

Table G10.A1. Tabulation of Information From Studies Comparing Injury Rates Among Persons of Similar Levels of Fitness and Physical Activity Habits Who Are Assigned Different Doses of Physical Activity

Citation	Subjects	Length of Study	Activity	Frequency	Duration	Intensity	MET-min/wk	Injury Definition	Percent Injured	Comment
Mann, 1969 (1)	132 mostly sedentary males, 25-60 years, "free of major disease"	26 weeks	Progressive levels of calisthenics, walking, jogging	3-4 day/wk	60 min	Gradual increase in intensity	Increasing from 2,200 to 3,200	Musculoskeletal "impairment"	49%	Authors: "Middle-aged men require 8 to 10 weeks of gradual preparative training before they are able to train...without developing impairments."
								Drop out due to "impairment"	11%	
			Control	0	0	-	-	-	No info	
Kilbom, 1969 (2); Saltin, 1969 (3)	63 sedentary otherwise healthy males, 36-60 years	10 weeks	Calisthenics, walk, jog, run	3 day/wk	30-45 min	Strive for maximal effort	900-1,000	"Troublesome complications"	48%	High injury rates due to running at high intensity, especially early in program
								Drop out due to adverse events	5%	
Pollock, 1977 (4)	187 male inmates, 20-35 years	20 weeks	Jogging ¹	1 day/wk	30 min	85%-90% Max HR	375	Training related, missed jogging for 7+ days	0%	Frequency and duration of running are related to incidence of injuries
				3 day/wk	30 min		1,125		12%	
				5 day/wk	30 min		1,875		39%	
				3 day/wk	15 min		560		22%	
				3 day/wk	30 min		1,125		24%	

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Citation	Subjects	Length of Study	Activity	Frequency	Duration	Intensity	MET-min/wk	Injury Definition	Percent Injured	Comment
Pollock, 1977 (4) (continued)	187 male inmates, 20-35 years	20 weeks	Jogging ¹	3 day/wk	45 min	85%-90% Max HR	1,670	Training related, missed jogging for 7+ days	54%	Frequency and duration of running are related to incidence of injuries
			Control	0	0	–	–	–	0%	
Pollock, 1991 (5)	57 sedentary otherwise healthy males and females 70-79 years	Week 1-13	Walking and jogging	3 day/wk	60 min	40%-70% Max HRR	450-630	Training related, missed jogging for 7+ days	5%	Intensity of walking/jogging is related to incidence of injuries
		Weeks 14- 26				75%-85% Max HRR	1,170		57%	
		Weeks 1-26	Control	0	0	–	–	–	0%	
Carroll, 1992 (6)	68 sedentary otherwise healthy males and females, 60-79 years	Week 1-13 (All subjects)	Walking ²	3 day/wk	20-40 min	40%-60% Max HRR	300-600	Stopped or significantly altered training 7+ days due to musculoskeletal problem	9%	Intensity of walking not related to incidence of injuries
		Week 14-26 (60% subjects)			45 min	65%-70% Max HRR	650		6%	
		Week 14-26 (40% subjects)			35 min	80-85% Max HRR	750		4%	
		Weeks 1-26	Control	0	0	–	–	–	0	

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Suter, 1994 (7)	75 sedentary otherwise healthy males, mean age 41 years	26 weeks	Walking ³	6 day/wk	30 min	50% VO _{2max}	900	Stopped training 7+ days ⁴ et al.	21%	Incidence of more severe injuries similar; incidence of mild injuries higher among joggers
			Jogging ³	4 day/wk		75% VO _{2max}	1,200		25%	
			Walking ³	6 day/wk		50% VO _{2max}	900	Any injury ⁴	54%	
			Jogging ³	4 day/wk		75% VO _{2max}	1,200	75%		
Ready, 1996 (8)	79 sedentary otherwise healthy post-menopausal females, mean age 61 years	24 weeks	Walking ⁵	3 day/wk	60 min	60% VO _{2max}	760	Dropped out of study	8%	Drop outs due to injury related to volume of walking
			Walking ⁵	5 day/wk			1,200		15%	
			Control	0			0	–	–	
Dunn, 1999 (9)	235 sedentary otherwise healthy males and females, 35-60 years	104 weeks	Gradual increase in aerobic activity of one's choice in structured setting or on own	3-5 day/wk	150 min/wk	Moderate intensity	500	Drop out of study due to injury	–	Low drop out rate, no inactive comparison
								Structured	3%	

