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4 Exercise is effective for patellofemoral pain: but what type, who benefits most and by how
5 much remains unknown.
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24 Exercise is a core component in the treatment of patellofemoral pain (PFP) (van der Heijden
25 et al 2015). Esculier et al. (2017) aimed to improve quadriceps strength AND dynamic
26 control with a personalized graduated exercise program, based on a recommendation from
27 the most recent consensus statement on PFP (Crossley et al 2016). In addition to the
28 education component, runners with PFP were asked to perform a standardised home
29 exercise programme aimed at improving strength, capacity to sustain mechanical load, and
30 dynamic control of the lower limbs. The personalised programme included four phases of
31 two weeks and gradually progressed through higher difficulty under a physiotherapist's
32 guidance. Three to four exercises were performed three times per week (maximum 20
33 min/session), and one exercise (lower limb control) was performed daily.
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43 As might be expected, the exercise + education group (the only group with specific
44 strengthening exercises) showed a significant increase in isometric strength of the
45 quadriceps and hip abductor muscles. Perhaps more surprisingly there were no differences
46 in improvements in symptoms and no alteration in running mechanics compared to the
47 other two groups. This pattern of results concurs with that in a trial of hip exercises for knee
48 osteoarthritis (Bennell et al 2010).
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54 These results beg the question: did the participants have sufficient muscle weakness when
55 they entered the trial to require strengthening exercises? Although muscle strengthening is
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4 regarded as a core component in PFP, it has been shown that not all patients with PFP have
5 isometric muscle weakness compared to age matched controls (Selfe et al 2016). It is
6 possible that some of the runners in this trial might not have muscle weakness because they
7 are a high functioning group.
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11 Trials with an exercise component are always hampered by several factors. The first
12 problem is creating an exercise group which controls for the placebo effect. In this trial the
13 authors have acknowledged the lack of a no treatment control group, which would have
14 helped decide if the runners were spontaneously improving. Secondly, the isometric
15 contraction outcome measure may be inappropriate for such a generalised muscle exercise
16 programme. Thirdly, the amount of exercise the participants were asked to perform (the
17 dosage) may be insufficient to see changes in gait mechanics. Finally there is often
18 uncertainty about the level of adherence to an exercise programme, which might also
19 account for the lack of effect compared to education alone or education + gait training.
20 Adherence to exercise programmes often requires substantial behaviour change to
21 accommodate regular exercise participation into daily life. However, one might argue that
22 the participants in this trial were more likely to be faithful to the programme because they
23 were runners and therefore motivated to return to their sporting activities. The dose of
24 exercise prescribed in this study is typical of those used in clinical practice by
25 physiotherapists. It proved to be no better than education alone in reducing symptoms and
26 altering running mechanics.
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40 Knowledge of the best intensity and the appropriate dose prescription of exercise is lacking
41 specifically in PFP (Van der Heijden RA et al, 2015). As a result, we have to extrapolate from
42 studies in osteoarthritis of the knee even though the condition and the age range are
43 different (Wallis et al 2015). Juhl et al (2016) identified several trials of aerobic
44 strengthening and performance exercise on those with knee OA. Exercise programmes that
45 included a combination of resistance strengthening, aerobic, and performance exercise
46 were not significantly better than control treatments in reducing pain. Stratified analyses
47 showed that exercise programmes focusing on quadriceps strength only were more
48 beneficial in reducing pain and disability than programs aimed at improving general lower
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limb strength. Exercise therapy programmes that focus on a single type of exercise are more efficacious in reducing pain and patient-reported disability than those mixing several types of exercise with different goals within the same session. An increased number of supervised sessions enhances the benefits of aerobic exercise, whereas exercise focusing on knee extensor muscle strength only may increase the benefits of resistance training and not of gait mechanics and symptoms.

Esculier et al's trial has shown us that the treatment for PFP of education + exercise was beneficial in improving symptoms in runners with PFP, but no more beneficial than education alone. Further work is needed to investigate the optimal exercise dosage, to monitor adherence to a home exercise programme and whether some runners have sufficient muscle strength not to warrant a strengthening programme.

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