Table 2: Description of methods of physical activity assessment

Author	**Physical Activity Measure**	
	Objective	Subjective
Astengo et al. 2010	N/A	Name: Not stated Type: Not stated Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: Training days/week, minutes/session Time frame: Not described Units of PA: Days/week
Bengtsson 1983	N/A	Name: not stated Type: Not described Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: (1) habits to exercise, (2) leisure time exertion Time frame: not reported Units of PA: (1) N patients habits to exercise (1. Never, 2. 1-2 times per month, 3. 1-3 times per week, 4. Daily) (2) N patients undertaking (1. Much less, 2. Rather less, 3. Unchanged, 4. Rather more, 5. Much more) leisure time exertion compared to before infarction
Bertie et al. 1992	Device name: Not stated Type: Pedometer Placement site: Not described Epoch length*: Not described Number of days of observation: 7 days Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described	N/A

	Data reduction techniques† defined? Not described Units of PA: Mean daily mileage walked	
Borland et al. 2014	Device name: KeepWalking LS2000 Type: Pedometer Placement site: Waist (or ankles for overweight patients) Epoch length*: Not reported Number of days of observation: 7 days Criteria for a valid day defined? Not fully described – Patients instructed to wear pedometer throughout the day and register the total number of steps on a log sheet at bedtime and reset device to zero each morning. Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not fully described – pedometer data was divided into 3 categories: 0-4396, 4397-5999 and ≥6000 steps/day. Units of PA: steps/day	Name: IPAQ Type: Questionnaire Validated? Yes, but reference provided shows use of IPAQ as indicator for PA is weak Evidence of outcome validated for use in population? Validated internationally in healthy population, not in CHD Derived measure: Category (low/moderate/high) and time sitting Time frame: 7 days Units of PA: IPAQ category, minutes sitting
Carlsson et al. 1997	N/A	Name: Not reported Type: Questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: Habitual PA level (1. Sedentary, 2. Walking or bicycling daily with minimum 30 minutes, 3. Sport activities in average once weekly, 4. Sport activities in average twice or more weekly, 5. Vigorous physical training) Time frame: Not reported Units of PA: Number of patients considered physically active
Cowie et al. 2011	Device name: ActivPAL™ Type: Accelerometer Placement site: Front of thigh Epoch length*: Not reported Number of days of observation: 7 days	N/A

	Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not fully described – monitor produces signal related to inclination and movement of the thigh which is interpreted by algorithms using the proprietary software. Units of PA: Mean time spent sitting and standing, mean number of steps, over an average 24-hr period. Walking pattern also recorded – mean steps/day and mean cadence during 'extra long', 'long', 'moderate', and 'short' walks over an average 24-hr period	
DeBusk et al. 1979	N/A	Name: not reported Type: Questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: walking distance Time frame: not reported Units of PA: miles/day
Devi et al. 2014	Device name: Sensewear Pro 3 Type: Accelerometer Placement site: Right upper arm Epoch length*: Not reported. Number of days of observation: 2 weekdays (12 hours per day) Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not fully described – monitor uses physiological signals, bodily movement and in-built algorithms to estimate physical activity.	N/A

	Units of PA: Daily average step count. Secondary – energy expenditure, duration of sedentary activity, duration of moderate activity.	
Engblom et al. 1992	N/A	Name: not reported Type: questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: exercise habits Time frame: not reported Units of PA: 3 categories: no exercise, exercise in conjunction with other hobbies, and regular exercise.
Erdman et al. 1986	N/A	Name: N/A Type: structured interview Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: habitual exercise (measured in a binary fashion, yes or no) Time frame: not reported Units of PA: % patients with specific answer pattern at the three time points.
Gottlieb et al. 1999	(1) Name: N/A Type: Doubly labelled water Placement site: N/A Epoch length*: N/A Number of days of observation: 10 days Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Equations for calculating energy expenditure reported. Units of PA: total energy expenditure, kcal/day	N/A

	(2) Name: Caltrac Type: Accelerometer Placement site: Hip Epoch length*: not reported Number of days of observation described? Not described Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described Units of PA: total energy expenditure, kcal/day	
Gulanick 1991	N/A	Name: not reported Type: questionnaire Validated? Yes, by author Evidence of outcome validated for use in population? Yes, validated by author in pilot study with recovering cardiac patients. Derived measure: Performance of physical activity score, broken down into each activity and total. Time frame: not described Units of PA: performance of physical activity score
Hämäläinen et al. 1989	N/A	Method of obtaining PA data not described Units of PA: % patients taking moderate to heavy exercise regularly
Hambrecht et al. 1993	N/A	Name: modified Minnesota leisure time physical activity questionnaire Type: questionnaire Validated? Not reported, reference to validation provided, but validated against physical capacity not energy expenditure. Evidence of outcome validated for use in population? No evidence of validation in CHD population Derived measure: energy expenditure in leisure time PA Time frame: previous weekend and on the previous 2 days Units of PA measure: Kcal/week

