Chapter 3
Identifying and Assessing Self-Management Behaviours

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Learning Outcomes

This chapter contributes to achieving the following learning outcomes:

BC1.2 Describe target behaviours in the self-management of chronic diseases.
BC4.2 Identify higher- and lower-level target behaviours for specific chronic diseases, based on appropriate guidance.
BC5.1 Assess the person's behaviour in self-management using appropriate measures.

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3.1 Target Behaviours for the Self-Management of Chronic Diseases

Seven high-priority chronic diseases were selected, based on their prevalence and potential for self-management, according to two European Union (EU)-funded projects addressing this topic (COMPAR-EU and PRO-STEP): type 2 diabetes (T2D), chronic obstructive pulmonary disease (COPD), hypertension, heart failure (HF), obesity, asthma and ischaemic heart disease. The self-management of these diseases encompasses, but is not restricted to, the change or maintenance of health-enhancing or health-protective behaviours presented in Table 3.1, called target behaviours. For listing these target behaviours, we followed the 6S hierarchy of pre-appraised evidence (DiCenso et al., 2009).[1]

Moreover, target behaviours were selected on the grounds of their overall relevance to persons living with these chronic diseases; behaviours pertinent only to specific cases (e.g. nutritional supplementation in malnourished persons with COPD) were not considered.

Symptom monitoring and management addresses physical or mental alterations associated with the chronic disease, which the person can notice. Examples include managing hypoglycaemia in diabetes or recording asthma symptoms. Other self-management components, such as self-monitoring of blood glucose when beneficial in persons with T2D, do not respect to "symptoms" and therefore are not addressed in this chapter.

The target behaviours presented above describe broad behaviours, designated as *high-level target behaviours*. These can usually be broken down into more granular behaviours, focusing on specific behavioural actions, designated as *low-level target behaviours*. For instance, physical activity, i.e. all voluntary muscle actions associated with increased energy expenditure (Caspersen et al., 1985), is a high-level target behaviour. Physical activity includes both daily living activities and exercise training and can, therefore, encompass low-level target behaviours, such as walking or swimming, as illustrated in Fig. 3.1.

A healthy diet is another high-level target behaviour. A healthy diet arises from a proper balance between its elements (foods) and their constituents (nutrients). The latter may vary in amount, depending on factors such as maturation and soil characteristics, which influence fruits' and vegetables' composition, and animal feed, which influence meats' and eggs' composition, to give just two examples. Moreover, nutrients interact with each other – e.g. dietary fibre influences cholesterol absorption and metabolism. Therefore, the same nutrient may have a different

[1] We used the highest possible layer in the 6S model, in the case, evidence-based current clinical guidelines and other summaries of evidence (e.g. Cryer, 2019). Lower layers in this model include, in descending order, synopsis of syntheses, summarising the findings of high-quality systematic reviews, often accompanied by a commentary on the methodological quality and the clinical applicability of its findings, and syntheses (systematic reviews). The bottom layer of the 6S model are single original studies, which have not been pre-appraised.

Table 3.1 Self-management behaviours in high-priority chronic diseases

Behaviour	Type 2 diabetes (ADA, 2021)	COPD (GOLD, 2020)	Hypertension (Williams et al., 2018)	Heart failure (McDonagh et al., 2021)	Obesity (Yumuk et al., 2015)	Asthma (GINA, 2021)	Ischaemic heart disease (Knuuti et al., 2020)
Diet (including alcohol intake)	•	–	•	•	•	•	•
Physical activity	•	•	•	•	•	–	•
Medication adherence	•	•	•	•	•	•	•
Smoking cessation	•	•	•	•	–	•	•
Symptom monitoring and management	•	•	–	•	–	•	•

From Guerreiro et al. (2021)

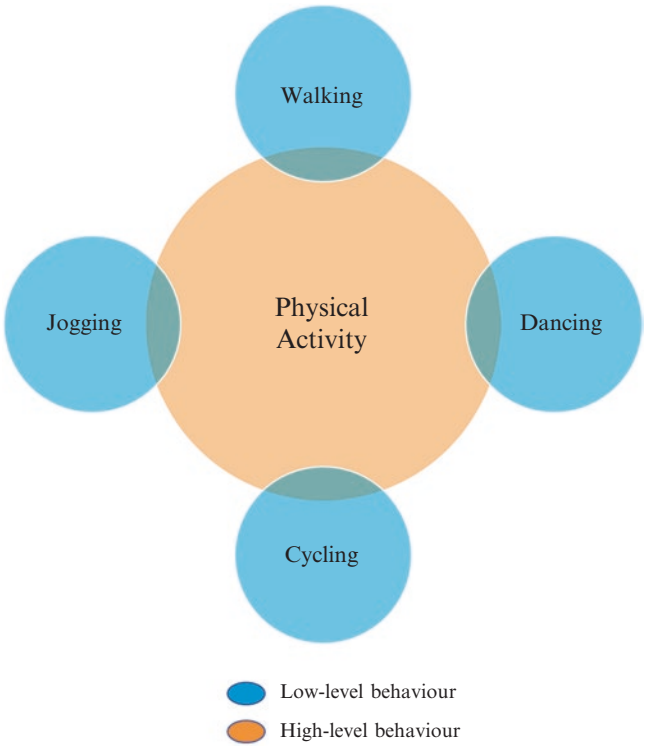

Fig. 3.1 Examples of low-level behaviours in physical activity

impact on health, depending on the food chosen and the clinical condition of the person eating it. Supporting the adoption of a healthy diet in practice requires the definition of more granular behaviours, such as reducing the intake of free sugars or limiting salt intake to no more than 5 g/day.

The target behaviours listed in Table 3.1 are informed by a biomedical perspective. They can, however, also be defined in terms emanating from the person living with chronic disease, grounded on a set of preferences, resources and experiences, unique to that person. This is exemplified, for medication-taking, by "Being able to walk to the supermarket without breathlessness" in a person with COPD or "Adjusting insulin to preferably reduce hypoglycaemia episodes to zero" in a person with T2D managed with insulin. As professionals and persons with chronic disease work collaboratively, materialising paradigms such as shared decision-making and person-centred communication, these target behaviours, defined from the person's perspective, will predictably become more common.

In the next sections, examples of low-level target behaviours for the self-management of each high-priority chronic disease are provided. Disease management interventions relying necessarily on professionals, such as ordering laboratory tests, initiating medicines and pulmonary rehabilitation and cardiac rehabilitation programmes, are outside the remit of this book.

Evidence levels underpinning target behaviours were defined differently across sources. For details about the evidence levels, refer to the international clinical guidelines, mentioned in the footnotes across this chapter.

Box 3.1 presents websites where potential updates of cited international clinical guidelines for the management of the selected chronic disease can be checked; it may be equally relevant to resort to national guidelines, where these exist.

Box 3.1 Websites of International Clinical Guidelines: Examples

- American Diabetes Association (ADA) practice guidelines resources: https://professional.diabetes.org/content-page/practice-guidelines-resources
- European Society of Cardiology (ESC) guidelines and scientific documents: https://www.escardio.org/Guidelines
- Global initiative for chronic obstructive lung disease (GOLD): https://goldcopd.org
- Global initiative for asthma (GINA): https://ginasthma.org

3.1.1 Type 2 Diabetes

Type 2 diabetes is the most prevalent type of diabetes. Hyperglycaemia results, initially, from the inability of cells to respond fully to insulin. Insulin resistance prompts an increase in the production of this hormone; over time pancreatic beta cells are frequently unable to keep up with demand, leading to the insufficient

production of insulin (IDF, 2021). The cornerstone of type 2 diabetes management is promoting a lifestyle composed of a healthy diet, regular physical activity, smoking cessation and weight loss, when needed. If lifestyle changes are insufficient to manage hyperglycaemia, pharmacologic treatment is initiated.

3.1.1.1 Diet

Diet plays a key role in the overall management of diabetes. There is no single diet pattern for persons with T2D. Research provides clarity on many food choices and eating patterns that can help these persons in achieving health goals, such as lower glycated haemoglobin levels (A1C), lower self-reported weight, lower lipid levels and quality of life (ADA, 2021). Therefore, a variety of eating behaviour patterns are acceptable for the self-management of T2D, which should be chosen based on the person's cultural and socio-economic background, preferences and needs (ADA, 2021).

