Prognosis of chronic low back pain in patients presenting to a private community-based group exercise program

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Abstract

Purpose To examine the prognosis and prognostic factors for patients with chronic low back pain presenting to a private, community-based, group exercise program.

Methods A total of 118 consecutive patients with chronic LBP were recruited. Baseline assessments included socio-demographic characteristics, back pain history and clinical examination findings. Primary outcome measures were pain intensity and disability at 3, 6 and 12 months. Potential prognostic factors to predict pain intensity and disability at 12 months were assessed using a multivariate regression model.

Results 112 (95 %) participants were followed up at 12 months. The majority of participants were female (73 %), had high educational levels (82 %) and resided in suburbs with a high socio-economic status (99 %). Pain

intensity improved markedly during the first 6 months (35 %) with further minimal reductions up to 12 months (39 %). Interestingly, disability improved to a greater degree than pain (48 % improvement at 6 months) and continued to improve throughout the 12 months (60 %). Baseline pain intensity accounted for 10 % of the variance in the 1 year pain outcomes. Duration of current episode, baseline disability and educational level accounted for 15 % of the variation in disability at 12 months.

Conclusions During a period of 12 months, patients with chronic LBP presenting to a private, community-based, group exercise program improved markedly, with greater improvements in disability than pain. The predictors investigated accounted for only 10 and 15 % of pain and disability outcomes, respectively.

Keywords Chronic low back pain · Prognosis · Disability · Outcomes

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Introduction

Clinical guidelines report the prognosis of chronic back pain to be poor [1]. A recent systematic review of the course of acute and chronic LBP [2] found moderate within-study and between-study variability in both pain and disability outcomes. This strongly suggests that while the average prognosis may be poor this is not the case for a substantial proportion of people. The moderate levels of between-study variability suggest that factors related to study design, setting and participants may significantly impact on the reported prognoses.

Previous studies have identified factors associated with prognosis in chronic LBP [3–6]; however, the lack of quality studies means prognostic factors for chronic LBP

remain unclear [7]. A large Australian cohort study [8] found previous sick leave due to LBP, high disability levels or high pain intensity at onset of chronicity, low levels of education, greater perceived risk of persistent pain, and being born outside Australia (immigrants) were associated with delayed recovery. Patients presenting for care in settings where these adverse prognostic factors are uncommon may have a more favorable prognosis than widely reported. Until now no study has investigated the prognosis of people with chronic low back pain attending a private, community-based, group exercise program.

It is reasonable to expect that evidence-based treatments which are endorsed in clinical guidelines will impact on the prognosis reported and may be an important source of the between-study variability [2]. The European guideline for the management of chronic non-specific LBP recommends supervised exercise therapy as a first-line treatment in the management of chronic LBP. Furthermore, group exercise and the use of cognitive behavioral therapy are also recommended [1]. Community-based group exercise programs based on guideline recommendations for chronic LBP have become increasingly common in the management of chronic LBP. Many of these programs are private, and given the requirement that patients must pay for the service, attract patients without work related injuries with higher average socioeconomic status and level of education. However, the prognosis of this particular group of private paying patients presenting to individualized group exercise classes is not well reported in the literature.

In assessing the prognosis of chronic LBP it is important to consider at a minimum both pain and disability outcomes. A recent review found greater changes in pain than disability but lower absolute scores for disability than pain at 1 year, as the baseline pain levels were higher than disability [2]. A better understanding of the relative prognosis in terms of pain and disability for people paying for and receiving high quality group exercise programs is important. Therefore, the aim of the present study was to examine the prognosis and prognostic factors for private paying patients with chronic LBP who presented to a private, community-based, group exercise program.

Materials and methods

We conducted a prospective study of participants with chronic LBP presenting to a private, community-based, group exercise program.

