Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis

Part 1. Aerobic Exercise Versus Non-Exercise Control (n = 15 Studies; 17 Group Comparisons)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Coleman et al. 1996 (1)	USA	Males/Females Osteoarthritis	N =25 F = 3/week I = Moderate D = 60 minutes L = 20 weeks	N = 30 Usual care	Cycling	–	–	–	No new symptoms or existing symptoms exacerbated during exercise program. Low rate of injuries documented.
Wigers et al. 1996 (2)	Norway	Males/Females Fibromyalgia	N = 20 F = 3/week I = Moderate D = 45 minutes L = 14 weeks	N = 20 Usual care	Aerobic dance and games	↓	–	–	↑ Work capacity
Ettinger et al. 1997 (3)	USA	Males/Females Osteoarthritis	N = 144 F = 3 I = 50-70% HHR D = 60 minutes L = 72 weeks	N = 149 Education	Walking	↓	↑	–	↓ ADL disability ↑ Muscle strength ↑ Fitness No radiographic progression
Sullivan et al. 1998 (4)	USA	Males/Females Osteoarthritis	N = 47 F = 3/week I = Moderate D = 30 minutes L = 8 weeks	N = 45 Usual care	Walking	↓	–	–	↑ Physical activity ↑ Self-efficacy Changes not sustained at 12 months
Hartman et al. 2000 (5)	USA	Males/Females Osteoarthritis	N = 19 F = 2/week I = Moderate D = 60 minutes L = 12 weeks	N = 16 Usual care	Tai Chi	–	–	–	↑ Self-efficacy for arthritis symptoms ↑ Satisfaction with general health, ↓ tension
Penninx et al. 2001 (6)**	USA	Males/Females Osteoarthritis	N = 88 F = 3 I = 50-70% HHR D = 60 minutes L = 72 weeks	N = 80 Education	Walking	–	–	–	47% Reduced risk of incident ADL disability

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 1. Aerobic Exercise Versus Non-Exercise Control (n = 15 Studies; 17 Group Comparisons) (continued)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Schachter et al. 2003 (7)	Canada	Females Fibromyalgia	N = 51 F = 3-5/week I = 40-75% HHR D = 1*30 minutes L = 16 weeks	N = 31 Wait list	Long bout Aerobics	–	–	–	Within group: ↓ Disease severity ↑ Well-being ↑ Self-efficacy
Schachter et al. 2003 (7)	Canada	Females Fibromyalgia	N = 56 F = 3-5/week I = 40-75% HHR D = 2*15min L = 16 weeks	N = 31 Wait list	Short bout Aerobics	–	↑	–	Within group: ↓ Disease severity ↑ Self-efficacy
Song et al. 2003 (8)	South Korea	Females Osteoarthritis	N = 38 F = 3/week I = Moderate† D = 20 minutes L = 12 weeks	N = 34 Wait list	Tai Chi	↓	↑	–	↑ Abdominal strength, ↑ Balance ↓ Stiffness
Talbot et al. 2003 (9)	USA	Males/Females Osteoarthritis	N = 17 F = N/A‡ I = Moderate D = N/A‡ L = 12 weeks	N = 17 Education	Walking	–	–	–	23% increase in step count over baseline ↑ Muscle strength ↑ Walk performance
Valim et al. 2003 (10)	Brazil	Females Fibromyalgia	N = 38 F = 3/week I = Moderate D = 45 minutes L = 20 weeks	N = 38 Stretching	Walking	↓	–	↑	↑ SF36 Role emotional and Mental Summary Score

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 1. Aerobic Exercise Versus Non-Exercise Control (n = 15 Studies; 17 Group Comparisons) (continued)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Bilberg et al. 2005 (11)	Sweden	Males/Females Rheumatoid arthritis	N = 22 F = 2/week I = Moderate D = 45 minutes L = 12 weeks	N = 27 Usual care	Aquatics	↓	↑	–	↑ Muscle function ↑ Muscle endurance
Mangani et al. 2006 (12)**	USA	Males/Females Osteoarthritis	N = 144 F = 3/week I = 50-70% HHR D = 60 minutes L = 72 weeks	N = 149 Education	Walking	↓	↑	–	↓ ADL disability ↑ Walking speed ↑ Muscle strength ↑ Fitness No radiographic progression Persons with and without comorbid conditions had similar outcomes.
Brismee et al. 2007 (13)	USA	Males/Females Osteoarthritis	N = 22 F = 3/week I = Moderate D = 40 minutes L = 12 weeks	N = 19 Attention Control	Tai Chi	↓	↑	–	↓ Stiffness
Fransen et al. 2007 (14)	Australia	Males/Females Osteoarthritis	N = 55 F = 2/week I = Moderate D = 60 minutes L = 12 weeks	N = 41 Wait list	Tai Chi	–	↑	–	–
Fransen et al. 2007 (14)	Australia	Males/Females Osteoarthritis	N = 56 F = 2/week I = Moderate D = 60 minutes L = 12 weeks	N = 41 Wait list	Aquatics	↓	↑	–	–

