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Are movement-based classification systems more effective than therapeutic exercise or guideline based care in improving outcomes for patients with chronic low back pain? A systematic review

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ABSTRACT

Objectives: The purpose of this systematic review was to determine if movement-based classification (MBC) systems are more effective than therapeutic exercise or guideline-based care (GBC) in improving outcomes in patients with low back pain (LBP) based upon randomized clinical trials (RCT) with moderate to high methodological quality and low to moderate risk of bias.

Methods: The search strategy was developed by a librarian experienced in systematic review methodology and peer reviewed by a second research librarian. The following databases were searched from their inception to May 17, 2018: PubMed, Embase, Cochrane Central Register of Controlled Trials, ClinicalTrials.gov, and the WHO International Clinical Trials Registry Platform. The identified RCTs with a PEDro score of ≥6 were screened and assessed for risk of bias by two blinded individual reviewers using Covidence.

Results: Seven studies were identified that had moderate-to-high methodological quality. One of the studies was identified as having a high risk of bias. Of the six studies that remained, only one study reported finding a statistically significant difference at the immediate follow-up that was not clinically significant. There was no significance at 6 and 12 months.

Discussion: There is a paucity of moderate to high methodological quality RCTs with similar methodology that compare MBC to standard of care treatments for patients with LBP. Studies with moderate to high methodological quality that have a low risk of bias do not support MBCs as being superior to general exercise or GBC in the treatment of nonradicular LBP.

Level of Evidence: 1a

KEYWORDS
Exercise; low back pain; physical therapy; randomized controlled trials

Introduction

In the United States, 26% of the population will experience at least 1 day of low back pain (LBP) during a 3-month time frame [1] and it is the second leading cause of disability [2]. The cost of treating LBP in the United states is more than $100 billion dollars a year [3]. Conservative therapy such as physical therapy has been shown to be as effective as surgery for the management of LBP [4]. Therapeutic exercise is considered to be a foundational component in the management of LBP in physical therapy [5–8]. A number of movement-based classification (MBC) systems have been created to manage patients that are suffering from LBP. These systems create subgroups of patients that suffer from LBP and then match them with specific therapeutic interventions.

The American Physical Therapy Association's Lumbar Clinical Practice Guidelines suggests that MBC systems meet the standard of level I evidence based on high-quality diagnostic studies, prospective studies, or randomized controlled trials [9]. The methodology regarding how these studies were obtained for the Lumbar Clinical Practice Guideline, including how they were assessed for quality, risk of bias, as well as which outcomes they were compared to is lacking. In reality some of the cited studies in the Lumbar Clinical Practice Guideline in support of this level I endorsement for the MBC systems are lower level evidence, including Clinical Prediction Rule derivation studies [10], pilot studies [11], and clinical commentaries [12]. These studies do not compare MBC systems to standard of care interventions such as therapeutic exercise or guideline-based care (GBC), they compare these MBC systems to low stress aerobic exercise and advice to stay active [13]. The objective of this review was to determine if there was moderate to high quality evidence with low to moderate risk of bias that MBC systems are more effective than therapeutic exercise or GBC in improving outcomes in patients with LBP.

Methods

To be eligible for this systematic review studies had to be randomized clinical trials (RCT) of a movement

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based classification (MBC) as defined by Karayannis et al. [14] that was being used to treat patients with nonradicular LBP. The primary outcome measures of interest were the numeric pain rating scale, the Oswestry Disability Index, and the Roland-Morris Low Back Pain and Disability Questionnaire.

We used the methods outlined by Furlan [15] and Lefevre [16] to guide the development of our search strategies. Controlled vocabulary and free text terms related to the four concepts in the question were used to search all databases and registries for randomized controlled trials. The concepts were: LBP, classification of musculoskeletal conditions, therapeutic exercise, and patient outcomes. The following databases were searched: PubMed which includes MEDLINE (1946 – May 17, 2018), Embase (embase.com 1974 – May 17, 2018), Cochrane Central Register of Controlled Trials (CENTRAL) (EBSCOHost to May 17, 2018), ClinicalTrials.gov (to May 17, 2018), and the WHO International Clinical Trials Registry Platform (to May 17, 2018).

The PubMed search strategy was developed by a librarian experienced in systematic review methodology, and was peer reviewed by a second research librarian using the PRESS standard [17]. The PubMed search was then adapted for the other databases. For identification of RCTs in PubMed, the Cochrane Highly Sensitive Search Strategy for identifying randomized trials in MEDLINE: sensitivity-maximizing version (2008 revision); PubMed format [16] was used. For identification of RCTs in Embase, the RCT filter based on the Scottish Intercollegiate Guidelines Network strategy and amended to embase.com format was used, as provided by the Cochrane Work Review Group [18]. No filter was used to identify RCTs in CENTRAL and all results were screened. No language or publication date filters were used. The search strategies are presented in Appendix A.

Database searches were supplemented by citation searching using bibliographies of relevant reviews and research articles. In order for the study to be eligible for this systematic review it had to be considered a MBC as defined by Karayannis et al. [14] that was being used to treat patients with non-radicular LBP. The classifications include: Mechanical Diagnosis and Treatment (MDT), Treatment Based Classification (TBC), Pathoanatomic Based Classification (PBC), Movement System Impairment Syndromes (MSI), and the O'Sullivan Classification System (OCS) [14]. In the literature the OCS system has also been called movement control impairment (MCI) and has been attributed to O'Sullivan [19]. The MDT, PBC, and MSI classification procedures are dominated by a biomechanical assessment [14]. Fear avoidance is considered in the TBC approach as neurophysiological and psychosocial variable are considered in the OCS/MCI approach [14].