Setting and participants

Consecutive patients with LBP who presented to a private, community-based, group exercise program were invited to

participate if they met all the following inclusion criteria; (1) chronic non-specific LBP (symptoms greater than 3 months duration, according to the classification proposed by de Vet et al. [4]) with or without leg pain (2) pain on a numerical pain rating scale equal or greater than two out of ten (3) adequate English communication for all data to be recorded and (4) baseline assessment performed less than 4 weeks prior to exercise classes starting. Exclusion criteria were (1) LBP that was not attributable to a recognizable, known specific pathology (e.g., infection, tumor, fracture, inflammatory disorder, cauda equina, radicular syndrome) [1], or (2) nerve root compromise (with at least two of the following signs: myotomal weakness, dermatomal sensory loss or hyporeflexia of the lower limb) or (3) currently pregnant. The University of Sydney's Human Research Ethics Committee approved the study.

Baseline data collection

Baseline data were collected by a physiotherapist as part of the standard 90-min assessment for all patients prior to starting the group exercise program. Data collected included demographic information, baseline measures of outcomes and potential prognostic factors.

Group exercise program

All participants were enrolled in a group exercise program, at one of two private clinics in Sydney. The program involved a strong educational component combined with physical retraining. Patients paid up front for a 10 week foundation program. Patients with private health insurance (87 %) were able to claim up to 50 % of the total cost of the classes from their insurer. The foundation program focuses on movement and posture re-education, combined with very specific pain behavior education, Acceptance and Commitment Therapy principles (focusing on awareness, acceptance, defusing of negative thoughts) [9] and CBT specifically in the area of decreasing catastrophizing. Educational and physical elements of the program focused on practicing activities of daily living, in particular sitting, standing, walking and bending. These were performed in front of large mirrors which gave patients maximum visual feedback about their physical movement patterns compared to an idealized goal (e.g., using neutral spine and hip and knee flexion for bending). The environment was light, non-threatening, interactive and involved music as well as education. Participants were also given a book of exercises and educational materials related to back pain and posture [10, 11]. At the end of the 10-week program, some participants enrolled in more advanced classes while other participants ceased participation in the group exercise classes. Advanced classes focused on physical aspects such

as developing lumbo-pelvic stability, endurance with gluteal strength, and incorporating upper body strengthening in functional positions. Whether participants continued in classes was recorded, but did not impact on their involvement in the study.

Outcome variables

Outcome measures were assessed at baseline, 3, 6 and 12 months. Follow-up measures were collected when patients attended the exercise classes. Participants who did not attend the classes during the week their follow-up assessment was due, were contacted by telephone and a telephone interview was conducted by a trained researcher.

Primary outcomes

The primary outcomes were average pain over the past week measured using the numerical pain rating scale [12] scored from 0 (no pain) to 10 (worst pain possible) and disability, measured using the Roland Morris Disability Questionnaire [13], scored from 0 to 24, with higher scores indicating worse disability status. Pain was assessed as both change in pain and also the proportion of patients who fully recovered from pain (score 0 or 1 for 1 month at time of assessment).

Secondary outcomes

Secondary outcomes were global impression of recovery (Global Perceived Effect Scale) [12, 14], bothersomeness of pain (Bothersome of Pain Scale) [15], function (Patient-specific Functional Scale) [16] and kinesiophobia (TAMPA Scale for Kinesiophobia) [17].

Prognostic factors

A limited number of baseline prognostic factors were investigated. We limited the number of prognostic factors to one per ten patients [18]. The prognostic factors were measures of pain intensity, previous episodes of LBP, duration of current episode, disability, global perceived effect of improvement, function, kinesiophobia, educational level, location of pain (absence of pain below the knee), catastrophizing, patients enrolled to the second term (scored as 0 = patients that only attended the first term of the classes or 1 = patients that attended two or more terms) and an 11-point prognosis scale. The Physiocise prognosis scale consists of ten items and is scored by adding up the number of positive items. The score can therefore vary from 0 to 10 with higher values indicating worse prognosis. The items are (1) greater than 5 years since first acute episode; (2) other painful areas, for

instance neck/shoulders; (3) CT/MRI/disc bulges/degenerative changes on X-Ray; (4) high kinesiophobia (defined as scores >40 on the TAMPA Scale for Kinesiophobia); (5) poor response to hands-on treatment in the last few years; (6) degree of constant pain (scored as yes/no); (7) unable to perform certain physical activities because of pain; (8) difficulty standing for prolonged periods; (9) difficulty sitting for prolonged periods; (10) trauma, such as MVA/fall.

