

TABLE 2. Summary of results for patient-reported outcome measures assessed at baseline and post-treatment (N = 29).

Variable	Baseline Mean ± SD	Post-treatment Mean ± SD	Unadjusted within-group change* Mean ± SD; P Value	Adjusted immediate treatment effect† Mean (95% CI); P Value
HOOS scores				
HOOS Pain [‡]				
MoveTrain (N=14)	72.5 ± 8.1	83.4 ± 9.2	10.9 ± 7.7; 0.0001	-4.1 (-9.1, 1.0); 0.11
JtMob (N=15)	77.5 ± 10.5	90.0 ± 6.5	12.5 ± 7.9; <0.0001	
HOOS Symptoms [‡]				
MoveTrain (N=14)	68.6 ± 15.1	77.5 ± 14.9	8.9 ± 9.8; 0.005	-4.2 (-11.7, 3.2); 0.25
JtMob (N=15)	74.0 ± 10.7	85.0 ± 9.1	11.0 ± 11.5; 0.002	
HOOS ADL [‡]				
MoveTrain (N=14)	80.3 ± 13.5	92.0 ± 9.3	11.8 ± 8.3; 0.0002 [§]	0.73 (-2.4, 3.9); 0.65 [¶]
JtMob (N=15)	90.1 ± 8.2	96.1 ± 4.1	6.0 ± 5.7; 0.0001 [§]	
HOOS Sport [‡]				
MoveTrain (N=14)	72.3 ± 23.1	89.3 ± 12.4	17.0 ± 17.9; 0.006 [§]	3.9 (-3.6, 11.5); 0.31 [¶]
JtMob (N=15)	75.0 ± 12.3	86.3 ± 11.9	11.3 ± 13.8; 0.01 [§]	
HOOS QOL [‡]				
MoveTrain (N=14)	54.9 ± 13.9	67.0 ± 14.0	12.1 ± 14.6; 0.005 [§]	-7.1 (-16.2, 2.0); 0.13 [¶]
JtMob (N=15)	50.8 ± 10.0	72.5 ± 12.7	21.7 ± 13.3; 0.0001 [§]	
Movement Evoked Pain				
Step down				
MoveTrain (N=10)	23.5 ± 22.9	10.8 ± 13.8	-12.7 ± 16.0; 0.04 [§]	6.6 (-1.5, 14.8); 0.11 [¶]
JtMob (N=11)	21.3 ± 21.2	3.8 ± 5.5	-17.6 ± 22.0; 0.03 [§]	
Squat				
MoveTrain (N=11)	25.2 ± 22.5	13.4 ± 18.3	-11.8 ± 12.9; 0.01 [§]	7.3 (-2.9, 17.5); 0.16 [¶]
JtMob (N=11)	23.3 ± 18.6	5.4 ± 8.1	-17.9 ± 21.3; 0.02 [§]	
Pain Pressure Threshold				
Therapist eminence				
MoveTrain (N=11)	4.0 ± 1.1	3.8 ± 1.6	-0.22 ± 1.1; 0.46 [§]	-0.10 (-0.97, 0.78); 0.83 [¶]
JtMob (N=11)	3.9 ± 0.74	3.8 ± 1.1	-0.11 ± 1.1; 0.21 [§]	
Anterior groin				
MoveTrain (N=11)	2.7 ± 1.4	2.7 ± 2.1	0.03 ± 2.3; 0.76 [§]	-0.14 (-1.4, 1.1); 0.83 [¶]
JtMob (N=11)	3.1 ± 1.7	3.0 ± 1.0	-0.08 ± 1.0; 0.53 [§]	

Abbreviations: SD, standard deviation; CI, confidence interval; MoveTrain, movement pattern training group; JtMob, joint mobilization group; HOOS, Hip Disability and Osteoarthritis Outcome Score; HOOSADL, function in activities of daily living; HOOSSport, function in sports and recreation; HOOSQOL, quality of life.

* Unadjusted within-group change is calculated by subtracting post minus baseline within each treatment group. P value by paired t-tests unless otherwise indicated.

† The adjusted immediate treatment effect is calculated by subtracting the least squares mean change between baseline and post for MoveTrain minus JtMob from the analysis of covariance (ANCOVA), and assesses the between-group difference in change after adjusting for baseline. Unless otherwise indicated, p value by ANCOVA using a generalized linear model where change is the dependent variable and baseline is the covariate.

‡ Patient-reported outcome measures with 100-mm disability.

§ P value by Wilcoxon signed rank test.

¶ P value by non-parametric analysis of covariance.

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COMPARISON OF MOVEMENT PATTERN TRAINING AND JOINT MOBILIZATION FOR CHRONIC PREARTHRTIC HIP DISORDERS: A PILOT RANDOMIZED CLINICAL TRIAL

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Purpose: A clear need exists to rigorously assess treatment strategies for chronic prearthritic hip disorders (PAHD). We assessed the preliminary effects of two physical therapist-led interventions that target two distinct mechanisms, abnormal movement patterns and sensory disturbances. Abnormal movement patterns, such as excessive hip adduction, may create altered mechanical stresses on hip joint structures, resulting in subsequent injury, pain and activity limitations. Movement pattern training (MoveTrain) may improve movement patterns and patient-reported outcomes, however further investigation is needed to be definitive. Sensory disturbances such as peripheral sensitization and central sensitization (aka nociceptive pain) may also contribute to pain persistence long after an initial injury. Joint mobilization (JtMob) is proposed to impart a neurophysiological response within the peripheral and central nervous system that results in pain reduction and improved mobility, yet the investigation of JtMob for the treatment of PAHD is limited.