Healthy eating recommendations are appropriate for persons with type 2 diabetes, when an individualised meal plan is not set. Table 3.2 presents low-level dietary target behaviours, based on the ADA guidelines (2021).

Obesity or overweight affects many persons with type 2 diabetes, reaching 90–95% in the American population (CDC, 2021). A simple manner to explain obesity physiopathology is considering that it results from a maintained positive energy balance. In other words, excessive weight arises from energy intake (food calories) continuously exceeding expenditure. For weight loss purposes, the restriction of energy intake is robustly supported by literature.

Some low-level target behaviours for self-managing type 2 diabetes are common to the general population. For example, the World Health Organization (2015) recommends a reduced intake of free sugars, for both adults and children, to less than 10% of total energy intake and suggests that it is further reduced below 5% (WHO, 2015). The term "free sugars" refers to all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices (WHO, 2015). As for the general population, persons with T2D should limit salt intake to 5 g/day.

3.1.1.2 Physical Activity

It has been shown that physical activity improves blood glucose control, reduces cardiovascular risk factors and contributes to weight loss and well-being in people with T2D (ADA, 2021). Exercise is a subset of physical activity that is planned, structured and repeated with the aim of maintaining or enhancing physical fitness (Caspersen et al., 1985). Interventions of at least 8-week duration resorting to structured exercise have been shown to lower A1C by an average of 0.66% in persons with type 2 diabetes, even without a significant change in body mass index (BMI) (ADA, 2021). Particularly in older adults with type 2 diabetes, A1C

Table 3.2 Diet: low-level target behaviours in T2D

Low-level target behaviours	Rationale	Level of evidence[a]
Reduce calorie intake in persons with overweight or obesity	Reduction of calorie intake in combination with lifestyle modification is expected to reduce weight at least by 5% Weight loss of at least 5% produces beneficial outcomes in glycaemic control, lipids and blood pressure	A
Eat nutrient-dense carbohydrate sources that are high in fibre (at least 14 g fibre per 1000 kcal) and minimally processed[b]	Adequate carbohydrate intake, namely, reducing overall intake when excessive, has demonstrated to improve glycaemia in persons with diabetes Eating plans should emphasise non-starchy vegetables[c], fruits and whole grains, as well as dairy products, with minimal added sugars	B
Minimise the consumption of foods with added sugar	Foods with added sugar can displace healthier, more nutrient-dense food choices	A
Eat food rich in monounsaturated and polyunsaturated fats[d]	A Mediterranean-style diet rich in monounsaturated and polyunsaturated fats may improve glucose metabolism and lower cardiovascular disease risk; it can be an effective alternative to a low-fat diet	B
For those who drink alcohol, drink with moderation[e]	Alcohol consumption may place people with diabetes at increased risk for hypoglycaemia, especially if taking insulin or insulin secretagogues People with diabetes should know about the signs, symptoms and self-management of delayed hypoglycaemia after drinking alcohol	B B
Prefer water in detriment of sugar-sweetened beverages or non-nutritive-sweetened beverages	Avoiding sugar-sweetened beverages, including fruit juices, is associated with glycaemic and weight control and reduction of the risk of cardiovascular disease and fatty liver Low-calorie, non-nutritive-sweetened beverages – assuming non-nutritive sweeteners' role in reducing overall energy and carbohydrate intake – may be used as an occasional or short-term option Water intake and decreasing both sweetened and non-nutritive-sweetened beverages are encouraged	B

Based on ADA (2021)

[a]For details about the evidence levels, refer to https://professional.diabetes.org/content-page/practice-guidelines-resources

[b]Examples for high-fibre, nutrient-dense carbohydrate sources are fruits, minimally processed cereals and cereal products (e.g. bread) and legumes (e.g. beans, chickpeas, lentils, peas, broad beans)

[c]In fact, all vegetables have some starch or other forms of carbohydrates. Corn, potatoes, cassava, yams and green peas are examples of vegetables with higher carbohydrate content, while lettuce, spinach, cabbage and watercress have lower carbohydrate content

[d]Vegetable oils, pulses, seeds and nuts are sources for both mono- and polyunsaturated fatty acids

[e]Drinking alcohol in moderation can be considered as no more than one drink per day for adult women and no more than two drinks per day for adult men. One drink corresponds roughly to 355 ml of beer, 150 ml of wine and 36 ml of distilled spirits

levels decrease with resistance training (ADA, 2021), regarded as exercise to stimulate the muscles and enhance strength resorting to external resistances or one's own body weight.

Globally, daily physical activity is recommended to decrease insulin resistance. Over time, activities should progress in intensity, frequency and/or duration to at least 150 minutes/week of moderate-intensity physical activity (ADA, 2021). A goal of 7000 steps/day is consistent with recommendations of 150 minutes/week of moderate-to-vigorous physical activity (Tudor-Locke et al., 2011b); specifically, this step-count threshold has shown benefit in persons with type 2 diabetes (Rossen et al., 2021). Younger and more physically fit persons able to run at 9.7 km/h for at least 25 min can benefit from shorter-duration, higher-intensity, activity (75 minutes/week). Aerobic physical activity[2] bouts should ideally last at least 10 minutes, with the goal of 30 minutes per day or more, most days of the week (ADA, 2021).

Physical activity has conditional recommendations for persons with cardiovascular risk factors. These risk factors, as well as atypical presentation of coronary artery disease, should be previously assessed in persons with diabetes. High-risk persons should be encouraged to start physical activity with short periods of low-intensity exercise and slowly increase the intensity and duration as tolerated (ADA, 2021). Lower-level target behaviours in physical activity are described in Table 3.3.

3.1.1.3 Smoking Cessation

Smoking cessation means quitting tobacco use or e-cigarettes. For people with T2D, the risk of cardiovascular disease, premature death, microvascular complications and worse glycaemic control is significantly increased by smoking, as shown by evidence from generalisable randomised controlled trials (level of evidence A) and supportive evidence from cohort studies (level of evidence B) (ADA, 2021). Therefore, smoking cessation is strongly advised for this population.

3.1.1.4 Medication Adherence

Medication adherence is an important determinant of outcomes in persons with diabetes, by decreasing morbidity and mortality. This includes adherence to antidiabetic agents and, where necessary, antihypertensive agents, statins, antiplatelet agents, nicotine replacement therapy and other medicines (ADA, 2021).

The rationale for taking specific drugs should be discussed with the person on a per case basis.

[2] Aerobic physical activity is any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen et al., 1985) mainly provided by oxidation of lipids and carbohydrates. This includes all sorts of daily living, worksite, fitness and sport-related physical activities (e.g. walking, jogging, climbing stairs and many other).

Table 3.3 Physical activity: low-level target behaviours in physical activity in T2D

Low-level target behaviours	Rationale	Level of evidence[a]
Engage in 150 min or more of moderate-to-vigorous intensity aerobic activity per week, spread over at least 3 days/week, with no more than 2 consecutive days without activity *OR for younger and more physically fit individuals*: engage in a minimum 75 min/week of vigorous-intensity or interval training	Moderate to high volumes of aerobic activity are associated with substantially lower cardiovascular and overall mortality risks Daily exercise, or at least not allowing more than 2 days to elapse between exercise sessions, decreases insulin resistance	B
Engage in 2–3 sessions/week of resistance exercise on non-consecutive days	Resistance training of any intensity may improve glycaemic control and strength	B
Decrease the amount of time spent in daily sedentary behaviour	Avoiding extended sedentary periods may help in glycaemic control	B
Interrupt prolonged sitting every 30 min	Prolonged sitting should be interrupted every 30 minutes for glycaemic control benefits	C
For older adults with diabetes, train flexibility and balance 2–3 times/week	A wide range of activities, including yoga, tai chi and other types, can have significant impacts on A1C, flexibility, muscle strength and balance	C

Based on ADA (2021)
[a]For details about the evidence levels, refer to https://professional.diabetes.org/content-page/practice-guidelines-resources

3.1.1.5 Symptom Monitoring and Management

Hypoglycaemia is the most frequent and life-threatening adverse effect of medicines such as insulin or insulin secretagogues. In type 2 diabetes, it is potentially preventable (Silbert et al., 2018). Persons with type 2 diabetes are expected to identify symptoms suggestive of hypoglycaemia, i.e. monitoring and managing them, by taking the appropriate course of action.

