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Review

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Physical conditioning programs for improving work outcomes among workers with back pain

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Objectives The aim of this review was to assess the effect of physical conditioning programs, compared to no or alternative interventions, in reducing time lost from work among patients with back pain.

Methods We conducted a systematic review with meta-analysis and meta-regression of randomized controlled trials (RCT) of physical conditioning programs for workers with back-pain-related work disability.

Results We included 23 RCT with 3676 participants, with 13 studies having a low risk of bias. In 14 studies, physical conditioning programs were compared to "usual care". Among workers with acute back pain, there was no effect on sickness absence. For workers with subacute back pain, we found conflicting results. Among workers with chronic back pain, pooled results of five studies showed a small effect on sickness absence at one year follow-up [standardized mean difference (SMD) -0.18, 95% confidence interval (95% CI) -0.37–0.00] but this effect disappeared at longer follow-up times. Six studies compared physical conditioning programs to exercise only with conflicting results. The addition of cognitive behavioral therapy to physical conditioning programs did not change the effectiveness. The meta-regression showed no significant effect of program intensity, inclusion of a workplace visit, occupation, setting of the intervention, the type of comparison, or the follow up time.

Conclusions The effectiveness of physical conditioning programs in reducing sick leave for workers with back pain remains uncertain. For acute back pain, these programs probably have no effect; for subacute back pain, the effect is unclear, and for chronic back pain there is a small effect at one year follow-up that does not last in the long run. Remaining heterogeneity could not be explained by meta-regression. A better understanding of the mechanism behind physical conditioning programs and return to work is needed to develop more effective interventions.

Key terms back disorder; exercise; return to work; review; sickness absence; worker health; worksite.

Back pain is a major medical and social problem that causes both individual physical and psychological distress and great expense to society in industrialized western countries (1). Most workers with back pain, their employers, and insurers agree that the goal of managing back pain is a timely return-to-work outcome following back-pain-related work disability.

Physical conditioning programs all incorporate some form of structured exercise or activity based on the idea that inactivity due to avoidance of painful activities can lead to so-called "deconditioning syndrome", which in turn can lead to more pain from attempts to move stiffened joints and muscles weakened by disuse. These programs have an explicitly stated expectation that as physical and functional capacities improve, so will the person's capability of returning to work. The programs include actual or simulated work tasks and can also address individual and work-related psychosocial factors that may play an important role in persisting symptoms and disability (2). This review was first published in 2003 (3) and was recently updated (4). New evidence was available since the previous search carried out in 2000 and the original search strategy was improved. The objective of this review is to assess the effect of physical conditioning programs on time lost from work among patients with back pain compared to no or alternative interventions.

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Methods

We included (cluster) randomized trials of physical conditioning programs that evaluated the effect on time lost from work among adults with back-pain-related work disability. Physical conditioning programs were defined as exercises designed to restore an individual's function with the aim of improving work status by addressing capacity to cope with specific job demands. The programs could also include additional components. Work-status outcomes should be measured as either the time between intervention and return to work or work status at the end of follow-up.

We searched CENTRAL (The Cochrane Library 2008, issue 3), Medline, Embase, CINAHL, PsycINFO, and PEDro for the period May 2002 to June 2008. In addition, we searched the reference lists of identified studies and consulted domain experts. More information about the search strategy can be found in the original review (4). Two reviewers independently assessed study eligibility, extracted data, and assessed trial quality and clinical relevance. We used consensus to resolve disagreements. Risk of bias was analyzed for all included studies according to the recommendations of the Back Review Group (5). Quality of the evidence was assessed with the GRADE approach (5).

Interventions were considered homogeneous if they had similar back pain duration, follow-up time, and type of control group. Outcomes were plotted as standardized mean differences (SMD) or odds ratios (OR). We re-calculated OR into SMD according to the following formula recommended in the Cochrane Handbook: SMD=ln (OR)/1.81 (6).

We used Bayesian multivariable random-effects meta-regression (7) to explain remaining heterogeneity by intensity of the programs (intense or light), occupation (blue-collar, white-collar, or combined), inclusion of a workplace visit in the program, the continent where the study was executed, control intervention (care as usual, exercise, or psychological approach), and follow-up time. Both univariate meta-SMD and multivariate meta-SMD were calculated.

