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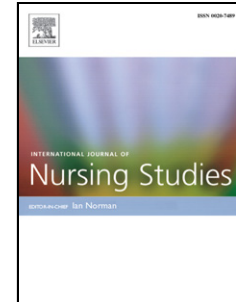

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1 **The effects of patient-professional partnerships on the self-management and**
2 **health outcomes for patients with chronic back pain: a quasi-experimental**
3 **study**

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1 What is already known about the topic?

2 • Good partnerships between patients and health professionals may improve patients'
3 self-management ability and treatment effectiveness for chronic pain. The
4 mechanisms for this improvement, however, are poorly understood.
5 • Health professionals rely almost exclusively on taught physical exercise to help
6 patients manage their chronic back pain.

7 What this paper adds?

8 • A good partnership between patients and health professionals has a direct positive
9 impact on patients' self-management ability and an indirect positive impact on quality
10 of life, where self-management is the mediator.
11 • Good self-management ability has a one-way positive effect on patients' quality of
12 life.
13 • Both patients and health professional should be aware that not only is pain self-
14 management support useful, but also good partnerships during the care process is a
15 necessary component to improve quality of life for patients with chronic back pain.

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1 **Abstract**

2 *Background*: Self-management may be a lifelong task for patients with chronic back pain.
3 Research suggests that chronic pain self-management programmes have beneficial effects
4 on patients' health outcome. Contemporary pain management theories and models also
5 suggest that a good patient-professional partnership enhances patients' ability to self-
6 manage their condition.

7 *Objectives*: 1) To investigate whether there is a reciprocal relationship between self-
8 management of chronic back pain and health-related quality of life (HRQoL); 2) to examine
9 the impact of a good patient-professional partnership on HRQoL, either directly, or indirectly
10 via change in the ability to self-manage pain.

11 *Design and setting*: This quasi-experimental study was designed to take place during routine
12 service appointments and conducted in a community-based pain management service in the
13 United Kingdom. A patient-professional partnership was established in which patients were
14 actively involved in setting up goals and developing individualised care plans. Through this,
15 health professionals undertook patients' health needs assessment, collaborated with
16 patients to identify specific problems, provided written materials and delivered individualised
17 exercise based on patients' life situation. Patients were recruited following initial consultation
18 and followed up three months later.

19 *Participants*: A total of 147 patients (65% female) with a mean age of 48 years (SD: 14 years)
20 were enrolled in the study. Of these, 103 subjects completed the study. Patients were
21 included if they were aged 18 and over, suffered from chronic back pain, had opted in to the
22 clinic and had sufficient ability to read and understand English. Patients were excluded if
23 they opted out this service after the initial assessment, suffered from malignant pain or
24 required acute medical interventions for their pain relief.

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Methods: Self-reported measures of HRQoL, patient-professional partnerships and self-management ability were collected at baseline and three months later. Pathways proposed were depicted using structural equation modelling.

Results: There was no association between patients' self-management ability and HRQoL at baseline. However, a positive direct effect was detected at three months (-0.38, $p<0.01$). A patient-professional partnership was not found to be beneficial for patients' HRQoL through a direct pathway, but via an indirect pathway where self-management was a mediator (-19.09, $p<0.01$).

Conclusions: This study suggests that the increase in patients' self-management ability may lead to improvement in HRQoL after pain management support provided in a partnership with health professionals. A good patient-professional partnership appears to be beneficial as an augmentation to self-management practice for patients with chronic back pain.

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2 Introduction

3 Chronic back pain is common health problem throughout the world and the leading cause of
4 activity limitation and work absence (Freburger et al., 2009, Vos et al., 2013). People with
5 chronic back pain often experience considerable discomfort, and their family and social
6 relationships are interrupted (Hunfeld et al., 2001). However, patients often struggle to
7 receive adequate management for their condition, or even a diagnosis (Baker et al., 2010).
8 Due to the high prevalence, associated deleterious impact and the lack of any guaranteed
9 cure, self-management has become a commonly accepted addition to medical interventions
10 in the treatment of chronic back pain (Blyth et al., 2005, Dixon et al., 2007, Lorig and Holman,
11 1993, Moore et al., 2000, Von Korff et al., 1998).

12 The self-management of a chronic condition refers to ‘an ability to manage the symptoms,
13 treatment, physical and psychosocial consequences and lifestyle changes inherent in living
14 with a chronic condition individually’ (Barlow et al., 2002, p. 178). Many self-management
15 programmes have been developed worldwide to support patients with chronic conditions
16 (Barlow et al., 2000, Lorig et al., 2001). These are believed to be beneficial for patients to
17 manage their symptoms and improve their quality of life. Patients involved showed a
18 decrease in depression and fatigue, a high degree of self-efficacy, greater relaxation skills
19 and exercise activities and cognitive symptom management (Barlow et al., 2002, Barlow et
20 al., 2000, Bourbeau and Van Der Palen, 2009, Effing et al., 2012, Gurden et al., 2012,
21 Lennon et al., 2013, Lorig, 2003, Lorig, 1993, Lorig et al., 1998, Lorig and Holman, 1993,
22 Smith-Turchyn et al., 2015). As a strategy to foster the implementation of self-management,
23 a practice guideline has been developed in the United Kingdom (UK), recommending that
24 patients’ attributes, needs and preferences should be taken into account when provided with
25 treatment and care by health professionals (Savigny et al., 2009). In addition, self-
26 management practice guidelines in Canada recommend that health professionals should

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conduct a broad patient assessment to identify potential factors related to patients' health status (Registered Nurses' Association of Ontario, 2010).