Data collection, data extraction, data analysis, and the Cochrane Collaborations risk of bias tool assessment were all performed using Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia. Available at http//:www.covidence.org). Identified titles and abstracts were reviewed by two individual reviewers without knowledge of each other's work (Figure 1). This process continued through a full text review by both reviewers to ensure that the papers met the inclusion and exclusion criteria. Final judgment in instances of disagreement between the two reviewers was competed in Covidence through consensus. There were no instances when consensus could not be attained in Covidence.

Once the full text articles were identified, the PEDro website was used to determine if the RCTs had been graded. Methodological quality was determined by the PEDro Scale; it was discovered that all papers of interest had official PEDro grades. The PEDro scale has been described as a reliable and internally valid tool for assessing the quality of RCTs [20–24]. An a priori decision was made to only include articles with a PEDro score of 6 or higher. This follows the PEDro recommendations that scores equal to or higher than 6 represent moderate to high methodological quality [25].

Studies that were deemed to have moderate to high quality on the PEDro (6 or greater) were assessed using the Cochrane Collaboration's risk of bias tool in Covidence by two individual reviewers without knowledge of each other's work. Final judgment in instances of disagreement between the two reviewers was competed in Covidence. The Cochrane Collaboration's risk of bias tool criteria includes: (1) random sequence generation; (2) allocation concealment; (3) blinding of participants, personnel, and outcome assessment; (4) incomplete outcome data; (5) selective reporting; and (6) other biases including similarity of baseline characteristics between treatment arms, co-intervention contamination, and validity of outcome measures. Each individual criterion was rated as providing high, low, or unclear risk of bias. Based on these assessments an overall risk of bias was determined for each study based on the rationale and methodology of Bostick [26]. If the study was rated as having low risk for each category, or had only 1 category that was rated as having high or unclear risk of bias, the study was rated as having a low risk of bias. Studies identified as having two categories with high or unclear risk of bias were rated as having a moderate risk of bias. Studies that had three categories with high or unclear risk of bias were rated as having a high risk of bias. Studies that had four categories with unclear risk of bias were rated as having a high risk of bias [26].

Data were sought for age, measures of pain, disability, functional performance, global perceived effect, Oswestry Disability Index, Roland-Morris Low

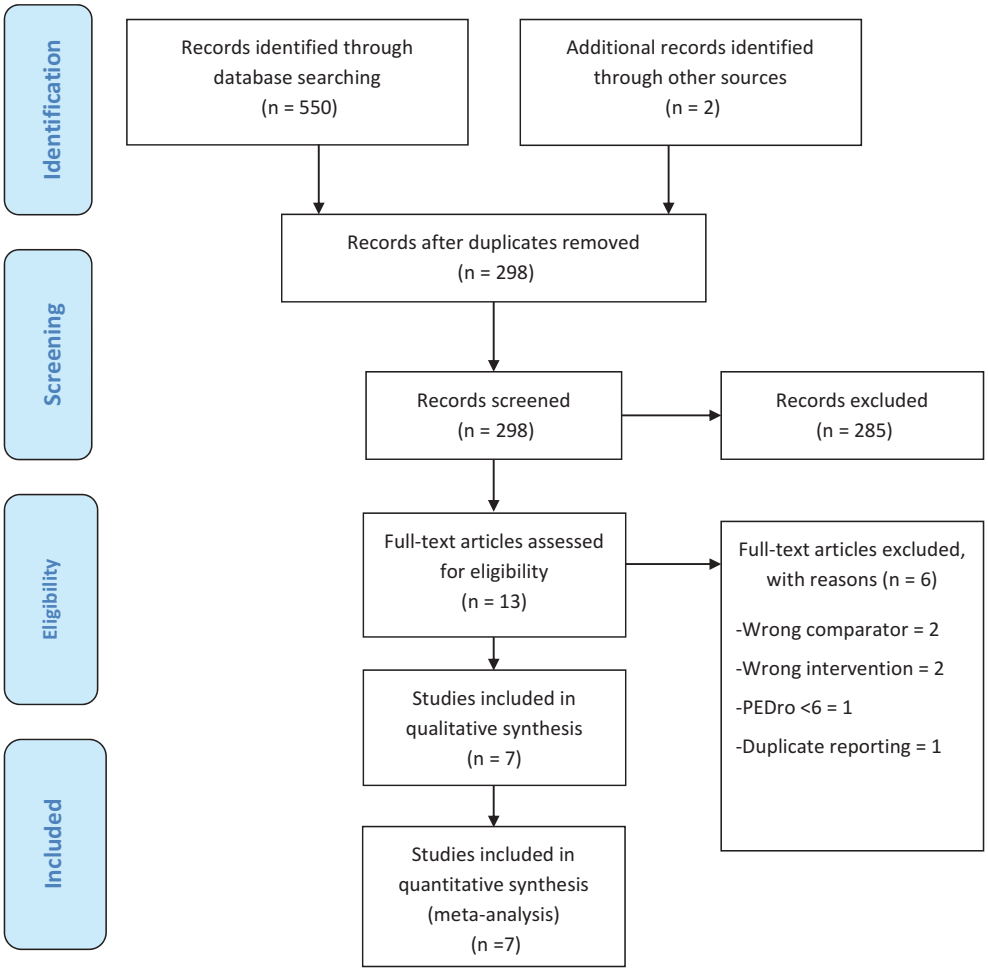

Figure 1. (PRISMA) flow diagram.