Results

We found 23 randomized controlled trials (RCT) with 28 comparisons that included 3676 participants (8–30). All interventions were related to work, contained exercises and had a focus on return to work. However, the number of sessions and the content varied greatly. We labeled the intensity of five interventions as "light" meaning that were delivered in fewer than five sessions (of one hour) or were described by the primary study author as a light intervention program (13, 15, 18, 25, 30). Eighteen studies were labeled as "intense", meaning that they were delivered in more than five sessions or were delivered on a full-time basis for more than two weeks. Seventeen interventions were delivered by a multidisciplinary group (8–12, 14, 16–19, 21, 22, 24–26, 29, 30) and five were delivered by an individual physiotherapist (13, 15, 20, 27, 28). In one study it was unclear who delivered the intervention (23). Fifteen interventions included an operant conditioning behavioral approach (8–12, 15, 16, 20–23, 25–27, 29). Fifteen interventions included occupational training or ergonomic advice (9–11, 14–17, 19, 21, 22, 24, 25, 28–30) and nine mentioned explicitly that return-to-work advice was included in the intervention (15, 16, 18, 20–22, 26, 27, 29). Six interventions also included a workplace visit in their physical conditioning program (16, 18, 20–22, 29) and one intervention was executed at the workplace (26). Thirteen of the 23 studies were assessed as having a low risk of bias. Eight studies had flaws due to unclear or no allocation concealment (8–10, 14, 17, 20, 23, 24).

Effects of physical conditioning programs

For workers with acute back pain, none of the physical conditioning programs had an effect on sickness absence compared to usual care (13, 14, 30). For workers with subacute back pain, we found conflicting results at six-month follow-up. One RCT (26) reported that the intense physical conditioning program was more effective than usual care [SMD 0.42, 95% confidence interval (95% CI) -0.76– -0.08], but two other RCT (15, 27) showed no significant difference (pooled SMD 0.13, 95% CI -0.09–0.35). The same problem occurred at one year follow-up. One study (27) reported that the physical conditioning program was less effective than usual care (SMD 0.39, 95% CI 0.02–0.77), but three other RCT (20, 21, 26) showed that their interventions were significantly more effective than usual care [pooled SMD -0.42, 95% CI -0.65– -0.18). The studies with a significant positive effect all involved the workplace.

For workers with chronic back pain, five RCT with 1093 workers (9, 12, 16, 23, 25) showed that intense physical conditioning programs are more effective than usual care at one year follow-up (SMD -0.18, 95% CI -0.37–0.00) (figure 1). However, at 2–3-year follow-up, no difference in effect was measured anymore (pooled SMD -0.24, 95% CI -0.58–0.10) (11, 18, 27).

For workers with chronic back pain, five studies (10, 11, 17, 22, 24) compared intense physical conditioning programs with an exercise-only program. After 3 and 6 months follow-up, no difference in effect was measured (17, 22, 24). After a one year follow-up, two RCT reported opposite effects (10, 11).

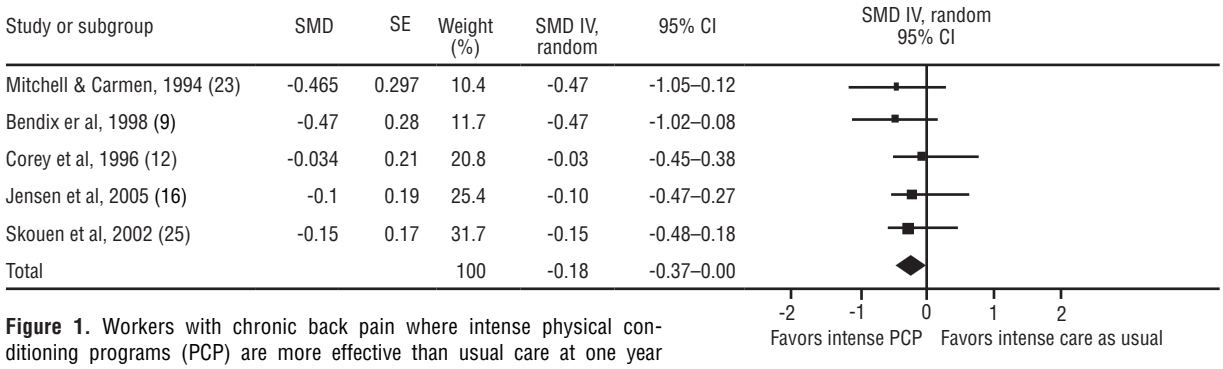

Figure 1. Workers with chronic back pain where intense physical conditioning programs (PCP) are more effective than usual care at one year follow-up. (i) Test for heterogenity: Tau^2=0.00; Chi^2=2.68, df=4 (P=0.61); I^2=0%. (ii) Test for overall effect: Z=1.91 (P=0.06). [SMD=standardized mean difference; SE=standard error; 95% CI=95% confidence interval.]

For workers with chronic back pain, physical conditioning programs with cognitive behavioral therapy (CBT) did not have more effect than programs without CBT (8, 16, 29). Moreover, two other studies found that physical conditioning was more effective than CBT alone (10, 16).

