General group exercise in low back pain management in a military population, a comparison with specific spine group exercise

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General group exercise in low back pain management in a military population: a service evaluation

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Keywords:	chronic low back pain, group rehabilitation, exercise, service evaluation
Abstract:	Objective: To investigate whether general group exercise (GGE) offers the same outcomes when compared with a specific spinal group exercise (SSGE) for chronic low back pain (CLBP) in a military population. Design: Retrospective service evaluation using routine service activity data. Setting: A UK military rehabilitation centre. Participants: A total of 106 CLBP patients. Interventions: Three-week intensive (five days per week, 15-day intervention) rehabilitation course for patients with CLBP. Six SSGE groups (n= 64); CLBP only. Six GGE groups (n=42); CLBP patients grouped with chronic lower limb injuries. Outcome Measures: Oswestry Disability Index (ODI), Numerical Pain-Rating Scores (NPRS) and the Modified Multi-Stage Fitness Test (Mod-MSFT). Long term effects were measured by Medical Employment Standard (MES) status and physiotherapy follow-up at three and 12 months. Results: A between-group analysis showed no significant difference in GGE compared to SSGE. Mean changes (standard deviation) in pain were -2.71 ±2.35 and -1.20 ±1.99 (p=0.018), ODI were -3.6±5.7 and -4±8.5 respectively (p = 0.649) and Mod-MSFT 28.4±30.8 and 29.7±31.7 respectively (p = 0.792). At three months, a greater proportion of the GGE were having on-going physiotherapy; GGE = 50%, SSGE = 30.2%, (p = 0.016) although, some differences were evident across MES with 32.5% of GGE compared to 20.6% of SSGE being medically fit with no restrictions. . At 12 months, groups were largely comparable for follow up physiotherapy and MES; 22.5% of GGE and 20.6% of SSGE continued to have physiotherapy input; 47.5% of GGE and 50.8% of SSGE medically fit with no restrictions. Conclusion: Patients with CLBP who completed a 3-week rehabilitation programme had comparable outcomes when grouped with LL patients, although only improvements in pain in the GGE group achieved a meaningful change. Further evaluation of potential costs and savings to service costs are now required.

TITLE

General group exercise in low back pain management in a military population, a comparison with specific spine group exercise: a service evaluation

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Key words: chronic low back pain, group therapy, exercise, service evaluation

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ABSTRACT

Objective: To investigate whether general group exercise (GGE) offers the same outcomes when compared with a specific spinal group exercise (SSGE) for chronic low back pain (CLBP) in a military population.

Design: Retrospective service evaluation using routine service activity data.

Setting: A UK military rehabilitation centre.

Participants: A total of 106 CLBP patients.

Interventions: Three-week intensive (five days per week, 15-day intervention) rehabilitation course for patients with CLBP. Six SSGE groups (n= 64); CLBP only. Six GGE groups (n=42); CLBP patients grouped with chronic lower limb injuries.

Outcome Measures: Oswestry Disability Index (ODI), Numerical Pain-Rating Scores (NPRS) and the Modified Multi-Stage Fitness Test (Mod-MSFT). Long term effects were measured by Medical Employment Standard (MES) status and physiotherapy follow-up at three and 12 months.

Results: A between-group analysis showed no significant difference in GGE compared to SSGE. Mean changes (standard deviation) in pain were -2.71 ±2.35 and -1.20 ±1.99 (p=0.018), ODI were -3.6±5.7 and -4±8.5 respectively (p = 0.649) and Mod-MSFT 28.4±30.8 and 29.7±31.7 respectively (p = 0.792). At three months, a greater proportion of the GGE were having on-going physiotherapy; GGE = 50%, SSGE = 30.2%, (p = 0.016) although, some differences were evident across MES with 32.5% of GGE compared to 20.6% of SSGE being medically fit with no restrictions. . At 12 months, groups were largely comparable for follow up physiotherapy and MES; 22.5% of GGE and 20.6% of SSGE continued to have physiotherapy input; 47.5% of GGE and 50.8% of SSGE medically fit with no restrictions.