Hypoglycaemia causes neurogenic and neuroglycopenic symptoms. The neurogenic symptoms result from the activation of the autonomic nervous system in response to a reduction in blood glucose; these symptoms include (Cryer, 2019):

- Tremor, palpitations and anxiety/arousal (catecholamine-mediated, adrenergic).
- Sweating, hunger and paresthesias (acetylcholine-mediated, cholinergic).

The neuroglycopenic symptoms result from the brain's deprivation of glucose; they include dizziness, weakness, drowsiness, delirium, confusion and, for lower blood sugar levels, seizure and coma.

Neuroglycopenic symptoms may be more difficult to perceive. Typically, neurogenic symptoms develop at a higher blood glucose threshold (approximately 58 mg/dL or 3.2 mmol/L), while neuroglycopenic symptoms develop at lower blood glucose threshold (approximately 51 mg/dL or 2.7 mmol/L), respectively, although there is intra- and inter-individual variation (Tesfaye et al., 2010).

A rapidly available glucose source should be chosen (e.g., table sugar) for correcting hypoglycaemia, as both protein and fat can influence the absorption rate for glucose (ADA, 2021). The self-management of hypoglycaemia in persons with blood glucose <70 mg/dL [3.9 mmol/L] relies preferably on the intake of glucose (15–20 g), although any form of carbohydrate that contains glucose may be used. Fifteen minutes after glucose intake, self-monitoring of blood glucose, where available, should be performed; if hypoglycaemia is maintained, glucose consumption (15 g) should be repeated. This approach is known as the "rule of 15". Once blood glucose returns to normal, the person should eat a meal or snack to prevent recurrence of hypoglycaemia (ADA, 2021).

3.1.2 Chronic Obstructive Pulmonary Disease

Chronic obstructive pulmonary disease (COPD) is currently one of the top three causes of death worldwide, with 90 per cent of fatalities occurring in low- and middle-income nations (GOLD, 2021). It is a common, preventable and treatable disease characterised by persistent respiratory symptoms and airflow limitation, caused by airway and/or alveolar abnormalities, which are typically originated by significant exposure to noxious particles or gases and influenced by host factors, such as abnormal lung development (GOLD, 2021).

Self-management of COPD, including the use of medicines, lifestyle changes and avoidance of risk factors, is essential to prevent disease progression and improve health outcomes. Evidence-based self-management principles are recommended in clinical guidelines for COPD (GOLD, 2021).

3.1.2.1 Physical Activity

The 2022 report of the Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2021) recommends physical activity for persons with COPD and evidence of benefits are considered clear. However, promoting and maintaining physical activity is challenging, and these persons have generally reduced physical activity levels, which increases the risk of adverse outcomes, including hospitalisation rates and mortality (GOLD, 2021). One barrier for broader physical activity promotion in persons with COPD is linked with the lack of evidence-based guidelines and inconsistencies regarding the type, quantity, timing and other cornerstone components of physical activity recommendations (GOLD, 2021; Liguori, 2021).

Assessment of persons with COPD has been focused mainly on exercise tolerance (GOLD, 2021) and not so much on physical activity. In this respect, a reference

measure is the number of steps performed per day (Tudor-Locke et al., 2011a). A meta-analysis showed that the simple use of a pedometer was enough to increase daily physical activity in persons with COPD, particularly in those with higher physical activity levels (≥4000 steps/day) at baseline, who probably had higher exercise tolerance (Armstrong et al., 2019). This beneficial effect was observed in the absence of pulmonary rehabilitation programmes, which are synergic to the use of pedometers. These findings underscore the importance of exercise tolerance assessment for tailoring lifestyle intervention in these persons and suggest that a stepwise approach may be sensible: focusing first on increasing exercise tolerance of beginners or persons with more limited physical activity and implementing physical activity promotion interventions for those with higher exercise tolerance and physical activity capacity.

3.1.2.2 Smoking Cessation

Smoking cessation is key to reducing progressive decline in lung function over time, as well as exacerbations (level of evidence A[3]) and smoking-related co-morbidities, such as lung cancer and cardiovascular disease (GOLD, 2021). Globally, cigarette smoking is the most common, but other types of tobacco such as pipe or cigar should be also considered.

3.1.2.3 Medication Adherence

Medication adherence is an important determinant of outcomes in persons living with COPD, by reducing symptoms, the frequency and severity of exacerbations, decreasing the risk of hospital admission and improving exercise tolerance and health status (GOLD, 2021). This includes adherence to bronchodilators, antimuscarinic drugs, anti-inflammatory agents, oxygen and, where necessary, other medicines (GOLD, 2021).

Adherence to influenza and pneumococcal vaccination can reduce the incidence of lower respiratory tract infections and death in persons with COPD (level of evidence B[4]) (GOLD, 2021).

The rationale for adhering to specific drugs should be discussed with the person on a per case basis.

3.1.2.4 Symptom Monitoring and Management

Persistent respiratory symptoms in COPD include dyspnoea, cough and/or sputum production (GOLD, 2021). There are recommendations to self-monitor and manage both dyspnoea and exacerbations, based on written action plans (GOLD, 2021).

[3] For details about the evidence levels, refer to https://goldcopd.org/gold-reports/

[4] For details about the evidence levels, refer to https://goldcopd.org/gold-reports/

In monitoring dyspnoea, trends and changes in symptoms such as respiratory distress, tiredness, restriction of activity and sleep disturbance are more meaningful than specific measures (GOLD, 2021). Integrated self-management of dyspnoea, based on a written action plan, may include breathlessness and energy conservation techniques and stress management strategies.

Exacerbation is an acute worsening of respiratory symptoms, usually associated with increased airway inflammation, increased mucus production and marked gas trapping. Dyspnoea, increased sputum purulence and volume, cough and wheeze are common symptoms of exacerbations. Written action plans for exacerbations must be personalised with respect to how to avoid aggravating factors and how to monitor and manage worsening of symptoms and contact information in the event of an exacerbation (GOLD, 2021).

3.1.3 Arterial Hypertension

Arterial hypertension is characterised by extra strain on blood vessels, heart and other organs. Persistent high blood pressure can increase the risk of several serious and potentially life-threatening conditions, such as myocardial infarction, haemorrhagic stroke and heart failure.

Changes in lifestyle may be sufficient to delay or prevent the need for drug therapy in persons with grade 1 hypertension and can also augment the effects of antihypertensive agents (Williams et al., 2018). Lifestyle changes (e.g. diet, physical activity, smoking cessation) are therefore considered in reference guidelines as the standard and primary treatment for controlling hypertension (Whelton et al., 2018; Williams et al., 2018). The American College of Cardiology, the American Heart Association, and others also additionally recommended that newly diagnosed hypertension with a lower blood pressure threshold can be managed with lifestyle antihypertensive therapy rather than medicines (Whelton et al., 2018). Difficulties in maintaining these lifestyle changes over time are a major drawback of this approach (Williams et al., 2018).

The following sections describe the lower-level target behaviours relevant for the self-management of arterial hypertension, based on Williams et al. (2018).

3.1.3.1 Diet

Diets mainly composed of vegetables, fruits, whole grains, low-fat dairy products, fish, chicken and lean meats, which are high in minerals, fibre and unsaturated fatty acids (namely, monounsaturated from olive oil) and low in saturated fat and cholesterol, are associated with a reduction of blood pressure (Williams et al., 2018). One example is the Mediterranean diet and Dietary Approaches to Stop Hypertension (DASH).

Examples of diet lower-level target behaviours are described in Table 3.4.