A good partnership between patients and health professionals appears to have a positive impact on the self-management of chronic pain (Dwarswaard et al., 2015, Fu et al., 2015, Lukewich et al., 2015, McQueen, 2001, Wasson et al., 2006). While health professionals are expert in providing health services to support patients, the pain itself and its impact can only be experienced by patients (Coulter and Ellins, 2007, May, 2010). A recent systematic review suggests that patients do not self-manage their chronic conditions, and they expect health professionals to fulfil a comprehensive role (Dwarswaard et al., 2015). A partnership in healthcare refers to collaborative care in which patients are actively involved with health professionals in developing treatment or care plans (Coulter et al., 2013, Enehaug, 2000). Health professionals are identified as the primary facilitator of self-management in primary care settings (Lukewich et al., 2015). Contemporary chronic pain management theories and models also suggest that a good patient-professional partnership enhances patients' ability to self-manage their condition (Bodenheimer et al., 2002, Cooper et al., 2008, Coulter and Collins, 2011, Street et al., 2009, Wagner et al., 2005). However, evidence for the relationship between patient-professional partnerships and self-management remains underspecified as do the practices, mechanisms and resources through which patient-professional partnerships may work in developing self-management ability and improving health outcomes.

Street et al. (2009) presented a theoretical idea on how patient-professional partnerships may contribute to patients' health outcomes, via both a direct and indirect effect (see Fig. 1). In the direct effect, patient-professional partnerships could be therapeutic when health professionals validate patients' perspectives and develop individualised care plans that may improve patients' physical symptoms and psychological well-being. In the indirect effect, partnerships act as a stimulus for shaping patients' beliefs about and attitudes to self-management, and integrating patients and professionals' complementary knowledge and

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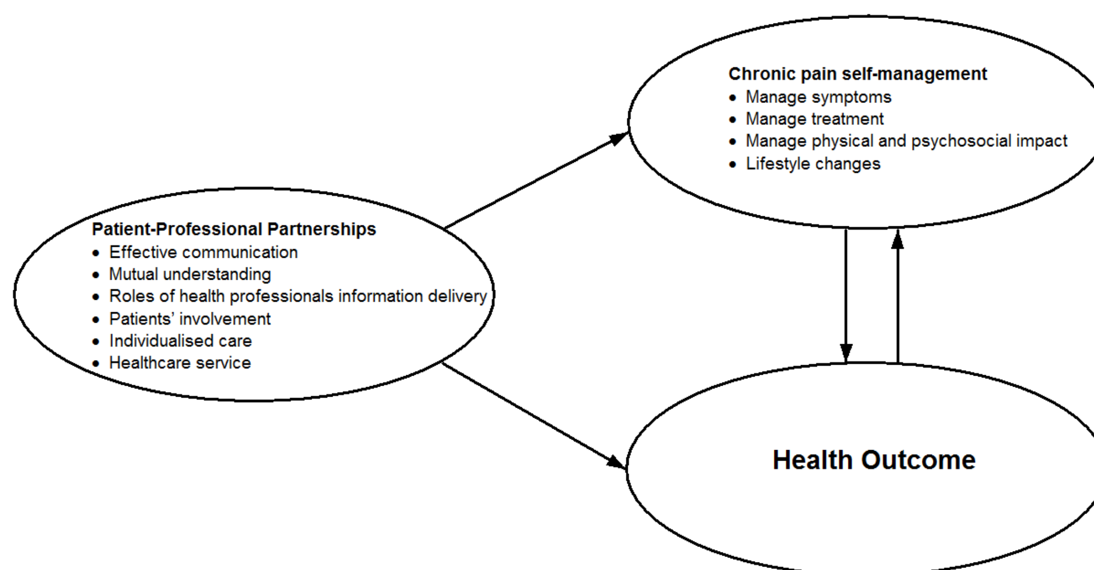
1 skills. In this paper, we provide empirical illustrations for two research questions. Firstly, we
2 investigated whether there was a reciprocal relationship between self-management of
3 chronic back pain and HRQoL. Secondly, we examined whether a good patient-professional
4 partnership leads to better HRQoL in both a direct pathway and indirect pathway where self-
5 management is considered as the mediator.