Conclusion: Patients with CLBP who completed a 3-week rehabilitation programme had comparable outcomes when grouped with LL patients, although only improvements in pain in the GGE group achieved a meaningful change. Further evaluation of potential costs and savings to service costs are now required.

INTRODUCTION

As well as the leading cause of disability in the general working age population globally, chronic low back pain (CLBP) is also the most common musculoskeletal presentation in the US and UK armed forces.[1 2] In 2009 7% of UK armed forces medical discharges were a consequence of low back pain.[3] Where exercise is recommended for management of LBP [4] in the general population, exercise rehabilitation has been identified as a research priority by the UK Defence Directive of Rehabilitation (DDR).[5]

Recent National Institute for Health and Clinical Excellence guidelines recommend group exercise as a management option for CLBP.[6] Recent systematic reviews (2015 and 2017) comparing group exercise programmes to one-to-one physiotherapy for management of chronic musculoskeletal conditions, including CLBP, reported similar clinical outcomes for improvements in pain intensity and functional disability.[7 8] Whilst both reviews endorse the use of physiotherapist led group exercise as a cost effective management approach for CLBP, another Cochrane review concluded that no one form of exercise afforded superior outcomes [9]; mirroring earlier review findings from Searle et al., [10] with evidence of support for a wide variety of exercise interventions, including yoga, Pilates, and strength/resistance training and stability/coordination exercises.[10]

Group exercise therapy is a core component in CLBP management within the Defence Medical Rehabilitation Programme (DMRP). [11 12] Regional Rehabilitation Units (RRU) provide 3-week intensive rehabilitation courses (five days per week, 15-day intervention) for patients with chronic musculoskeletal conditions, including CLBP, with 15 patients enrolled on each course. This long established mode of delivery has historically differentiated upper limb, lower limb (LL) and specific spinal group exercise (SSGE) courses. Patients are referred to the RRU from physiotherapists working at Primary Healthcare Rehabilitation Facilities (PCRF), (Figure 1).

In June 2015, the investigating RRU was unable to fill the SSGE course quota; moreover, LL courses were routinely full. Consequently, LL patients had to wait longer for a LL course, exceeding Key Performance Indicators (KPIs) outlined in the DMRP. Based on the available research evidence at that time, amalgamating the LL and SSGE into a General Group Exercise (GGE) course was a justifiable course of action to afford positive outcomes for patients with CLBP. Additionally, the ability to offer courses more regularly could reduce the socioeconomic burden of CLBP in a military population, hastening return to duties and reducing healthcare usage.

From a detailed literature search the authors identified one study that investigated the effectiveness of exclusively LL exercise in the treatment of CLBP. Cai et al.[13] demonstrated that LL strengthening was equally effective to lumbar extensor or lumbar stabilisation exercises for improving lumbar multifidus muscle activation and superior for running functional outcomes in a recreational running population with CLBP (n=84). No study was identified specifically investigating outcomes in exercise groups comprising both CLBP and LL conditions or in a more representative population. In view of these findings, and in line with the identified DDR research priorities, the aim of this service evaluation (SE) was to evaluate the outcomes of the GGE for CLBP patients compared to existing data for SSGE.

METHODS

Design

A retrospective SE was designed using routine service activity data. In the absence of reporting guidelines [14] the Standards for Reporting Implementation Studies (StaRI) document was used to inform the methods of the SE.[15] A priori protocol was developed with expertise from the University of Birmingham and approved by the Academic Department of Military Rehabilitation. Ethical approved was granted by the School of Sport and Exercise Sciences Ethics Committee University of Birmingham, and the Ministry of Defence Research Ethics Committee.

