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Physiotherapy Outcomes Are Associated With Shorter Waiting Times, More Treatment Sessions and Younger Age: Analysis of a Clinical Database

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ABSTRACT

Background: Musculoskeletal (MSK) conditions affect over 20.3 million people in the UK, presenting a substantial economic impact on health and social services. Physiotherapy can alleviate MSK conditions, especially if delivered in the acute or sub-acute period. However, patients often present after significant waiting times.

Objectives: Our analysis examined how waiting times and the number of treatments influenced physiotherapy outcomes for MSK conditions.

Design: Retrospective analysis of the Data for Impact, Physio First dataset.

Methods: Logistic regression models assessed the effects of symptom duration, treatment frequency, and other variables on pain, Patient-Specific Functional Scores (PSFSs), and Goal Achievement (GA).

Results: Analysis of 15,624 patient records showed that patients treated within two weeks of symptom onset were more likely to have favourable outcomes in pain (odds ratio [OR] = 2.01, 95% Confidence Interval [95% CI] = 1.65–2.45), PSFS (OR = 1.80, 95% CI = 1.55–2.08), and GA (OR = 1.74, 95% CI = 1.51–2.01) compared to those treated after longer durations. Receiving four or more treatment sessions significantly improved outcomes compared with only one session (pain: OR = 4.64, PSFS: OR = 5.72, GA: OR = 1.94, all p's < 0.001), with no additional benefits beyond four sessions. Younger age was associated with better outcomes (approximately OR = 0.99 per year age difference). Other findings included better outcomes in males and in those with fewer previous episodes of the condition.

Conclusions: Shorter waiting times, a greater number of treatments, and younger patient age are associated with better physiotherapy outcomes for MSK conditions.

1 | Introduction

Musculoskeletal (MSK) conditions are an umbrella term for disorders affecting bones, joints, muscles, and the spine. These conditions result in pain, stiffness, limited mobility and disability, impacting quality of life and independence (Versus Arthritis 2021; Vos et al. 2020). They are a global health concern as they are the greatest cause of disability in the UK and worldwide (Versus Arthritis 2021; Vos et al. 2020). Over 20.3 million people live with MSK conditions, and 20% of

England's population consults their general practitioner about this once each year (Office for National Statistics 2023). These numbers are expected to increase because the UK has an ageing population, and the prevalence of MSK conditions increases with age (Versus Arthritis 2021). MSK conditions represent a significant economic burden as they are the second biggest cause of sickness absence, accounting for 22.4% of total sickness absence, costing the UK an estimated £7 billion a year (Office for National Statistics 2023).

The management of MSK conditions is multi-disciplinary and includes physicians, physiotherapists, and pharmacology (Foster et al. 2018). Physiotherapy is recommended as a first-line treatment for lower back pain and other musculoskeletal pain and is effective in supporting self-management and alleviating symptoms of MSK conditions (Corp et al. 2021; Foster et al. 2018; García-Moreno et al. 2022; Ginnerup-Nielsen et al. 2016). Guidelines for acute management include advice to stay active and education about the condition (Bertucco and Cesari 2010; Corp et al. 2021; Foster et al. 2018; Lin et al. 2020; Wand et al. 2004). These recommendations differ for managing chronic MSK conditions. In addition to the above, exercise therapy is a first-line treatment recommendation with several second-line additional intervention options (Foster et al. 2018). In some cases, chronic pain can lead to compensatory changes in posture, avoidance of activities due to fear, and psychological distress. To effectively manage such manifestations of chronic pain, additional treatment modalities may need to be utilised. These may include targeted exercises to correct postural imbalances, cognitive-behavioural therapy to address fear-avoidance behaviours, and counselling to manage the psychosocial aspects of chronic pain (Hylands-White, Duarte, and Raphael 2017).

Despite early physiotherapy being recommended (Foster et al. 2018), patients often present for physiotherapy after significant waiting times due to a variety of reasons, including limited resources, delays in referrals, or patients adopting a wait-and-see approach and only seeking treatment later. Most research has investigated the effect of waiting times in the public sector. However, waiting times are also pertinent to the private sector as patients may change from the public to the private sector after significant waiting periods or employing a wait-and-see approach.

It is not surprising that longer waiting times for therapy can lead to a deterioration in the health status of patients while waiting (Lynch et al. 2008). However, a recent systematic review investigating the effect of MSK physiotherapy waiting times on outcomes could not draw conclusive findings due to mixed results. Despite this finding, most studies included in this review reported that longer waiting times had a detrimental effect on at least one clinical outcome, including pain, disability, quality of life and psychosocial outcomes (Deslauriers et al. 2021).

