

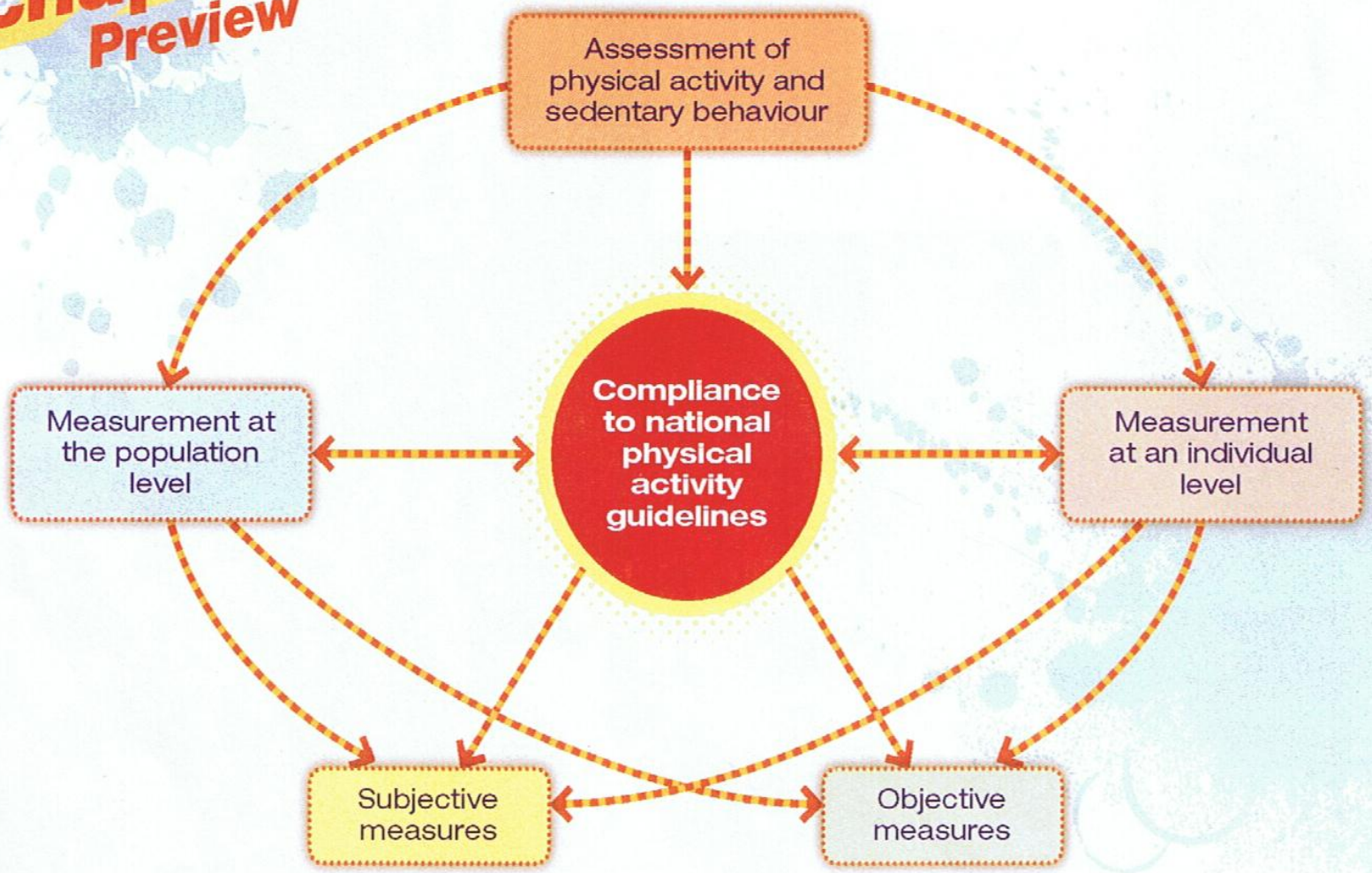
KEY KNOWLEDGE

- **Use of subjective and objective tools (including recall surveys or diaries, pedometry, accelerometry and observation) to assess physical activity and sedentary behaviours as described in the National Physical Activity Guidelines**

KEY SKILLS

- **Evaluating adherence to the National Physical Activity Guidelines and evaluation of objective and subjective methods used for assessing sedentary behaviours.**
- **Participate in primary data collection and structure a report in relation to physical activity and sedentary behaviours**

chapter Preview



Modern Life… A life of Convenience.



We're spectators, sport

COUCH POTATOES

Watching rather than playing is on the rise

Katherine Firkin

WE might love watching our sport, but the number of Australians taking part has dropped to its lowest level in at least five years.

We're a nation of sports watchers, not players, data from the Australian Bureau of Statistics shows. Just 64 per cent of us took part in at least one sport or physical recreational activity in the past 12 months, according to the latest figures.

The participation rate of Aussies aged 15 and over has fallen by 2 per cent from 2005-06.

Fit For Life director Adrian Buckley said the drop in exercise rates was a concern.

"With the trend of people living in highly urbanised areas where there's not a lot of space, the focus is shifting to indoor living," he said.

"It's just harder for people to exercise. You're not exactly going to kick a soccer ball around on a tiny balcony. If this continues we're going to have a more unhealthy population with cardiovascular and aerobic health problems."

Rates of exercise are similar between men and women — participation rates are 65 and 63 per cent respectively.

People 15-17 had the highest levels of participation, at 79 per cent, while just 48 per cent of people 65 and over were exercising.

Walking is the most popular form of exercise, followed by gym activities and swimming.

But Australians appear to be shunning the local sports club, with only 26 per cent playing organised sports. Victoria is ranked fourth for participation, at 64.6 per cent.