Statistical analysis

Analyses were performed using SPSS version 20 (SPSS, Inc., Chicago, IL). Descriptive statistics (mean $\pm$ SD) were used to summarize the baseline characteristics of the patients and prognostic outcomes at baseline, 3, 6 and 12 months. Comparison between mean baseline and 3, 6 or 12 month outcomes were performed using Paired-samples *t* test. $P < 0.05$ was considered significant.

To evaluate prognostic factors, univariate associations between each of the prognostic variables and pain scores and disability (RMDQ) at 12 months were assessed using linear regression. Variables with significant univariate associations ($p < 0.2$) were entered into a backwards multivariate regression model.

For the regression analyses, the number of previous episodes was dichotomized (0–1 episodes/2 or more episodes), duration of the current episode was recorded in days and log transformed, and educational level was dichotomized (0 = school, high school certificate and trade/diploma and 1 = advanced diploma, bachelor degree and postgraduate degree).

Results

From January 2010 to January 2011 consecutive patients from two private physiotherapy clinics in Sydney, Australia were screened. One hundred and eighteen met the inclusion criteria and all consented to enter the study. Follow-up rates were high, with 116 (98 %), 114 (97 %) and 112 (95 %) participants being followed up at 3, 6 and 12 months, respectively. Baseline characteristics of the 118 participants are shown in Table 1. The majority of participants were female (73 %), had high educational levels (82 %), did not smoke (96 %) and resided in suburbs with a high socioeconomic status (99 %). All participants were private paying and not covered by workers compensation.

Participants' outcome data at baseline, 3, 6 and 12 months are presented in Table 2 and Fig. 1. Pain intensity, bothersomeness, disability and function reduced during the follow-up period, with mean pain intensity,

Table 1 Baseline characteristics of study population

Characteristics	No (%) or mean (±SD)
Gender (female)	86 (73)
Age (years)	46.5 ± 12.5
Weight (kg)	72.5 ± 15.5
Height (cm)	171 ± 8.5
Smoker	5 (4)
Socioeconomic status (<i>n</i> = 118)	
Resides in suburb with mean household income above Australian mean	117 (99)
Previous episodes of LBP (<i>n</i> = 113)	
Never	9 (7.5)
1–5	26 (22.5)
6–10	11 (9.5)
11 or over	71 (60.5)
Previous sick leave due to LBP (<i>n</i> = 116)	65 (55)
Previous treatment for LBP (<i>n</i> = 118)	114 (96.5)
Duration of current episode of LBP ^a , median (IQR) (<i>n</i> = 113)	365 (172–730)
Leg pain ^b (<i>n</i> = 112)	23 (19.5)
Highest level of education diploma or higher ^c (<i>n</i> = 109)	97 (82)
Employment status before episode of LBP (<i>n</i> = 113)	
Full time/full duties	82 (69.5)
Part time/full duties	14 (12)
Not seeking employment (retired/child care)	12 (10)
Work status changed as result of LBP (<i>n</i> = 113)	10 (8.5)
Current employment status (<i>n</i> = 113)	
Full time/full duties	62 (52.5)
Full time/selected duties	6 (5)
Part time/full duties	19 (16)
Part time/selected duties	2 (1.7)
Not seeking employment (retired/child care)	24 (20)
Private health insurance	103 (87)
Pain catastrophizing scale (<i>n</i> = 112)	16 ± 10

IQR interquartile range

^a Measured in days^b Defined as back pain extending below the knee^c University study based

bothersomeness, disability and function improving by 39, 41, 60 and 72 % of the initial levels, respectively. Pain intensity and bothersomeness improved markedly during the first 6 months (35 and 37 %, respectively) with minimal further reductions up to 12 months (39 and 41 %, respectively). Conversely, disability and function continued to improve considerably throughout the 12 months. After 3, 6 and 12 months, 19 (16 %), 30 (25.5 %) and 29 (25 %) participants had completely recovered (pain

score 0 or 1 for 1 month at time of assessment) from their LBP, respectively.

