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Does probiotic supplementation affect pulmonary exacerbation and intestinal inflammation in cystic fibrosis: a systematic review of randomized clinical trials.

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Study design (if review, criteria of inclusion for studies)

All randomised and quasi-randomised controlled clinical trials in which a prescribed regimen of physical training is compared to no physical training in people with cystic fibrosis.

List of included studies (24)

Beaudoin 2017; Cerny 1989; Douglas 2015; Hebestreit 2010; Hommerding 2015; Klijn 2004; Kriemler 2013; Michel 1989; Moorcroft 2004; Rovedder 2014; Santana-Sosa 2012; Santana-Sosa 2014; Schneiderman-Walker 2000; Selvadurai 2002; Turchetta 1991

Participants

People with CF, of any age, and any degree of disease severity, diagnosed on the basis of clinical criteria and sweat testing or genotype analysis. Specific details on age and degree of disease severity at commencement of the study were recorded.

Interventions

Aerobic training; Anaerobic training; Combined aerobic and anaerobic training

Outcome measures

Annual change in BMI (kg/ml); Annual change in Borg breathlessness during constant load arm ergometry; Annual change in Borg breathlessness during constant load bicycle ergometry; Annual change in Borg muscle effort during constant load arm ergometry; Annual change in Borg muscle effort during constant load bicycle ergometry; Annual change in FEV1 (ml); Annual change in FVC(ml); Annual change in lactate (mmol/l) during constant load arm ergometry (beat/min); Annual change in lactate (mmol/l)during constant load bicycle ergometry; Annual change in peak heart rate during constant load arm ergometry (beat/min); Annual change in peak heart rate during constant load bicycle ergometry (beat/min); Annual change in RER during constant load arm ergometry; Annual change in RER during constant load bicycle ergometry; Annual change in RR during constant load arm ergometry (breaths/min); Annual change in RR during constant load bicycle ergometry (breaths/min); Annual change in Ve (L/min) during constant load arm ergometry; Annual change in Ve (L/min) during constant load bicycle ergometry; Annual change of ideal weight for height (%); Annual rate change in peak working capacity during maximal exercise test (%); Annual rate change in VO2max during maximal exercise test (ml/kg/min); Annual rate decline peak heart rate (beats/min); Annual rate of change in FEF 25-75 (%); Annual rate of change in FEV1 (%); Annual rate of change in FVC (%); Annual rate of change in VE (L/min); Change FVC (%); Change in activity; Change in fat free mass (kg); Change in FEV1 (%); Change in FEV1(%); Change in FVC (%); Change in lactate during maximal test (mmol/L); Change in lower limb strength (Newton metres); Change in maximum workload during maximal test (watts); Change in mean power during maximal test (watts); Change in peak power during maximal test (watts); Change in physical function (CF questionnaire); Change in quality of life; Change in saturation during maximal exercise test (%); Change in strength (Newton metres); Change in VO2 max (ml/kg/min); Change in VO2 max during maximal exercise test (ml/kg/min); Change in weight (kg)

Main results

24 parallel RCTs (875 participants). The number of participants in the studies ranged from nine to 117, with a wide range of disease severity. The studies' age demographics varied: in two studies, all participants were adults; in 13 studies, participants were 18 years and younger; in one study, participants were 15 years and older; in one study, participants were 12 years and older; and seven studies included all age ranges. The active training programme lasted up to and including six months in 14 studies, and longer than six months in the remaining 10 studies. Of the 24 included studies, seven implemented a followâ€•up period (when supervision was withdrawn, but participants were still allowed to exercise) ranging from one to 12 months. Studies employed differing levels of supervision: in 12 studies, training was supervised; in 11 studies, it was partially supervised; and in one study, training was unsupervised. The quality of the included studies varied widely. In studies with an active training programme lasting over six months in people with CF, physical activity probably has a positive effect on exercise capacity when compared to no physical activity (usual care) (mean difference (MD) 1.60, 95% confidence interval (CI) 0.16 to 3.05; 6 RCTs, 348 participants; moderateâ€•certainty evidence). The magnitude of improvement in exercise capacity is interpreted as small, although study results were heterogeneous. Physical activity interventions may

have no effect on lung function (forced expiratory volume in one second (FEV1) % predicted) (MD 2.41, 95% CI â€'0.49 to 5.31; 6 RCTs, 367 participants), HRQoL physical functioning (MD 2.19, 95% CI â€'3.42 to 7.80; 4 RCTs, 247 participants) and HRQoL respiratory domain (MD â€'0.05, 95% CI â€'3.61 to 3.51; 4 RCTs, 251 participants) at six months and longer (lowâ€•certainty evidence). One study (117 participants) reported no differences between the physical activity and control groups in the number of participants experiencing a pulmonary exacerbation by six months (incidence rate ratio 1.28, 95% CI 0.85 to 1.94) or in the time to first exacerbation over 12 months (hazard ratio 1.34, 95% CI 0.65 to 2.80) (both highâ€•certainty evidence); and no effects of physical activity on diabetic control (after 1 hour: MD â€'0.04 mmol/L, 95% CI â€'1.11 to 1.03; 67 participants; after 2 hours: MD â€'0.44 mmol/L, 95% CI â€'1.43 to 0.55; 81 participants; moderateâ€•certainty evidence). No difference between groups in the number of adverse events over six months (odds ratio 6.22, 95% CI 0.72 to 53.40; 2 RCTs, 156 participants; lowâ€•certainty evidence). For other time points (up to and including six months and during a followâ€•up period with no active intervention), the effects of physical activity versus control were similar to those reported for the outcomes above. However, only three out of seven studies adding a followâ€•up period with no active intervention (ranging between one and 12 months) reported on the primary outcomes of changes in exercise capacity and lung function, and one on HRQoL. These data must be interpreted with caution. Altogether, given the heterogeneity of effects across studies, the wide variation in study quality and lack of information on clinically meaningful changes for several outcome measures, the authors consider the overall certainty of evidence on the effects of physical activity interventions on exercise capacity, lung function and HRQoL to be low to moderate.

Authors' conclusions

Physical activity interventions for six months and longer likely improve exercise capacity when compared to no training (moderateâ€•certainty evidence). Current evidence shows little or no effect on lung function and HRQoL (lowâ€•certainty evidence). Over recent decades, physical activity has gained increasing interest and is already part of multidisciplinary care offered to most people with CF. Adverse effects of physical activity appear rare and there is no reason to actively discourage regular physical activity and exercise. The benefits of including physical activity in an individual's regular care may be influenced by the type and duration of the activity programme as well as individual preferences for and barriers to physical activity. Further highâ€•quality and sufficientlyâ€•sized studies are needed to comprehensively assess the benefits of physical activity and exercise in people with CF, particularly in the new era of CF medicine.

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See also

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Keywords

exercise; non pharmacological intervention - devices OR physiotherapy; training; Combined Modality Therapy; Aerobic training; Chest physiotherapy; strength training;