 4 Linear Regression With Pairwise Deletion Analysis Predicting 1-Week Change in Percent Change in Oswestry Disability Index After Dry Needling

Variables Retained in Final Model	Unstandardized Beta Coefficient	Standardized Beta Coefficient	Significance of Beta Coefficient	Adjusted R^2	Significance of Model Fit
Pain with multifidus lift test	29%	0.33	.01		
Aggravation with standing	–23%	–0.30	.01		
Full model				0.16	.01

Another limitation of this study includes the relatively small sample size in relation to the number of potential predictor variables assessed, which results in an increase in the risk of chance associations. Although commonly performed in samples of a similar size,[16,20,28,43] formal recommendations for adequate sample size in multiple linear regression analyses suggest much larger samples to mitigate this risk.[52,53] Additionally, a liberal alpha level was used in the univariate step, which could serve to further increase the probability of chance associations. As stated above, it was not our intent to create a clinical prediction rule for dry needling. In addition to the current study being a suboptimal single-group design, it was markedly underpowered to produce a stable clinical prediction rule. Recent research has demonstrated that the factors identified in clinical prediction rules are unstable in studies with inadequate sample size and can widely differ based on the threshold used to dichotomize the outcome variable (eg, ODI score).[48] Therefore, we purposely avoided dichotomizing short-term improvement in self-reported disability in the current study. Moreover,

it should be acknowledged that our dry needling consisted of a single treatment session to a single muscle group (lumbar multifidus). Although this standardized approach serves to help strengthen the internal validity of the current study, it conflicts with more common clinical practice, which would indicate treatment of more muscle groups over several treatment sessions,[45] which may weaken the generalizability of our results.

CONCLUSION

We identified 6 variables from the patient history and physical examination that were associated with improvement in self-reported disability 1 week after a single treatment session of dry needling. Increased LBP with the MLT was the strongest predictor of clinical improvement, suggesting that the finding of pain during muscle contraction should be studied in future dry needling studies. Because the design of the current study does not allow for the differentiation of treatment-effect modifiers and general prognostic indicators, it cannot be inferred that these variables are associated with response to the dry needling treatment. The associations observed may be due to chance or to natural history. Therefore, future research should attempt to develop a clinical prediction rule within a larger randomized clinical trial. ◉

KEY POINTS

FINDINGS: We identified 6 variables from the patient history and physical examination that showed significant association with improvement in self-reported disability at 1-week follow-up after a single treatment session of dry needling. Pain with the MLT showed the strongest association.

IMPLICATIONS: There may be a set of variables that indicate greater likelihood of positive treatment response to dry needling in patients with LBP. These findings should be re-examined within the context of a larger randomized controlled trial.

CAUTION: The design of the current study cannot differentiate between factors that predict favorable prognosis from dry needling and those that are simply favorable prognostic indicators. Further, until independently verified, it is possible that the associations reported may simply be chance findings. Therefore, these results should not be inferred to be predictive of response to dry needling treatment.

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