Table 3.4 Diet: low-level target behaviours in hypertension

Low-level target behaviours	Rationale	Level of evidence[a]
Limit salt intake to <5 g per day	Excess sodium intake (>2 g of sodium per day or >5 g of salt daily) has shown an increase in blood pressure with age	A
Increase the consumption of fresh fruits and vegetables	Adopting a healthy and balanced diet may assist in blood pressure reduction and reduce cardiovascular risk	A
Increase the consumption of fish		
Prefer monounsaturated and polyunsaturated fat food sources[b]		
Minimise the consumption of red meat, preferring fish and poultry		
For those who drink alcohol, drink with moderation[c]	Moderate consumption of alcohol is associated with a reduction in cardiovascular events and all-cause mortality	A

Based on Williams et al. (2018)

[a]For details about the evidence levels, refer to https://doi.org/10.1080/08037051.2018.1527177

[b]Vegetable oils, pulses, seeds and nuts are sources for both mono- and polyunsaturated fatty acids

[c]Another way of defining moderate alcohol consumption is drinking alcohol less than 14 units per week for men and less than 8 units per week for women. A unit of alcohol is equal to 125 ml of wine or 250 ml of beer (Tasnim et al., 2020)

3.1.3.2 Physical Activity

Aerobic physical activity has been considered particularly beneficial for both the prevention and treatment of hypertension and to lower cardiovascular risk and mortality (Williams et al., 2018). Recommendations for physical activity in persons with hypertension (Table 3.5) are similar to those for the general population, except for vigorous exercise,[5] which is not endorsed (Whelton et al., 2018; Williams et al., 2018). Resistance exercise[6] is also recommended for this population (Williams et al., 2018).

[5]Vigorous exercise refers to exercise that is performed at 6.0 or more METs (1 MET ≈ resting metabolism), meaning it demands 6 times or more the energy expenditure and oxygen consumption, compared to that of one's resting state (WHO, 2020). On an individual's personal capacity perspective, vigorous-intensity exercise is usually a 7 or 8 on a scale of 1 to 10 (WHO, 2020). In a practice perspective, vigorous exercise includes but is not limited to activities like jogging or running, playing strenuous racquet sports (singles tennis, paddle ball or others) or other strenuous sports (basketball, soccer or others) (Sallis et al., 1985).

[6]Resistance exercise is any exercise performed to optimise muscular fitness, namely, strength, hypertrophy, power and local muscular endurance, which can encompass free weights, machines, body weight, bands/tubing or any other object that requires one to exert force against a resistance (Ratamess, 2021).

Table 3.5 Physical activity: low-level target behaviours in hypertension

Low-level target behaviours	Rationale	Level of evidence[a]
Performance at least 30 min of moderate-intensity dynamic aerobic exercise (walking, jogging, cycling or swimming) on 5–7 days per week	Aerobic endurance training, dynamic resistance training and isometric training[b] reduce resting systolic blood pressure and diastolic blood pressure	A
Performance of resistance exercises on 2–3 days per week	Resistance exercises on 2–3 days per week reduce blood pressure in persons with hypertension	A

Based on Williams et al. (2018)
[a]For details about the evidence levels, refer to https://doi.org/10.1080/08037051.2018.1527177
[b]Isometric training is all training performed with voluntary muscle contraction but without movement (i.e. sustained contraction against an immovable load or resistance with no or minimal change in length of the involved muscle group) (Fu et al., 2020)

3.1.3.3 Smoking Cessation

Persons with normal blood pressure and untreated hypertension that smoke present higher daily blood pressure values than non-smokers (Williams et al., 2018). Smoking cessation is the most cost-effective cardiovascular disease prevention strategy, including for the prevention of stroke, myocardial infarction and peripheral artery disease (Williams et al., 2018).

3.1.3.4 Medication Adherence

Medication adherence in persons with hypertension is associated with an effective reduction of blood pressure and cardiovascular events (Williams et al., 2018). Antihypertensive agents include angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers and diuretics (Williams et al., 2018).

The rationale for adhering to specific drugs should be discussed with the person on a per case basis.

3.1.4 Heart Failure

Heart failure is characterised by key symptoms (e.g. dyspnoea, ankle swelling and weariness) that may be accompanied with signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema). Elevated intracardiac pressures

and/or insufficient cardiac output at rest and/or during exercise is caused by structural and/or functional abnormalities of the heart. Heart failure is one of the most frequent causes of hospitalisation and death. To avoid exacerbations, several self-management behaviours are recommended.

3.1.4.1 Diet

There are three low-level dietary behaviours recommended for persons with heart failure, additionally to a healthy diet: avoiding excessive salt intake (>5 g/day), avoiding large volumes of fluid intake and avoiding excessive alcohol intake, understood as drinking more than 2 units of alcohol per day in men or 1 unit of alcohol per day in women. Evidence shows that limiting sodium intake prevents morbidities associated with this condition (McDonagh et al., 2021).

3.1.4.2 Physical Activity

Persons with heart failure should undertake regular exercise and be physically active (McDonagh et al., 2021). However, specific physical activity guidance for these persons is not available; general physical activity guidelines apply, which recommend ≥150–300 min/week of moderate-intensity aerobic physical activity or 75–150 min/week of vigorous-intensity aerobic physical activity (Piercy et al., 2018; Ye et al., 2021). Persons living with heart failure report a lower involvement in physical activity, which increases their cardiometabolic risk (Yates et al., 2017; Ye et al., 2021).

Exercises in the form of cardiac rehabilitation programmes specific for this population have demonstrated benefit but are outside the remit of this book (McDonagh et al., 2021).

3.1.4.3 Smoking Cessation

Smoking cessation is recommended for persons with heart failure. Although smoking cessation has not been shown to reduce the risk of developing heart failure, tobacco is associated with the development of cardiovascular disease (McDonagh et al., 2021; Ezekowitz et al., 2017).

3.1.4.4 Medication Adherence

Medication adherence is critical to prevent or delay the development of overt heart failure, manage symptomatic persons with reduced ejection fraction and improve exercise capacity. Medication adherence reduces the risk of heart failure-related

hospitalisation in persons with signs and/or symptoms of congestion, reduces mortality and prolongs life. This includes adherence to diuretics, antihypertensives, beta-blocker agents and, where necessary, other medicines (McDonagh et al., 2021).

The rationale for adhering to specific drugs should be discussed with the person on a per case basis.

3.1.4.5 Symptom Monitoring and Management

Monitoring and managing symptoms in persons with heart failure are recommended as part of an overall strategy to reduce the risk of hospitalisation and mortality associated with this disease (McDonagh et al., 2021). For example, in the case of increasing dyspnoea or oedema in three consecutive days, persons may increase their diuretic dose and/or alert their healthcare team. Symptom management may include flexible use of diuretic and fluid intake as agreed with the healthcare team. It is also recommended that a sudden unexpected weight gain of >2 kg in three consecutive days triggers an increase in diuretic dose and/or an alert to the healthcare team (McDonagh et al., 2021).

3.1.5 Obesity

Obesity is a metabolic chronic disease resulting from complex interactions between biological, behavioural, psychosocial, genetic and environmental factors, which should be considered by professionals to support self-management (Frühbeck et al., 2019). Understanding the role of these factors is critical to avoid misconceptions, such as associating obesity with a poor lifestyle and absence of will power, and to avoid stigma.

The self-management of obesity includes a diet with restriction of energy intake, regular physical activity and, when applicable, medication-taking. Behaviour changes are by far the most important component for integrating successful eating and activity patterns over the long term (Yumuk et al., 2015). A personalised energy-restricted diet, based on nutritional habits, physical activity, co-morbidities and previous dieting attempts, is beyond the remit of this book, as it requires the intervention of a nutritionist. As for the remainder sections, we focus on recommendations that can be actioned by a range of professionals.

Weight management is a lifelong process; monitoring the weight is important in self-management for persons with obesity. A 5–15% weight loss over a period of 6 months is realistic and of proven health benefit, and a greater (20% or more) weight loss may be considered for those with greater degrees of obesity (BMI $\geq$ 35 kg/m^2) (Yumuk et al., 2015).

3.1.5.1 Diet

Balanced hypocaloric diet produces clinically significant weight loss, irrespective of the macronutrients' proportion (Yumuk et al., 2015). Low-level target behaviours depicted in Table 3.6 are underpinned by less robust evidence (in the case, non-analytic studies, such as case reports and case series, and expert opinion); in the absence of more robust evidence, they are accepted as desirable for setting self-management recommendations for adults with obesity.
Decreasing energy density of foods and drinks may encompass a range of behaviours:

- Adequate the consumption of vegetables, beans, legumes, lentils, grain, unsweetened cereals, fruits and fibre.
- Prefer the consumption of seafood over meats and meat products with a high-fat content.
- Reduce the intake of foods containing added sugars and fats (e.g. spreadable fats, fats for seasoning).
- Replace the consumption of sugary drinks and alcohol-containing beverages for water or herbal teas.