6 **Fig. 1 Causal paths depicting the relationships between patient-professional**
7 **partnerships, self-management, and health outcome**



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9 ## Methods

10 ### Design and procedures

11 This quasi-experimental study was designed to take place during routine service
12 appointments and not as a stand-alone research study. It was conducted in the community-
13 based pain management service in the UK, where the self-management of chronic back pain
14 was supported by a range of health professionals (physiotherapists, nurses and health care
15 trainer) to improve patients' self-management ability and quality of life. A patient-professional
16 partnership was generally established in this service by health professionals providing
17 individualised care and working together with the patient. Patients were actively involved
18 with health professionals in setting up realistic goals and developing individualised treatment

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1 and care plans. Through this, health professionals undertook patients' health needs
2 assessment, collaborated with patients to identify specific problems that they desired to be
3 addressed, set up achievable goals, provided written materials, delivered information and
4 individualised exercise based on patients' life situation. The patients practised self-
5 management skills and provided feedback on their progress to health professionals during
6 the individual consultations. The face-to-face consultation sessions also offered patients
7 flexible appointment options to bring along their family members and last approximately 60
8 minutes. This service did not provide any medical interventional treatment such as injection
9 therapy.

10 On average, new patients referred to the clinic are discharged after two to four months
11 according to their self-management ability. In order to observe the development of self-
12 management of chronic back pain, participants were recruited straight after their initial
13 consultation in which they started to receive self-management support (baseline), and then
14 followed for three months (follow-up). After patients had completed their first appointment
15 and agreed to participate in this study, they were invited by YF or KM into a private room in
16 the clinic for baseline data collection. Once patients had signed the consent forms, self-
17 reported questionnaires were given by YF to be completed by the patients without
18 assistance. Three months later, the same set of questionnaires was collected by YF from the
19 same patients when they returned back to the service for further consultation.

20 **Participants**

21 The sample size was calculated with respect to the standardized difference of 0.30 with a
22 90% power level (Cohen, 1988). A total of 147 patients were recruited to participate in this
23 study using a consecutive sampling strategy. Patients were included if they were aged 18
24 and over, suffered from chronic back pain, had opted in to the clinic and were able to read
25 and understand English sufficiently to understand patients' information sheets, consent
26 forms and study questionnaires. Patients were excluded if they opted out this service after

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1 the initial assessment, suffered from malignant pain or required acute medical interventions
2 for their pain relief.

3 **Measure of HRQoL**

4 The primary outcome was HRQoL measured by the DoloTest, which is a validated, generic,
5 pain-related quality of life questionnaire routinely used in clinical settings in Denmark and UK
6 (Kristiansen et al., 2012, Kristiansen et al., 2010). This measurement consists of eight
7 domains: 'pain', 'problems with light physical activities', 'problems with more strenuous
8 physical activities', 'problems doing job', 'reduced energy and strength', 'low spirit', 'reduced
9 social life' and 'problems sleeping'. Each domain is scored on a 100mm visual analogue
10 scale. DoloTest Score is the sum of the measurement on each DoloTest domain in
11 millimeters and ranges from 0 to 800. A lower score reflects a more favorable health
12 outcome. It is well-validated and demonstrates a satisfactory level of internal consistency,
13 with coefficients of Cronbach's alpha being 0.615 to 0.715 (Kristiansen et al., 2010).
14 DoloTest was chosen as it was routinely used in the clinic; it was decided to continue using it
15 as an outcome measure of HRQoL. Inclusion of another questionnaire for the same purpose
16 would have imposed an unnecessary burden on patients, and also would have disturbed
17 routine practice.

18 **Measure of patients' perceived self-management ability**

19 Patients' self-management ability for chronic back pain was evaluated using the Partners in
20 Health (PIH) scale, a 12-item self-administered tool for patients to assess their self-
21 management knowledge, attitude, behaviors and impacts of their chronic condition. The PIH
22 scale is primarily designed to measure generic self-management for chronic conditions,
23 which provides a simple tool for health professionals (general practitioners, nurses and allied
24 health professionals) to assess self-management at a given point of time and maximise their
25 patients' self-management capacity over time (Battersby et al., 2003). Peñarrieta-de
26 Córdova et al. (2014) showed that the scale has internal reliability and face validity. Patients

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1 make a rating for each item on a nine-point (0-8) Likert scale, with 0 being the worst and 8
2 being the best response. A total score is computed for a possible total of 96 points. A higher
3 score represents better self-management practice. The PIH scale has been shown to have
4 high internal consistency (Cronbach's alpha=0.82) (Petkov et al., 2010).

5 **Measure of patients' perceived patient-professional partnerships**

6 The Patient Partnership in Care questionnaire (PPiC) was specifically designed to measure
7 the core elements of health professionals to work in partnership with patients with chronic
8 conditions to support self-management (Powell et al., 2009). It was also applied in the NHS
9 Adult Cancer Survivorship Programme (Davies and Batehup, 2010). This generic
10 questionnaire for patients consists of two subscales – partnership and confidence: 11 items
11 using a five-point 'poor' to 'excellent' ordinal scale to measure the partnership and five items
12 on a rating scale of 0 to 10 to measure the confidence. We did not include the confidence
13 subscale in our analysis to avoid a potential multicollinearity problem, with partnership being
14 correlated with confidence at 0.68 reported in previous research (Powell et al., 2009). We
15 used component factor analysis (CFA) to assess the measurement properties of patient
16 perceived partnership latent variable using the 11 partnership items, which all load
17 significantly and strongly on a single partnership dimension at the 0.01 level. Fig. 2 shows
18 that the standardised loading ranges from 0.52 to 0.81. The subscale of these 11 partnership
19 items also has good internal consistency (Cronbach's alpha=0.937) in this study. Although
20 the chi-square with 34 degrees of freedom is significant ($\chi^2(34) = 61.61, p < 0.01$), the

21 measures of fit are reasonably good with $RMSEA = 0.08$ and $CFI = 0.97$.

