

# Physical Therapy and Manual Physical Therapy for Patients with Non-Specific Low-Back Pain: Differences in Patient Characteristics with Implications for Diagnostic Classification

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**Abstract:** A previous study compared socio-demographic characteristics, health problem characteristics, and primary process data between a database sample of patients referred to physical therapy (PT) versus a sample of patients referred for specific manual physical therapy (MPT) diagnosis and management. This study did not differentiate between patients based on affected body region or diagnosis. The present study is a secondary analysis of these data for patients with non-specific low-back pain (LBP). Statistical analysis indicated that the MPT patient sample was significantly ( $P < 0.01$ ) different from the PT database sample with regard to socio-demographic data: The MPT patients were more often male, younger, had attained a higher level of post-secondary education, and were more often gainfully employed. The MPT sample was also significantly ( $P < 0.01$ ) different from the PT sample with regard to health problem characteristics indicating more often acute, recurrent, non-surgical LBP of shorter duration and unknown etiology in the MPT sample. Both samples were also significantly different with regard to the most common impairments, limitations in activities, and restrictions in participation. After correction for socio-demographic differences, both samples remained significantly different for pathology, recurrence, and mechanism of injury. Diagnosis and management with MPT resulted in a significantly better outcome at discharge than PT as determined by the therapist based on patient verbal report ( $P = 0.0000$ ); however, data on recurrence and the unclear influence of socio-demographic data as well as the absence of more reliable, valid, and responsive outcome measures render these outcome data somewhat equivocal. Interpretation of these data with regard to their potential use in diagnostic classification of patients with non-specific LBP is discussed.

**Key Words:** Manual Physical Therapy, Physical Therapy, Non-Specific Low Back Pain, Patient Characteristics, Diagnostic Classification

In the Netherlands as in other parts of the world, non-specific low-back pain (LBP) is a health problem responsible for high health care and wage substitution costs<sup>1</sup>. Physical therapy (PT) ranks among the more prominent interventions used for this patient group.

In an earlier article<sup>2</sup>, we discussed how manual therapy interventions have been an inextricable part of PT practice since the very beginning of the profession, and we explained their justifiable continued inclusion in the PT scope of practice. Internationally, manual physical therapy (MPT) is integrated firmly within the profession as a whole and, for example, in the United States, entry-level education has over the years placed an increasing emphasis on MPT curricular content including thrust techniques<sup>3-6</sup>.

In the Netherlands, physical therapists use thrust and non-thrust manual interventions at a high frequency in clinical practice<sup>7</sup>. However, the MPT education and

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reimbursement situation is unique as compared to other countries: in the Netherlands, entry-level PT education deals almost entirely with non-thrust manual techniques and MPT is considered a clinical specialization within PT. To become a registered manual therapist, one has to successfully complete one of five available post-graduate diploma or professional Master's degree programs conforming to IFOMT standards<sup>8</sup>. Registered manual therapists then enter into capitated care contracts with insurance providers separate from and at a higher reimbursement rate than non-registered colleagues. This unique position for MPT in the Netherlands has led to separate professional profiles defining a distinct PT and MPT scope of practice<sup>9-10</sup> and even separate clinical practice guidelines for PT and MPT diagnosis and management of patients with non-specific LBP<sup>11-15</sup>.

With regard to the management of patients with LBP, it has been argued that absence of patient classification other than an all-encompassing category of non-specific LBP results in heterogenous populations that preclude the therapist picking up on a real and present effect when studying specific therapeutic interventions<sup>16</sup>. The identification of diagnostic subgroups using a treatment-based diagnostic classification model has the potential for greater treatment efficacy. Recent research has resulted in clinical prediction rules predicting the likelihood of a positive outcome with thrust manipulation and stabilization for specific subgroups of patients with non-specific LBP<sup>17-20</sup>. One could argue as to whether the sharp delineation between PT and MPT as exists in the Netherlands is a natural or desirable situation. However, it does provide us with a unique avenue to study socio-demographic and health problem characteristics that may serve as predictive variables that may prove helpful in the identification of diagnostic subgroups from the larger population of patients with non-specific LBP.