Additional behaviours advocated in the literature are resorting to a Mediterranean "type" diet, based on low-fat ingredients, controlling the fat in cooking (sautéed, stewed or roasted dishes), using aromatic herbs instead of salt, and choosing whole grain foods (Esposito et al., 2011).

Adopting regular meal patterns and planning what to eat during the day is an important low-level target behaviour. Persons with obesity benefit from maintaining a pattern of at least three meals, breakfast, lunch and dinner, as anchor meals (Camolas et al., 2015). Adopting intermediate snacks between meals may be an option if effective in appetite control (Chapelot, 2011; Camolas et al., 2015).

Table 3.6 Diet: low-level target behaviours in obesity

Low-level target behaviours	Rationale	Level of evidence[a]
Decrease energy density of foods and drinks	Weight loss between 5% and 15% of initial body weight is associated with a reduction in cardiovascular risk factors, improvement in lipid profiles, reduction in blood glucose and glycosylated haemoglobin and decreased risk for developing type 2 diabetes and other obesity-related complications	Levels 3 and 4
Decrease the size of food portions		
Adopt a regular meal pattern		

Based on Yumuk et al. (2015)
[a]For details about the evidence levels refer to https://doi.org/10.1159/000442721

3.1.5.2 Physical Activity

Increased physical activity, including exercise, is considered a main component of obesity management, in conjunction with a decreased energy intake and healthy eating (Table 3.7). Comprehensive lifestyle interventions are considered effective for weight reduction but also for preserving fat-free mass (Yumuk et al., 2015). Physical activity has proven useful for the management and treatment of most obesity co-morbidities, as well as other diseases and impairments (Pedersen & Saltin, 2015). Furthermore, obesity management may reduce the need to treat co-morbidities pharmacologically (Yumuk et al., 2015).

Guidelines recommend that persons with obesity should engage in at least 150 min/week of moderate aerobic exercise (such as brisk walking), combined with two/three weekly sessions of resistance exercise, to increase muscle strength (Schutz et al., 2019; Yumuk et al., 2015). More physical activity (e.g. about 300 min/week of endurance activity at moderate intensity or 150 min of vigorous activity) may provide additional benefits, including higher mobilisation of visceral fat (Schutz et al., 2019). Additionally, guidelines underscore the importance of enjoyment in reducing sedentarism and increasing physical activity (Schutz et al., 2019). Physical activity can be split into multiple short segments of 10 minutes minimum, to have a metabolic impact (Schutz et al., 2019).

Examples of lower-level target behaviours are described in Table 3.8, based on Yumuk et al. (2015).

Persons with obesity who reach a high cardiorespiratory fitness have a lower mortality risk due to all aetiologies than normal-weight sedentary persons, namely, those who sit or lie down for a prolonged period (Schutz et al., 2019). Walking is suggested as the best physical activity for these persons, as it fosters autonomy and competence and is practical (can be done anywhere, free of charge, without requiring specific equipment, apart from regular walking shoes). Furthermore, persons can adjust the intensity (speed, slopes, stairs) and select a particular terrain (snow, sand, grass or others) (Schutz et al., 2019).

Table 3.7 Approach to the initial management of obesity

BMI (kg/m^2)[a]	WC (cm)[a]		With co-morbidities
	Normal	High	
25.0–29.9	L	L	L ± D
30.0–34.9	L	L ± D	L ± D ± S[b]
35.0–39.9	L ± D	L ± D	L ± D ± S
≥40.0	L ± D ± S	L ± D ± S	L ± D ± S

Note: *BMI* body mass index, *WC* waist circumference, *L* lifestyle intervention (diet and physical activity), *D* consider pharmacological treatment, *S* consider bariatric surgery

[a]BMI and WC cut-offs are different for some ethnic groups

[b]Patients with type 2 diabetes on an individual basis. Based on Yumuk et al. (2015)

Table 3.8 Physical activity: low-level target behaviours in obesity

Low-level target behaviours	Rationale	Class of recommendation[a]
Performance at least 150 min/week of aerobic exercise combined with 2–3 weekly sessions of resistance training	Aerobic training (e.g. brisk walking) is the optimal mode of exercise for reducing fat mass and body mass, while resistance training increases lean mass in middle-aged and overweight/obese individuals	{Level 2; grade B}
	Increasing physical activity induces: Reductions in intra-abdominal fat and increases in lean (muscle and bone) mass while attenuating the weight loss-induced decline of resting energy expenditure[b] {level 2}. Reductions in blood pressure and improvements in glucose tolerance, insulin sensitivity, lipid profile and physical fitness {level 1}. Better compliance to the dietary regimen, which has a positive influence on long-term weight maintenance {level 2}. Feelings of well-being and better self-esteem {level 2}. Reductions in anxiety and depression {level 2}.	{Level 1, 2}

Based on Yumuk et al. (2015)

[a]For details about the evidence levels, refer to https://doi.org/10.1159/000442721

[b]Weight loss-induced decline of resting energy expenditure is a decline in resting and exercise-related energy expenditure observed in response to weight loss and negative energy balance (Dulloo et al., 2012). This reduction is greater than the expected reduction in energy expenditure due to the reduction of overall body mass, including both fat and fat-free mass. This thermogenic adaptation (modulated energy expenditure) is believed to be mediated mainly by the autonomic nervous system in response to both reduction of body mass and reduction of energy intake (Dulloo et al., 2012)

3.1.5.3 Medication Adherence

Obesity management requires a holistic approach. Adequate diet and physical activity are the cornerstone of obesity management; pharmacologic therapy has the potential to enhance results obtained by lifestyle interventions (Yumuk et al., 2015). All medicines have inherently more risks than diet and physical activity.

The rationale for adhering to specific drugs should be discussed with the person on a per case basis.

3.1.6 Asthma

Asthma is a complex condition marked by persistent inflammation of the airways. Clinically, it is characterised by respiratory symptoms, such as wheezing, shortness of breath, chest tightness and cough, with varying intensity and frequency over time, as well as fluctuating expiratory airflow restriction. Globally, asthma is a prevalent chronic condition, affecting 1–18% of the population (GINA, 2021).

Diet, smoking cessation, medication adherence and symptom monitoring and management are self-management behaviours that impact on disease management. Regular and moderate physical activity has significant health benefits for people with asthma, as for the general population (GINA, 2021), but it is not regarded as a target behaviour for self-management.

3.1.6.1 Diet

A healthy diet is recommended for persons living with asthma, including high consumption of fresh fruit and vegetables.[7] In some studies, this is linked to an improvement in asthma control and a reduced risk of exacerbations (GINA, 2021). For confirmed food allergy, food allergen avoidance may reduce asthma exacerbations (level of evidence D[8]) (GINA, 2021).

3.1.6.2 Smoking Cessation

Smoking cessation, including e-cigarettes, is a key target behaviour in people with asthma. These persons should be referred to counselling and smoking cessation programmes (level of evidence A) (GINA, 2021). Those with asthma exposed to tobacco have a greater risk of exacerbations when compared with those with asthma that do not smoke (GINA, 2021). Additionally, persons living with asthma should avoid environmental smoke exposure (level of evidence B[9]).

[7] The World Health Organization (2003) proposes the consumption of 400 g of fruits and vegetables as an adequate goal for a prudent diet. Two to three servings of fruit (e.g. one pear, one apple, one slice of pineapple) and three servings of vegetables (e.g. soup, salad, boiled vegetables) may be adequate to achieve the goal.

[8] For details about the evidence levels, refer to https://ginasthma.org/wp-content/uploads/2021/05/GINA-Main-Report-2021-V2-WMS.pdf

[9] For details about the evidence levels, refer to https://ginasthma.org/wp-content/uploads/2021/05/GINA-Main-Report-2021-V2-WMS.pdf

3.1.6.3 Medication Adherence

Adherence to medication is central to achieve optimal asthma outcomes by decreasing the frequency of exacerbations (GINA, 2021). This includes adherence to asthma medicines, such as inhalers, and vaccines (e.g. influenza and pneumococcal). In addition, being adherent to a correct inhaler technique is a key low-level behaviour for improving asthma control (level of evidence A[10]).