About 2.8 million adults attended an AFL game in the past 12 months, making footy the country's favourite spectator sport.

Cricket, horse racing, motor sports and rugby union attracted fewer spectators than in 2005-06, while soccer was up 2 per cent, the only major sport to see an increase.

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LONG LIFE

The median age of Australia's population has risen by 4.8 years in the past two decades, from 32.1 years in 1990 to 36.8 years in 2010.

POPULAR DESTINATION:

2600 Aussies moved states to Victoria in 2010 – behind only Queensland.

CENTENARIANS

3700 people are aged 100 years and over, an increase of 18.2% in a year. In the past two decades, the number of centenarians increased by 185 per cent, with more than three times as many females as males in this age group.

SEX RATIO

About 105 males are born for each 100 females, but higher mortality rates for males at younger ages means the ratio is approaching 1-1 by the time they are in the 30-64 years age group.

LEISURE

Concerts have been popular, with 30% of Australians over 15 going to at least one – up 5%.



SPECTATOR SPORTS

- About 2.8 million people attended an AFL game in the past year, with more than a third of those attending six or more games.
- Horse racing is the second most popular spectator sport but attendance fell significantly, from 13% in 2005-2006 to 11%.
- Soccer was the only sport to record a significant spike in attendance, from 600,000 in 2005-2006 to 900,000 in 2010.

PARTICIPATION SPORTS

- The three most popular sports or activities are walking (23%), gym activities (14%) and swimming (7%).
- Just 64% of all Australians aged 15 and over (65% of men, 63% of women) participated in at least one sport or physical activity in the past 12 months.



Physical Activity

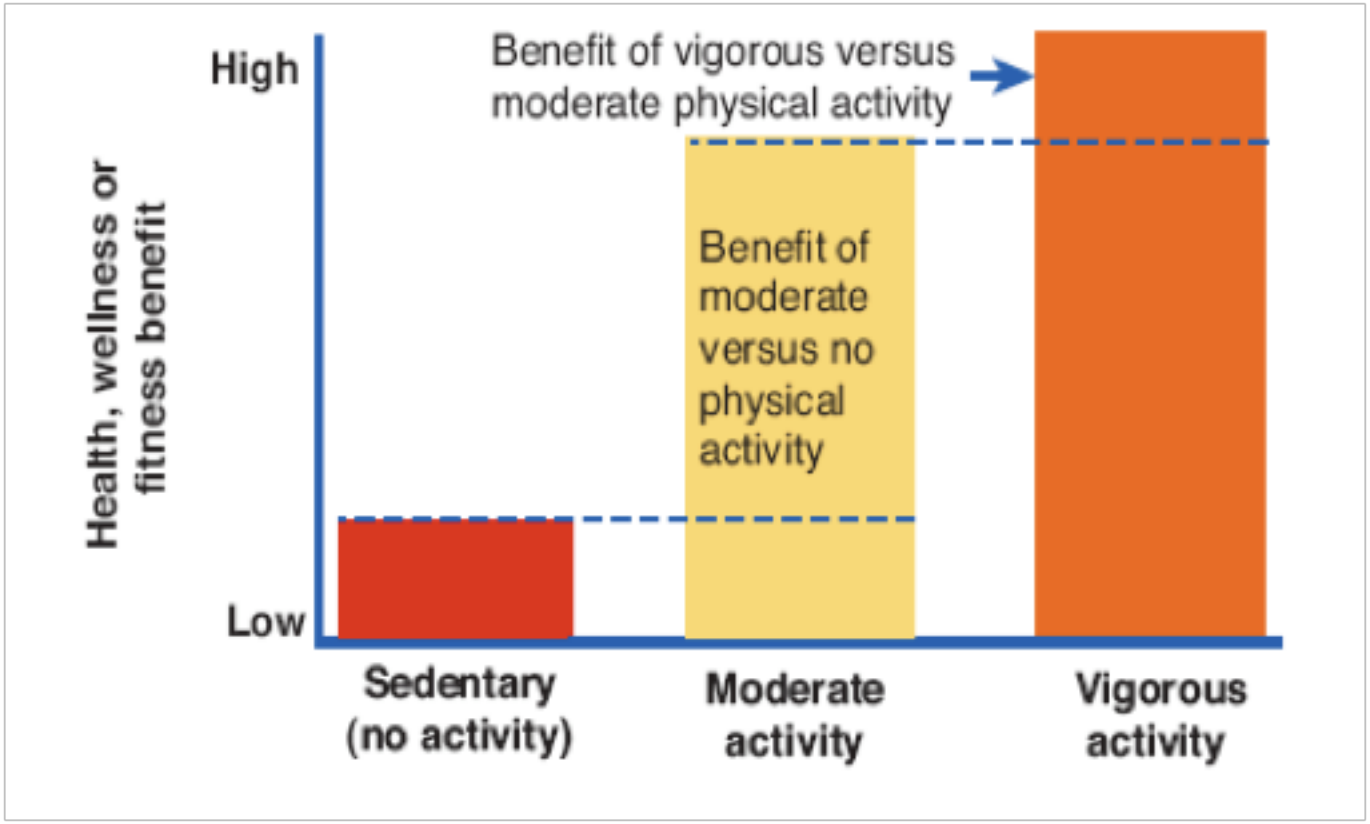
- Physical activity can be defined as ‘any body movement produced by the skeletal muscles that results in expenditure of energy’.



Why Physical Activity?