22 **Fig. 2 Component Factor Analysis for patients' perceived patient-professional**
23 **partnership**

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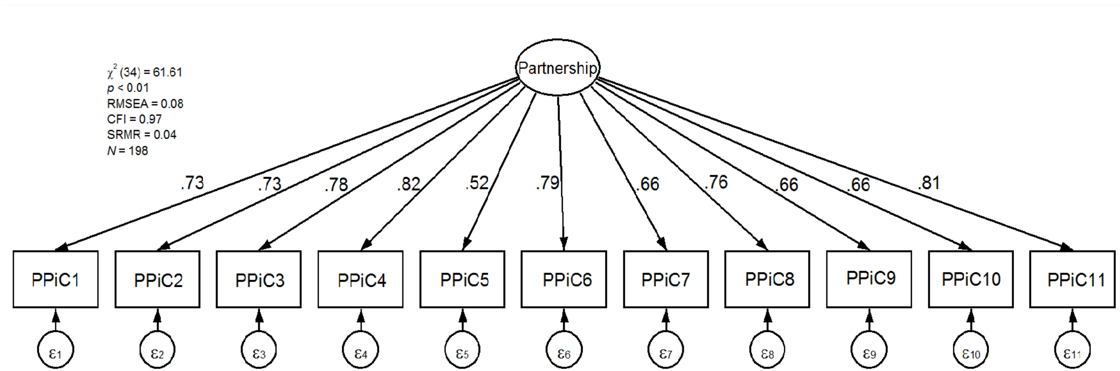

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2 **Demographic and clinical characteristics**

3 Demographic data were retrieved from the patients' electronic medical records. Research
4 evidence suggests that increased age (Kawi, 2014), poor health status (Kawi, 2014) and
5 mental health problems (Bair et al., 2009, Hadjistavropoulos and Shymkiw, 2007) may
6 impede the development of patients' self-management ability. We controlled for seven socio-
7 demographic characteristics (age, gender, marital status, ethnicity, religion, highest level of
8 education, and employment status) in our analyses. These factors are often associated with
9 basic variation in health (Chandola, 2000, Rose and Pevalin, 2000). We also used self-
10 reported duration of their pain problem (Breivik et al., 2006, LeFort et al., 1998) to account
11 for medical treatment histories. Given the fact that patients may experience benefit as a
12 result of taking medication rather than the practice of self-management strategies,
13 medication usage specifically related to pain relief was adopted to control for a potential
14 confounder. We also included self-reported mental health problems in general, which are
15 believed to be associated with decline in HRQoL especially in patients with chronic back
16 pain (Bair et al., 2009, Hadjistavropoulos and Shymkiw, 2007, Schmidt et al., 2012).

17 **Statistical analyses**

18 We performed a causal path analysis to simultaneously depict relationships between
19 partnership, self-management ability, and HRQoL. The autoregressions of the variables,
20 self-management ability and HRQoL, on each other over time allow controlling for

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1 covariance stability. These autoregression coefficients are determined by intra-individual
2 stability (Hertzog and Nesselroade, 1987). A simultaneous equation model that allows for
3 reciprocal effects and autoregressive effects between health-related quality of life ($HRQoL$)
4 and self-management ability ($SelfMGT$) at baseline and follow-up may be written as

5 $$HRQoL_{i,F} = \alpha^{HRQoL} + \gamma_1 HRQoL_{i,B} + \beta_1 Prtnr_{i,F} + \delta_1 SelfMGT_{i,F} + \zeta_1 X_i + \varepsilon^{HRQoL} \quad (1)$$

6 $$SelfMGT_{i,F} = \alpha^{SelfMGT} + \gamma_2 SelfMGT_{i,B} + \beta_2 Prtnr_{i,F} + \delta_2 HRQoL_{i,F} + \zeta_2 X_i + \varepsilon^{SelfMGT} \quad (2)$$

7 Where B and F represent baseline and follow-up respectively; i represents an individual; α
8 is a time-invariant intercept; ζ is row vectors of coefficients of X_i which is a vector of control
9 variables that vary over individuals (e.g. gender). The term ε is random disturbance that is
10 assumed to be independent and normally distributed with means of zero and constant
11 variance. We also assumed that X_i is strictly exogenous, meaning that it is independent of ε.