Back Pain and Disability Questionnaire, muscle strength, muscle endurance, activities of daily living, Back Performance Scale, Numeric Pain Rating Scale, 5-Minute Walk Distance Test, Pain Catastrophizing Scale, Start Back Screening Tool, Prone instability test, passive straight leg test, Patient Specific Functional Scale, Fear Avoidance Behavior Questionnaire, and the Short Form-36.

The summary measures that were sought for each study were trial registry, type of classification system, outcome timeline, mean between group differences, 95% confidence intervals, and whether or not there were statistically significant between group differences.

Results

A PRISMA flow diagram is provided in Figure 1. Five-hundred and fifty studies were identified through database screening and 2 additional studies were identified through screening of reference lists of relevant studies that utilized an MBC system as previously defined and compared the outcomes to therapeutic exercise or GBC to treat nonradicular LBP. After duplicates were removed, 298 studies remained. Two-hundred and ninety-eight studies were screened by title and abstract, which excluded 285 studies. From the 13 articles that were available for full text assessment, 6 studies were excluded. Two of the studies had the wrong comparator, 2 had the wrong intervention, 1 had a PEDro score of less than 6, and the last article was determined to be a duplicate in reporting. This left 7 articles that were available for qualitative analysis.

All studies included in this literature review were RCTs. These RCTs however differed by recruitment, interventions, outcome measures, follow-up intervals, and statistical analyses. These differences between the studies are outlined in Table 1.

> The articles by Apeldoorn et al. [27], Azevedo et al. [28], and Fritz et al. [13] had Pedro Scores of 8; the articles by Halliday et al. [29], Saner [19], and Van Dillen et al. [30] had PEDro scores of 7; and the final article by Henry et al. [31] had a PEDro score of 6.

The assessment for the risk of bias for each article is summarized in Table 2. The articles by Apeldoorn et al. [27], Azevedo et al. [28], Halliday et al. [29], Saner [19], and Van Dillen et al. [30] were considered to have a low risk of bias. The article by Henry et al. [31] was considered to be a moderate risk for bias and the paper by Fritz et al. [13] was considered to be at

Table 1. Study characteristics.

	Population	Recruitment locations	Interventions	Outcome measures	Follow-up intervals	Statistical analyses
Apeldoorn et al. [27]	116 SA-CLBP	21 private physical therapy clinics in the city of Amsterdam and the surrounding	TBC vs. Dutch LBP	Primary: NPRS, ODI, GPES	8 weeks	Linear mixed model Generalized linear mixed model
	57.1% female		Guidelines	Secondary: FABQ, Örebro Musculoskeletal Pain Screening Questionnaire (ÖMPSQ)	26 weeks	
	42.6 yrs				52 weeks	
Azevedo et al. [28]	148 CLBP	1 University based outpatient physical therapy clinic Brazil	MSI vs. Stretching and Strengthening	NPRS, RM, GPES	2 weeks	Linear mixed models
	61.5% female				16 weeks	
	41.9 yrs				26 weeks	
Fritz et al. [13]	78 ALBP	5 University based Employee Health Services outpatient clinics	CPG vs. TBC	NPRS, mODI, ODI, SF-36, CES-CD, FABQ,	16 weeks	Independent sample *t* test
						chi-squared tests
						Mann–Whitney *U* test
	38% female					
	37.4 yrs					
Halliday et al. [29]	133 CLBP	1 Hospital based physical therapy department in Sydney Australia	MDT vs. Motor Control	Primary: Recruitment of trunk muscles	4 weeks	Linear regression models
	80% female					
				Secondary: PSFS, GPEQ		
	48.6 yrs					
Henry et al. [31]	124 CLBP	Not reported in the study	Matched and unmatched for TBC and MSI	ODI, NPRS, GCPS, FABQ, PSFS, SF-36	7 weeks	Independent sample *t*-tests
					52 weeks	Chi-square tests
	50.5% female					
	41.5 yrs					
Saner et al. [19]	106 CLBP	Five hospital outpatient departments and eight private practices in Switzerland	MCI vs. general exercise	Primary: PSFS	9–12 weeks	Univariate and repeated measures ANOVA
	37.7% female			Secondary: GCPS, RM	26 weeks	
	41.6 yrs				52 weeks	Linear mixed model
Van Dillen et al. [30]	*N* = 101, CLBP	Musculoskeletal Analysis Laboratory	MSI vs. nonclassification specific	mODI, NPRS, FABQ, SF-36, and Satisfaction with care	6 weeks	Hierarchical linear modeling
	49% female				26 weeks	
	42.7 yrs				52 weeks	

TBC = Treatment-Based Classification; Movement System Impairment = MSI; CPG = Clinical Practice Guidelines; MDT = Mechanical Diagnosis and Treatment (McKenzie); Epidemiological Studies Depression Scale (CES-CD); Global Perceived Effect scale (GPES); Global Perceived Effect questionnaire (GPEQ); Graded Chronic Pain Scale = GCPS; MCI = Movement Control Impairment; ODI = Oswestry Disability Index; mODI = Modified Oswestry Disability; NPRS = Numeric Pain Rating Scale; Örebro Musculoskeletal Pain Screening Questionnaire (ÖMPSQ); PSFS = Patient Specific Functional Scale; RM = Roland-Morris

Table 2. Risk of bias summary.