In our attempt to identify a subgroup of patients with non-specific LBP who might benefit more from a MPT than

a PT referral, we collected data on socio-demographic, health problem, and primary process characteristics for 1,198 MPT-patients<sup>2</sup>. This article discusses the secondary analysis of these data collected for a subgroup of 381 patients with non-specific LBP (32% of the total population of 1,198) referred to MPT. This secondary analysis means to answer the following questions:

1. What is the distribution of patients referred to MPT for LBP with regard to socio-demographic characteristics, health problem characteristics, and primary process data?
2. Is there a difference in socio-demographic characteristics between patients with LBP referred to MPT versus PT?
3. If so, is the distribution of patients referred to MPT versus PT different with regard to health problem characteristics after correction for the differences in socio-demographic characteristics?
4. Can the data collected be used in the identification of a diagnostic subgroup of patients with non-specific LBP that may benefit more from specific MPT diagnosis and management?

## Methods and Materials

### *Data Collection Form*

The data collection form used consisted of mainly closed-ended questions for collection of data on socio-demographic (age, gender, education, and occupation/activities) and health problem characteristics using ICF (International Classification of Functioning, Disability, and Health) terminology (i.e., mechanism of injury, cause of injury, duration, recurrence, pathology, structure and function, activities, and participation). Table 1 provides definitions of relevant ICF terminology<sup>21</sup>. We also collected primary process data. The primary process refers to the sequential process of examination, evaluation, diagnosis,

Table 1: Relevant ICF Terminology (WHO 2001)

Dimensions of health state	Definitions
Impairment	Any loss or abnormality of body structure or of a physiological or psychological function.
Activity	The nature and extent of functioning at the level of the person. Activities may be limited in nature, duration, or quality.
Participation	The nature and extent of a person's involvement in life situations in relation to impairments, activities, health conditions, and contextual factors. Participation may be restricted in nature, duration, or quality.

treatment planning, and intervention as occurs in PT clinical practice. The primary process data included treatment goals, number of treatment sessions, interventions, and reasons for discharge. Heerkens et al<sup>22</sup> provided the definitions used for the MPT interventions. The data collection form used and the data collected were similar to the PT data collection forms used in an earlier study<sup>23</sup>, therefore allowing for comparison between studies on socio-demographic and health problem characteristics of the PT and MPT samples. A similar data collection form used in a study on the PT diagnostic consult previously demonstrated good reliability<sup>24</sup>.

### ***Therapist Selection***

The roster of the Dutch Society for Manual Therapy was used to select the manual physical therapists involved in data collection. Initially, two geographical regions with a balanced distribution of larger and smaller communities within the same region were selected, and study duration was set at three months. A lower than expected number of data collection forms returned at an intermediate count prompted us to increase the study duration to five months, add two additional regions, and increase the number of participating therapists in the two original regions. We provided educational sessions for the participating therapists to address the goal of this study and to provide information on the data collection form and its manual, the ICF terminology, and study logistics. More specific information on therapist selection can be found in the earlier article<sup>2</sup>.

### ***Patient Population***

Because we intended data to be representative of MPT daily clinical practice, we used no selection criteria for patient inclusion. Patients were informed regarding study goals and were asked to sign an informed consent. The therapists were requested to ask the first two new patients of each week to participate to prevent selection bias on the part of the therapist. Our initial study<sup>2</sup> produced data on 1,198 patients referred to MT. Original data collection occurred in 2001.

For the secondary analysis reported here, we used the 4-digit coding system required for reimbursement purposes by the Association of Dutch Health Insurance Companies. We used the 2-digit localization code to select patients with complaints in the thoraco-lumbar, lumbar, sacral, or sacroiliac regions. In our sample of 1,198 MT patients, 973 had a complaint localized in the spine (81%). We used the 2-digit pathology code of the coding system to exclude patients with specific causes for their LBP, e.g., lumbosacral radicular syndrome, lumbar stenosis. Therefore, this secondary analysis only dealt with patients with non-specific LBP, which in this study was operationally defined as LBP without a specific etiologic or structure-based medical diagnosis. Our patient sample for this analysis (MPT-LBP) consisted of 381 of the 973

patients (40%), all with non-specific LBP.