12 γ_1 and γ_2 describe the autoregressive effects, or the effects of self-management ability and
13 HRQoL at baseline on themselves measured at follow-up, respectively. A small or zero
14 autoregressive coefficient means that there has been a substantial reshuffling of the
15 individuals' standings on the construct over time. In contrast, a sizable autoregressive
16 coefficient means that individuals' relative standings on the construct have changed very
17 little over time. β_1 presents the effect of partnership on the follow-up HRQoL adjusted for the

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1 effect of follow-up self-management ability, and baseline HRQoL. β_2 presents the effect of
2 partnership on the follow-up self-management ability adjusted for baseline self-management
3 ability and baseline HRQoL. δ_1 and δ_2 present the effects of individuals' self-management
4 ability on their HRQoL and the effect of HRQoL on their self-management ability,
5 respectively. The mediated effect of partnership on HRQoL is $\beta_2\delta_1$.

6 Structural equation models (SEM) allow for the use of latent variables to correct for
7 measurement error, multivariate outcomes, and the calculation of overall fit statistics for
8 model evaluation (Bovaird, 2007, Curran, 2003, Mehta and Neale, 2005). The two equations
9 are simultaneously estimated on our data by maximum likelihood methods in SEM
10 procedure of Stata13.1 (StataCorp, 2013). Evaluation of model-data fit is based on the most
11 recommended indices, such as the root mean-square error of approximation (RMSEA) and
12 the comparative fit index (CFI). The RMSEA is an absolute misfit index. Values less than
13 0.08 indicate an adequate fit and values of 0.06 or less indicate a good fit of the model (Hu
14 and Bentler, 1998, Hu and Bentler, 1999). The CFI measures the proportional improvement
15 in fit by comparing a hypothesised model with the null hypothesis model as the baseline
16 model. Values ranged from 0.90 to 1 (perfect fit), indicating a good fit of the model (Hu and
17 Bentler, 1999). Baseline PPiC scores were added to account for any possible imbalance and
18 to improve the precision of the estimates. To account for missing data, the full information
19 maximum likelihood procedure was used.

20 **Rigour**

21 This analysis of this study controlled and adjusted history, maturation and multiple treatment
22 interference threats. Meanwhile, the time interval between baseline and follow-up (three
23 months) was relatively short in comparison with the history of patients' back pain, which
24 limited the likelihood of maturation threat. All questionnaires used have demonstrated good

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1 validity and reliability. The same set of questionnaires was administrated by the same people
2 to collect patients' responses at both baseline and follow-up, helping to minimise the threat
3 to the internal validity of this study.

4 Results

5 A total of 103 patients completed this study. The results showed that there was no
6 association between patients' self-management ability and HRQoL at baseline. However, a
7 positive direct effect was detected at three months (-0.38, $p<0.01$). A patient-professional
8 partnership was not found to be beneficial for patients' HRQoL through a direct pathway, but
9 via an indirect pathway where self-management was a mediator (-19.09, $p<0.01$). These
10 results are presented in detail below.

11 Demographic and clinical characteristics

12 The demographic and clinical characteristics of the patients collected at the time of initial
13 consultation were presented in Table 1. The cohort mean age was 48 years (SD: 14 years,
14 range: 19-84 years). There was a majority of women (65.3%), with 59.9% living with a
15 spouse or partner. More than three quarters (79.6%) of the patients were White British, and
16 around half (46.3%) were Christian. The proportion of patients who were unemployed
17 (40.1%) is almost double those who were in full time employment (23.1%). In terms of the
18 educational background, only 8.8% of the patients held a higher degree or equivalent while
19 approximately 30.6% of them held no qualification at all. All participants reported
20 experiencing back pain for at least 12 months with about half of them (45.6%) suffering for
21 more than eight years. Most (87.1%) took medication for pain relief, and only 19 participants
22 (12.9%) did not. A majority (79.6%) had a current mental health condition, with 23.1%
23 reporting anxiety, 5.5% reporting depression, and around half of them (51.0%) reporting both
24 anxiety and depression.

25 At three months, 103 (70.1%) completed both baseline and follow-up data collection. Twelve
26 (8.2%) patients failed to attend for follow-up as they had had similar previous treatment

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1 experience without improvement, and 32 (21.7%) patients were discharged automatically
2 according to the service attendance policy (patients would be discharged if they did not
3 attend two consecutive appointments without any contact). With respect to demographic
4 characteristics (age, gender, marital status, and highest level of education), as well as the
5 outcome variables (patient-professional partnership, self-management ability, and HRQoL),
6 there was no significant difference detected between patients who participated at both data
7 collection points and those who participated only at baseline. As a result, missing data in our
8 sample were likely to have been missing by chance, and therefore the completed-case
9 analysis was used providing unbiased estimates. Categorical variables were compared by
10 Wilcoxon rank sum test and continuous variables were compared by paired *t*-test.