Benefits of Physical Activity



Main purposes of measuring physical activity

table 1.1

Main purposes of measuring physical activity

At the population level	• To document the frequency and distribution of physical activity in defined population groups • To monitor the achievement of physical activity guidelines and population trends over time • To study the relationship between physical activity and health conditions (for example cardiovascular risk factors, type 2 diabetes, obesity, cancer and mental health) • To determine the amount or dose of physical activity required to influence specific health parameters • To identify the biological, psychological and environmental factors that influence physical activity • To evaluate the effectiveness of large-scale physical activity intervention programs
At the individual level	• To detect change in an individual's health and/or behaviour • To determine the effect of any change in physical activity behaviour



Summary of National Physical Activity Guidelines

table 1.2

Summary of national physical activity guidelines

Subgroup	Physical activity guidelines	Sedentary behaviour guidelines
Children 0–5 years[1]	• For healthy development in infants (0 to1 years), physical activity (particularly floor-based play in safe environments) should be encouraged from birth. • Toddlers (1 to 3 years of age) and preschoolers (3 to 5 years of age) should be physically active every day for at least 3 hours, spread throughout the day. • For children 2 to 5 years of age, sitting and watching television and the use of other electronic media should be limited to less than 1 hour per day.	• Children younger than 2 years of age should not spend any time watching television or using other electronic media (DVDs, computer and other electronic games). • Infants, toddlers, and preschoolers should not be sedentary, or kept inactive, for more than 1 hour at a time, with the exception of sleeping.
Children 5–12 years[2]	At least 60 minutes (and up to several hours) of moderate- to vigorous-intensity physical activity (MVPA) every day.	No more than 2 hours a day using electronic media for entertainment (e.g. computer, internet, games, TV), particularly during daylight hours (unless it is educational).
Youth 12–18 years[2]	At least 60 minutes of moderate- to vigorous-intensity physical activity every day.	No more than 2 hours a day using electronic media for entertainment (e.g. computer, internet, games, TV), particularly during daylight hours (unless it is educational).

National Physical Activity Guidelines

- Produced by the Australian Department of Health and Ageing.
- Outline the minimum levels of physical activity required for optimum health and body weight.
- They are not designed for high-level fitness or sports training, but are intended to provide realistic strategies for incorporating physical activity into our daily lives.

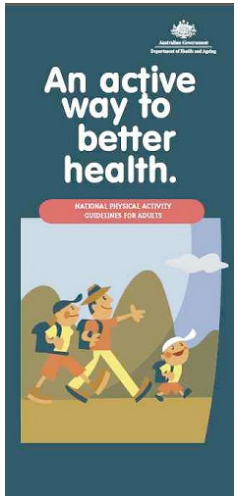


table 1.2

Summary of national physical activity guidelines

Subgroup	Physical activity guidelines	Sedentary behaviour guidelines
Adults 18–65 years[2]	• Think of movement as an opportunity, not an inconvenience. • Be active every day in as many ways as possible. • Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days. • If possible, also enjoy some regular, vigorous activity for extra health and fitness.	
Older adults 65+ years[2]	• All people (no matter what their age, weight, health problems or abilities) should do some form of physical activity. • Be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility. • Accumulate at least 30 minutes of moderate-intensity physical activity on most, preferably all, days. • Those who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable, and gradually build up the recommended amount, type and frequency of activity. • Those who continue to enjoy a lifetime of physical activity should carry on doing so in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.	

table 1.2

Summary of national physical activity guidelines

Subgroup	Physical activity guidelines	Sedentary behaviour guidelines
Overweight or obese children and youth[3]	• 'More physical activity than is currently being engaged in' should be prescribed for the prevention of obesity in children and adolescents. • Children's activity and play vary with age and stage of development; the prescription should be based on age-appropriate activity.	

Subgroup	Physical activity guidelines	Sedentary behaviour guidelines
Overweight or obese adults[3]	• Overweight or obese adults should engage in 60 minutes of physical activity per day. • Once weight has been lost, adults should accumulate 60–90 minutes of activity per day to avoid weight regain.	

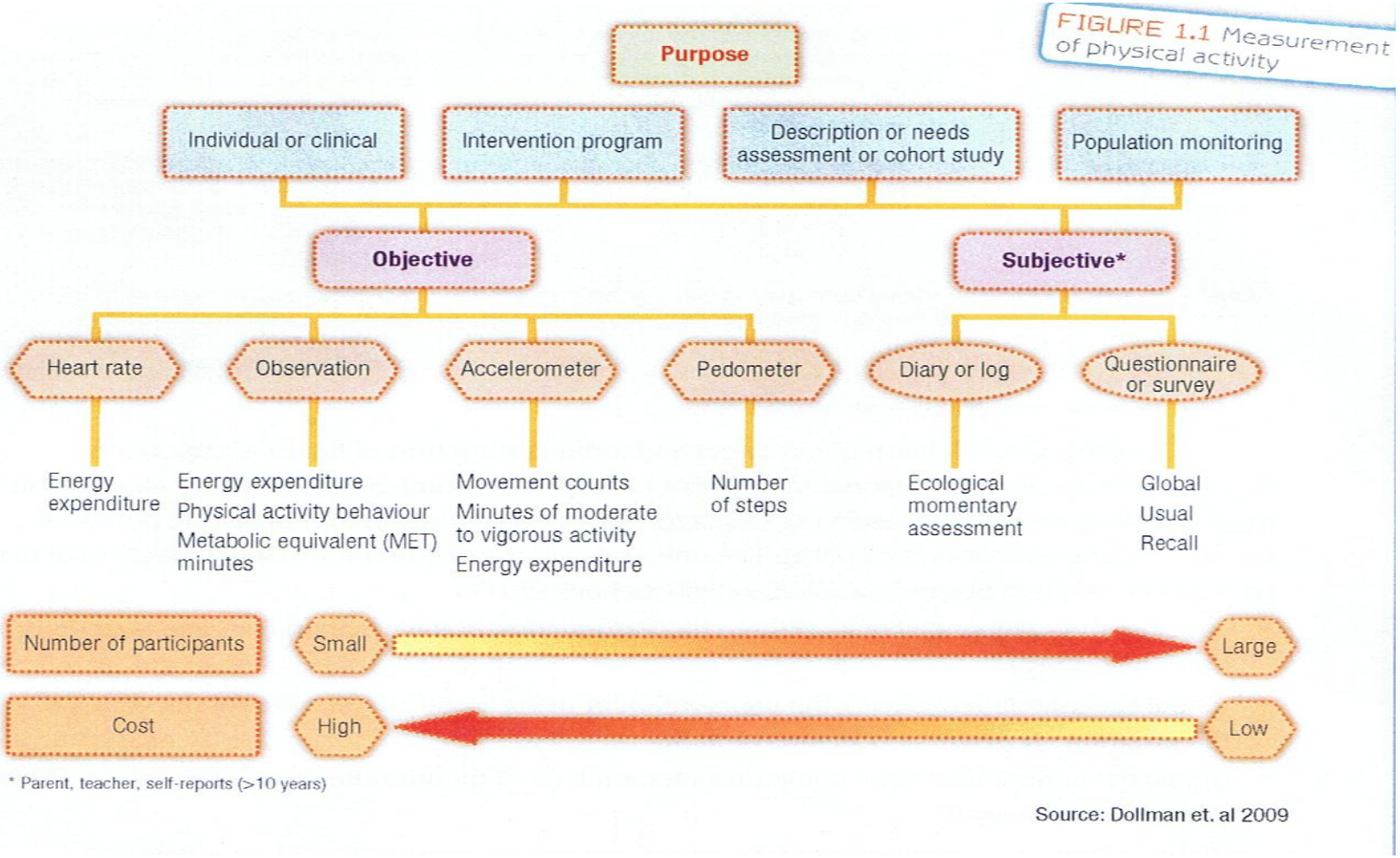
Sources: **1** Okely et al. 2008 **2** www.healthyactive.gov.au **3** National Health and Medical Research Council 2003