Meta-regression

Table 1 shows the results of the meta-regression for the 28 comparisons. We could not identify any factor that explained the variation in outcomes between studies. Only interventions performed in Western Europe showed a non-significant trend towards a better result compared to those executed in the Nordic countries or North America.

Discussion

Intense physical conditioning programs were more effective in decreasing time off work among patients with chronic back pain when compared to care as usual; this was the case possibly also for patients with subacute pain but not for patients with acute pain. The effect probably does not last at the long-term follow-up of 2–3 years. We found no added value of CBT in addition to a physical conditioning program. No factors could be identified that explained the variation in outcomes between studies.

For the systematic review and the meta-analysis, we followed the guidelines of the Back Review Group and the Cochrane Collaboration and pooled as much data as possible to increase potential effect sizes (5, 6). Based on expert judgment, we categorized studies beforehand in subgroups to minimize issues with heterogeneity. However, we still encountered high statistical heterogeneity in studies that clinically seemed homogeneous. This finding

Table 1. Results of univariate and multivariate Bayesian random effects meta-regression models (N=28, 23 studies). [PCP=physical conditioning program; SMD=standardized mean difference; 95% CI= 95% confidence interval.]

Factor	Number of studies	Crude meta-regression model		Adjusted meta-regression model	
		SMD [a]	95% CI	SMD [b]	95% CI
Intensity					
Intense	23	1 [c]		1 [c]	
Light	5	-0.002	-0.32– 0.32	-0.22	-0.72– 0.29
Constant		-0.23	-0.38– -0.09		
Workplace visit					
No	19	1 [c]		1 [c]	
Yes	9	-0.03	-0.29– 0.26	-0.06	-0.43– 0.35
Constant		-0.22	-0.39– -0.08		
Type of work					
Variety	22	1 [c]		1 [c]	
Blue-collar	5	-0.11	-0.41– 0.22	-0.07	-0.47– 0.37
White-collar	1	-0.15	-0.76– 0.49	0.16	-0.73– 1.07
Constant		-0.20	-0.36– -0.06		
Country					
Nordic countries	12	1 [c]		1 [c]	
Western Europe	11	0.23	-0.01– 0.52	0.26	-0.14– 0.67
North America	5	0.03	-0.34– 0.40	-0.13	-0.63– 0.37
Constant		-0.33	-0.53– -0.16		
Comparison					
Care as usual	16	1 [c]		1 [c]	
Exercise	5	-0.06	-0.40– 0.29	-0.24	-0.71– 0.25
Psychological approach	4	-0.28	-0.67– 0.09	-0.39	-0.94– 0.10
PCP + psychological approach	3	0.43	-0.02– 0.93	0.49	-0.07– 1.11
Constant		-0.22	-0.39– -0.07		
Follow-up time					
Long	20	1 [c]		1 [c]	
Intermediate	5	0.25	-0.06– 0.60	0.09	-0.35– 0.59
Short	3	0.14	-0.33– 0.61	0.22	-0.37– 0.84
Constant		-0.29	-0.45– -0.15		
Constant				-0.24	-0.64– 0.10

[a] Univariate.
[b] Multivariate, adjusted for all the other variables in the model.
[c] Reference.

is not unique and needs further investigation (31). The meta-regression made it possible to analyze which variable can explain the differences in effect on work status when all the studies are included. Two previous publications have also combined these two analysis methods (32, 33). One review looked at specific components of exercise interventions, such as program design, delivery type, intensity, and additional treatment (32). Another review analyzed factors (such as study design, pain duration, involvement of workers' compensation, and previous surgery) in various types of interventions for back pain (33). In contrast to these two publications, none of the factors we included in the meta-regression could explain why some studies are effective and others are not.

It remains unclear if physical conditioning programs reduce sickness absence more than exercise therapy for workers with chronic back pain. The difference between physical conditioning and exercise lies in the explicit objective of enabling the individual to return to work in the conditioning programs. Since both types of interventions can be effective, the added value of the focus on work in physical conditioning programs remains unclear (32). Most studies compared physical conditioning programs with care as usual. However, it was not always clear what care as usual was. A cost-effectiveness analysis should show if alternative interventions use fewer resources and thus are less costly but equally effective.

Results of this updated Cochrane review and meta-regression show that more research is needed to understand why some physical conditioning programs are effective and others are not.

Concluding remarks

The effectiveness of physical conditioning programs in reducing sick leave for workers with back pain remains uncertain. Remaining heterogeneity could not be explained by meta-regression. A better understanding of the mechanism behind physical conditioning programs and return to work is needed to develop more effective interventions.

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