As a comparison for socio-demographic and health problem characteristics, we used a sample of 301 patients to PT referred for LBP (PT-LBP). Data on this sample were collected in 1998 as part of a study comparing two different reimbursement models, one used nationally and one used in Amsterdam<sup>23</sup>. Data collected were similar for both samples. Where possible and methodologically sound, we compared data from both samples.

### ***Statistical Analysis***

Fully completed data collection forms were analyzed with SPSS for Windows 6.1.3 software (SPSS Inc., Chicago, IL, USA). Frequency distribution tables described the patient samples with regards to relevant socio-demographic and health problem characteristics. Non-parametric tests, i.e., chi-square, Fisher exact, and Mann-Whitney tests (all with a significance level set at  $\alpha=0.05$ ), were used for statistical analyses. We used a factorial analysis of variance (ANOVA) to correct for effects based on socio-demographic differences.

## **Results**

### ***Patient Population***

The MPT-LBP sample (n=381) made up 32% of the total sample of 1,198 MPT-patients; the PT-LBP sample (n=301) accounted for 13% of 2,234 patients referred for PT.

### ***Socio-Demographic Characteristics***

Table 2 provides the socio-demographic characteristics (age, gender, education, and daily activities/occupation) of both patient samples. The MPT-LBP sample was characterized by age (mainly 35-44 years old; mean 40.7; SD 12.8; median 40); their level of education (associate's, undergraduate, and graduate level); and by being gainfully employed. In the MPT-LBP sample, significantly more patients were male, younger, had attained a higher level of education, and were more often gainfully employed than patients in the PT-LBP sample ( $P<0.01$ ). Patients in the PT-LBP sample more often were over 55, with a lower educational level, and not gainfully employed.

### ***Characteristics of the Health Problem LBP***

Table 3 describes the health problem LBP in terms of mechanism and cause of injury, duration, and recurrence. In the MPT-LBP sample, LBP more often occurred acutely and was less often the result of an exacerbation of congenital or pre-existing problems than in the PT-LBP sample ( $P<0.01$ ). Recurrence was more common in the MPT-LBP sample than in the PT-LBP sample ( $P<0.01$ ), and the duration of LBP since occurrence was shorter ( $P<0.01$ ). Referral to the manual physical therapist was within a week of occurrence in 56 patients (15%); 106

Table 2: Socio-demographic characteristics MPT-LBP and PT-LBP samples

Personal Data	MPT-LBP (n=381)	PT-LBP (n=301)
	%	%
<b>Gender</b>		
Male	50.4	38.2
Female	49.1	61.8
Data not entered/unknown	0.5	
<b>Age category (in years)</b>		
0-14	0.8	0
15-24	8.4	3.7
25-34	23.9	24.3
35-44	30.4	19.9
45-54	21.0	20.3
55-64	9.7	14.3
Over 65	4.5	17.6
Data not entered/unknown	1.3	0
<b>Education</b>		
None/special education/primary education	4.7	18.3
4-year secondary education	28.9	33.2
5- to 6-year secondary education	13.4	14.0
Associate level	26.0	16.9
Undergraduate/graduate level	23.6	13.0
Data not entered/unknown	3.4	4.7
<b>Daily activities (multiple answers allowed)</b>		
Student	4.7	3.0
Homemaker	27.3	38.5
Gainfully employed	73.5	53.2
Unemployed	16.5	44.2
Other	2.1	2.0

(28%) were referred within a week to a month.

Table 4 provides the distribution of main pathology codes for both samples. Patients in the MPT-LBP sample more often had LBP of unknown etiology and related to non-surgical orthopedic dysfunction ( $P<0.01$ ). Patients in the PT-LBP sample more often were categorized as overuse/degeneration ( $P<0.01$ ).

Tables 5 to 7 contain the impairments in structure and function, limitations in activities, and restrictions in participation for both samples. Some impairments--most commonly related to joint mobility, joint stability, body posture, resting muscle tone, muscle strength, and pain--occurred in both samples resulting in overlap.