Selecting appropriate measurement instruments



- **When a large number of people are samples a low cost *subjective* measure is generally used**
- **When sampling individuals or small numbers of people *objective* measures are more likely to be used**

FIGURE 1.1 Measurement of physical activity



Source: Dollman et. al 2009

table 1.3

Levels of evaluation for a school-based physical activity intervention

Level of evaluation	Description	Examples
Formative evaluation	On-going assessment of the program activities, with the goal of constantly improving the intervention strategies	Collection of initial, pre- intervention (baseline) data, then regular collection of physical of activity data, using a pedometer to track total steps at lunchtime
Process evaluation	Collecting data about the implementation (delivery) information (e.g. reach of the program, participant satisfaction with program and resources, how the program was implemented)	Direct observation to determine whether PE lessons were delivered by the teacher (or interventionist) in the way they were intended
Impact evaluation	Achievement of program goals (immediate effects)	Increased MVPA* during PE lessons, a decrease in the number of girls sitting at lunchtime and an increase in the number of girls walking in the playground
Outcome evaluation	Achievement of long-term goals rarely carried out, given the long-term nature of goals	An observed increase in total physical activity 12 months post-intervention, reduction in number of obese girls

* MVPA = moderate- to vigorous-intensity physical activity

The only way to determine in a physical activity program increases a person's physical activity behaviour is:

- **Measure their physical activity prior to the introduction of a program (pre-intervention testing)**
- **Repeat the assessment during or at the conclusion the program using identical measures (post intervention)**
- **Repeat the assessment 3-12 months after post intervention assessment (follow up)**



Physical Activity monitoring & surveillance concept model

table 1.4

Physical activity monitoring and surveillance conceptual model

Measure	Domain	Variables
Physical activity (PA): **Direct**	Leisure-time (LT)	Walking, moderate-intensity, vigorous-intensity, organised- and non-organised sport and exercise, total PA, active play
	Transport	Walking, cycling
	Work	Heavy labour, walking
	Home	Vigorous gardening, vigorous household chores, walking
	School	Physical activity (includes sport and PE participation)
	Other	PA in parks, active transport to parks, inactivity
Physical activity: **Indirect**	Leisure-time	Use of sports clubs, playgrounds, recreation facilities, parks, walking trails, cycling trails
	Transport	Public transport use
	Schools	Delivery of physical education programs
	Other	Fundamental motor skills, fitness, coaches and other non-playing involvement

Physical activity is often linked to other variables such as biological, psychological and socio-cultural factors. The mutual relationship between two or more of these factors and physical activity is known as a correlate

table 1.4

Physical activity monitoring and surveillance conceptual model

Measure	Domain	Variables
Individual correlates	Psychological	Attitudes, beliefs, perceptions, values, self-efficacy, self-motivation, stage of change, enjoyment, preference, intention to be active, mood disturbance, pros and cons, good perceived health or fitness, barriers, perceptions of safety and security, sense of control over health, quality of life
	Behavioural	Time spent outdoors, PA history, sedentary behaviour (e.g. television viewing, electronic games, computer use), car use, nutrition (healthy food intake, high-fat intake), smoking (adolescents)
Environmental correlates	Physical	Availability and access to facilities (green space, parks, clubs, recreation facilities, etc.), availability and access to PA programs, connectivity of streets, availability and access to active transport options (public transport, cycle paths, walking trails, footpaths), environmental aesthetics, weather, crime
	Economic	Cost of recreation facilities, cost of car versus public transport, state and local government budgets for PA and public (i.e. non-elite) facilities, budgets for active transport versus car transport
	Policy	Workplace PA policies, zoning and land use, urban design and planning regulations, walking and cycling policies, liability legislation, policies for active transport versus car transport, school PE/sport policies, access policies
	Socio-cultural	Social participation, social support, parents' attitudes to children's sport/physical activity, modelling, general practitioner support, social capital, social benefits, social isolation
Health outcomes	Overweight	Height, weight and waist in children and adults
	Other	Type 2 diabetes, cardiovascular disease (blood lipids, blood pressure)

Domains of Physical Activity

Domains	Examples
1.Leisure time P.A	Various activities, different surveys may ask questions about activity freq, intensity and duration
2. Gardening & Yard Work	Various definitions / intensities. Range from light intensity gardening to vigorous digging/moving heavy objects
3. Household Chores	Range or tasks. Significant gender differences
4. Active Transport	Walking or cycling for transport
5. Occupational P.A	Diverse occupations. Occupations requiring less energy in recent decades.