11 **Table 1 Descriptive Characteristics of the Study Participants at Baseline (N=147)**

Item	Mean (SD)	Range	N	%
Age	47.8 (13.9)	19-84		
Gender				
Female			96	65.30
Male			51	34.70
Relationship status				
Married/Civil partnership/Co-habiting			88	59.86
Widowed/Divorced/Separated			33	22.45
Single			21	14.29
Unknown			5	3.40
Ethnicity				
British			117	79.60
Non-British			30	20.40
Religion				
No religion			47	31.97
Christian			68	46.26
Muslim			12	8.16
Unknown			20	13.60
Employment status				
Full time			34	23.13
Part time			23	15.65
Unemployed			59	40.14
Retired			24	16.33
Unknown			7	4.76
Education level				
Degree, or Degree equivalent and above			13	8.80

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Item	Mean (SD)	Range	N	%
A' levels, vocational level 3 and above			9	6.10
Other qualifications below 'A' level, vocational level 3 & level unknown			80	54.50
No qualifications			45	30.60
Pain history (year)				
1-4			55	37.41
5-7			25	17.01
≥8			67	45.58
Medication usage				
No medication			19	12.93
Single medication			50	34.01
Multiple medication			78	53.06
Mental health conditions				
Anxiety			34	23.10
Depression			8	5.50
Depression & anxiety			75	51.0
None			30	20.4

1 **Structural model**

2 The SEM with the partnership latent variable mediated by self-management ability indicates
3 that the estimated model provides an acceptable fit to the data
4 ($\chi^2 = 7.65, df = 1, RMSEA < 0.001, CFI = 1$). Fig. 3 shows the standardised coefficients for
5 hypothesised paths at the 1% significance level. The model accounts for 47% of the
6 variance in HRQoL scores. To avoid clutter, the correlations between all demographic and
7 clinical factors have been omitted from Fig. 3.

8 **Fig. 3 Standardised path coefficients for hypothesised relationships**

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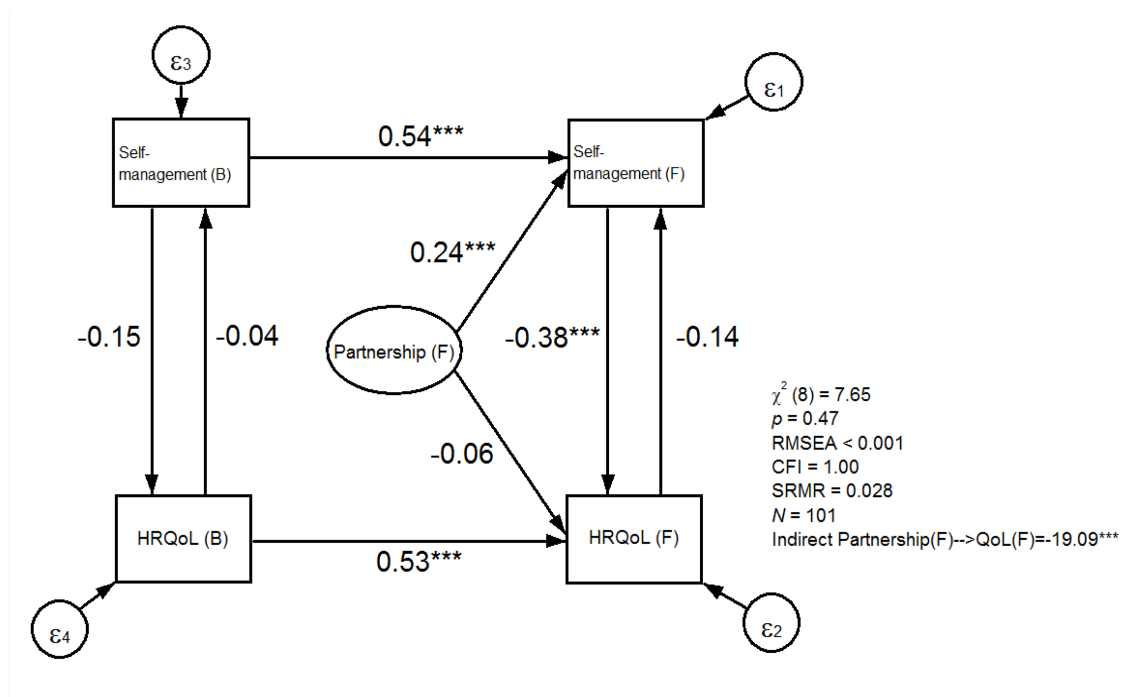

2 *p<0.1, **p<0.05, ***p<0.01

3 As shown in Fig. 3, after adjusting for demographic and clinical factors, the stationary
4 autoregressive effect of self-management ability ($0.54, p < 0.01$) is significant as is the
5 stationary autoregressive effect of HRQoL ($0.53, p < 0.01$). These coefficients indicate
6 moderate stability of self-management ability and HRQoL over time.

7 Net of autoregressive effects, the results of the path analysis showed that there was no
8 causal effect of self-management ability on HRQoL at baseline, however a significant effect
9 was detected ($-0.38, p < 0.01$) at three-month follow-up after the pain management support
10 provided by health professionals in the pain clinics. In addition, it is noteworthy that the self-
11 management ability had a one way effect on HRQoL, and no evidence was found to support
12 an effect in the opposite direction. Thus patients with greater self-management ability were
13 more likely to have better HRQoL. The results also showed that the patient-professional
14 partnership had no direct effect on HRQoL ($-0.06, p > 0.1$). However, it is positively

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associated with self-management ability as predicted ($0.24, p < 0.01$). Thus, patients having greater partnerships with health professionals have higher levels of self-management ability. The adjusted model also highlighted that the patient-professional partnership failed to contribute independently to explaining variance in HRQoL in the model, suggesting a mediating effect ($-19.09, p < 0.01$) in which higher levels of self-management ability accounts for the relationship between greater partnership and better HRQoL.