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Citation	Subjects	Length of Study	Activity	Frequency	Duration	Intensity	MET-min/wk	Injury Definition	Percent Injured	Comment
Dunn, 1999 (9) (continued)	235 sedentary otherwise healthy males and females, 35-60 years	104 weeks	Gradual increase in aerobic activity of one's choice in structured setting or on own	3-5 day/wk	150 min/wk	Moderate intensity	500	Lifestyle (on own)	1%	Low drop out rate, no inactive comparison
King, 2000 (10)	103 sedentary otherwise healthy males, and females, mean age 70 years	52 weeks	Gradual increase in aerobic and strength training, aerobic goal is brisk walking	4 day/wk	40-60 min	60%-75% HRR	750	Drop out of study due to injury	0%	Low drop out rate, few complaints of soreness, separate rates for aerobic and stretching groups not provided
								Complaint of soreness	<10%	
			Stretching			Mild	500	–	–	
King, 2002 (11)	100 sedentary otherwise healthy females, 49-82 years	52 weeks	Gradual increase over 6 weeks to goal of brisk walking	4 day/wk	30-40 min	40%-60% HRR	550	Drop out of study due to injury	0%	Low drop out rate, few complaints of soreness, no inactive comparison
								Complaint of soreness	<10%	
Ory, 2005 (12)	11 home-based, community, clinic, and worksite intervention trials; 5,518 total participants, ranging from 80 to 1,608 per trial	Varied	10 interventions recommended moderate activity, 1 moderate to vigorous	–	–	Moderate to vigorous	–	Serious adverse event	None	Ratio of adverse events to number of participants ranged from 0% to 22%, suggesting dissimilar reporting practices
								Minor adverse event	<1%	

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LIFE Study Invest., 2006 (13)	424 sedentary otherwise healthy males and females, 70-89 years	52 weeks	Slow progression to 150 min/wk of walking at moderate pace ⁶	3-5 day/wk	150 min/wk	Moderate pace	500	Sore muscles	84%	Musculoskeletal problems were equally common in intervention and control groups
								Foot pain	53%	
								Joint sprain	10%	
			Control	0	0	-	-	Sore muscles	80%	
								Foot pain	49%	
								Joint sprain	10%	
Church, 2007 (14)	464 sedentary postmenopausal overweight or obese females; mean age, 57 years	26 weeks	Treadmill walking, recumbant exercycles, gradual increase to goal over 8 weeks	3-4 day/wk	75 min/wk	50% VO _{2max}	250	Drop out of study due to injury	0%	Drop out rate low (1% overall), unrelated to volume of activity
					150 min/wk		500		4%	

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Church, 2007 (14) (continued)	464 sedentary postmenopausal overweight or obese females; mean age, 57 years	26 weeks	Treadmill walking, recumbant exercycles, gradual increase to goal over 8 weeks	3-4 day/wk	200 min/wk	50% VO _{2max}	750	Drop out of study due to injury	0%	Drop out rate low (1% overall), unrelated to volume of activity
			Control	0	0	–	–	–	0%	
Yueng, 2001(15)	Cochrane review of interventions to prevent lower limb soft tissue running injuries	–	–	–	–	–	–	–	–	Incidence of injuries can be reduced by reducing frequency, duration, intensity, or total amount of training

HR, heart rate; HRR, heart rate reserve; MET, metabolic equivalent; mph, mile per hour

¹MET-min estimates are calculated assuming an 8 minutes/mile pace, or 12.5 METs/min.

²Assumes about 100 MET-min/wk during warm-up and cool-down; walking at 40-50% HRRmax is 3.5 METs, 60-70% HRRmax is 4.0 METs, and 80-85% HRRmax is 6.0 METs.

³Assumes a jogging pace of 10 min/mile (10 METs) and walking pace of 4 min/mile (5 METs).

⁴Same subjects, different outcomes

⁵Average measured walking pace was 3.7 mph, estimated at 4 METs.

⁶Assumes walking pace of 20 min/mile (3.3 METs).

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