It is expected that longer waiting times could complicate treatment as chronic conditions are known to be less responsive to interventions (Feine and Lund 1997; Mallen et al. 2007). This is likely to result in the need for a higher number of interventions. However, there is limited evidence to support this. We therefore propose to establish how waiting times, number of treatments, and other key factors, such as age, gender, history of the condition, and baseline severity, influence physiotherapy outcomes (Rankin 2020). Identifying potential moderating and mediating factors could inform how we propose self management strategies for those with existing conditions (i.e., when to seek treatment and when to 'wait and see') and how to manage patient expectations.

The purpose of this study is to answer three research questions. Firstly, is there a significant difference in treatment outcomes between patients who seek physiotherapy treatment early and those who wait longer before seeking treatment? Secondly, how does the number of physiotherapy treatment sessions affects the outcomes for MSK conditions? Finally, do other important factors such as age, sex, history of previous episodes of the condition, and baseline pain severity have an impact on treatment outcomes?

2 | Methods

2.1 | Ethical Declaration

This study has been conducted as part of the Data for Impact project (Moore, Bryant, and Olivier 2012). A favourable ethical opinion has been in place throughout the duration of this project and allows the use of these data for research. Approval was most recently granted by the Life, Health, and Physical Sciences Research Ethics Committee (Ref: 2020-7221) prior to the commencement of this study. The research has been conducted according to the principles outlined in the Declaration of Helsinki, except for prior registration in a database due to its retrospective enactment.

2.2 | Database

This cross-sectional study used data extracted from an online standardised data collection system (SDC) of patient outcomes from physiotherapy from 2014 to 2022 (Moore, Bryant, and Olivier 2012; Murtagh et al. 2021). For the analysis, we included all individuals for whom a complete dataset of the Numeric Pain Rating Scale (NPRS), Patient Specific Functional Score (PSFS) and Goal Achievement (GA) was available. The SDC was populated by UK private practice physiotherapists who are members of Physio First (the trade Organisation for Chartered Physiotherapists in Private Practice) and are participating in the Data for Impact project. The SDC system includes information on patient demographics, diagnosis, symptoms, treatment details, and outcome measures (i.e., NPRS, PSFS, GA). The online SDC was administered using FileMaker Pro 16 Advanced (Claris International Inc., Cupertino, USA).

2.3 | Outcome Measures

The 11-point NPRS is a widely used measure of pain intensity in clinical practice (Dworkin et al. 2008; Farrar et al. 2001; Maughan and Lewis 2010) with good reliability and validity compared to other approaches for assessing clinical pain (Euasobhon et al. 2022). For our analysis, baseline pain was

categorised into three levels: mild (NPRS = 0–3), moderate (NPRS = 4–7) and severe pain (NPRS = 8–10) (Salaffi et al. 2004). A good pain outcome was defined as acceptable pain (NPRS ≤3) and a poor pain outcome as unacceptable pain (NPRS >3) (Myles et al. 2017). We also established whether a minimal clinically important difference (MCID) in pain was achieved at the end of treatment (a decrease in NPRS from baseline to end of treatment ≥2) or not achieved (NPRS change from baseline to end of treatment <2) (Salaffi et al. 2004).

PSFS is a self-reported patient-specific measure designed to assess functional change, primarily in patients presenting with MSK disorders (Stratford et al. 1995). The scale was developed as a self-report measure of physical function that could be used in patients with varying levels of independence. To establish PSFS outcome, the change in each PSFS activity from baseline to the end of treatment is calculated on an individual basis. If either of the two scores was absent, then that activity was ignored. A mean change in all PSFS activities was calculated for each individual. A MCID in PSFS was defined as a mean change of ≥2.3, between baseline and end of treatment on an individual basis (Maughan and Lewis 2010).

Goals were set pre-treatment and agreed upon between the patient and their physiotherapist. Goals could include pain, range of movement, function, patient's interpretation of subjective perceived improvements and the ability to work. GA was recorded at discharge as being either 'Exceeded', 'Fully achieved', 'Significantly achieved', 'Partially achieved', or 'not achieved'. For the purposes of this study, success at discharge was deemed to occur when goals were either fully achieved or exceeded, whereas goals that were not fully achieved (i.e., significantly achieved, partially achieved, or not achieved) were deemed unsuccessful. Patients that had goals recorded as 'Other, that is worse, poor referral, additional problems' were excluded from the analysis.