Inclusion Criteria

All CLBP patients accepted for residential rehabilitation from December 2014 to June 2015 were admitted to six established SSGE courses; patients accepted from December 2015 to June 2016 were admitted to six GGE courses. Inclusion criteria: Army, Royal Air Force (RAF) or Royal Navy (RN) personnel, aged 17 - 55. All patients were seen by a GP and physiotherapist at PCRF and, in 69% of cases, an exercise therapist. All patients had CLBP (>3months) [16] and a diagnosis confirmed by a Sports and Exercise Medicine Physician. For the purpose of this SE, clinical presentations were categorised as: non-specific LBP, radiculopathy, sacroiliac joint, trauma, and post-operative spinal surgery. All potential participants were screened to confirm eligibility for participation in active exercise in a group setting with no medical contraindications e.g. cardiovascular, respiratory, neurological or mental health conditions.

Course Design

There is no published evidence supporting the RRU 3-week residential rehabilitation course as opposed to different models or timescale. Duration of 3-weeks for the programmes is pragmatic, with a need to balance time to deliver a clinical intervention, manage waiting lists and allowing individuals' time away from their unit and primary duties to focus on rehabilitation. The course elements include: *strength training and functional conditioning, sensorimotor training, motor control and dynamic stability training, range of motion, flexibility and general movement, cardiovascular conditioning, hydrotherapy, education (pain, goal setting, anatomy and physiology, diet and nutrition, principles of training and relaxation)* [17]

Each course is led by a designated senior physiotherapist and exercise therapist. Exercise prescription, progression and intensity is controlled and monitored by the physiotherapist and exercise therapist, and always conducted in a group environment. In line with normal service delivery one-to-one treatment was available, if required. The main difference between the SSGE and GGE was that unlike the GGE, the SSGE had daily, mat-based, spinal mobility sessions.

Outcome Measures

Pain: Numerical Pain-Rating Score (NPRS). A valid and responsive self-report measure of pain intensity, (0-10) where 0 = no pain and 10 = worst possible pain with values recorded at pre and post rehabilitation course. [18]

Disability: **Oswestry Disability Index (ODI).** The ODI is a back specific patient reported questionnaire, consisting of 10 questions that assess the level of pain interference with physical activities of daily living.[19] Test retest reliability is reported to be excellent ICC 0.88 (95%CI 0.77-0.94) and ICC 0.94 (95%CI 0.89-0.97).[20 21]

Long term outcomes of the intervention were assessed using individual's **Medical Employment Standard** (MES) status at three and 12 months. MES categories are listed below [22] although this SE had a specific focus on medical fitness with no restrictions (P2):

P0	Medically unfit for duty and under medical care
P2	Medically fit for unrestricted service worldwide
P3	Medically fit for duty with minor employment limitations
P4	Medically fit for duty within the limitations of pregnancy
P7	Medically fit for duty with major employment limitations

Fitness: **Modified multi-stage fitness test (Mod-MSFT).** A measure physical function, the Mod-MSFT is a modification of the established Multi Stage Fitness Test (MSFT). [23] It was first used with traumatic brain injuries demonstrating excellent reliability and validity. [24 25] Markers are place at 0, 10 and 20metres where the test involves walking, and then running, the 20 metre distance in time to a shortening frequency of beeps, played out on an audio device. The test is terminated by the patient due to pain or fatigue and has been used in a CLBP military population.[26] The MSFT is used by the RAF and RN as measurement of physical fitness; achieving an age and sex appropriate pass mark is essential to achieve medical fitness with no restrictions (P2) MES.[22 27]

Healthcare use including ongoing physiotherapy interventions was also evaluated at three and 12 months.[28]

Procedure

ODI and Mod-MSFT were recorded by the individual course physiotherapist at the start and end of each course. The researcher extracted baseline demographic characteristics and all outcome measure data from a manual search of electronic defence medical records of all individuals participating in the six SSGE and six GGE courses.

Data analysis

Data was analysed using primarily descriptive methods, utilising the statistical analysis software SPSS version 21 (SPSS Inc., Chicago, Illinois). The alpha level was set at 0.05. Prior to statistical analysis, the Shapiro-Wilks test for normality was utilised due to the small sample size. As a result, the Mann-Whitney U test was selected as an appropriate non-parametric test. [29]

RESULTS

A total of 106 CLBP patients met the inclusion criteria and were included in the evaluation. The personal characteristics of participants are presented in Table 1.