The rationale for adhering to specific drugs should be discussed with the person on a per case basis.

3.1.6.4 Symptom Monitoring and Management

Asthma symptoms such as wheezing, tightness of the chest, shortness of breath and coughing vary in intensity and frequency and contribute to the disease burden. Insufficient control of symptoms is strongly linked to an increase of exacerbations (GINA, 2021). Monitoring and self-managing symptoms is therefore a key target behaviour (GINA, 2021).

Persons with asthma should be trained to keep track of their symptoms, with or without a diary, and to take action in case of worsening (GINA, 2021). Based on written action plans, agreed with a healthcare professional, these persons can make short-term changes to their treatment for symptom managing.

Self-management of asthma symptoms may include breathing exercises as a supplement to asthma pharmacotherapy; these are beneficial for symptoms and quality of life (level of evidence A), but do not improve lung function or reduce exacerbation risk (GINA, 2021). Relaxation strategies may also be useful to self-manage asthma symptoms (level of evidence B), in conjunction with pharmacotherapy, although there is lack of evidence on the best stress reduction strategy (GINA, 2021).

Preventing asthma symptoms from worsening may include avoidance of allergen exposure (level of evidence C), of outdoor air pollutants and of weather conditions (level of evidence D). Staying indoors in a climate-controlled environment and refraining from vigorous outdoor physical activity may be useful when the weather is very cold or there is significant air pollution. Keeping away from polluted environments during viral infections is also recommended, if feasible (GINA, 2021).

[10] For details about the evidence levels, refer to https://ginasthma.org/wp-content/uploads/2021/05/GINA-Main-Report-2021-V2-WMS.pdf

3.1.7 Ischaemic Heart Disease

Ischaemic heart disease, also known as coronary heart disease or coronary artery disease, is a condition marked by the formation of obstructive or nonobstructive atherosclerotic plaque in the epicardial arteries. The dynamic nature of the coronary artery disease process causes a variety of clinical manifestations, which can be classified as acute coronary syndromes or chronic coronary syndromes. This section focuses only on self-management behaviours for chronic coronary syndrome. This syndrome can be sped up or slowed down by lifestyle changes, pharmacologic therapy and invasive procedures. A healthy lifestyle improves the cardiometabolic profile and reduces the risk of cardiovascular events and mortality (Knuuti et al., 2020). Key self-management behaviours include diet, physical activity, smoking cessation, medication adherence and symptom monitoring and management (Knuuti et al., 2020).

3.1.7.1 Diet

Unhealthy diets are the main cause of inception and progression of coronary artery disease. Persons with ischaemic heart disease should adopt a healthy diet and limit alcohol intake (Knuuti et al., 2020). Adequate fat intake (total, saturated and unsaturated) should be achieved by individually adequate portions of lean meat, low-fat dairy products and vegetable oils.

Table 3.9 presents low-level diet behaviours for these persons based on Knuuti et al. (2020).

3.1.7.2 Physical Activity

Physical activity, including exercise, has been advocated for persons with ischaemic heart disease due to beneficial effects on cardiovascular risk factors and cardiovascular system physiology (Knuuti et al., 2020). Increasing exercise capacity is an independent predictor of increased survival among men and women with ischaemic heart disease (Knuuti et al., 2020). Although physical activity is generally considered to be safe, guidelines have stressed the importance of initial assessment for proper physical activity counselling and exercise prescription (Piopoli et al., 2014).

It is recommended that all persons with ischaemic heart disease engage in 30–60 minutes of moderate physical activity most days, but even irregular activity is beneficial (level of evidence A[11]) (Knuuti et al., 2020).

[11] For details about the evidence levels, refer to https://doi.org/10.1093/eurheartj/ehz425

Table 3.9 Diet: low-level target behaviours in ischaemic heart disease

Low-level target behaviours	Rationale
Increase consumption of fruits and vegetables (>200 g each per day)[a]	Changes to healthy eating patterns in people with chronic coronary syndromes have resulted in a decrease in mortality and cardiovascular events
Eat 35–45 g of fibre per day[b], preferably from whole grains	
Eat 1–2 servings of fish per week (one to be oily fish)	
Limit saturated fat to <10% of total intake[c]	
Limit consumption of lean meat, low-fat dairy products and liquid vegetable oils	
Adopt a diet rich in monounsaturated and polyunsaturated fats[d]	
As little intake of trans unsaturated fats[e] as possible, preferably no intake from processed food	
Limit salt consumption to 5 g/day	
Avoid energy-dense foods, such as sugar-sweetened soft drinks	
Limit alcohol to <100 g/week or 15 g/day[f]	Levels of alcohol >100 g per week were linked to an increased risk of all-cause and other cardiovascular disease death

Based on Knuuti et al. (2020)

[a]Two to three servings of fruit (e.g. one pear, one apple, one slice of pineapple) and three servings of vegetables (e.g. soup, salad, boiled vegetables) may be adequate to achieve the goal

[b]In addition to preferring wholegrain cereal products, an adequate consumption of fruits and vegetables and legumes would contribute to achieving the daily fibre goals

[c]The only direct way to assess this is to measure the entire food intake and its composition. A practical way to achieve it is to reduce fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard

[d]Unsaturated fats are found in fish, nuts and seeds, avocado and vegetable oils (e.g. sunflower, soybean, canola and olive oils)

[e]Dietary trans-fats can be derived either from industrially produced foods (e.g. from baked and fried foods, pre-packaged pizzas, pies, cookies, biscuits, wafers and some cooking oils and spreads) or ruminant (e.g. cows, sheep, goats and camels) meat and dairy

[f]Another way of defining alcohol consumption is using weight per unit of of volume. Fifteen grams per day is equivalent to roughly 375 ml of 5% alcohol by volume (ABV) beer, 150 ml of 12.5% ABV wine and 50 ml of 40% ABV spirit

3.1.7.3 Smoking Cessation

Smoking cessation improves the prognosis of chronic coronary syndrome, with a 36% mortality risk reduction for those who quit (Critchley & Capewell, 2003; Hussain et al., 2021). People with ischaemic heart disease should stop smoking and avoid second-hand smoke (Knuuti et al., 2020).

3.1.7.4 Medication Adherence

Drug therapy aims to reduce angina symptoms and ischaemia caused by exercise and to prevent cardiovascular events (Knuuti et al., 2020). Adherence to anti-ischaemic drugs and, where necessary, other drugs, is an important determinant of clinical outcomes, by decreasing morbidity and mortality.

3.1.7.5 Symptom Monitoring and Management

Persons with chronic coronary syndrome experience "stable" anginal symptoms. Typical angina has three characteristics: constricting discomfort in the front of the chest or in the neck, jaw, shoulder or arm (short-term pain, typically less than 10 minutes); precipitation by physical exertion; and relief by rest or nitrates within 5 minutes. Symptoms typically appear or become more severe with higher degrees of exertion – such as walking up an incline or against a breeze or in cold weather – and then disappear in a matter of minutes after these triggering variables have passed. 'Stable' anginal symptoms may include shortness of breath and less-specific symptoms, such as fatigue, nausea, burning, restlessness, or a sense of impending doom (Knuuti et al., 2020).

In the self-management of ischaemic heart disease, early recognition of symptoms and avoidance of behaviours that trigger these symptoms are essential to reduce the risk of hospitalisation and mortality, as well as deterioration of associated co-morbidities (Knuuti et al., 2020).

3.2 Assessing Target Behaviours in the Self-Management of Chronic Diseases

Assessment is a first step in understanding self-management behaviours and identifying needs. Available tools can either measure a single target behaviour (e.g. Adult Eating Behaviour Questionnaire, AEBQ) or a range of self-management behaviours. For instance, the Summary of Diabetes Self-Care Activities (SDSCA) is a brief self-report questionnaire of diabetes self-management that includes items assessing diet, physical activity and smoking (Toobert et al., 2000). The European Heart Failure Self-care Behaviour scale (EHFScB-9) is another reliable and valid instrument, with nine items covering physical activity, diet, medication-taking and other behaviours (Jaarsma et al., 2009). Next, we present examples of instruments that are not disease-specific to assess self-management behaviours.