Other factors: Age was analysed as a continuous variable and sex was dichotomised. The number of treatment sessions had 10 levels (1–10), with each level representing the number of treatments in the current episode and 10 indicating 10 or more treatments. The duration of symptoms had four levels: less than 1 week, 1–2 weeks, 3–6 weeks, and more than 6 weeks. The history of previous episodes had three levels: no previous episodes, one previous episode and two or more previous episodes.

2.4 | Statistical Analysis

Logistic regression models were fitted for each of the three outcomes (pain, PSFS, GA). We modelled the outcome of physiotherapy treatment in relation to an acceptable (NPRS ≤3) or unacceptable pain score (NPRS ≥4), an MCID in PSFS (≥2.3 vs. <2.3) and full achievement versus not full achievement in goals. Independent variables included 'duration of symptoms', 'number of treatments', 'history of condition' (0, 1, >1), 'sex' and 'age' and pre-treatment pain score (baseline) with levels (mild, moderate, severe). For the modelling of PSFS, we also included the number of subject-specific activities as an independent variable. The analyses were carried out using the statistical software R, with the significance level set at 5%. For each of the models, the Hosmer–Lemeshow (HL) test was used to assess the goodness-of-fit. Additionally, the Area Under the Receiver Operating Characteristic curve (AUROC) was used to examine the discrimination ability of the logistic models. Finally, pairwise comparisons of the different levels of the independent variables 'duration of symptoms', 'number of treatments', and 'history of condition' were performed on each of the three logistic models using the R package emmeans and applying Tukey's correction for multiple testing.

3 | Results

3.1 | Descriptives

Our inclusion criteria resulted in the analysis of 15,624 therapy records. The age distribution of the patients ranged from 5 to 95 years, with a median age of 54 years (IQR: 40–65 years) (Table 1). The sample included marginally more females than males (52% vs. 48%). The majority of patients had no previous history of their condition (62%) compared with patients reporting one previous episode of the condition (15%) or more than one previous episode (23%). Individuals presented to therapy after a varied duration of symptoms of 0–1 weeks (8.8%), 1–2 weeks (17%), 3–6 weeks (26%) and longer than 6 weeks (49%). Baseline pain scores were spread between mild (11%, 0–3 NPRS), moderate (62%, 4–7 NPRS) and severe (27%, 8–10 NPRS).

The number of treatment sessions that patients received varied, and the outcomes for pain and PSFS were very good (87% acceptable pain and 80% MCID PSFS change, respectively). GA was fully achieved or exceeded in 61% of individuals and only significantly, partially, or not achieved in 39%.

Descriptive analysis of the diagnostic data (Table 2) revealed 58 different diagnostic responses within the SDC dataset. The most prevalent condition was joint dysfunction/pain, which accounted for 18.6% of all cases. This was followed by muscular tenderness/dysfunction (8.9%), non-specific low back pain (acute/chronic) (7.7%), and tendinopathy (6.2%). All other individual diagnoses had occurrence rates of less than 5%, with miscellaneous conditions (i.e., conditions with an occurrence rate of less than 1%) accounting for 6.6% of the total sample. Finally, 0.9% of diagnoses were classified as 'undefined', indicating missing data.

In terms of body site, lower limb conditions accounted for 36.2% of all cases, followed by the lumbar spine and pelvis (26.2%), upper limb (17.2%), head and neck (14.8%) and thoracic spine (3.9%). A smaller proportion of the diagnoses (0.9%) were grouped under the category of 'miscellaneous' for body sites with occurrence rates of less than 1%. Finally, 0.7% of the cases were classified as 'undefined', indicating missing or unspecified body site data.

3.2 | Model Fit for the Outcome Measures

The HL test suggested no evidence of lack of fit for the fitted logistic regression models that we employed for pain ($p = 0.144$),

TABLE 1 | Descriptive statistics.