There was a significant between-group difference with regards to the five most common impairments ( $P<0.01$ ) with reduced joint motion more frequent in the MPT-LBP sample and decreased muscle strength more frequent in the PT-LBP sample. Limitations in specific activities related to work and training were common in the MPT-LBP sample and limitations in walking and negotiating stairs in the PT-LBP sample. The between-group difference was significant ( $P<0.01$ ) for the five most common limitations in activities in both samples (limitations in work posture, carrying, and lifting; squatting, kneeling, and bending; leisure time activities; transfers, rolling, rising, and sitting down; specific activities related to work

Table 3: Health problem characteristics MPT-LBP and PT-LBP samples

Health problem	MPT-LBP (n=381)	PT-LBP (n=301)
	%	%
<b>Mechanism of injury</b>		
Acute/traumatic	10.8	8.0
Acute/non-traumatic	28.3	26.6
Non-acute/gradual	52.5	52.2
Exacerbation congenital or pre-existing problem	13.9	11.3
Other	1.8	2.0
Data not entered/unknown	2.7	0
<b>Cause of injury</b>		
Work-related	32.3	26.9
In and around the house	7.6	14.3
Sports/hobby	13.4	10.0
Transportation	1.3	3.0
Other	14.2	15.6
Data not entered/unknown	31.2	30.2
<b>Duration</b>		
0-7 days	14.7	8.0
1 week to 1 month	27.8	29.6
1 to 3 months	22.8	19.3
3 to 6 months	8.7	9.3
6 months to 1 year	5.8	6.6
More than 1 year	20.2	26.7
Data not entered/unknown	0	0.3
<b>Recurrence</b>		
Yes	43.8	26.2
No	55.9	73.1
Data not entered/unknown	10.3	0.7

and training; and walking and negotiating stairs). Both samples were also significantly different with regards to the three most common restrictions in participation ( $P=0.03$ ). The MPT-LBP sample more often had problems with participation in occupation, activities, and education and with participation in sports, hobby, and leisure time activities than did the PT-LBP sample.

### Relation Between Variables

Our initial analysis of socio-demographic and health problem characteristics showed several significant between-group differences as discussed above. We used a factorial ANOVA to determine if the between-group differences in characteristics of the health problem LBP were the result of said socio-demographic differences between the two samples. Both samples proved to be still significantly ( $P<0.01$ ) different with regards to pathology, recurrence, and mechanism of injury after correction for age, gender, education, and gainful employment status. The difference in duration of complaints was no longer

significant after correction for these socio-demographic differences.

### Primary Process Data

At the impairment level, the five most common MPT treatment goals were (as indicated on the percentage of data collection forms):

1. Increasing joint mobility (93%)
2. Decreasing pain (53%)
3. Improving resting muscle tone (30%)
4. Improving joint stability (30%)
5. Improving body posture (30%)

At the level of limitations in activities and restrictions in participation, the most prevalent treatment goals were:

1. Improving skills (46%)
2. Teaching the patient to self-manage the health problem (31%)
3. Improving participation (28%)

**Table 4:** Distribution percentages main category “pathology” (coding system Association of Dutch Health Insurance Companies) MPT-LBP and PT-LBP samples

	MPT-LBP (n=381) %	PT-LBP (n=301) %
<b>Main category of pathology</b>		
Musculoskeletal surgery	0	0
Non-surgical orthopaedic dysfunction	10.8	6.3
Overuse/degeneration/dystrophy	48.0	61.5
Traumatic dysfunction	6.8	4.3
Cardiovascular or lymphatic disease	0	0
Pulmonary disease	0	0
Other internal disease	0	0.3
Neurological dysfunction	0	0
Symptomatology/psychosomatic/urologic/gynecologic	34.4	27.6
Rheumatic disease	0	0