Table 1 shows there was no between-group statistical significant difference for the following characteristics: age (p = 0.864), waiting time (p = 0.864) or male/female ratio (p = 0.170). The most common clinical diagnosis was non-specific CLBP; 73 of the 106 sample; SSGE 70.3%, GGE 65.9%. There was no statistically significant difference between groups in the clinical presentation *(p* = 0.413). The frequency of non-specific LBP was lower than the commonly reported 90% of all presentations of LBP.[30] Waiting time was measured from first presentation at PCRF to the first day of the course. The most common LL presentations within the GGE were post-op anterior cruciate ligament reconstructions, anterior knee pain and hip pain.

		SSGE (n=64)	GGE (n=42)	*p* value
Age (years)		33.3 ± 7.19	33.9 ± 7.9	0.864*
Waiting Time (days)		277.8 ± 220.6	272.6 ± 241.6	0.864*
Male / Female Ratio		76.6% / 23.4%	64.3% / 35.7%	0.170**
No. of Spine / LL patients on each course (% spinal)	Course 1	12	7 / 6 (53.8%)	n/a
	Course 2	13	5 / 10 (33.3%)	
	Course 3	9	10 / 5 (66.7%)	
	Course 4	7	4 / 9 (30.8%)	
	Course 5	13	9 / 6 (60%)	
	Course 6	10	7 / 8 (46.7%)	

*Data presented as mean ± SD *Mann-Whitney **Chi-squared test*

Table 1. Characteristics of participants in SSGE and GGE

A between-group analysis, summarised in Table 2, showed no significant difference in the GGE outcomes when compared with the SSGE group. Pain mean change was -2.71 and-1.20 (p=0.018), ODI mean change -3.6±5.7 and -4±8.5 respectively *(p*=0.649) and mod-MSFT mean change 28.4±30.8 and 29.7±31.7 respectively, (p=0.792).

	SSGE (n=63)	GGE (n=40)	*p* value
Pain			

Mean NPRS pre course	4.63 ± 2.31	5.17 ± 2.00	0.800
Mean NPRS post course	3.33 ± 2.32	1.81 ± 2.14	0.907
Mean NPRS change	-1.20 ±1.99	-2.71 ± 2.35	0.018
Disability			
Mean ODI pre course	21.9 ± 11.4	22.7 ± 9.8	0.761
Mean ODI post course	17.6 ± 11.1	19.4 ± 10	0.322
Mean ODI change	-4 ± 8.5	-3.6 ± 5.7	0.649
	SSGE (*n*=60)	**GGE (*n*=40)**	
Physical Function			
Mean Mod-MSFT pre course*	141.8 ± 51.7	138.4 ± 63.2	0.867
Mean Mod-MSFT post course*	171.5 ± 54.4	166.7 ± 58.1	0.725
Mean Mod-MSFT change*	29.7 ± 31.7	28.4 ± 30.8	0.792

*Data presented as mean ± SD; SD: Standard Deviation; ODI: Oswestry disability Index; Mod-MSFT: Modified Multistage fitness test; *no of individual shuttles of 10metres*

Table 2. Pre and post intervention measures for pain, disability and physical function

Physiotherapy and functional status at 3 and 12 month follow up

At 3 months a greater proportion of the GGE group were still having on-going physiotherapy care(50%) compared with 30.2% in SSGE, although more of the GGE were medically fit with no employment restrictions (32.5%)compared to 20.6% of the SSGE group. Notwithstanding some differences across categories of MES, at 12 months, groups were largely comparable with 22.5% of the GGE and 20.6% of the SSGE continuing to have physiotherapy and 47.5 of GGE and 50.8% of SSGE deemed medically fit with no employment restrictions (see Table 3).