Variable	*N* = 15,624
Age (years)	54 (IQR: 40–65)
Sex	
Female	8094 (52%)
Male	7530 (48%)
History of condition	
No previous history	9676 (62%)
1 previous episode	2293 (15%)
2 or more previous episodes	3655 (23%)
Duration of symptoms	
Less than 1 week	1380 (9%)
1–2 weeks	2605 (17%)
3–6 weeks	4053 (26%)
More than 6 weeks	7586 (49%)
Baseline pain (NPRS)	
Mild (0–3)	1769 (11%)
Moderate (4–7)	9703 (62%)
Severe (8–10)	4152 (27%)
Number of treatments	
1	1597 (10%)
2	3133 (20%)
3	3328 (21%)
4	2878 (18%)
5	1977 (13%)
6	1095 (7%)
7	505 (3%)
8	431 (3%)
9	183 (1%)
10 or more	497 (3%)
Pain outcome (NPRS)	
Acceptable (0–3)	13,618 (87%)
Not acceptable (4–10)	2006 (13%)
MCID in PSFS	
Achieved (ΔPSFS ≥2.3)	12,445 (80%)
Not achieved (ΔPSFS <2.3)	3179 (20%)
PSFS activities	
1 activity	4190 (27%)
2 activities	4979 (32%)
3 activities	6455 (41%)
Goal Achievement	
Achieved	9464 (61%)
Not achieved	6160 (39%)

Abbreviations: MCID = minimal clinically important difference, NPRS = Numerical Pain Rating Scale, PSFS = Patient-Specific Functional Scale.

TABLE 2 | Descriptive statistics for diagnosis.

Diagnosis	Frequency	Percentage
Joint dysfunction/pain	2901	18.6
Muscular tenderness/dysfunction	1392	8.9
Non-specific low back pain (acute/chronic)	1198	7.7
Miscellaneous[a]	1035	6.6
Tendinopathy	973	6.2
Osteoarthritis	693	4.4
Disc lesion with neural impingement	581	3.7
Ligamentous injury	519	3.3
Post-operative symptoms	496	3.2
Anterior knee pain	460	2.9
Soft tissue injury	429	2.7
Nerve impingement	425	2.7
Multiple tissue injury (bone, joint, soft tissue)	420	2.7
Bony injury (e.g., fracture)	376	2.4
Disc lesion	376	2.4
Whiplash	371	2.4
Joint injury	343	2.2
Rotator cuff	340	2.2
Muscle imbalance	331	2.1
Impingement syndrome	287	1.8
Capsulitis	271	1.7
Other	271	1.7
Meniscal tear/cartilage/labrum	264	1.7
Spondylosis/arthrosis	210	1.3
Repetitive strain injury/overuse injury	180	1.2
Tennis elbow	175	1.1
Bursitis	168	1.1
Undefined[b]	139	0.9

[a]Miscellaneous: Conditions with occurrence rates of less than 1%.
[b]Undefined: Missing or unspecified diagnostic data.

PSFS ($p = 0.340$) or GA ($p = 0.870$). The discrimination ability of the logistic models was acceptable for pain (AUROC = 74.03%) and PSFS (AUROC = 69.96%) but less so for GA (AUROC = 62.67%). See Supporting Information S1 for full model details, including interpretation of the odd ratios for the effect of each independent variable in each model.

3.3 | Duration of Symptoms

Individuals who reported shorter symptom durations prior to treatment were more likely to have favourable pain, PSFS and

GA outcomes than those with a longer duration of symptoms (Table 3 and Figure 1A–C). Pairwise comparisons indicated that patients waiting 1–2 weeks for treatment did not significantly differ in their outcomes compared with those receiving treatment in the first week of symptoms (pain: $p = 0.996$, PSFS: $p = 0.656$, GA: $p = 0.335$). However, symptom durations of 0–1 weeks or 1–2 weeks were significantly more likely to achieve favourable pain, PSFS, and GA outcomes than individuals who had experienced symptoms for more than 2 weeks before presenting for treatment (p's < 0.001). Furthermore, those waiting 3–6 weeks were also more likely to achieve favourable pain, PSFS, and GA outcomes compared with individuals who had experienced symptoms for more than 6 weeks before presenting for treatment (p's < 0.001), suggesting that the longer the duration of symptoms, the less likely individuals were to have favourable pain, PSFS, and GA outcomes.

3.4 | Number of Treatments

Individuals who received just one treatment were less likely to have better pain, PSFS, or GA outcomes than those receiving two or more treatments (p's < 0.001, Table 4). Pairwise comparisons suggested that individuals receiving four or more physiotherapy treatments had significantly better pain, PSFS and GA outcomes than those receiving fewer treatments for almost all comparisons (Figure 2A–C, see Supporting Information S1: S4–S6 for full details). However, there were no significant differences in pain, PSFS, or GA outcomes for individuals who received five or more treatments compared with those who received four treatments (p's > 0.05).