**Table 5:** Impairments present in MPT-LBP and PT-LBP samples

MPT evaluation	MPT-LBP (n=381) %	PT-LBP (n=301) %
<b>Impairment of structure</b>		
Lesion	44.1	-
Structural abnormality	14.7	-
<b>Impairment of function</b>		
Mobility/glide bone	21.0	-
Joint mobility	94.2	62.5
Joint range of motion	79.5	-
Manual endfeel	71.4	-
Joint position	23.4	12.0
Joint stability	27.3	24.3
Movement pattern bone/joint	30.7	-
Body posture	28.6	43.5
Pain	90.8	97.7
Sensation and proprioception	11.0	6.0
Neurologic impairment	9.7	-
Muscle strength	17.8	28.9
Muscle length	17.8	22.6
Resting muscle tone	41.2	72.1
Mental/psychological impairment	5.2	23.3
Hearing and balance	0.3	-
Dizziness	0.3	-
Vascular system	0	3.3
Other	2.1	-

Table 6: Limitations in activities in MPT-LBP and PT-LBP samples

MPT evaluation	MPT-LBP (n=381) %	PT-LBP (n=301) %
<b>Limitation in activities</b>		
Dressing, grooming, toileting, eating	26.8	16.9
Squatting, kneeling, bending, etc.	60.1	62.5
Reaching, gripping, manipulating, manual dexterity, etc.	14.2	7.0
Transfers, rolling, rising and sitting down	47.0	41.5
Walking, negotiating stairs	32.0	43.9
Work posture, carrying, lifting (work/house work)	73.2	68.1
Doing dishes, cleaning, cooking (household activities)	27.3	24.6
Leisure time activities (sports/hobby)	47.5	27.2
Specific activities related to work/training	43.0	25.6
Instrumental ADL	1.8	0.3
Use of coping strategies	10.2	23.6
Use of compensation strategies	14.2	13.0
Other activities	7.9	5.0

Table 7: Restrictions in participation in MPT-LBP and PT-LBP samples

MPT evaluation	MPT-LBP (n=381) %	PT-LBP (n=301) %
<b>Restrictions in participation</b>		
Participation in household	29.4	28.6
Participation in occupation/activities/education	50.9	37.2
Participation in sports/hobby/leisure time activities	44.4	25.6
General independence	7.6	8.0
Other	2.4	-

Table 8: Nature of the manual therapy intervention in MPT-LBP sample (n=381)

MPT intervention	%
<b>Producing</b>	
Traction motion	36.0
Compression motion	4.2
Glide motion	42.0
Traction-glide motion	32.0
Compression-glide motion	5.0
Joint motion with traction	53.0
Joint motion without traction	24.4

Table 8 contains an overview of the MPT interventions used; producing joint motion with concurrent traction (53%) and producing glides (42%) were the most commonly used interventions.

The mean number of sessions per patient for the MPT-LBP sample was 5.5 (SD 2.9; median 5; range 1-18). This included sessions consisting of only MPT and of sessions combining specific MPT interventions and PT. The mean number of sessions in the PT-LBP sample was 14.2 (SD 13.6; median 11; range 1-164). In 12% of the patients in the MPT-LBP sample, the therapist recommended continued PT with goals at the impairment level in 61%, at the level of limitations in activities in 59%, and at the level of restrictions in participation in 46% of these patients.

In 83% of patients in the MPT-LBP sample, a “favorable result” (as determined by the therapist based on patient verbal report) was the reason for discharge. Insufficient results to justify continued treatment were the reason in 7%. In the PT-LBP sample, these percentages were 68% and 6%, respectively. Chi-square analysis indicated that the number of patients with a favorable result was significantly higher in the MT-LBP sample as compared to the PT-LBP sample (P=0.0000).