An important consideration for these instruments is that their psychometric properties (i.e. adequate reliability and validity) may not have been evaluated in all countries or settings.

3.2.1 Diet

As highlighted by Hu and Willett (2018), "diet is a complex, dynamic exposure with no perfect method to quantify all aspects of dietary intakes and eating behaviours".

To assess an individual's usual diet in epidemiological studies, Burke (1947) proposed a detailed dietary history interview, which included a 24-hour recall, a 3-day food record and a checklist of foods consumed over the preceding month. To overcome the time- and effort-consuming nature of this method, surrogate methods have been proposed for research contexts. Amidst these are food-frequency questionnaires (Willet, 1990), 24-hour recalls (Buzzard, 1998) and food records (or diaries) (Buzzard, 1998). As any approach relying on self-reporting, data may be biased by memory and willingness to give true reports.

A growing amount of evidence supports the beneficial effect of the quality of diet, over the importance of selected nutrients, in endpoints such as mortality and cardiovascular events (e.g. Panizza et al., 2018). Several instruments have been proposed to estimate the overall diet quality – not necessarily individual foods or nutrients. One example is the Healthy Eating Index (HEI) (Krebs-Smith et al., 2018). The 14-point Mediterranean Diet Adherence Screener (MEDAS) is considered a valid instrument for estimating adherence to the Mediterranean diet (Schröder et al., 2011). Both HEI and MEDAS look at a set of foods, indicative of overall dietary quality, and can be used to assess low-level dietary behaviours.

In clinical settings, 24-hour recalls and food records (or diaries) may be useful for the person's initial assessment and monitoring. Persons may report what they know is appropriate to eat and not their real diet. In research contexts, it has been demonstrated that, e.g. individuals with higher fat and total energy intake are more prone to underreport (Hebert et al., 1995). The influence of social desirability also influences reported intakes of fruit and vegetables (Miller et al., 2008). Nonetheless, these reports represent a surrogate of individuals' diet and provide indication on nutrition knowledge; both are useful as a baseline information in behaviour change interventions.

As summarised in Table 3.10, for assessing dietary behaviours in the context of behaviour change support, professionals may resort to measures of overall diet quality, which have predictive value for health outcomes, such as the HEI and MEDAS. Other options are 24-hour recalls and food records, which may be complemented by objective biomarkers (e.g. blood levels of fatty acids, carotenoids) and digital technology tools (e.g. cell phone images of foods and meals), for improving the accuracy of dietary assessment and the intervention plan.

Table 3.10 Examples of instruments for assessing diet and dietary behaviours in persons living with chronic disease

Food-frequency questionnaires (Willet, 1990) Food-frequency questionnaires consist of a list of foods and asking subjects to report how often they have eaten each of them (from never to several times a day), over a specific period (e.g. the last 6 months). The accuracy of the data depends on the adequacy of the list (both the type and number of foods listed) and on the memory and cooperation from the person
24-hour recall (Witschi, 1990) Twenty-four-hour recall is a method that tries to identify and quantify a person's food intake, during a specific day. Its reliability depends on the skill of the interviewer and the memory, cooperation and communication ability of the person
Food records (Buzzard, 1998) Food record (or diary) is a method for which persons are requested to record everything they eat, using food weight or common measures, such as tablespoons and units, and when they eat it. Accuracy does not depend on the person's memory, evaluation or frankness, although it may be diminished by changes in food choices or eating behaviours
Healthy Eating Index (Reedy et al., 2018) The healthy eating index estimates diet quality by measuring its alignment with the dietary guidelines for Americans. It may be used to assess diet quality in population surveillance initiatives and evaluations of food environments and food assistance programmes, as well as for nutrition interventions
Mediterranean Diet Adherence Screener (Schröder et al., 2011) The Mediterranean diet adherence screener (MEDAS) is a 14-item instrument, developed for rapid estimation of adherence to the Mediterranean diet, useful in clinical practice

3.2.2 Physical Activity

Common methods for measuring physical activity include self-report (e.g. logs, diaries, questionnaires, recalls) and objective measures (e.g. accelerometers/activity monitors, pedometers, heart rate monitors, combined sensors) (Dowd et al., 2018; Rodrigues et al., 2022). In general, objective measures are preferable for assessing physical activity in adults (Dowd et al., 2018) and are often used as criterion methods (Rodrigues et al., 2022). They are also credited with a more accurate estimation of daily physical activity levels in persons with chronic diseases (Alothman et al., 2017). Self-reported measures tend to overestimate physical activity and underestimate sedentary time when compared with accelerometry, including in persons with chronic diseases (Schmidt et al., 2020; Ramirez-Marrero et al., 2014).

Self-reported measures of physical activity, also referred to as subjective measures, are usually assessed using questionnaires or recalls, which may be self-administered or answered as an interview. Self-reported physical activity may also be collected using diaries or logs, which require the person to record all activities carried out throughout the day, usually on a minimum of 2 weekdays and 1 weekend day. General questionnaires are simple and easy to administer; examples can be found in Table 3.11. An extensive list of self-reported physical activity assessment tools and the underscoring of their limitations are available from meta-research

Table 3.11 Common methods for assessing physical activity in persons with chronic diseases

Objective measures
Accelerometer Accelerometers detect movement/acceleration; they are used to count steps and to assess the intensity of acceleration; to estimate time spent in physical activity of light, moderate and vigorous intensity; and to estimate related energy expenditure. The objective measurement of physical activity using accelerometer has been successfully conducted in persons with different clinical conditions, including type 2 diabetes (Feig et al., 2021; Baier et al., 2021), chronic obstructive pulmonary disease (Morita et al., 2018; Pinto et al., 2020), hypertension (Sousa Junior et al., 2020; Schlenk et al., 2021; Martinez Aguirre-Betolaza et al., 2020), heart failure (Schmidt et al., 2020; Izawa et al., 2014), obesity (Baillot et al., 2020; Bell et al., 2015) and ischaemic heart disease (Chokshi et al., 2018)
Pedometer A pedometer is a device that counts the number of steps taken. The measurement of step counts using pedometers has been used and found useful in persons with different clinical conditions including, but not limited to, type 2 diabetes (Leischik et al., 2021), hypertension (Sousa Junior et al., 2020) and ischaemic heart disease (Reid et al., 2012)
Combined motion sensors Combined sensors are wearables that include different data collection sensors, including accelerometer (as earlier described), inclinometer (which is important to warrant accuracy in the assessment of sedentary behaviour) and heart rate sensor which has been found useful to assess the metabolic intensity in different movement behaviours, beyond the related time spent in them, and estimate energy expenditure (Strath et al., 2013)
Self-report measures
International physical activity questionnaire (IPAQ) It consists of a questionnaire originally developed in the late 1990s by an international consensus group, to be used by adults (18–65 years old) in different formats: short and long form, self-administered or telephone interview form and focusing on the "last 7 days" or on a "usual week" (Craig et al., 2003). The IPAQ has been widely used in both healthy and clinical populations, including persons with type 2 diabetes (Lopes et al., 2021), hypertension (Lopes et al., 2021; Riegel et al., 2019), heart failure (Schmidt et al., 2020; Klompstra et al., 2019) and ischaemic heart disease (Maddison et al., 2015)
Global physical activity questionnaire (GPAQ) The GPAQ consists of a 16-item questionnaire designed to estimate an individual's level of physical activity in 3 domains, work, transport and leisure time, and the time spent in sedentary behaviours, from a "usual week". It was developed by the WHO to be used both at a local and international scale as a surveillance tool to monitor physical activity levels, as a chronic disease risk factor (WHO, 2005), and it distinguishes itself from IPAQ by assessing each domain separately instead of including all domains together for the calculation of physical activity-related parameters. The GPAQ has been widely used in both healthy and clinical populations, including persons with type 2 diabetes (Alzahrani et al., 2019) and obesity (Marcos-Pardo et al., 2020; Baillot et al., 2020)
Yale physical activity survey (YPAS) Developed initially for the elderly population, to assess overall and specific physical activity and sitting, including index scores composed of questions on vigorous activity, leisurely walking, moving, sitting and standing (Dipietro et al., 1993). YPAS has been further validated and used in other populations, including in with chronic obstructive pulmonary disease (Mihaltan et al., 2019)

(Rodrigues et al., 2022). Objective measures of physical activity (Table 3.11) are available in daily practice via wearables (e.g. activity monitors, smartwatches) and mobile phone-based sensors.