Heath et al. 1987	N/A	Name: Harvard Alumni Activity Survey Type: questionnaire Validated? Not reported but reference provided Evidence of outcome validated for use in population? Validated in healthy population, not CHD Derived measure: leisure time physical activity Time frame: not described Units of PA: kcal/week
Higgins et al. 2001	N/A	Name: N/A Type: interview Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: exercise habits Time frame: previous 3 months Units of PA: exercise participation classification: very active (exercising more than 3 times per week for at least 20 mins per time), moderately active (exercising less than 3 times per week for at least 20 mins per time), or sedentary (exercising less than 20 min, once per week)
Houle et al. 2011	Name: Yamax Digiwalker NL-2000 Type: pedometer Placement site: waist Epoch length*: not described Number of days of observation: 7 consecutive days Criteria for a valid day defined? Not fully described – morning to bedtime. Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described Units of PA: average daily steps	N/A
Lidell & Fridlund. 1996	N/A	Name: WHO questionnaire Type: questionnaire

		Validated? Uncertain, reference provided but unable to locate full publication Evidence of outcome validated for use in population? uncertain Derived measure: PA habits (dichotomised – started to exercise after MI, did not start to exercise after MI) Time frame: not described Units of PA: % patients physically exercising
Maddison et al. 2015	N/A	Name: IPAQ Type: questionnaire Validated? Yes, reference provided for validation study Evidence of outcome validated for use in population? Validated internationally in healthy population, not in CHD Derived measure: Total physical activity, leisure time physical activity and walking time Time frame: 7 days Units of PA: minutes per week
Mueller et al. 2007	N/A	Name: not described (interview using questionnaire modelled after Harvard Alumni studies of Paffenberger and colleagues (1986)) Type: questionnaire Validated? Not reported (3 different references provided in description of PA measure) Evidence of outcome validated for use in population? Uncertain Derived measure: energy expenditure Time frame: the previous year Units of PA: kcal/week
Naser et al. 2008	N/A	Name: not reported Type: questionnaire Validated? Not reported Evidence of outcome validated for use in population? uncertain

		Derived measure: physical activity level – exercising vigorously 20min 3 times per week Time frame: 3 days Units of PA: % patients exercising
Oldenberg et al. 1995	N/A	Name: Self-report inventory (adapted from National Heart Foundation's 1986 Risk Factor Prevalence Survey. Type: questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: exercise classification Time frame: not described Units of PA: Classification ("regular exerciser" – 3+ times per week, "moderately regular exerciser" – 2 times per week, "non-exercisers" – 1 or less times per week.
Oliveira et al. 2014	Name: Actigraph GT1M Type: accelerometer Placement site: right hip Epoch length*: not reported Number of days of observation: 7 consecutive days Criteria for a valid day defined? Not fully described – during the day except while sleeping, bathing and during aquatic activities Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described Units of PA: Average minutes per day spent at sedentary, light, moderate-vigorous intensity PA	N/A
Ornish et al. 1998	N/A	Name: not reported Type: questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: frequency and duration of exercise.

		Time frame: not reported Units of PA: Exercise times per week, exercise hours per week
Otterstad et al. 2003	N/A	Name: food frequency questionnaire Type: questionnaire (patients in intervention group also kept diaries) Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: exercise habits Time frame: not reported Units of PA: amount of exercise per week
Reid et al. 2011	Name: Yamax DIGI-WALKER Type: pedometer Placement site: hip Epoch length*: not described Number of days of observation: 9 days, first and last day discarded Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described Units of PA: steps per day	Name: Modified version of the Godin Leisure-Time Exercise Questionnaire Type: questionnaire Validated? Yes Evidence of outcome validated for use in population? Previously validated in population by authors. Derived measure: Frequency and duration of moderate and vigorous exercise Time frame: 'a typical week' Units of PA: Total minutes of moderate and vigorous exercise per week.
Ribeiro et al. 2012	Name: ActiGraph Type: accelerometer Placement site: waist Epoch length*: not described Number of days of observation: 7 consecutive days Criteria for a valid day defined? Not described – asked to wear during all waking hours Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Analysed with a computer programme (ActiLife Software, ActiGraph), computing the	N/A

	average min/day spent at different PA intensities according to cut points relating to cound/min to PA intensity (Freedson, Melanson, Sirard 1998). Units of PA: Minutes per day performing light, moderate, vigorous and very vigorous PA	
Senden et al. 2005	N/A	Name: Modified Baecke questionnaire for physical activity in elderly people. Type: questionnaire Validated? Yes Evidence of outcome validated for use in population? Validated for Dutch elderly population, not in HF. Derived measure: DPA score Time frame: over the past year Units of PA measure: DPA score
Sivarajan et al. 1982	N/A	Name: Activity summary questionnaire Type: questionnaire Validated? Reference for validation study reported. Evidence of outcome validated for use in population? Validated for use in cardiac rehabilitation. Derived measure: activity level Time frame: not described Units of PA: METs, and maximum distance walked (miles) in a day at least 3 times per week
Ståhle et al. 1999	N/A	Name: N/A Type: Self-reported estimation of physical activity level Validated? Not reported, reference of previous use provided. Evidence of outcome validated for use in population? Literature search shows use of tool in elderly, but not CHD Derived measure: Score 1-6 where 1 corresponds to sedentary and 6 to strenuous exercise comprising at least 3h a week on activities such as jogging, skiing, tennis, swimming and aerobic training. Time frame: A typical week