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 1. Aerobic Exercise Versus Non-Exercise Control (n = 15 Studies; 17 Group Comparisons) (continued)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Song et al. 2008 (15)	South Korea	Females Osteoarthritis	N = 38 F = 3/week I = Moderate D = 60 minutes L = 12 weeks	N = 34 Wait list	Tai Chi	↓	–	–	↓ Stiffness ↑ Motivation to perform health behaviors ↑ Performance of health behaviors
Song et al. 2008 (15)	South Korea	Females Osteoarthritis	N = 38 F = 3/week I = Moderate D = 60 minutes L = 12 weeks	N = 34 Wait list	Tai Chi	10	8	1	4 ↑ Self-efficacy; 4 ↑ Muscle strength; 2 ↑ Physical activity; 3 Decrease symptoms; 4 ↑ Measures of mental/emotional health; 5 ↑ or no change in symptoms/disease activity

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 2. Strength Training Versus Non-Exercise Control (n = 8)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Coleman et al. 1996 (1)	USA	Males/Females Osteoarthritis	N = 25 F = 3/week I = 50-80% 1 RM D = 2 sets x 10 reps L = 20 weeks	N = 30 Usual care	Isokinetic	↓	↑	–	↑ Muscle strength ↓ Disease activity ↑ Walking speed ↓ Stiffness
Schilke et al. 1996 (16)	USA	Males/Females Osteoarthritis	N = 10 F = 3/week I = NR D = 1-6 sets x 5 reps L = 8 weeks	N = 10 Usual care	Isokinetic	↓	–	–	↑ Muscle strength ↑ Range-of-motion ↑ Mobility ↓ Stiffness
Ettinger et al. 1997 (3)	USA	Males/Females Osteoarthritis	N = 146 F = 3/week I = Moderate D = 2 sets x 12 reps L = 72 weeks	N = 149 Education	Isotonic	↓	↑	–	↑ Muscle Strength ↑ Fitness ↓ ADL disability
Hakkinen et al. 2001 (17)	Finland	Males/Females Rheumatoid arthritis	N = 35 F = 2/week I = 50-70% 1 RM D = 2 sets x 8-12 reps L = 96 weeks	N = 35 Range of motion	Isotonic	↓	↑	–	↑ Muscle strength ↑ Bone mineral density ↓ Disease activity
Penninx et al. 2001 (6)**	USA	Males/Females Osteoarthritis	N = F = 3/week I = Moderate D = 2 sets x 12 reps L = 72 weeks	N = 80 Education	Isotonic	–	–	–	40% Reduced risk of incident ADL disability

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 2. Strength Training Versus Non-Exercise Control (n = 8) (continued)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Hakkinen et al. 2004 (18)	Finland	Males/Females Rheumatoid arthritis	N = 35 F = 3/week I = 50-70% 1 RM D = 2 sets x 8-12 reps L = 96 weeks	N = 35 Wait list	Isotonic	↓	↑		↑ Walking speed ↑ Muscle strength ↓ Stiffness ↓ Disease activity
Kingsley et al. 2005 (19)	USA	Females Fibromyalgia	N = 15 F = 2/week I = 40-80% 1 RM D = 1 set x 8-12 reps L = 12 weeks	N = 14 Wait list	Isotonic	–	↑	–	↑ Upper body strength ↑ Rating perceived exertion (↑ Function reported among completers only)
Mangani et al. 2006 (12)**	USA	Males/Females Osteoarthritis	N = 146 F = 3/week I = Moderate D = 2 sets x 12 reps L = 72 weeks	N = 149 Education	Isotonic	–	–	–	↓ ADL disability among those with no comorbidity at 18 months; ↓ ADL disability among those with comorbidities was only significant at 3 months.
Mangani et al. 2006 (12)**	USA	Males/Females Osteoarthritis	N = 146 F = 3/week I = Moderate D = 2 sets x 12 reps L = 72 weeks	N = 149 Education	Isotonic	5	5	0	6 ↑ Muscle strength, 3 ↓ Stiffness, 3 ↓ Disease activity, 4 ADL disability/mobility, 1 range of motion