Discussion

This study shows that the increase in patients' self-management ability leads to the improvement in HRQoL after the pain management support provided in a good patient-professional partnership. However, a patient-professional partnership alone is not sufficient to improve patients' HRQoL directly, but the positive effect is found from an indirect pathway where self-management is a mediator. This may suggest that patient-professional partnerships play an important role in stimulating and nurturing patients' internal resources to change behaviors associated with chronic pain, which consequently improve their health. The findings of this study support the view that patients' self-management ability has a significant positive impact upon their health, whilst simultaneous reciprocal causality does not occur between them. This is consistent with Braden's Self-help Model (Braden, 1993, LeFort, 2000), which specifies that self-help supported by a set of enabling skills allows people with chronic conditions to achieve improved quality of life. Such consistency is particularly noteworthy, given the different measures were used for health outcome. It suggests that despite some differences in measurement in the study samples, the pattern of relationships among the constructs appears stable and robust in different clinical populations. More studies using pain-specific measures for health status may be needed to enable further comparisons. The lack of impact of HRQoL on self-management ability also suggests that pain self-management support could still improve health outcomes for patients suffering from even extreme negative impact of pain.

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1 It is worth noting that the positive impact of self-management skills on patients' HRQoL was
2 not significant at baseline, however this impact appeared to be significant three months later
3 when a patient-professional partnership was established and developed during the time
4 patients were attending the clinic. This finding provides additional support for the Chronic
5 Care Model (Wagner et al., 1999, Wagner et al., 2001), which illustrates that improved
6 health outcomes for disease management, as the results of self-management support, may
7 only be achieved through productive interactions between informed activated patients and
8 the prepared proactive health professionals. Similar effects of good patient-professional
9 partnerships have been shown on symptom management for different patient groups. For
10 instance, chronic obstructive pulmonary disease, depression and diabetes (Bury, 2004,
11 Powell et al., 2009). Given the fact that patients with chronic conditions are likely to suffer
12 from other health problems, further research may be needed to demonstrate the influences
13 of building partnership on health outcome of patients with multiple conditions in primary care
14 settings.

15 Our path analysis suggests that there is moderate stability in both self-management ability
16 and HRQoL over time. These results indicate that the development of self-management of
17 chronic back pain may be a consequence of establishing good patient-professional
18 partnerships that involve collaborative care and self-management education. This is
19 consistent with Lorig and Holman's theory of self-management education that argues
20 forming a partnership between patients health professionals is a core self-management skill
21 (Lorig and Holman, 2003). However, we could not completely exclude the possibility that the
22 increase in self-management ability may also enhance patient-professional partnerships.
23 This is likely to occur when patients intend to establish a good partnership with health
24 professionals with the purpose of gaining more support in managing their conditions, or
25 being involved in decision-making about their treatment. However, to our knowledge,
26 research to date has not explicated a direct theoretical pathway between self-management
27 ability and patient-professional partnerships. It is worth noting that a patient-professional

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1 partnership differs from traditional patient education and familiarity developed during the
2 consultation. The key to successful partnership is to recognise that patients are experts in
3 their conditions and life situation, and their partnerships are developed based on mutual
4 respect for each other's competencies and recognition of the advantages of combining these
5 resources to achieve beneficial outcomes (Coulter, 1999, Coulter and Collins, 2011, Coulter
6 and Ellins, 2007). Additionally, self-management education embedded in a patient-
7 professional partnership also differs from traditional patient education that solely focuses on
8 having health professionals teach and pass on disease-specific skills and information.
9 Instead, it is based on patient concerns and problems, allowing patients to identify their
10 health needs and make a decision about their condition (Bodenheimer et al., 2002, Lorig and
11 Holman, 2003). Through this approach, patients are provided with information and
12 individualised exercises in the context of pain management, including problem definition,
13 generation of possible solutions, solution implementation and evaluation of results. This is
14 more likely to increase patients' self-efficacy and their individual confidence to undertake a
15 behaviour necessary to achieve a desired goal (Bandura, 1997). This way of delivering
16 patients' education has also been echoed in how health professionals provided their support
17 in the pain management service of this study. Health professionals worked together with
18 patients to undertake health needs assessment during the initial consultation, and then
19 created individualised care plans to follow up their needs.

20 Despite the paucity of evidence that having a good patient-professional partnership has a
21 direct impact on health outcomes (Street et al., 2009), our results suggest that the impact of
22 patient-professional partnerships on HRQoL is mediated by the development of chronic back
23 pain self-management. This non-significant direct effect of patient-professional partnership
24 may provide additional evidence supporting the point that the relationship between continuity
25 of care and outcomes are more uncertain (Cabana and Jee, Saultz and Albedaiwi, 2004,
26 Saultz and Lochner, 2005). Health professionals at the pain clinics in this study worked as a
27 team and provided the care and support at different stages of the treatment process.