Study	Random sequence generation	Allocation concealment	Outcome assessment blinding	Incomplete outcome data	Selective reporting	Other sources of bias[a]	Overall risk of bias
Apeldoorn et al. [27]	L	L	L	L	L	L	Low
Azevedo et al. [28]	L	L	U	L	L	L	Low
Fritz et al. [13]	L	L	U	H	H	L	High
Halliday et al. [29]	L	L	U	L	L	L	Low
Henry et al. [31]	H	L	H	L	L	L	Moderate
Saner et al. [19]	L	U	L	L	L	L	Low
Van Dillen et al. [30]	L	L	U	L	L	L	Low

H = high risk of bias; L = low risk of bias; U = unclear risk of bias.
[a] Other sources of bias included similarity of baseline characteristics between treatment arms, contamination, and validity of outcome measures

high risk of bias. The judgment for the Fritz et al. [13] paper was made by the two reviewers secondary to the Numeric Pain Rating Scale being reported at baseline, but absent at the follow-up intervals.

The results for each study are included in Table 3. All of the studies that were included in this study were considered to have moderate-to-high methodological quality on the PEDro scale. The study by Fritz et al. [13] was considered to be at high risk for bias given that the Numeric Pain Rating Scale was not reported at follow-up. In addition, the article by Fritz et al. [13] was the only study of the seven that sampled from an acute LBP population.

Given the variability in sampling methodology, outcome measures used, and follow-up periods, it was not possible to perform a meta-analysis as originally planned. As a result, our analysis is descriptive.

The synthesis of results is included in Table 3. The study by Fritz et al. [13] found statistically significant differences between groups for the Modified Oswestry Disability Index and Short Form-36 sig at 4 weeks. The Numeric Pain Rating Scale was not reported at follow-up. There were no differences for any outcome measures at 1 year. Saner et al. [19] also found statistically significant between group differences at the immediate follow-up that were not present at the 6- and 12-month follow-up intervals. No additional analyses were performed for this study.

Discussion

Although six of the seven articles retained within this systematic review of the literature were RCTs with moderate to high methodological quality with a low-to-moderate risk of bias, a quantitative analysis could not be performed secondary to the lack of homogeneity of research methodology and outcomes.

For close to a decade it has been recognized that movement based classification systems can discriminate between groups of patients, be comprehensive in their ability to classify all patients, and create mutually exclusive groups [32]. Failure to meet these expectations significantly limits the clinical utility of these tools [32]. In addition, if a MBC system has classifications that patients rarely fit into, it may make the clinical utility of the system related to its complexity questionable [32].

To evaluate this clinical utility, we assessed the percentage of subjects that could not be classified for each study and the prevalence of the group classification for each MBC system. It was evident that many studies required the subjects to fit the classification at enrollment. The majority of studies reported a relatively low percentage that could not be classified; only 1 study reported that more than a quarter of the study participants could not be classified in the TBC system (Table 3).

Previous research on treatment-based classifications has reported the difficulty in accurately determining a subgroup for clinical patients. Stanton et al. reported that 25.2% of patients could not be classified, and an additional 25.2% met the criteria for more than one subgroup [33]. A more recent study of the TBC system found that 65.74% of patients fit into 1 category, with a high prevalence for the stabilization category (21.91%), while 19.58% fit into more than 1 category and 13.29% of patients could not be categorized [34]. Classification using the TBC system is even more difficult in chronic LBP patients, with only 37.3% demonstrating clear classification [35]. This problem is not unique to the TBC; it has been reported that 27% of subjects in the MDT system cannot be classified and of those that are classified, 92% fit into the derangement category [36].

In a reliability study by Trudelle-Jackson et al. on the MSI system for LBP the authors reported between examiner agreement of 75% with a kappa coefficient of 0.61 [37]. For this study, in a system with five categories, both examiners selected lumbar rotation with extension 37.5–41.7% of the time and lumbar rotation 41.7% of the time suggesting that as high as 83.7% of patients were classified into only two of the five categories in the MSI system [37]. Harris-Hayes and Van Dillen reported a percent agreement of 83% with a kappa of 0.75 (95% CI = .51 to.99) for the MSI system [38]. In their study 36.7% of the subjects fit into the extension with rotation category, with 36.7–46.7% of their subjects being classified in the rotation category [38]. Their findings are similar to the previously reported study with as many as 83.4% of subjects fitting into two categories in a five-category system. This suggests that the reliability reported in these studies that utilize the kappa statistic is

Table 3. Synthesis of results.