3.5 | Age

Younger individuals were more likely to have a more favourable pain, PSFS, and GA outcome compared to older individuals (approximately OR = 0.99 for each year difference in age for all analyses) (Figure 3A–C).

3.6 | Additional Factors Affecting Treatment Outcomes

We also summarised the effects of the other independent variables (see Supporting Information S1: S1–S3 for full details). Patients with mild baseline pain scores were more likely to have favourable post-treatment pain outcomes (p's < 0.001) and to achieve their goals (p's < 0.001), but they were less likely to have a favourable PSFS outcome (p's ≤ 0.002). Furthermore, patients who completed more PSFS activities were more likely to have a favourable PSFS outcome than patients who completed less ($p < 0.001$). A history of previous episodes did not affect pain ($p = 0.057$) or PSFS ($p = 0.067$) outcomes. However, significant

TABLE 3 | Changes in the odds ratio (OR) for a good pain outcome (NPRS ≤3), achievement of a minimal clinically important difference in Patient-Specific Functional Score (PSFS), and Goal Achievement (GA) between patients receiving treatment within the first week of symptoms (0–1 week) and patients with longer symptom durations.

	Pain			PSFS			GA		
Symptom duration	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***
0–1 week	—	—		—	—		—	—	
1–2 weeks	0.97	0.75, 1.24	0.80	0.90	0.74, 1.08	0.30	0.88	0.76, 1.02	0.09
3–6 weeks	0.58	0.46, 0.72	<0.001	0.63	0.53, 0.76	<0.001	0.69	0.60, 0.79	<0.001
>6 weeks	0.28	0.23, 0.35	<0.001	0.41	0.35, 0.49	<0.001	0.41	0.36, 0.47	<0.001

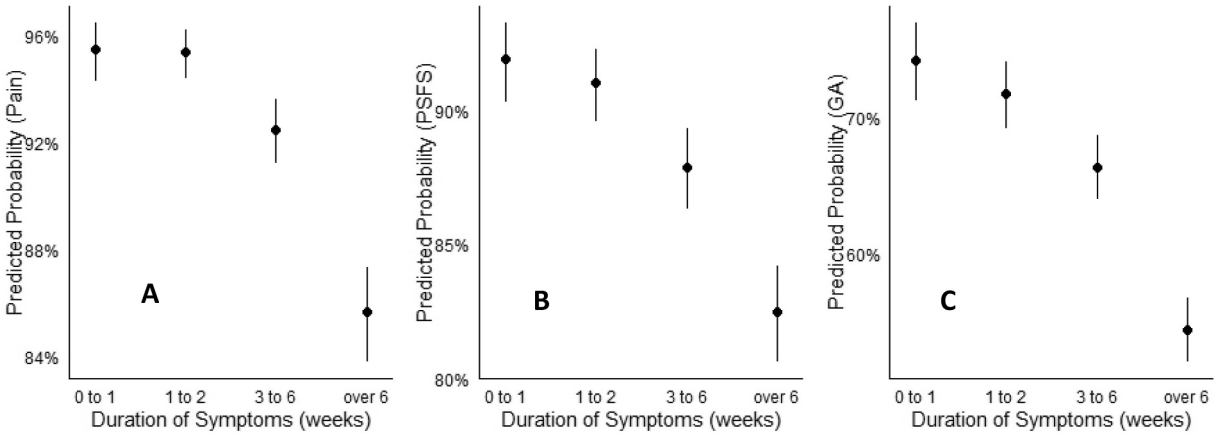

FIGURE 1 | Effect of symptom duration on the predicted probability of achieving (A) a good outcome for pain (NPRS ≤3), (B) a minimal clinically important difference for Patient-Specific Function Score (change in PSFS ≥2.3), and (C) fully achieving or exceeding goals (Goal Achievement [GA]) for physiotherapy outcomes.

TABLE 4 | Effect of treatment number on changes in the odds ratio (OR) for a good pain outcome (NPRS ≤3), achievement of a minimal clinically important difference in Patient-Specific Functional Score (PSFS), and Goal Achievement (GA).