The results of the univariate analysis are presented in Table 3. Table 4 presents the results of the multivariate backward regression analysis. Baseline pain intensity was the only independent predictor of 12-month pain scores and accounted for only 10 % ($R^2 = 0.102$) of the outcome variance (Table 4). Duration of current episode, disability and educational level were independent predictors of disability accounting for 15 % of the variation on disability at 12 months (Table 4).

Discussion

Summary of main findings

The primary finding of this study is that patients with chronic LBP who presented to a private, community-based, group exercise program incorporating cognitive behavior therapy improved substantially over the course of 1 year. During the first 6 months disability, function and pain intensity improved similarly; however between 6 and 12 months disability and function continued to improve while only small further improvements in pain occurred. At 12 months pain intensity had reduced on average by 39 % while disability and function had improved by 60 and 72 %, respectively.

The predictors investigated did not explain a substantial amount of the variation in outcome for either pain or disability. The only independent predictor of 12-month pain outcomes was baseline pain intensity, but this accounted for only 10 % of the variation. The independent predictors of 12-month disability were duration of current episode, baseline disability and educational level, accounting for 15 % of the variation at 12 months.

Strengths and limitations of the study

A strength of this study is the inclusion of a clearly defined cohort of consecutive patients with chronic LBP (>3 months) that enrolled in a private paying group exercise program. The high 1-year follow-up rate (95 %) and the use of validated outcome measures are further strengths. Nevertheless, we understand that an even longer follow-up period with more regular sampling may give a more comprehensive assessment of the course of chronic LBP.

We limited the number of baseline prognostic factors investigated to one per ten patients, which could have ruled out some important prognostic factors already investigated by others studies, although inclusion of too many variables

Table 2 Primary and secondary outcomes

Outcomes	Baseline mean $\pm$ SD	3 months mean $\pm$ SD	3 months percentage of change	6 months mean $\pm$ SD	6 months percentage of change	12 months mean $\pm$ SD	12 months absolute change scores ^g $\pm$ SD	12 months percentage of change
Bothersomeness ^a	5.4 $\pm$ 2.5	4.1 $\pm$ 2.2*	24	3.4 $\pm$ 2.3*	37	3.2 $\pm$ 2.4*	2.2 $\pm$ 3.2	41
Global impression of recovery ^b	0.25 $\pm$ 2.4	1.5 $\pm$ 1.9*	–	2.1 $\pm$ 1.7*	–	2.5 $\pm$ 2*	–	–
Pain ^c	4.4 $\pm$ 2.1	3.7 $\pm$ 2.1*	16	2.9 $\pm$ 2*	35	2.7 $\pm$ 2.2*	1.7 $\pm$ 2.6	39
Function ^d	12.3 $\pm$ 5.3	15.5 $\pm$ 6.1*	26	18 $\pm$ 6*	46	21.1 $\pm$ 6*	8.8 $\pm$ 9.4	72
Disability ^e	7.8 $\pm$ 4.2	5.2 $\pm$ 4.2*	34	4.1 $\pm$ 4*	48	3.1 $\pm$ 3.2*	4.7 $\pm$ 4.5	60
Kinesiophobia ^f	36 $\pm$ 7.5	34.8 $\pm$ 7.3	4	32.8 $\pm$ 7*	9	31 $\pm$ 7*	5 $\pm$ 10.7	14

* Significant mean difference between baseline data and 3, 6 or 12 months ($p < 0.05$)

^a Rated on scale from 0 = not at all bothersome to 10 = extremely bothersome

^b Rated on scale from –5 = vastly worse, 0 = unchanged to 5 = completely recovered

^c Rated on scale from 0 = no pain to 10 = worst pain possible

^d Sum of the activities scores on a scale from 0 = unable to perform activity to 10 = able to perform activity at pre-injury level, divided by the number of activities

^e Rated from 0 to 24, with higher scores indicating a higher level of disability

^f A total score was calculated after inversion of the individual scores of items 4, 8, 12 and 16. Rated from 17 to 68, with higher scores indicating a high degree of kinesiophobia

^g 12 months absolute scores are based on the difference between baseline scores and 12 months follow-up

Fig. 1 Percentage improvement in function, disability, pain intensity and bothersomeness

into the model makes it less stable and less generalizable [18].