	Trial registered?	Population	Percent not classified*	Mean differences [95% confidence intervals] for primary outcomes	Statistically significant between group differences?
Apeldoorn et al. [27]	Yes	116 SA-CLBP 57.1% female 42.6 yrs	25.6%	**ODI –** TBC 5.1 [2.1–8.1] -Dutch LBP 5.6 [2.7–8.4] Guidelines **NPRS** – TBC 2.0 [1.4–2.6] -Dutch LBP 2.5 [1.9–3.1] Guidelines	No
Azevedo et al. [28]	Yes	148 CLBP 61.5% female 41.9 yrs	1.7%	**NPRS** – 8 week 0.05 [−0.9–0.8] -16 week −0.23 [−1.08–0.61] -26 week 0.24 [−0.61–1.08] **RM** – 8 week 0.0 [−1.55–1.56] -16 week −0.07 [−1.62–1.49] -26 week 0.21 [−1.35–1.76]	No
Fritz et al. [13]	No	78 ALBP 38% female 37.4 yrs	0%	**mODI** – 4 week 10.9 [1.9–19.9] **NPRS** – Not reported **SF-36**-4 week physical component summary 5.6 [0.6–10.7] Mental component summary 5.7 [1.8–9.5]	Yes for mODI and SF-36 sig at 4 weeks. NPRS not reported at follow-up. No difference at 1 year.
Halliday et al. [29]	Yes	133 CLBP 80% female 48.6 yrs	9.8%	**VAS** – 0.0 [−1.2 – 1.2]	No
Henry et al. [31]	Yes	124 CLBP 50.5% female 41.5 yrs		**ODI** – 7 week matched 8.03 [4.84–11.22] -7 week unmatched 9.48 [3.96–15.00] -52 week matched 3.19 [−0.12–6.51] -52 week unmatched −0.98 [−6.7–4.74] **NPRS** – 7 week matched 1.17 [0.76–1.59] -7 week unmatched 1.00 [0.31–1.69] -52 week matched −0.20 [−0.66–0.25] -52 week unmatched 0.18 [−0.56–0.91]	No
Saner et al. [19]	Yes	106 CLBP 37.7% female 41.6 yrs		**RM** – 9–12 week 1.6 [0.1–3.1] -26 week 1.0 [−0.5–2.5] -52 week 1.6 [−0.4–2.6]	Statistically significant difference at immediate term that was not clinically significant. No difference at 6 and 12 months
Van Dillen et al. [30]	Yes	*N* = 101, CLBP 49% female 42.7 yrs	5.9%	**mODI** – Unclear main effects. Authors reported that the were no statistically significant between group differences and ran a multivariate analysis to determine if there were any predictors of mODI	No

TBC = Treatment-Based Classification; Movement System Impairment = MSI; CPG = Clinical Practice Guidelines; MDT = Mechanical Diagnosis and Treatment (McKenzie); ODI = Oswestry Disability Index; NPRS = Numeric Pain Rating Scale; RM = Roland-Morris; mODI = Modified Oswestry Disability; CLBP = chronic low back pain; ALBP = Acute Low back pain; SA = Subacute

potentially overinflated by the high prevalence of classification into two of the five MSI categories. It also suggests that the complexity of the five-category MSI system may not be warranted.

Other reliability studies on the MSI system have relied on retrospectively selected cases that ensure a balanced representation of all five MSI categories [39]. This is similar to the methodology that has been used to examine the reliability of the OCS/MCI. In a study utilizing 25 videotaped cases, Dankaerts and colleagues found almost perfect agreement (97%) and a kappa coefficient of 0.96. However, this sampling methodology is inconsistent with clinical practice and does not allow for an accurate reflection of the prevalence of different categories within the system. Retrospective methodology artificially overinflates the reliability of the tool by sampling from only those subjects that have been previously classified [39]. This may be reflected in the sampling methodology for the RTCs that were identified for this systematic review that may have overinflated the efficacy of the MBC systems.

There were no statistically significant between group difference identified by Apeldoorn et al. [27] (TBC), Azevedo et al. [28] (MSI), Halliday et al. [29] (MDT), Henry et al. [31] (MSI), or Van Dillen et al. [30] (MSI) in a chronic LBP population. The study by Saner et al. [19] found a statistically significant difference at the immediate term follow-up that was not clinically significant. The mean difference at the immediate follow-up on the Roland-Morris Low Back Pain and Disability Questionnaire was 1.6 with a 95% CI of 0.1–3.1. This threshold is far below the 30% change that represents a clinically significant difference on the Roland-Morris Low Back Pain and Disability Questionnaire that was decided prospectively and most likely represents a Type I statistical error. There were no statistically significant differences observed at 6 and 12 months for this study.

There were statistically significant between group differences that were reported by Fritz et al. [13,40] for the Modified Oswestry Disability Index with a mean difference of 10.9. As previously stated, The study by Fritz et al. [13] was considered to be at a high risk for bias and was the only study of the seven that sampled from an acute LBP population. However, when considering the difficulties of classifying individuals with chronic back pain, it is also possible that the TBC is more appropriate for use in an acute population, with less clinical utility on the chronic LBP population [35].

This review was limited by the paucity of evidence that directly compares various forms of MBC systems to general exercise or GBC. We suggest that future research include direct, straightforward comparisons to meaningful general exercise programs. Additionally, while a meta-analysis was planned, it could not be completed due to the heterogeneity of the research including differences in outcome measures, temporal differences in data collection, gross differences in inclusion/exclusion criteria, and the use of regressive analyses to answer prospective questions. Attempts to standardize these factors when designing RCTs may allow for more meaningful generalizations to be made in the care of patients with LBP. Given that these systems may not be superior to general exercise or GBC, they may be adding unwarranted complexity and variability into entry-level physical therapy education and practice without adding any value to the diagnosis and treatment of patients with chronic LBP.