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 3. Combined Aerobic and Strength Training versus Non-Exercise Control (n= 6)

Reference	Country	Subjects* Sex Arthritis Type	Intervention* Number of Subjects, Frequency/Intensity/ Duration, Length Rx Dose Minutes/Week	Control Number of Subjects, Type	Mode, Activity Type, Resistance Type	Reported Significant Outcomes Pain, Intervention vs. Control	Reported Significant Outcomes Function Intervention vs. Control	Reported Significant Outcomes QOL,* Intervention vs. Control	Reported Significant Outcomes Other, Intervention vs. Control
Coleman et al. 1996 (1)	USA	Males/Females Osteoarthritis	N = 25 F = 3/week I = 75-80% 1 RM; 60-75% HHR D = 60 minutes L = 20 weeks	N = 30 Usual care	Isokinetic cycling	–	–	–	Joint symptoms were stable over time ↑ Muscle strength 2 Minor injuries occurred in combined group Low overall rate of new injuries
Stenstrom et al. 1996 (20)	Sweden	Males/Females Inflammatory arthritis	N = 27 F = 5/week I = Moderate D = 30 minutes L = 12 weeks	N = 27 Relaxation	NR Walking	–	–	–	↑ Perceived exertion while walking Relaxation (control) training improved muscle function and QOL and joint tenderness
Rejeski et al. 2002 (21)	USA	Males/Females Osteoarthritis	N= 80 F = 3/week I = 50-75% HHR D = 60 minutes L = 72 weeks	N = 78 Education and attention control	Isotonic Walking	–	↑	–	↑ Satisfaction with function 2.6% of body weight lost (1.3% control)
Dias et al. 2003 (22)	Brazil	Males/Females Osteoarthritis	N = 25 F = 2x week strength ; 3/week aerobic I = Moderate D = 40 minutes walking; strength NR L = 12 weeks	N = 25 Usual care	Isotonic Walking	↓	↑	–	–

Table G5.A4. Characteristics of Randomized Controlled Trial Studies of Aerobic, Strength, or Combined Exercise Interventions Among Adults With Arthritis (continued)

Part 3. Combined Aerobic and Strength Training versus Non-Exercise Control (n= 6) (continued)

Munneke et al 2005 (23); de Jong et al. 2003 (24)§	Netherlands	Males/Females Rheumatoid arthritis	N = 151 F = 2 I = Moderate D =75 minutes L = 104 weeks	N = 158 Usual care	Isotonic Cycling Impact sports	–	↑	–	↑ Mental health, fitness, and muscle strength No change in radiographic progression or disease activity summary measure
Munneke et al 2005 (23); de Jong et al. 2003 (24)§	Netherlands	Males/Females Rheumatoid arthritis	N = 151 F = 2 I = Moderate D =75 minutes L = 104 weeks	N = 158 Usual care	Isotonic Cycling Impact sports	1	3	0	2 ↑ Muscle strength, 2 ↑ Fitness/perceived exertion, 2 No change in disease activity, 1 ↑ Mental health, 1 ↓ Body weight

↓, decrease; ↑, increase; ADL, activity of daily living; D, duration (minutes) per session; F, frequency per week; HHR, heart rate reserve; I, Intensity; L, length of interventions (weeks), n, number; N/A, not applicable; NR, not reported; QOL, quality of life; RM = repetition maximum

** These studies were secondary analyses of the Ettinger et al. 1997 (3) study, examining outcomes by comorbidity status and incident activities of daily living disability.

† If intensity is listed as "moderate", the study did not specifically state the exercise intensity in terms of %Maximum heart rate, heart rate reserve, etc. If the mode of exercise was of at least 3 metabolic equivalent (METs) per the Compendium of Physical Activity (25) then the intensity was listed as "moderate."

‡ In this study, there was no prescribed dose given in terms of frequency and duration. Exercise goal was to increase pedometer steps by 10% over 4 weeks.

§ The Munneke (23) study is a follow-up study of the original report by de Jong (24). Details of the exercise intervention reported in this table are from both studies.

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