## Discussion

This study provides us with varied information. First, it provides us, by way of the collected primary process data, with insight into the clinical practice patterns with regard to management of patients with non-specific LBP by physical therapists with a post-graduate specialization in MPT. Considering the emphasis placed on joint function in the MPT educational programs, the reported frequency of treatment goals selected in the MPT-LBP sample is somewhat obvious with increasing joint mobility as the most common treatment goal (93%). Treatment goals at the level of activities and participation were mentioned albeit with a lower frequency. The data collected for the MPT-LBP sample show that the therapists placed a diagnostic emphasis on pain and impairments in functions of the spine and pelvic region including adjacent joints. It is well known that LBP correlates poorly with impairments in lumbopelvic tissue structure and disabilities<sup>25</sup>. In recent years, personal psychological factors have received increasing attention in the diagnosis and management of patients with benign LBP<sup>26</sup>, and PT management of this patient group has expanded to include attempting to influence personal factors, such as pain-related fear for (re)-injury, fear avoidance behavior, passive coping, and catastrophizing thoughts and feelings. This study revealed that therapists set treatment goals both at the level of impairments in function and at the level of personal and environmental factors, indicating that therapists are looking to achieve a balance between biological and psychosocial aspects of the health problem LBP.

Second, the study also provides us with information about GP referral behavior in the Netherlands. The high percentage of patients in the MPT-LBP sample referred by their GP within one month of occurrence (43%) was somewhat remarkable, especially because it is in direct contradiction with the Dutch Association of General Practitioners Clinical Practice Guideline on LBP<sup>27</sup>. This guideline noted MPT as a possible intervention in patients with LBP of >6 weeks duration. GP referral behavior seemed in line with more recent evidence on the efficacy of spinal MPT in patients with acute non-specific LBP<sup>28,29</sup>.

Third, this study provided us with, albeit equivocal, data on treatment efficacy for PT versus MPT for this patient group. The mean number of sessions in the MPT-LBP sample was 5.5 (SD 2,9), while the mean number of sessions in the PT-LBP sample was 14.2 (SD 13,6). Similar to the findings in the primary analysis<sup>2</sup>, this again seemed to indicate a lesser number of MPT versus PT sessions, in this case for patients with non-specific LBP. In these patients with non-specific LBP, a significantly greater percentage (83%) achieved a favorable result with MPT intervention than with PT treatment (68%). However, there was a greater frequency of recurrent complaints in the MPT-LBP sample, which might imply premature

discharge from MPT, too little time spent on practicing activities and on increasing the load-bearing ability of the regional tissues. It is unclear which role the predominantly younger age, higher educational level, and male gender in the MPT-LBP sample may have had on the number of sessions or the higher recurrence rate. In summary, although the mean number of sessions was lower for patients in the MPT-LBP than in the PT-LBP groups, overall data with regard to outcome are equivocal and do not allow us to make any conclusions with regard to the superior efficacy of PT or MPT. We suggest that future studies collect outcome data with regard to patient functional outcome and health care and other costs using reliable, valid, and responsive outcome measures.

Fourth and most relevant to the initial study question with regard to identifying a subgroup with non-specific LBP that might benefit more from MPT diagnosis and management, this study provided preliminary data on significant differences between the two groups. For this secondary analysis, we used a patient population with a medical referral diagnosis of non-specific LBP. We discussed the limitations of this all-encompassing diagnosis and the potential benefits of a treatment-based classification system for identification of diagnostic subgroups. The current study is unique in that it researched and compared socio-demographic characteristics, health problem characteristics, and primary process data for patients with non-specific LBP referred for PT or for specific MPT diagnosis and management. The intent was to study whether such data might help identify patients with non-specific LBP that can benefit more from specific MPT diagnosis and management, i.e., to establish preliminary evidence that certain socio-demographic and health problem characteristics can be used for a treatment-based classification of patients with non-specific LBP. Of course, the unspoken assumption is that either the GP when determining the need for referral to PT or MPT or the patient with a request to the GP for a specific referral perhaps has some implicit knowledge that will help the therapist with said diagnostic classification. A review of the literature produced no comparable studies, and an international frame of reference for this study, therefore, is missing.