Methods: Patients, 18-40 years, with chronic PAHD were recruited. Baseline assessment included self-report questionnaire completion, clinical examination and quantitative sensory testing. The primary outcome was the Hip disability and Osteoarthritis Outcome Score (HOOS), a hip-specific, patient-reported outcome measure. Secondary outcomes included movement evoked pain assessed with a repetitive step down task and a repetitive deep squat task, and pain pressure threshold assessed at the anterior groin of the most bothersome hip (local pressure hypersensitivity) and the dominant thenar eminence (generalized pressure hypersensitivity). After baseline assessment, patients were randomized into 1 of 2 treatment groups, MoveTrain or JtMob. Randomization was stratified by sex and HOOS Symptoms quartile, as determined from data collected during previous study. Treatment was provided by 4 experienced physical therapists (2 in each treatment arm) who were trained in standardized procedures. *Treatment for both groups* included 10 supervised sessions over 12 weeks and incorporated assessment of patient goals, patient education and instruction in a home program. Patient education focused on patient-specific tasks, such as work or fitness activities, identified by each patient to be symptom-producing. *The goal of MoveTrain* was to reduce stresses on the hip joint by optimizing the biomechanics of daily and patient-specific tasks. The key element of MoveTrain was task-specific instruction to correct abnormal movement patterns demonstrated

during daily tasks and patient-specific tasks. For example, hip adduction and femoral internal rotation were minimized during step-down tasks. The home program included repeated practice of the modified tasks. Difficulty of the tasks were progressed based on each patient's performance. *The goal of JtMob* was to reduce pain and improve pain-free motion of the hip. The key element of JtMob was manual techniques provided by the physical therapist. Specific criteria were used to determine the joint mobilization techniques and parameters used for each patient. The patient's symptom report to each technique was monitored and if indicated, the technique modified according to our outlined procedures. The home program included flexibility exercises. Immediately after treatment completion, patients returned for follow up assessment. Data collected at baseline and post-treatment were analyzed with analysis of covariance (ANCOVA) using a generalized linear model where change is the dependent variable and baseline is the covariate. The adjusted immediate treatment effect was calculated by subtracting the least squares mean change between baseline and post for MoveTrain minus JtMob from the ANCOVA, and assesses the between-group difference in change after adjusting for baseline.

Results: Thirty-three patients with PAHD were randomized. Demographics are provided in Table 1. Four patients did not complete treatment or post-treatment testing (3 due to COVID pandemic, 1 lost to follow up); 7 patients did not complete post-treatment laboratory testing (due to COVID), but did complete post-treatment questionnaires. Both groups demonstrated clinically important within-group improvements in the HOOS subscales and movement evoked pain ratings after treatment (Table 2). No changes were noted in pain pressure threshold for either group. After adjusting for baseline, there were no between-group differences in change in outcomes when comparing MoveTrain and JtMob.

Conclusions: Our preliminary findings suggest that 12 weeks of physical therapist-led intervention, including either MoveTrain or JtMob, may result in improvements in patient-reported pain and activities limitations. Further investigation is needed to determine the sustained effects of each treatment and to determine if specific patient factors are associated with treatment prognosis.

TABLE 1. Demographics for all patients who provided follow-up data, overall and by treatment group (N = 29).

Variable	Overall Sample N = 29	By Treatment Group	
		MoveTrain n = 14	JtMob n = 15
Age [‡] (yr), mean ± SD	30 ± 5.7 (range 22 to 39)	31 ± 6.1 (range 24 to 39)	28 ± 5.2 (range 22 to 38)
Gender, n (%)			
Male	6 (21%)	3 (21%)	3 (20%)
Female	23 (79%)	11 (79%)	12 (80%)
Measured BMI (kg/m ²), mean ± SD	25.1 ± 5.3 (range 18.1 to 41.5)	26.1 ± 4.5 (range 19.5 to 34.5)	24.2 ± 6.0 (range 18.1 to 41.5)
Study Limit, n (%)			
Left	14 (48%)	7 (50%)	7 (47%)
Right	15 (52%)	7 (50%)	8 (53%)
UCLA [§] , median (range)	9 (4 to 10)	7.5 (4 to 10)	10 (4 to 10)
Pain duration (categorical), n (%)			
3 to <6 months ago	5 (17)	2 (14)	3 (20)
6 to <12 months ago	5 (17)	2 (14)	3 (20)
1 to 2 years ago	8 (28)	4 (29)	4 (27)
3 to <5 years ago	3 (10)	1 (7)	2 (13)
6 to 10 years ago	7 (24)	5 (36)	2 (13)
>10 years ago	1 (4)	0 (0)	1 (7)

Abbreviations: SD, standard deviation; MoveTrain, movement pattern training group; JtMob, joint mobilization group;

UCLA, University of California Los Angeles Activity Score.

Age is self-reported by patients in screening interview.

* Patients are asked to rate their activity level over the previous 6 months. 10=regularly participates in impact sports;

1=wholly inactive, dependent on others.

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