Conclusions

The best available moderate to high methodological quality evidence that has a low risk of bias does not support MBC as being superior to general exercise or GBC in the treatment of nonradicular LBP. Further research is needed to evaluate which, if any, of these systems should continue to be promoted in contemporary physical therapy practice.

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Appendix A: Electronic Search Strategies

PubMed

((((((((((((low back pain [mh:noexp]) OR low back pain/physiopathology [mh]) OR low back pain/rehabilitation [mh]) OR low back pain/therapy [mh]) OR (low back pain/prevention and control [mh])))) OR (((((back injuries [mh:noexp]) OR back injuries/therapy [mh]) OR lumbosacral region [mh:noexp]) OR lumbosacral region/injuries [mh]) OR lumbar vertebrae [mh:noexp])) OR (((((sciatica [mh:noexp]) OR sciatica/physiopathology [mh]) OR (sciatica/prevention and control [mh])) OR sciatica/rehabilitation [mh]) OR sciatica/therapy [mh])) OR (((((((spinal diseases [mh:noexp]) OR intervertebral disc degeneration [mh]) OR intervertebral disc displacement [mh]) OR lordosis [mh]) OR scoliosis [mh]) OR spinal stenosis [mh]) OR spondylitis [mh]) OR spondylosis [mh])) OR ((((((((((((((((((((low back pain [tiab]) OR lower back pain [tiab]) OR LBP [tiab]) OR back pain [tiab]) OR backache [tiab]) OR back injuries [tiab]) OR lumbosacral [tiab]) OR lumbar vertebrae [tiab]) OR sciatica [tiab]) OR spinal diseases [tiab]) OR intervertebral disc degeneration [tiab]) OR intervertebral disc displacement [tiab]) OR lordosis [tiab]) OR scoliosis [tiab]) OR spinal stenosis [tiab]) OR spondylitis [tiab]) OR spondylosis [tiab]) OR spondylolysis [tiab]) OR spondylolisthesis [tiab]) OR lumbar pain [tiab])))) AND (((((chronic pain/classification [mh]) OR low back pain/classification [mh]) OR classification [mh])) OR ((((((((((((((((((movement based classification [tiab]) OR MBC [tiab]) OR subgroup-specific pain [tiab]) OR subgroup classification [tiab]) OR classification [tiab]) OR classification-specific [tiab]) OR (mechanical diagnosis and treatment [tiab]))) OR MDT [tiab]) OR treatment based classification [tiab]) OR TBC [tiab]) OR pathoanatomic based classification [tiab]) OR PBC [tiab]) OR movement system impairment [tiab]) OR MSI [tiab]) OR impairment-based classification [tiab]) OR O'Sullivan classification [tiab]) OR OCS [tiab]) OR multidimensional pain inventory [tiab]) OR MPI classification [tiab])))) AND ((((((((((((((((((physical therapy modalities [mh:noexp]) OR exercise movement techniques [mh:noexp]) OR exercise therapy [mh:noexp]) OR muscle stretching exercises [mh]) OR plyometric exercise [mh]) OR resistance training [mh]) OR exercise [mh:noexp]) OR circuit-based exercise [mh]) OR cool-down exercise [mh]) OR physical conditioning, human [mh]) OR running [mh]) OR jogging [mh]) OR swimming [mh]) OR walking [mh]) OR warm-up exercise [mh])) OR ((((((((((((((((exercise* [tiab]) OR movement [tiab]) OR train* [tiab]) OR stabili* [tiab]) OR muscle stretching [tiab]) OR endurance test [tiab]) OR motor control [tiab]) OR plyometric [tiab]) OR physical conditioning [tiab]) OR running [tiab]) OR jogging [tiab]) OR swimming [tiab]) OR walking [tiab]) OR standard care [tiab]) OR usual care [tiab]) OR graded activity [tiab]) OR symptom-guided [tiab])) OR ((physical therap*[Text Word]) OR physiotherap*[Text Word])))) AND (((outcome assessment[mh:noexp] OR patient outcome assessment[mh] OR treatment outcome[mh:noexp] OR pain measurement[mh] OR quality of life[mh])) OR (outcome assessment[tiab] OR treatment outcome[tiab] OR pain[tiab] OR disability[tiab] OR global perceived effect [tiab] OR global impression of recovery[tiab] OR oswestry [tiab] OR ODI[tiab] OR roland morris[tiab] OR muscle strength[tiab] OR muscle endurance[tiab] OR activities of daily living[tiab] OR back performance scale[tiab] OR BPS [tiab] OR 5-minute walk distance test[tiab] OR numeric pain rating scale[tiab] OR NPRS[tiab] OR pain catastrophizing scale[tiab] OR PCS[tiab] OR start back screening tool[tiab] OR prone instability test[tiab] OR passive straight leg test [tiab] OR lumbar-spine flexion[tiab] OR patient specific functional scale[tiab] OR graded chronic pain scale[tiab] OR fear avoidance behavior questionnaire[tiab] OR short form 36 [tiab] OR functional performance[tiab] OR quality of life [tiab])))) AND ((((((((((randomized controlled trial[pt]) OR controlled clinical trial[pt]) OR randomized[tiab]) OR placebo [tiab]) OR drug therapy[sh]) OR randomly[tiab]) OR trial [tiab]) OR groups[tiab])) NOT (animals[mh] NOT humans [mh])))