		SSGE (*n*=63)	**GGE (*n*=40)**
Percentage of physio follow up at 3 and 12 months			
3 month post course	Ongoing physio Discharged Care Complete Admin Discharge	30.2% 41.3% 28.5%	50% 15% 35%
12 months post course	Ongoing physio Discharged Care Complete Admin Discharge	20.6% 54% 25.4%	22.5% 40% 37.5%
Percentage of post intervention employment standard at 3 and 12 months			

3 month post course	P2 P3 P7 P4 P0	20.6% 28.6% 47.6% 0% 3.2%	32.5% 10% 55% 0% 2.5%
12 months post course	P2 P3 P7 P4 P0	50.8% 22.2% 23.8% 1.6% 1.6%	47.5% 20% 32.5% 0% 0%

Table 3. Physiotherapy and functional status at 3 and 12 month follow up

Missing data

Full data sets were available for ODI evaluation, although 3 values were missing for post course Mod-MSFT SSGE, and 11 for NPRS pre and post SSGE, 13 pre and 19 post GGE.

DISCUSSION

The aim of this SE, the first of its kind was to examine outcomes in CLBP patients completing a 3-week course when grouped with LL patients, compared to a group of CLBP patients only. Given the inherent difficulties of conducting clinical trials in a military setting, where participants may be deployed or posted at short notice, use of SE offers an alternative approach to evaluate practice and implement changes in a timely manner. Additionally, this offers a means to systematically assess activities and outcomes to examine efficiency and effectiveness of a service.[31] Whilst cost effectiveness is a key driver a new multi-criteria decision analysis model incorporates a more comprehensive evaluation inclusive of access, equity, effectiveness of treatment and impact on future services.[32] This SE therefore provides a robust evaluation of the impact of changes in patient outcomes in a military setting. In summary this SE found more than 2 point difference in pain scores in favour of GGE, although no between-group difference was found with respect to disability or physical function. A greater proportion of the GGE were still having on-going physiotherapy care at 3 months although 32.5%% of the GGE were medically fit with no restrictions compared to only 20.6%

of the SSGE. At 12 months, groups were largely comparable with respect to follow up physiotherapy and those who were deemed medically fit with no or minor employment restrictions.

Measures

Selection, administration and interpretation of outcome measures are important facets in evaluation [33]. In this SE outcome measures were informed DDR policy, with 4 of the 5 well established areas for measuring outcomes in LBP included; disability, back specific function, generic health status pain, and work.[34]

Pain

Notwithstanding the extent of the missing data for NPRS change scores achieved those reported in the wider literature for MCID. [18] It is interesting that this sizeable change was observed during the 3-week course which would suggest that the non-physical factors such as beliefs, knowledge *etc*. had a role in pain perception; reflective of the multidimensional nature of LBP. [35] Caution should be taken when interpreting these findings given the extent of the missing data for pain.

Disability

Based on the reported requirements for the general population neither group achieved a meaningful change in disability scores. However, where both groups were largely of minimal disability based on ODI and the absence of a population-specific measure of disability, where a sensitive and specific has not yet been established, groups did meet the values required at the lower end of the range for the reported MCID from other populations, ranging 2.92 to 15.36 [36] to a 10 point change combined with a 30% improvement from baseline [37]

Fitness

The only MCID documented in the literature for a shuttle-based test is the Shuttle Walking Test.[38] The authors found a change of 76m would be required to represent a 95% confidence interval. However, this was in a population of 29 patients with a diagnosis of spinal stenosis, with a mean age of 69; notably higher than the mean age reported here. Moreover, ceiling effects of this test were found [39]; out of a total of 90 patients, 31 had achieved 11 of the 12 levels at baseline assessment. Furthermore, it has a different format to the Mod-MSFT being conducted over a 10m not 20m distance.

The only comparable study using the Mod-MSFT in a CLBP military population involved 56 subjects completing an equivalent 3-week course at the Defence Medical Rehabilitation Centre (DMRC).