	Pain			PSFS			GA		
Treatments	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***	**OR**	**95% CI**	***p***
1	—	—		—	—		—	—	
2	2.99	2.52, 3.54	<0.001	3.39	2.97, 3.88	<0.001	1.47	1.30, 1.67	<0.001
3	3.95	3.33, 4.70	<0.001	4.47	3.89, 5.13	<0.001	1.72	1.51, 1.95	<0.001
4	4.64	3.87, 5.57	<0.001	5.72	4.93, 6.65	<0.001	1.94	1.70, 2.21	<0.001
5	5.48	4.48, 6.72	<0.001	6.10	5.16, 7.23	<0.001	2.04	1.77, 2.35	<0.001
6	6.36	4.98, 8.16	<0.001	6.32	5.16, 7.79	<0.001	2.34	1.98, 2.76	<0.001
7	6.71	4.86, 9.44	<0.001	8.91	6.56, 12.3	<0.001	2.46	1.98, 3.06	<0.001
8	5.04	3.67, 7.04	<0.001	7.71	5.65, 10.7	<0.001	2.26	1.80, 2.85	<0.001
9	5.41	3.44, 8.86	<0.001	6.38	4.18, 10.1	<0.001	2.49	1.80, 3.47	<0.001
10+	6.05	4.45, 8.33	<0.001	7.48	5.61, 10.1	<0.001	2.03	1.64, 2.51	<0.001

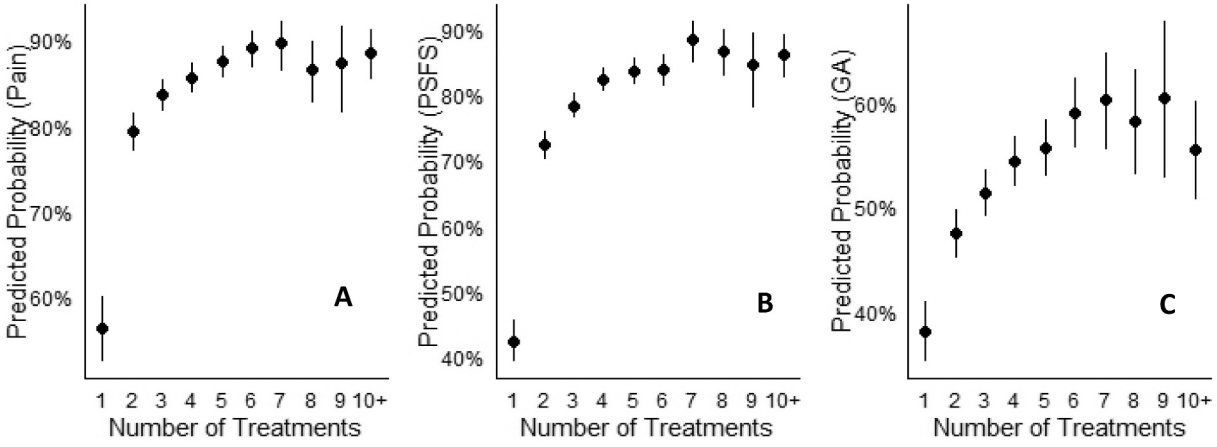

FIGURE 2 | Effect of treatment number on the predicted probability (PP) of achieving (A) a good outcome for pain (NPRS ≤3), (B) a minimal clinically important difference for Patient-Specific Function Score (change in PSFS ≥2.3), and (C) fully achieving or exceeding goals (Goal Achievement [GA]) for physiotherapy outcomes.