Embase

(('low back pain'/exp OR 'backache'/de OR 'discogenic pain'/exp) OR ((low AND ('back'/exp OR back) AND pain:*ab*,ti) OR (low* AND ('back'/exp OR back) AND pain:*ab*,ti) OR (back AND pain:*ab*,ti) OR (backache:*ab*,ti) OR (discogenic AND back AND pain:*ab*,ti) OR (back AND (muscle NEAR/2 pain)))) AND (('classification'/de OR 'clinical classification'/exp OR 'mechanical diagnosis and therapy'/exp OR 'multidimensional pain inventory'/exp) OR ((classification:*ab*,ti) OR ('movement system impairment':*ab*,ti) OR ('subgroup specific pain':*ab*,ti) OR (mechanical NEXT/1 diagnosis NEXT/2 therapy) OR (mechanical NEXT/1 diagnosis NEXT/2 treatment) OR (multidimensional NEXT/1 pain NEXT/1 inventory) OR (pathoanatomic NEAR/2 classification) OR ((osullivan NEXT/2 classification):*ab*,ti) OR ((impairment NEXT/2 classification):*ab*,ti) OR (mpi NEXT/2 classification) OR ((subgroup NEXT/2 classification):*ab*,ti) OR ((classification NEXT/1

specific):*ab*,ti) OR ((therapy NEXT/2 classification):*ab*,ti) OR ((treatment NEXT/2 classification):*ab*,ti))) AND (('physiotherapy'/de OR 'home physiotherapy'/exp OR 'joint mobilization'/exp OR 'exercise'/exp OR 'muscle stretching'/exp OR 'physical activity/exp' OR 'usual care/exp') OR (((physical NEAR/1 therapy):*ab*,ti) OR (physiotherapy:*ab*,ti) OR (exercis*:*ab*,ti) OR ((muscle NEAR/2 stretch*):*ab*,ti) OR ((endurance NEAR/1 test):*ab*,ti) OR ((resistance NEXT/1 train*):*ab*,ti) OR ((motor NEXT/1 control*):*ab*,ti) OR (stabili*:*ab*,ti) OR ((graded NEAR/1 activity):*ab*,ti) OR ((symptom NEAR/1 guided):*ab*,ti) OR ((usual NEAR/1 care):*ab*,ti) OR ((standard NEAR/1 care):*ab*,ti))) AND (('treatment outcome'/exp OR 'pain measurement'/exp OR 'pain'/exp OR 'disability'/exp OR 'global perceived effect'/exp OR 'oswestry disability index'/exp OR 'roland morris disability questionnaire'/exp OR 'muscle strength'/exp OR 'daily life activity'/exp OR 'six minute walk test'/exp OR 'start back screening tool'/exp OR 'patient specific functional scale'/exp OR 'graded chronic pain scale'/exp OR 'short form 36'/exp OR 'functional performance'/exp) OR (((outcome NEAR/2 assess*):*ab*,ti) OR ((treatment NEXT/1 outcome*):*ab*,ti) OR ((pain NEAR/2 measure*):*ab*,ti) OR (disabilit*:*ab*,ti) OR ((global NEXT/1 perceived NEXT/1 effect):*ab*,ti) OR ((global NEXT/1 impression NEXT/2 recovery):*ab*,ti) OR (oswestry:*ab*,ti) OR ((roland NEXT/1 morris):*ab*,ti) OR ((muscle NEXT/1 strength):*ab*,ti) OR ((muscle NEXT/1 endurance):*ab*,ti) OR ((activities NEXT/2 living):*ab*,ti) OR ((back NEXT/2 scale):*ab*,ti) OR ((walk NEXT/1 distance NEXT/1 test):*ab*,ti) OR ((pain NEXT/2 scale):*ab*,ti) OR ((start NEXT/1 back NEXT/2 tool):*ab*,ti) OR ((prone NEXT/1 instability NEXT/1 test):*ab*,ti) OR ((passive NEXT/2 leg NEXT/1 test):*ab*,ti) OR ((lumbar NEXT/2 flexion):*ab*,ti) OR ((patient NEXT/2 functional NEXT/1 scale):*ab*,ti) OR ((graded NEXT/2 pain NEXT/1 scale):*ab*,ti) OR ((fear NEXT/1 avoidance NEXT/2 questionnaire):*ab*,ti) OR ((short NEXT/1 form NEXT/1 36):*ab*,ti) OR ((functional NEXT/1 performance):*ab*,ti))) AND ('clinical trial'/exp OR 'clinical trial'/de OR 'randomized controlled trial'/exp OR 'randomized controlled trial'/de OR 'randomization'/exp OR 'randomization'/de OR 'single blind procedure'/exp OR 'single blind procedure'/de OR 'double blind procedure'/exp OR 'double blind procedure'/de OR 'crossover procedure'/exp OR 'crossover procedure'/de OR 'placebo'/exp OR 'placebo'/de OR 'prospective study'/exp OR 'prospective study'/de OR ('randomi?ed controlled' NEXT/1 trial*) OR rct OR 'randomly allocated' OR 'allocated randomly' OR 'random allocation'/exp OR 'random allocation' OR (allocated NEAR/2 random) OR (single NEXT/1 blind*) OR (double NEXT/1 blind*) OR ((treble OR triple) NEAR/1 blind*) OR placebo*)