Measuring *Dimensions* of Physical Activity

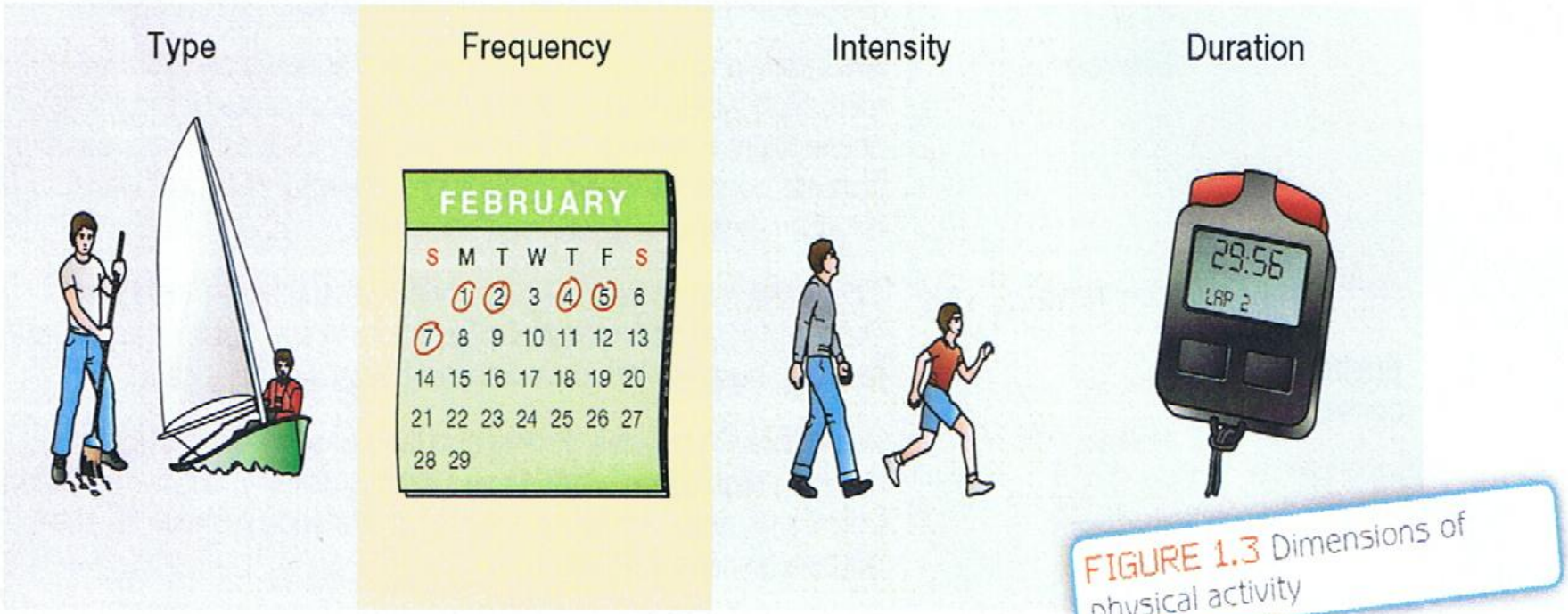


FIGURE 1.3 Dimensions of physical activity

Dimensions of Physical Activity

- **Type** – Identifies the 'type' of physical activity being undertaken e.g. gardening, walking, football, etc.
- **Frequency** – How often the individual participates in the activity for.
- **Intensity** – How hard the individual is working. Usually described as a % of max HR, % VO2 max, or a descriptor.
- **Duration** – How long the individual participates for.



Metabolic Equivalent **– Describes the energy cost of an activity. A MET rating of 1.0 occurs at rest = reference point**

A MET value of 6.0 indicates an intensity 6 times that of rest

table 1.5

Classification of physical activity intensity

Intensity classification	Description	METs	Energy expended (kJ/min)	% max HR	Examples of activities
Low intensity (light)	This is the lightest category in terms of perceived and actual exertion and energy expenditure.	<3	<15	<50	Walking slowly, golf, gardening, household chores
Moderate intensity	Generally consists of sustained rhythmic movements. At this level you should feel some exertion but still be able to carry out a conversation comfortably.	3–6	15–30	50–70	Bike-riding (moderate pace), playing tennis doubles, dancing, weight-lifting
Vigorous intensity	Participation at this level leads to a substantial increase in heart and respiratory rates.	7+	30+	70+	Skipping, running, boxing, playing squash

table 1.7

Instruments used to measure physical activity

Instrument	Measure	Is instrument suitable for addressing:						Expense	Reactivity
		Frequency?	Intensity?	Duration?	Type?	Context?	Energy expenditure?		
Recall survey[1]	Subjective	Yes	Yes	Yes	Yes	Yes	No	Low	n/a
Diary or log	Subjective	Yes	Yes	Yes	Yes	Yes	No	Low	High
Pedometer	Objective	No	No	No	No	No	Yes[2]	Low	Low
Accelerometer	Objective	Yes[2]	Yes[2]	Yes[2]	No	No	Yes[2]	High	Low
Direct observation	Objective	Yes	Yes	Yes	Yes	Yes	No	Moderate	High

Note: **1** Can be administered by self-report or proxy-report. **2** Only with certain versions of this type of instrument.