Roberts et al. [26] reported a mean change of 120m, considerably less than distances in this SE; 284m (GGE) and 297m (SSGE). Given their lower mean pre-course and post-course distances of 1040m and 1160m respectively this suggests a lower functioning group compared to this SE (GGE = 1715m; SSGE= 1667m). As a tertiary tier of the care pathway (Figure 1) these findings for DMRC are not unexpected. In the absence of other published data the mean post-course scores achieved by both groups is 500m below the pass mark required for males of a comparable age in the RAF and RN MSFT, [27] suggesting that full MES was still not achieved by the end of the course.

MES was used to evaluate work disability rather than the Functional Assessment Tool (FAA) reported elsewhere in the literature which limits the ability to draw comparison with this current service evelaution.[40] MES selection was chosen primarily due to the known problem of clinicians assessing FAA in practice, rather than the patient.[41] That said the MES correlates well to the FAA and critically has been linked to military operational effectiveness.

Implications for practice and policy

It has been documented that prompt recovery (in non-specific LBP) is most likely to occur during a three months post-onset, with only gradual improvements thereafter. [42 43] Moreover, studies have found that 62% of all patients continued to complain of pain at 12 months. [44] This raises the question as to what we can realistically expect given patients commenced the course, on average, 8+ months from initial presentation. Only 69% of patients saw an Exercise Therapist at PCRF pre-course; one of their primary functions is group exercise. There may be greater potential for improvements if rehabilitation courses are offered earlier in the care pathway, and which may in turn ameliorate some of the cost burden of managing more established chronic pain presentations.

With a lack of comparable data for those individuals who did not attend an RRU course; this study raises the question of whether the right patients are being selected for course participation as part of the DMRP tier approach. Despite DMRP referral guidelines and timescales, referral patterns to the RRU are patient- and therapist- dependant, informed by therapist expertise, patient operational demands and clinical presentation. This may also explain the variability in waiting times seen in this SE. With a review citing 1501 potential prognostic factors associated with poor recovery from LBP [43], decision making for patient referral is complex. With the recent introduction of the STarTBack tool into the DMRP this may now better differentiate different presentations of LBP and inform targeted management. [11 45]

Maher [46] summaries the challenges clinicians face where no single treatment cures CLBP, and the abundant unregulated, non-evidence based management options that bombard patients confuse

the issue further. Whilst there is no specific evidence for the 3-week model, elements found within the course are well evidenced. This SE goes someway to justify the need for more research into the modes of rehabilitation delivery in the UK military setting to assist with clinical decision making.

Strengths and limitations

One of the main limitations is that pain, ODI and Mod-MSFT data was not available at the three or 12-month follow up points. The habitual use of outcome measures in clinical practice has challenges, and is widely reported in the literature.[47] The lack of routine outcome measures recorded across the DMRP limits the impact of the findings of this SE and warrants further investigation. Moreover, population specific measures with established measurement properties are required to further inform practice decisions. [48] This SE has highlighted the inconsistent recording of the numerical pain rating scale [18] pre- and post-course, despite being an outcome measure documented in DDR policy. Finally evaluation of the impact of a GGE course on LL patients was beyond the scope of this SE, although could be useful to strengthen proposed service changes.

CONCLUSION

Patients with CLBP who completed a 3-week rehabilitation programme had comparable outcomes when grouped with LL patients, although only improvements in pain in the GGE group achieved more than the MCID on completion of the course. At 12 month follow up both groups were largely comparable with respect to achieving medical fitness with no or minor employment restrictions. This service evaluation supports the need to further consider timing for rehabilitation in the care pathway, comprehensive use of patient reported outcomes and further evaluation of potential costs and savings to service costs.

Legend: Figure 1. Summary of Defence Medical Rehabilitation Centre model

Clinical messages

- Comparable outcomes are achieved if CLBP patients complete a 3-week exercise programme when grouped with LL patients, compared to a group comprised of CLBP patients only.
- Efficiency savings could be made by grouping mixed military musculoskeletal presentations together for group exercise therapy earlier in the care pathway.

Conflict of interest

The author declares that there are no known conflicts of interests**.**

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