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(SU outcome assessment OR TI outcome assessment OR *AB* outcome assessment) OR (SU patient outcome assessment OR TI patient outcome assessment OR *AB* patient outcome assessment OR (SU patient reported outcome OR TI patient reported outcome OR *AB* patient reported outcome) OR (SU pain OR TI pain OR *AB* pain) OR (SU disability OR TI disability OR *AB* disability) OR (TI global perceived effect OR *AB* global perceived effect) OR (TI global impression of recovery OR *AB* global impression of recovery) OR (TI oswestry OR *AB* oswestry) OR (TI roland morris OR *AB* roland morris)OR (SU muscle strength OR TI muscle strength OR *AB* muscle strength) OR (TI muscle endurance OR *AB* muscle endurance) OR (SU activities of daily living OR TI activities of daily living OR *AB* activities of daily living) OR (TI back performance scale OR *AB* back performance scale) OR (TI walk distance test OR *AB* walk distance test) OR (TI numeric pain rating scale OR *AB* numeric pain rating scale) OR (TI start back screening tool OR *AB* start back screening tool) OR (TI lumbar flexion OR *AB* lumbar flexion) OR (TI patient specific functional scale OR *AB* patient specific functional scale) OR (TI graded chronic pain scale OR *AB* graded chronic pain scale) OR (TI short form 36 OR *AB* short form 36) OR (TI functional performance OR *AB* functional performance) OR (SU treatment outcome OR *AB* treatment outcome OR TI treatment outcome) AND (SU low* back pain OR TI low* back pain OR *AB* low* back pain) OR (SU back injur* OR TI back injur* OR *AB* back injur*) OR (SU back muscles OR TI back muscles OR *AB* back muscles) OR (SU spinal injuries OR TI spinal injur* OR *AB* spinal injur*) OR (SU lumbosacral region OR TI lumbosacral region OR *AB* lumbosacral region) OR (SU backache OR TI backache OR *AB* backache) OR (TI dorsalgia OR *AB* dorsalgia) OR (SU sciatica OR TI sciatica OR *AB* sciatica) OR (TI lumbar pain OR *AB* lumbar pain) OR (TI lumbago OR *AB* lumbago) OR (SU spinal disease* OR TI spinal disease* OR *AB* spinal disease*) OR (SU scoliosis OR TI scoliosis OR *AB* scoliosis) OR (SU lordosis OR TI lordosis OR *AB* lordosis) OR (SU spinal stenosis OR TI spinal stenosis OR *AB* spinal stenosis) OR (TI back pain OR *AB* back pain) OR (SU spondylitis OR TI spondylitis OR *AB* spondylitis) OR (SU spondylolysis OR TI spondylolysis OR *AB* spondylolysis) OR (SU spondylolisthesis OR TI spondylolisthesis OR *AB* spondylolisthesis) AND (SU classification OR TI classification OR *AB* classification) OR (TI movement based N2 classification OR *AB* movement based N2 classification) OR (TI subgroup specific pain OR *AB* subgroup specific pain) OR (TI mechanical diagnosis and (treatment OR therapy) OR *AB* mechanical diagnosis and (treatment OR therapy)) OR (TI treatment based classification OR *AB* treatment based classification) OR (TI pathoanatomic based classification OR *AB* pathoanatomic based classification) OR (TI movement system impairment OR *AB* movement system impairment) OR (TI impairment based classification OR *AB* impairment based classification) OR (TI o'sullivan classification OR *AB* o'sullivan classification) OR (TI multidimensional pain inventory OR *AB* multidimensional pain inventory) AND (SU physical therap* OR TI physical therap* OR *AB* physical therap*) OR (SU physiotherap* OR TI physiotherap* OR *AB* physiotherap*) OR (SU kinesiotherap* OR TI kinesiotherap* OR *AB* kinesiotherap*) OR (SU joint mobilization OR TI joint mobilization OR *AB* joint mobilization) OR (SU exercis* OR TI exercis* OR *AB* exercis*) OR (SU resistance train* OR TI resistance train* OR *AB* resistance train*) OR (SU physical conditioning OR TI physical conditioning OR *AB* physical conditioning) OR (SU running OR TI running OR *AB* running) OR (SU jogging OR TI jogging OR *AB* jogging) OR (SU swimming OR TI swimming OR *AB* swimming) OR (SU walking OR TI walking OR *AB* walking) OR (SU physical activit* OR TI physical activit* OR *AB* physical activit*) OR (TI mobilization OR *AB* mobilization) OR (TI motor train* OR *AB* motor train*) OR (TI stabilization OR *AB* stabilization) OR (TI stretching OR *AB* stretching) OR (TI endurance train* OR *AB* endurance train*) OR (TI physical fitness OR *AB* physical fitness) OR (TI strengthen* OR *AB* strengthen*) OR (TI usual care OR *AB* usual care) OR (TI standard care OR *AB* standard care) OR (TI graded activity OR *AB* graded activity) OR (TI symptom guided OR *AB* symptom guided)

Clinical Trials.gov

Condition or disease: low back pain

Other terms: classification
Study type: Intervention Studies

WHO International Trials Registry Platform

Condition: low back pain
Intervention: classification
Recruitment status: all