Comparison with existing literature

Our study found a more favorable prognosis for people with chronic LBP than widely reported in the literature. Van Tulder et al. [19] reported only small improvements in pain intensity and disability after 12 months (14.2 and 14.7 %, respectively). Grotle and colleagues [5], found only moderate changes in disability after 1 year (25 % reduction) for people with chronic LBP. When comparing the prognosis of our study participants to previous

literature, it is important to realize we aimed to recruit a cohort lacking many of the previously reported adverse prognostic factors and who were receiving recommended care. As such we hypothesized that patients presenting with a high educational and socioeconomic status and drawn from a private paying, community-based, group exercise program incorporating cognitive behavioral therapy, would have a more favorable prognosis than widely reported for chronic LBP. The results of the study support our hypothesis. The prognosis found in this study may not generalize well to patients in other settings where these favorable prognostic factors are not present.

An interesting finding in our study was that disability and function improved more than pain, especially between 6 and 12 months. These findings are consistent with results from a previous trial [20] where patients receiving a program based on cognitive behavioral principles, similar to our cohort, improved by 49 % for disability but only 29 % for pain after 12 months. Similar findings of greater changes in disability than pain were also reported by a systematic review of multidisciplinary rehabilitation for chronic LBP [21]. Conversely a recent systematic review of the prognosis of persistent LBP [2] found greater changes in pain than disability over 12 months. The studies included in this review did not typically include exercise programs with cognitive behavioral principles and may explain these differences in findings.

Our study found few important predictors of 12 month pain or disability. Multivariate models predicted only 10

Table 3 Univariate regression analysis with pain intensity and disability at 12 months follow-up as the dependent variable

Prognostic factors	Pain intensity				Disability		
	N	R ²	Unstandardized coefficient (95 % CI)	p value	R ²	Unstandardized coefficient (95 % CI)	p value
Number of previous episodes ^a	113	0.010	−0.650 (−1.889 to 0.589)	0.589	0.011	−0.016 (−2.798 to 0.766)	0.261
Pain intensity ^b	113	0.101	0.342 (0.150 to 0.534)	0.001	0.039	0.307 (0.021 to 0.592)	0.035
Duration of current episode ^c	113	0.006	0.148 (−0.211 to 0.508)	0.416	0.047	0.601 (0.094 to 1.108)	0.021
Disability ^d	113	0.013	0.061 (−0.039 to 0.160)	0.231	0.106	0.249 (0.113 to 0.386)	<0.001
Function ^e	107	0.001	−0.013 (−0.095 to 0.069)	0.753	0.003	−0.035 (−0.154 to 0.083)	0.556
Global impression of recovery ^f	113	0.054	−0.218 (−0.390 to −0.046)	0.014	0.007	−0.116 (−0.369 to 0.138)	0.369
Kinesiophobia ^g	113	0.034	0.055 (0.001 to 0.110)	0.049	0.040	0.085 (0.006 to 0.164)	0.034
Educational Level ^h	109	0.006	0.485 (−0.743 to 1.714)	0.435	0.028	1.536 (−0.210 to 3.281)	0.084
Leg Pain ⁱ	112	0.008	0.500 (−0.551 to 1.550)	0.348	0.006	0.617 (−0.894 to 2.128)	0.420
Catastrophizing ^j	112	0.044	0.047 (0.006 to 0.089)	0.027	0.031	0.057 (−0.003 to 0.118)	0.063
Patients enrolled for the 2nd term ^k	113	0.014	0.553 (−0.320 to 1.425)	0.212	0.001	−0.253 (−1.517 to 1.010)	0.692
11 point prognosis scale ^l	113	0.001	−0.040 (−0.278 to 0.198)	0.739	0.017	0.234 (−0.105 to 0.574)	0.174