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1 Services and care delivered by different health professionals in disease management are
2 often referred as a continuity of care (Haggerty et al., 2003). With sufficient resources, it may
3 be necessary to provide systematic education and training for health professionals on the
4 self-management of chronic pain in order to help patients develop more trust in and better
5 partnerships with health professionals. The demographic characteristics of the participants
6 were similar to those of population with chronic back pain reported in previous studies, such
7 as the Health Survey for England (Health and Social Care Information Centre, 2011), Survey
8 of Chronic Pain in Europe (Breivik et al., 2006) and the Institute of Medicine in the US
9 (Institute of Medicine, 2011). The majority were females, and many were less able or unable
10 to work outside. Most of them took medication for pain relief, and had a current mental
11 health problem. The estimation of these individual-level effects in this study makes it
12 possible to provide empirical evidence to support the influence of partnerships on chronic
13 back pain self-management.

14 There has been considerable interest on initiating health policies for increasing patients'
15 involvement in their healthcare and collaboration with health professionals in the UK (NHS
16 Executive, 2000, NHS Executive, 1999), the Unites States (US) (Koch, 1992), the
17 Netherlands (Den Brink- Muinen et al., 2006) and Australia (Queensland Health, 2002). The
18 World Health Organisation (World Health Organisation, 2002) has also recognised and
19 supported patients to play an active and participatory role in improving their well-being and
20 increase the efficiency of the health care system (Coulter et al., 2008, World Health
21 Organisation, 1997). This study also confirms the beneficial impact of, and supports the
22 worldwide application of self-management programmes that were originally developed from
23 the Arthritis Self-Management Programme (Lorig, 1986, Lorig, 2003, Lorig, 1993). Patients
24 take a lead role in managing their chronic conditions, with effective self-management support
25 accomplished by health professionals working collaboratively to support and empower
26 patients to use the effective self-management strategies (Lukewich et al., 2015). In line with
27 these policies, the findings of this study contribute to a growing literature highlighting the

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1 importance of patient-professional partnerships in the self-management of chronic pain and
2 confirm causal relations between patient-professional partnerships, self-management of
3 chronic back pain and health outcomes.

4 Limitations and conclusions

5 As with any research, this study has some limitations which need to be discussed. First, the
6 time interval between baseline and follow-up is relatively short, so longer-term follow-up is
7 needed to provide further data on the maintenance of self-management development and
8 health improvement. Second, the relatively small sample size affects the power of the study
9 and its ability to detect effects. The sample of patients is limited to those able to understand
10 English, thus the generalisability to other cultural groups may be questionable. Also, there
11 were 32 people who were discharged due to the service attendance policy, therefore it was
12 uncertain whether follow-up data would have strengthened or weakened the study findings if
13 these people had been followed up. However, no significant difference was detected
14 between patients who completed this study and those who participated only at baseline,
15 therefore missing data were likely to have been missing by chance. This may suggest that
16 our estimates and conclusions were robust to omitting those non-attenders. Given the fact
17 that the severity of certain medical conditions (e.g. pain) is subjective and may be difficult to
18 measure through objective tests, self-reported retrospective measures used in this study
19 may further overestimate as well as underestimate the outcomes (Prince et al., 2008) due to
20 the asymptomatic nature of many comorbidities such as pain, hypertension, diabetes, heart
21 disease and cancer at moderate and sometimes very elevated levels.

22 Despite these limitations, this study suggests that the increase in patients' self-management
23 ability may lead to improvement in their health outcomes after pain management support
24 provided through a partnership with health professionals in primary care. It also suggests
25 that a patient-professional partnership is beneficial for patients' health outcome via an
26 indirect pathway where self-management was a mediator. The findings of this study extend
27 the understanding of the practice of self-management in the treatment of chronic pain and in

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1 the improvement of patients' health outcomes. This study highlights that the self-
2 management support alone may not be sufficient and partnerships in care can make an
3 essential contribution to ensure improved health outcomes. Given the increasing recognition
4 of the value of professional-patient partnership in supporting patients to live the best possible
5 quality of life with their chronic condition (Barnes and Hudson, 2006), this study provides
6 empirical evidence that assessment of PPiC is valuable and that measuring patient-reported
7 professional-patient partnership is key to improving self-management by patients with
8 chronic conditions. The primary clinical implication of the study is the demonstration that a
9 good patient-professional partnership is beneficial as an augmentation to self-management
10 practice for patients with chronic pain. Both patients and health professional should be
11 aware that not only is pain self-management support useful, but also their partnerships
12 during the care process is a necessary component to facilitate the journey from receiving
13 pain management support and care to improved health outcomes. Moreover, rather than
14 relying almost exclusively on taught physical exercise, health professionals should
15 emphasise the effective communication skills required understand patient's expectations and
16 preferences and work together with patients to set up achievable goals and recommend
17 individualised treatments. There may also be a need for clinical leads to gain feedback from
18 patients and health professionals on their partnerships. More research may be needed to be
19 able to confirm the results of this study in a larger sample of patients. Further studies are
20 also needed to assess the cost-effectiveness of pain management clinics of this kind, the
21 results of which may reduce doctor visits and financial burden to health services.

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