Subjective vs Objective

- ***Subjective methods***
  - Assess multiple domains
  - Can be used for large groups
  - Have low reliability and validity
  - Not suitable for particular groups e.g. elderly, children



- ***Objective methods***
  - Use tools or devices, or
  - Direct Observation
  - Can be expensive & require expert knowledge

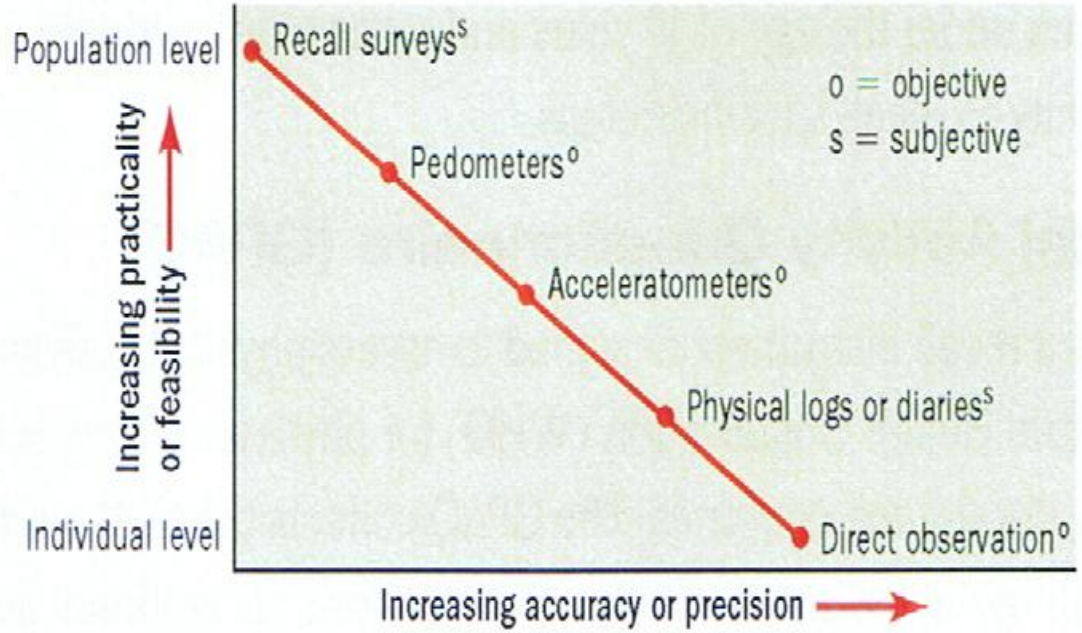
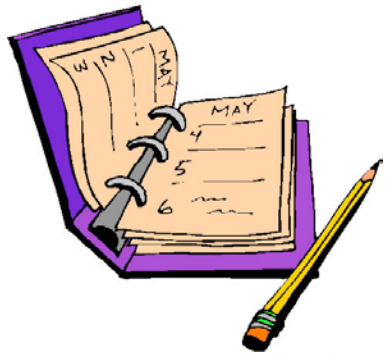


FIGURE 1.6 Trade-off between practicality and accuracy



Using diaries and logs to assess physical activity

Advantages

- Can capture quantitative and qualitative information
- Can be administered quickly and easily
- Cost-effective for large-scale studies
- Usually low-participant burden
- Have the potential to predict energy expenditure from daily physical activities when compared to the *Compendium of Physical Activities* (see Table 1.6 on page 11)

Disadvantages

- Not suitable for assessing children under age 10 or very old adults, due to cognitive limitations
- Reliability and validity problems associated with social desirability bias, memory limitations or misinterpretation of physical activities in different populations
- Interviewer may be needed to obtain accurate data



Using direct observation to assess physical activity

Advantages

- Captures excellent quantitative and qualitative information
- Allows for the collection of contextual information (including environmental conditions, the presence of significant others or the availability of physical activity cues such as toys or equipment)
- Useful in a variety of community and school-based settings
- Computer software makes data collection and analysis simpler than in the past

Disadvantages

- Difficult to use with large populations
- Intrusive
- Highly labour-intensive and time-consuming
- Only allows specific physical-activity behaviours to be observed
- The presence of an observer or cameras may bias the behaviour of those being observed (reactivity)
- Time-intensive in terms of training to establish between-observer and within-observer reliability

SOPLAY

- System for Observing Play and Leisure Activity in Youth.

SOPLAY observation form
(System for Observing Play and Leisure Activity in Youth)



Date: _____ /_____ /_____ **Observer:** _____ **Period:** BS LU AS (circle)

Start time	Area	Condition A	U	S	O	E	Girls S	W	V	Act.	Boys S	W	V	Act.
____ : ____	1	N Y	N Y	N Y	N Y	N Y	__	__	__	__	__	__	__	__
____ : ____	2	N Y	N Y	N Y	N Y	N Y	....	...	....	....	....	...	....	....

Form codes:

BS = Before School
LU = Lunchtime
AS = After School

A = Accessible area
U = Useable area
S = Supervised area
O = Organised activity
E = Equipment provided

S = Sedentary
W = Walking
V = Very active
Act. = Prominent activity

Activity codes:

0 = No identifiable activity
1 = Aerobics
2 = Baseball or softball
3 = Basketball
4 = Dance
5 = Football
6 = Gymnastics
7 = Martial arts
8 = Racquet sports
9 = Soccer
10 = Swimming
11 = Volleyball
12 = Weight training
13 = Other playground games
14 = None of the above

FIGURE 1.9 SOPLAY observation form

Adapted from: Welk 2002

SOFIT

System for Observing Fitness Instruction Time

- comprehensive tool for assessing physical education classes by providing for the collection of data on <u>student activity levels</u>, the <u>lesson context</u>, and <u>teacher behavior</u>.