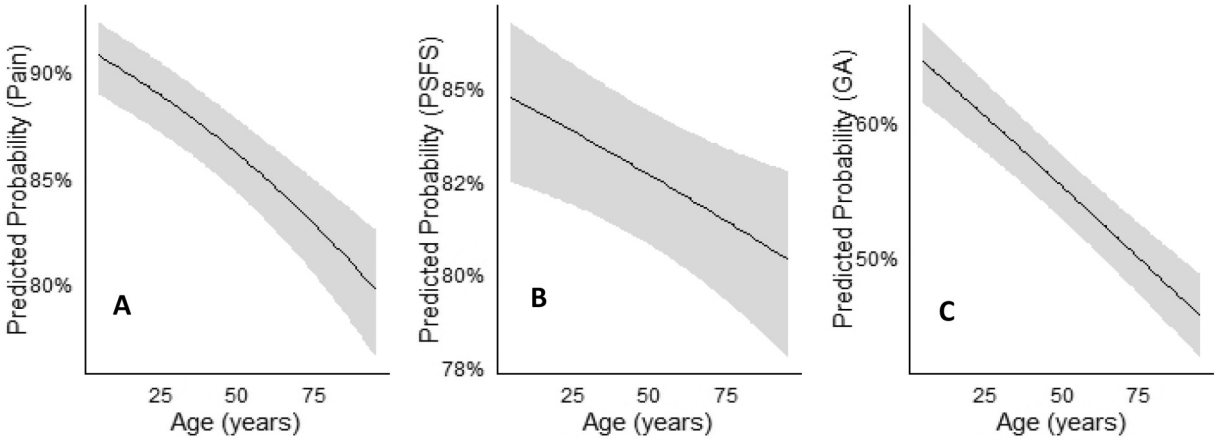

FIGURE 3 | Effect of age on the predicted probability (PP) of achieving (A) a good outcome for pain (NPRS ≤3), (B) a minimal clinically important difference for Patient-Specific Function Score (change in PSFS ≥2.3), and (C) fully achieving or exceeding goals (Goal Achievement [GA]) for physiotherapy outcomes.

differences were evident for GA, where patients with two or more previous episodes were less likely to achieve their goals than those with no previous history ($p < 0.001$). Males were more likely than females to have acceptable pain score (OR = 1.24, $p < 0.001$, 95% CI (1.12–1.37)) and to achieve their goals (OR = 1.14, $p < 0.001$, 95% CI (1.06–1.21)). There was no significant gender effect for PSFS (OR = 1.06, $p = 0.200$, 95% CI (0.98–1.15)).

4 | Discussion

This study examined how physiotherapy outcomes for MSK conditions are influenced by factors including symptom duration, number of treatments, previous condition history, age, and gender. Our analysis of a large national dataset, which included 15,624 patient records covering 58 different diagnoses, demonstrates that shorter waiting times for MSK physiotherapy, more treatment sessions and a younger age lead to better pain reduction, functional outcomes, and goal achievement. Interestingly, the beneficial effect of a greater number of treatment sessions plateaued after only four treatment sessions.

Physiotherapy in the acute period of musculoskeletal symptoms is known to be effective, with the greatest evidence base in the provision of advice and education and exercise therapy (Babatunde et al. 2017; Foster et al. 2018; Linton, Hellsing, and Andersson 1993). Our data supports this observation and suggests that patients who start physiotherapy within the first 2 weeks of symptom onset have better outcomes, while longer waiting times are associated with a decreased likelihood of good outcomes for pain, function, and goal achievement (Figure 1). For instance, patients who waited for 3–6 weeks to receive treatment were 42% less likely to achieve a good outcome for pain (NPRS ≤3), while those who waited for over 6 weeks were 72% less likely to achieve a good outcome for pain compared to those who received treatment within 1 week of experiencing symptoms. Early interventions can reduce the emergence of pain avoidance behaviour (Zale and Ditre 2015), which may include changed levels of physical activity, compensatory postures, and abnormal movement strategies (Nishi et al. 2019). All of these behaviours can lead to the development of chronic pain, which is known to be more resistant to therapeutic interventions (Yarnitsky 2015). Recent guidelines propose different therapeutic approaches and interventions when treating acute or chronic lower back pain (Foster et al. 2018) as the underlying pathophysiological processes are likely to be different. Early effective management has also been found to reduce sickness absence (Linton, Hellsing, and Andersson 1993), a side-effect of musculoskeletal conditions with a huge impact on society (Versus Arthritis 2021). Although it is likely that individuals with more severe symptoms may be consulting private physiotherapy earlier than individuals with mild symptoms, this is not driving these findings in our analysis as we controlled for baseline pain severity.

The best evidence for the effectiveness of physiotherapy management of musculoskeletal conditions is the provision and performance of exercise therapy (Babatunde et al. 2017). Therefore, it is not surprising that a number of treatments are required to optimise the effect of physiotherapy. Our data strongly supports this premise, with the probability of a good physiotherapy outcome improving as the number of treatments increased from one to four sessions (Figure 3). However, our data also indicates that further increases in the treatment number beyond four sessions did not afford any additional improvements in pain, functional outcomes, or goal achievement. A straightforward interpretation of these findings would indicate that the cumulative efficacy of physiotherapy on acute MSK conditions becomes relatively limited beyond a small number of treatment sessions. However, it is more likely that this observed plateau reflects an interaction with numerous factors, such as the type and severity of the condition being treated, the type and frequency of treatment being used, adherence to treatment, as well as various psychological, social, and demographic considerations, which can influence the optimal number of treatments required to achieve a positive physiotherapy outcome (Aasdahl et al. 2021; Bailey et al. 2018; Lee et al. 2020). Overall, this data supports the effectiveness of physiotherapy interventions across a varying number of treatment sessions, with optimal therapeutic outcomes achieved with as few as four sessions. This should encourage practitioners and health care commissioners in the private and public sectors.