Both samples of patients with LBP were significantly different on most socio-demographic and health problem characteristics studied. However, these socio-demographic differences might have resulted from the PT-LBP sample being part of a larger sample of patients from Amsterdam and vicinity covered by the Dutch national health insurance plan whereas patients in the MPT-LBP sample were a more homogenous sample in that they may have been covered by private insurances tied in to higher yearly incomes with associated socio-demographic implications. After correction for socio-demographic characteristics (age, gender, education, and gainful employment status),

both samples continued to be significantly different with regards to pathology code, recurrence, and mechanism of injury. Limitations in specific activities related to work and training were common in the MPT-LBP sample and limitations in walking and negotiating stairs in the PT-LBP sample. The MPT-LBP sample more often had problems with participation in occupation, activities, and education and with participation in sports, hobby, and leisure time activities than did the PT-LBP sample.

With regard to a potential role for socio-demographic and health problem characteristics in the diagnostic classification of patients with non-specific LBP, it would seem relevant that some differences in characteristics of the health problem LBP persisted after correction for the observed differences in socio-demographic characteristics; for example, patients in the MPT-LBP group were significantly different from patients in the PT-LBP group in that their LBP was more often recurrent, acute, of unknown etiology and related to non-surgical orthopedic dysfunction, and not the result of an exacerbation of congenital or pre-existing problems. Patients in the MPT-LBP group were also characterized by limitations related to work and training and participation problems related to occupation, activities, and education and sports, hobby, and leisure time activities. This study provides preliminary evidence that these health problem characteristics might be useful in the identification of a subgroup of patients with non-specific LBP that may benefit from MPT diagnosis and management. We suggest that these health problem characteristics should be considered as potential factors in the development of future clinical prediction rules for the management of patients with non-specific LBP.

We acknowledge that this study has limitations. As discussed above outcome data collected were equivocal and did not allow us to confidently document a superior outcome for MPT. A more unequivocal documented superior outcome with MPT could have more strongly indicated potential predictive validity for a good outcome with MPT diagnosis and management for patients with LBP with the health problem characteristics noted above.

In this study and in the primary analysis<sup>2</sup>, we used a factorial ANOVA to correct for effects based on socio-demographic differences. We acknowledge that for the secondary analysis discussed here, which in essence was a retrospective observational study, due to the great number of covariates a propensity analysis might have been a better way to ensure that the members of both samples were equal to the greatest possible extent on relevant socio-demographic and other collected variables<sup>30,31</sup>. However, at the time of analysis, we were not aware of this statistical method. Also, using a propensity analysis would likely have further decreased the already limited number of subjects in both groups, thereby not allowing for any conclusions.

Another limitation of this study related to sample

size concerns limited power. For the primary analysis<sup>2</sup>, we performed a power analysis to determine the minimum number of data collection forms needed to show significant differences between the PMT and PT samples studied with a significance level set at  $\alpha=0.01$ . We determined that 1,200 data collections forms were needed. The primary analysis satisfied this criterion with 1,198 forms but obviously this secondary analysis did not thereby increasing the chance of a type II error.

We acknowledge that this study has further limitations as discussed in the article with the primary analysis<sup>2</sup>. These limitations are related to patient influx and external validity, selection and participation of therapists, and the data collection form used. More specifically, the earlier article discussed potential patient selection bias, possible insufficient representation of daily MT clinical practice, a lack of data on reliability and validity of PT/MPT diagnosis according to the ICF model, and the absence of clearly defined boundaries between PT and MPT.

## Conclusion

This study provided information on clinical practice patterns of physical therapists specializing in MPT with regard to the management of patients with non-specific LBP. It also provided information on GP referral behavior in the Netherlands, as well as outcome data comparing PT versus MPT management of this patient population. Perhaps most importantly, this study provided preliminary data that certain health problem characteristics in patients with non-specific LBP might hold prognostic value with regard to a favorable outcome with specific MPT diagnosis and management. These characteristics included LBP that is:

- Recurrent
  - Acute
  - Of unknown etiology and related to non-surgical orthopedic dysfunction
  - Not the result of an exacerbation of congenital or pre-existing problems
- This LBP leads to:
- Limitations related to work and training
  - Participation problems related to occupation, activities, and education and sports, hobby, and leisure time activities.

However, the lack of unequivocal outcome data has the obvious potential of invalidating this assumption. We suggest that the health problem characteristics identified be considered as factors in the development of future clinical prediction rules for the management of patients with non-specific LBP.

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