Modified SOFIT recording sheet

Date: ____/____/____ School: _____ Location: _____

Observer: _____ Number of students: _____ Number of observations: _____

Start time: _____ End time: _____ Lesson length (min): _____

Student, gender	Interval	Student activity					Lesson context		
Student 1 (circle) M F	1	1	2	3	4	5	M	S	G
	2	1	2	3	4	5	M	S	G
	3	1	2	3	4	5	M	S	G
	4	1	2	3	4	5	M	S	G
	5	1	2	3	4	5	M	S	G
	6	1	2	3	4	5	M	S	G
	7	1	2	3	4	5	M	S	G
	8	1	2	3	4	5	M	S	G
	9	1	2	3	4	5	M	S	G
	10	1	2	3	4	5	M	S	G
	11	1	2	3	4	5	M	S	G
	12	1	2	3	4	5	M	S	G
Totals									
Student 2 (circle) M F	1	1	2	3	4	5	M	S	G
	2	1	2	3	4	5	M	S	G
	3	1	2	3	4	5	M	S	G
	4	1	2	3	4	5	M	S	G
	5	1	2	3	4	5	M	S	G
	6	1	2	3	4	5	M	S	G
	7	1	2	3	4	5	M	S	G
	8	1	2	3	4	5	M	S	G
	9	1	2	3	4	5	M	S	G
	10	1	2	3	4	5	M	S	G
	11	1	2	3	4	5	M	S	G
	12	1	2	3	4	5	M	S	G
Totals									

Student activity
1 – Lying
2 – Sitting
3 – Standing
4 – Walking
5 – Very active

Lesson context

M – Management
Not involved in knowledge or movement (e.g. splitting into teams, changing equipment, moving from one activity to the next)

Motor content (moving)

S – Skill practice
Activities primarily to improve or practise skills

G – Game play
Application of skills in game or competition

1.12 Modified SOFIT sheet

SOFIT recording sheet

Adapted from: McKenzie 2002



FIGURE 1.11 Why would SOFIT rather than SOPLAY be used during this setting?

Using a pedometer to assess physical activity



Advantages

- Inexpensive
- Small, lightweight and non-invasive
- Easy to administer to large groups
- Useful for detecting change (between pre- and post-tests) in the daily average number of steps taken, or to identify changes in rank order among groups
- Objectively measures the most common physical activity behaviour (walking)
- Appropriate for use in a range of settings (workplaces, the community and schools)
- Provides immediate feedback and has the potential to promote behaviour change

Disadvantages

- Assesses only one type of physical activity behaviour (walking or running)
- Cannot record and store data in real time
- Unable to record the magnitude of movement detected (a step is recorded regardless of the intensity or mode during walking, running or jumping)
- Provides no information about frequency, intensity or duration of physical activity
- Not an appropriate choice for comparing children with different levels of physical maturity because of the influence of body size and speed of locomotion on step count
- Can provide estimates of energy expenditure, however these are based on studies of adults and are inaccurate estimates for children