		Units of PA: classification scale, 1-6
Todd & Ballantyne 1992	N/A	Name: N/A Type: activity diary Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: level of PA Time frame: not reported Units of PA: not described
Toobert et al. 1998	N/A	Name: (1) Stanford 7 day recall (2) Summary of Self-Care Activities Questionnaire Type: questionnaire Validated? Not described in paper, but literature search showed both measures validated. Evidence of outcome validated for use in population? Neither measure validated in CHD population. Derived measure: (1) Average kcal per day (2) number of days and amount of time engaged in physical activity in last 7 days Time frame: 7 days Units of PA: (1) Average daily kcal, (2) Number of days and amount of time
Van den Berg-Emons et al. 2004	Name: Activity monitor AM Type: accelerometer Placement site: Four uniaxial accelerometers attached to trunk and thighs, connected to the AM worn around the waist. Epoch length*: not described Number of days of observation: 2 randomly selected consecutive weekdays (48 hours) Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described	N/A

	Data reduction techniques[†] defined? Not fully described – data calculated per day and averaged over 2 days. Units of PA: (1) % of 24 hours engaged in dynamic activity, (2) G, (3) Number of transitions, (4) Number of walking periods >10s, (5) Number of walking periods >5s	
Wall et al. 2009	N/A	Name: Yale Physical Activity Survey (YPAS) Type: questionnaire Validated? Yes Evidence of outcome validated for use in population? Validated in healthy older populations, not HF patients Derived measure: Vigorous activity, leisurely walking, moving, standing, sitting and total index scores. Time frame: typical week Units of PA: index score.
Wang et al. 2016	N/A	Name: Myocardial infarction dimensional assessment scale (MIDAS) – physical activity one of the subscales Type: questionnaire Validated? Yes Evidence of outcome validated for use in population? Validated in MI patients Derived measure: Physical activity score Time frame: not described Units of PA: Likert scale 1-5
West et al. 2012	N/A	Name: N/A Type: structured interview Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: Undertaking physical exercise (>100kcal/day) Time frame: not reported Units of PA: Number (%) patients undertaking physical exercise

Willenheimer et al. 2001	N/A	Name: N/A Type: interview Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: degree of habitual physical activity (score calculated by average time (min/week) x intensity (1 to 3)^2 / 100) Time frame: 1 week Units of PA: Total activity score
Witham et al. 2007	Name: Stayhealthy RT3 Type: accelerometer Placement site: waist Epoch length*: 1 minute Number of days of observation: 7 days Criteria for a valid day defined? Not fully described, first and last days discarded to reduce influence of incomplete days and transport artefact. Participants asked to wear device from when they first dressed in the morning to when they retired at night. Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described. Units of PA: Counts/24 hours	N/A
Witham et al. 2012	Name: Stayhealthy RT3 Type: accelerometer Placement site: waist Epoch length*: not reported Number of days of observation: 7 days Criteria for a valid day defined? Not described Minimum data requirement for inclusion in analysis defined? Not described Data reduction techniques† defined? Not described Units of PA: Counts/24 hours	N/A

Zwisler et al. 2008	N/A	Name: N/A Type: adapted interview questionnaire Validated? Not reported Evidence of outcome validated for use in population? Uncertain Derived measure: physical activity level Time frame: not reported Units of PA: % patients undertaking <4hours per week

PA=physical activity, IPAQ=international physical activity questionnaire, kcal=kilocalories, CHD=coronary heart disease, WHO=world health organisation, MI=myocardial infarction, METs=metabolic equivalents. *Epoch length: the defined time interval over which data is recorded. †Data reduction techniques: the criteria used to define valid data for use in analysis.

Summary:

Subjective methods: The most commonly used subjective approach was questionnaires (20 studies). [17,18,20,22,25,27,28,31-36,38,39,41,42,45,47,48] Fourteen different questionnaires were used across the studies, and six did not provide a name for the questionnaire that was used. Eleven of the questionnaires were validated, [XII-XVIII] however only four were clearly validated in the appropriate cardiac populations. [XIX-XXII] Other subjective methods included structured interview in five studies, [23,29,49,50,53] an activity diary, [44] self-reported estimation, [43] and no description provided in three studies. [14,15,26]

Objective methods: Eight studies used accelerometers, [19,21,24,36,40,46,51,52] four used pedometers [16,17,30,39] and one used doubly labelled water. [24] The number of days observation was most commonly seven days [16,17,19,30,36,39,40,51,52], two studies used two day observation, [21,46] and one study did not describe the observation days.[24] Placement of the pedometers and accelerometers also varied across studies; most frequently used was waist placement [17,30,40,51,52] followed by hip placement, [24,36,39] and thigh, [19] upper arm, [21] and trunk [46] in one study each. Epoch length was described in one study only. [51] Similarly, data reduction techniques were described adequately in one study only. [40] The criteria for a valid day was not defined sufficiently in any study, nor the minimum data requirement for inclusion in analysis.