Our analysis replicates previous findings in the literature that greater age is associated with poorer outcomes (Loeser 2010). This is not surprising as healing is slower with age and more comorbidities exist, including osteoarthritis (Briggs et al. 2016; Loeser 2010; Versus Arthritis 2021). Older individuals can also be less active, which is known to be detrimental to the management of musculoskeletal pain and has far-reaching implications on independence and mortality (Briggs et al. 2016). In the context of an ageing population, this is concerning and highlights the need for recommendations to reduce the occurrence of musculoskeletal conditions and the development of effective interventions and MSK care strategies (Public Health England 2019).

The association between therapy outcomes and previous episodes of the same condition is less clear. In our analysis, the condition history was not associated with either pain or PSFS outcome. However, not having a history of this condition was interestingly associated with a poor outcome in goal achievement. This is inconsistent with previous literature where a history of the condition or persistent occurrence of an MSK condition is linked to reduced treatment effectiveness (Lynch et al. 2008). This is not easy to explain but may relate to the subjective nature of GA outcomes and the potential for individuals with previous episodes to be more conservative in their treatment goals.

Another interesting finding is that men have a better pain outcome and are more likely to achieve their goals compared with women. The observed differences in outcomes between the sexes were not large, and a similar pattern has been reported previously in the literature (McGeary et al. 2003). However, this finding is noteworthy considering that women across almost all age groups have a higher systemic risk of developing an MSK

condition (Nordander et al. 2009; Wijnhoven, de Vet, and Picavet 2006a) and are also more likely to be living with a chronic MSK condition (Overstreet et al. 2023). The reasons behind the higher occurrence of MSK conditions in women seem to differ based on the specific condition but generally include biological, psychological, social, and economic factors (Overstreet et al. 2023). Women are also more susceptible to MSK conditions based on certain risk factors when compared to men (Wijnhoven, de Vet, and Picavet 2006b). In terms of treatment, multiple biological and psychological processes are known to influence the sensitivity and perception of pain as well as the response to treatment (Bartley and Fillingim 2013). A better understanding of these factors could help improve MSK physiotherapy outcomes for women.

There are limitations to this retrospective cross-sectional analysis of a clinical dataset as there is no a priori hypothesis for the data collection. Additionally, the interpretation of treatment effectiveness needs to be performed with care without a control group. The cohort in this study represents a fee-paying subset of individuals attending physiotherapy. This factor may influence an individual's response to advice and adherence to exercise provision, which has not, to our knowledge, been reported in the literature. However, these factors do mean that the findings should not be extrapolated to hold for all physiotherapy attendees without further analysis. In order to gain a better understanding of the associations highlighted in this study, it is recommended that future research focuses on examining the underlying causes. Specifically, researchers should investigate the factors that affect the optimal number of treatments required to achieve positive outcomes for patients with acute MSK conditions. Additionally, it would be beneficial to explore the reasons that influence patients' decisions about when to seek treatment for an MSK condition. This is particularly important given the poor probability of good outcomes being observed for patients who experienced longer symptom durations in this study.

5 | Conclusion

The results of this study highlight several important factors that impact physiotherapy outcomes for MSK conditions. The findings suggest that patients who have shorter waiting times, receive more treatments, and are younger in age are more likely to achieve positive results. Additionally, there were differences between males and females, with males having slightly better outcomes with regard to pain and being more likely to achieve their treatment goals. These insights have important implications for healthcare providers seeking to optimise treatment strategies for MSK patients.

Author Contributions

S.M. developed the idea for the paper. G.O. managed the data collection. U.H., A.T. and S.M. were involved in planning and executing the data management and data analyses and were responsible for the interpretation of the results. U.H., J.B., and S.M. all contributed to the writing of the paper. All authors reviewed and contributed to the final manuscript.

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Ethics Statement

Approval was most recently granted by the Life, Health, and Physical Sciences Research Ethics Committee at the University of Brighton (Ref: 2020-7221) prior to the commencement of this study.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.