^a An episode of LBP was classified as pain lasting for more than 24 h. Scored as 0 (from 0 to 1 episode) or 1 (from two or more episodes)

^b Rated on a scale from 0 = no pain to 10 = worst pain possible

^c Duration of the current episode was recorded in days and log transformed for the analyses

^d Rated from 0 to 24, with higher scores indicating a higher level of disability

^e Sum of the activities scores on a scale from 0 = unable to perform activity to 10 = able to perform activity at pre-injury level divided by the number of activities

^f Rated on scale from −5 = vastly worse, 0 = unchanged to 5 = completely recovered

^g A total score was calculated after inversion of the individual scores of items 4, 8, 12 and 16. Rated from 17 to 78, with higher scores indicating a high degree of kinesiophobia

^h Educational level was score from 0 = school and technical college (school, high school certificate and trade) to 1 = University study based (diploma, advanced diploma, bachelor degree and postgraduate degree)

ⁱ Defined as back pain extended below the knee. Scored as 0 = no or 1 = yes

^j The Pain Catastrophizing Scale sum score was calculated from all items (range, 13–65), with a higher scores indicating a higher level of pain catastrophizing

^k Patients who continues classes after the first term. Scored as 0 = patients enrolled for one term only or 1 = patients enrolled for two or more terms

^l Rated from 0 to 10, with higher values indicating worse prognosis

and 15 % of pain and disability outcomes, respectively. These findings are somewhat lower than previous studies although most previous studies have failed to identify strong predictors of outcome in chronic LBP. Bekkering et al. [22] followed a mixed group (acute/chronic LBP) of 500 patients with non-specific LBP for 12 months. This study evaluated prognostic factors associated with pain and disability at 12 months follow-up. The final model consisted of two factors for pain (duration of the current episode and pain intensity at baseline) and three for disability (paid job, episode duration and disability), these factors explained 10 and 28 %, respectively, of the variance. Grotle et al. [5], found five prognostic factors associated with 12-month disability in people with chronic LBP (being not employed widespread pain, chronic pain grade, fear of pain and catastrophizing), representing 52.7 % of variance. However, they note that beyond baseline

disability the effect size for most predictors is relatively low. A possible reason predictors in our study failed to explain much of the variance may be that we deliberately included a cohort lacking most of the previously described prognostic factors. In this population, predicting outcome may be more difficult or other predictors may be more important.

Conclusions

Over the course of 1 year, patients with chronic LBP who presented to a private paying, community-based, group exercise program incorporating cognitive behavioral therapy, improved markedly. During the first 6 months, pain intensity, bothersomeness, disability and function improved similarly, but from 6 to 12 months, disability and function

Table 4 Backward regression analyses with pain intensity ($n = 112$) and disability ($n = 108$) at 12 months follow up as dependent variable

Predictors	R^2	Regression coefficient (95 % CI)
Pain intensity at 12 months ($n = 112$)	0.102	
Pain intensity at baseline ^a		0.344 (0.050 to 0.534)
Constant		1.244 (0.323 to 2.195)
Disability at 12 months ($n = 109$)	0.154	
Duration of current episode ^b		0.457 (−0.048 to 0.961)
Disability ^c		0.234 (0.095 to 0.372)
Educational level ^d		1.408 (−0.260 to 3.075)
Constant		−2.505 (−5.825 to 0.815)

^a Rated on a scale from 0 = no pain to 10 = worst pain possible

^b Duration of the current episode was recorded in days and log transformed for the analyses

^c Rated from 0 to 24, with higher scores indicating a higher level of disability

^d Educational level was scored from 0 = school and technical college (school, high school certificate and trade) to 1 = University study based (diploma, advanced diploma, bachelor degree and post-graduate degree)

continued to improve while only small further changes in bothersomeness and pain intensity occurred.

Pain intensity at baseline was the only independent predictor of 12-month pain scores, accounting for 10 % of the variation. There were three independent predictors of 12 months disability; duration of current episode, baseline disability and educational level, accounting for 15 % of the variation. Most of the variance in outcome was not explained by any of the predictors we investigated in this study.

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Conflict of interest None.

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