Using an accelerometer to assess physical activity



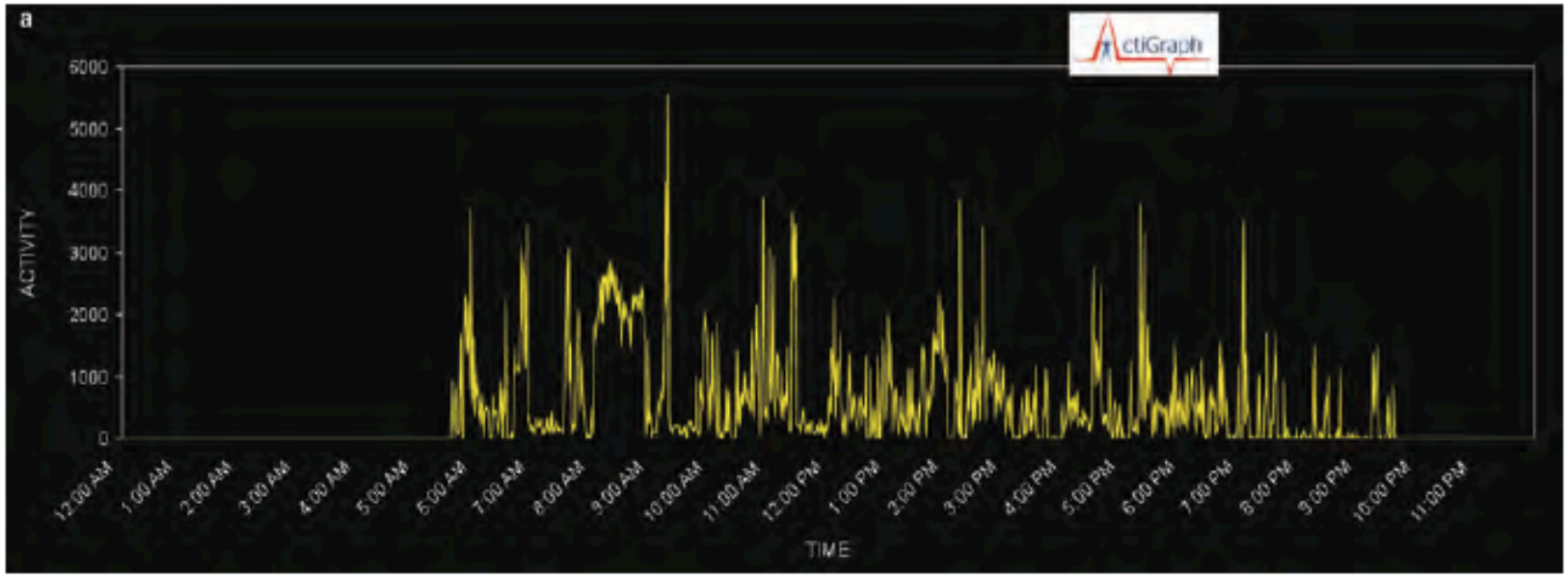
Advantages

- Accelerometers are small, lightweight (40 grams) and non-invasive, although still robust.
- They are a low burden to participants compared to heart-rate monitors (no chest straps).
- They provide an objective indicator of body movement (acceleration).
- Accelerometers are a good alternative to self-reporting physical activity by children (because children under 10 years often cannot accurately recall their behaviour).
- They can be used in the laboratory or on the playing field.
- They assess dimensions of intensity, frequency and duration.
- They record movement in real time (minute by minute).
- Data can be stored for extended periods (14 to 22 days or more).
- Some newer models have an interface to provide participants with feedback.
- They can assess physical activity that is difficult to capture (such as children's physical activity, incidental or light-intensity physical activity, sedentary time).

Disadvantages

- They are expensive for use with large populations. (Each accelerometer costs from about $250 to $3000.)
- Older versions are not waterproof, and new versions are not validated for wearing during aquatic-based activities.
- They are not sensitive to low-impact physical activities, and therefore underestimate movement during cycling and rollerblading, or activities that are predominantly upper-body.
- Energy expenditure prediction equations are mostly based on laboratory studies; more field-based studies of special populations (such as children) are required. To date, there has been poor agreement as to what cut-points (ranges of movement counts per minute or of g-forces) represent different intensities of energy expenditure.
- There are subject compliance issues. (People forget to wear them or refuse to wear ther after a short period.)
- They potentially alter physical activity behaviour and patterns (reactivity).
- Older models do not have an on/off/reset button or an interface to provide feedbacl





Note: <100 cpm: sedentary behaviour; 100–1950 cpm: light-intensity activity; >1950 cpm: moderate-to-vigorous activity

table 1.12

Appropriate measures for assessing physical activity among population subgroups

Instrument subgroup	Self reported recall survey	Self-reported diary or log	Proxy report	Pedometer	Accelerometer	Direct observation
Children 0–9 years	✗	✗	☺☺☺	☺☺	☺	☺☺☺
Children 10–12 years	☺	☺	☺☺	☺☺	☺☺	☺☺☺
Adolescents	☺☺	☺☺	☺	☺☺	☺☺☺	☺☺☺
Adults	☺☺☺	☺☺☺	☺	☺☺	☺☺☺	☺☺
Older adults 65+ years	✗	☺☺	☺	☺☺	☺☺	☺
People with an intellectual disability	✗	☺	☺☺☺	☺	☺	☺☺☺
People from a NESB[1]	✗[2]	✗[2]	☺☺	☺	☺	☺☺☺

Key: ✗ Not at all appropriate, ☺ Somewhat appropriate, ☺☺ Appropriate, ☺☺☺ Highly appropriate
Note: **1** NESB Non-English-speaking background **2** Only appropriate if translated into the language spoken

Sedentary Behaviours :

•are associated with low levels of energy expenditure (1-2 METS) and linked to various negative health consequences

•involve sitting staying in the same place for long periods of time (watching TV, commuting by car, reading, using a computer, etc....)

•can be seen in people who are highly active - but not at the same time

•only apply to people up to 18 years of age in the National Physical Activity Guidelines (as of 2010) but likely to include adults in the future

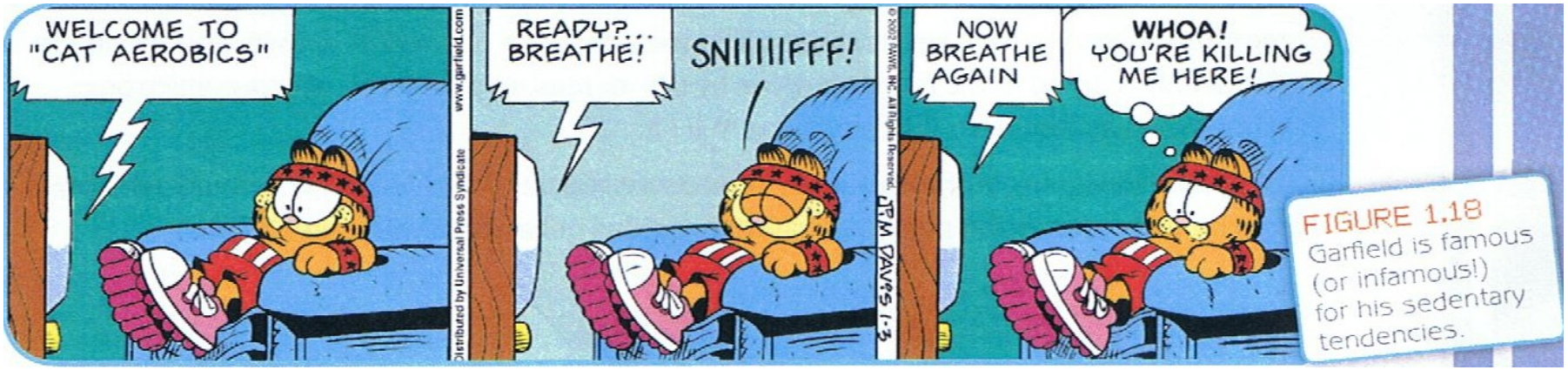


FIGURE 1.18
Garfield is famous (or infamous!) for his sedentary tendencies.

The Challenge.