Such measures of physical activity have been commonly used in persons with chronic disease in different research contexts (Table 3.11) and are widely available in daily practice, via wearables (e.g. activity monitors, smartwatches) and mobile phone-based sensors.

3.2.3 Medication Adherence

Medication adherence measures may include direct or indirect assessment of how the person uses prescribed medicines (Lam & Fresco, 2015; Buono et al., 2017; Anghel et al., 2019; Forbes et al., 2018).

Direct methods such as measurement of drug or metabolite levels in blood or urine, or detection of blood levels of biological markers added to the drug formulation, prove drug administration. However, they are subject to variations in inter-individual metabolism (Buono et al., 2017). Additionally, they are relatively expensive, potentially burdensome (e.g. requiring venipuncture or urine collection) and not available for most medicines, which hinders routine use.

Amidst indirect methods, self-report, through questionnaires, diaries or clinical interview, is the most common approach in practice. Questionnaires are inexpensive and simple to apply, contributing to their popularity. They can be self-administered (online or in a paper format) or through an interviewer, depending on the questionnaire. These questionnaires have generally been validated against other measures, both subjective and objective. Some instruments give additional information about attitudes, behaviour determinants and intentions (Anghel et al., 2019), an aspect that will be explored in Chap. 4. Examples of questionnaires are listed in Table 3.12.

Table 3.12 Questionnaires for assessing medication adherence in persons living with chronic disease

Brief Medication Questionnaire (Svarstad et al., 1999) Explores both patient's medication-taking behaviour and barriers to adherence. The questionnaire has three screens: a five-item regimen screen, which assesses how persons took each of their medications in the past week; a two-item belief screen that appraises drug effect and adverse events; and a two-item recall screen related to remembering difficulties
Eight-Item Morisky Medication Adherence Scale (MMAS-8) (Morisky et al., 2008) An eight-item questionnaire: The first seven items are yes/no answers, and the last item is a five-point Likert response, focusing on medication-taking behaviours, especially related to adherence barriers
Medication Adherence Report Scale (MARS-10) (Horne & Weinman, 2002; Cohen et al., 2009) It assesses medication-taking behaviours and attitudes towards medication through ten questions with a simple scoring to evaluate adherence behaviour, attitude towards medication and general disease control during the past week. Additionally, it examines beliefs and barriers to medication adherence. The MARS-5 and MARS-6 are variations of this questionnaire, including five and six statements, respectively, with a five-point rating scale

Claims data derived from medicines dispensing in pharmacies is another indirect method to assess adherence. Measures calculated from pharmacy data to assess the number of doses dispensed in a time period include PDC (proportion of days covered) and MPR (medication possession ratio). These measures are still not readily available in clinical practice in many countries.

In summary, none of the available methods can be considered as a gold standard, and the combination of methods is recommended, when feasible. Decisions on the selection of a method to assess adherence should be based on a per case basis, considering aspects such as the accuracy and reliability of data and resources available.

3.2.4 Smoking Cessation

Smoking abstinence is the main outcome of smoking cessation interventions. This can be assessed through biochemical validation or self-report measures (including interviews). The main outcomes assessed are point prevalence abstinence (e.g. past 7 days) and prolonged or continuous abstinence (e.g. past 30 days, 6 months and 12 months). The Russell standard criteria (West et al., 2005) are commonly used to select the best measure for assessing smoking abstinence in the context of smoking cessation interventions, in which biochemically validated abstinence is preferred over self-report and prolonged or continuous abstinence is preferred over point prevalence abstinence; in 2017, a Delphi exercise was conducted to achieve a consensus on assessment criteria for smoking cessation (Pound et al., 2021).

Examples of biochemical measures are:

- Carbon monoxide, detected through, e.g. expired air sample.
- Cotinine (e.g. saliva samples).

As for self-report or interviews, *number of cigarettes smoked in the past 7 days (or 30 days)* is the most common. Other questions include:

- Quit attempts in the past 30 days.
- Average cigarettes smoked per day.
- Duration of smoking at that rate.

When assessing smoking cessation, it is also important to include assessment of vaping.

Key Points

- Physical activity, medication adherence and smoking cessation are high-level target behaviours for self-managing type 2 diabetes, chronic obstructive pulmonary disease, hypertension, heart failure, obesity, asthma and ischaemic heart disease.
- Diet is a high-level target behaviour in the self-management of type 2 diabetes, hypertension, heart failure, obesity, asthma and ischaemic heart disease.

- Symptom monitoring and management is a high-level target behaviour relevant for those living with type 2 diabetes, chronic obstructive pulmonary disease, heart failure, asthma and ischaemic heart disease.
- Diet low-level target behaviours include, for example, reducing calorie intake, minimising the consumption of foods with added sugar, avoiding excessive salt intake, increasing the consumption of fresh fruits and vegetables and limiting saturated fat consumption.
- Decreasing daily sedentary behaviour and performing aerobic activity or resistance exercises are examples of low-level target behaviours in physical activity.
- Medication adherence low-level target behaviours include, for instance, adherence to influenza and pneumococcal vaccination, adherence to a correct inhaler technique or adherence to specific drugs.
- Managing symptoms' low-level target behaviours may include flexible use of diuretic and fluid intake or avoidance of allergen exposure or outdoor air pollutants.
- Assessment, preferably with specific and validated tools, is the first step for understanding self-management behaviours and identifying needs.
- Target behaviours can be assessed using objective (e.g. accelerometers/activity monitors, pedometers) and/or subjective measures (e.g. Eight-Item Morisky Medication Adherence Scale, food-frequency questionnaires).

References

ADA – American Diabetes Association. (2019). *Standards of medical care in diabetes-2019*. https://care.diabetesjournals.org/content/diacare/suppl/2018/12/17/42.Supplement_1.DC1/DC_42_S1_2019_UPDATED.pdf

Alothman, S., Yahya, A., Rucker, J., & Kluding, P. M. (2017). Effectiveness of interventions for promoting objectively measured physical activity of adults with type 2 diabetes: A systematic review. *Journal of Physical Activity & Health, 14*, 408–415. https://doi.org/10.1123/jpah.2016-0528

Alzahrani, A. M., Albakri, S. B. B., Alqutub, T. T., Alghamdi, A. A., & Rio, A. A. (2019). Physical activity level and its barriers among patients with type 2 diabetes mellitus attending primary healthcare centers in Saudi Arabia. *Journal of Family Medicine and Primary Care, 8*, 5. https://doi.org/10.4103/jfmpc.jfmpc_433_19

American College of Cardiology Foundation and the American Heart Association, I. (2018). *Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults*. http://hyper.ahajournals.org

American Diabetes Association. (2021). *Professional practice committee: Standards of medical care in diabetes—2021*. https://doi.org/10.2337/dc21-Sppc.

Anghel, L. A., Farcas, A. M., & Oprean, R. N. (2019). An overview of the common methods used to measure treatment adherence. *Medicine and Pharmacy Reports, 92*(2), 117–122. https://doi.org/10.15386/mpr-1201

Armstrong, M., Winnard, A., Chynkiamis, N., Boyle, S., Burtin, C., & Vogiatzis, I. (2019). Use of pedometers as a tool to promote daily physical activity levels in patients with COPD: A systematic review and meta-analysis. *European Respiratory Review, 28*(154), 190039. https://doi.org/10.1183/16000617.0039-2019

Baier, J. M., Funck, K. L., Vernstrøm, L., Laugesen, E., & Poulsen, P. L. (2021). Low physical activity is associated with impaired endothelial function in patients with type 2 diabetes and controls after 5 years of follow-up. *BMC Endocrine Disorders, 21*, 189. https://doi.org/10.1186/s12902-021-00857-9

Baillot, A., Black, M., Brunet, J., & Romain, A. J. (2020). Biopsychosocial correlates of physical activity and sedentary time in adults with severe obesity. *Clinical Obesity, 10*. https://doi.org/10.1111/cob.12355

Bakker, E. A., Hartman, Y. A. W., Hopman, M. T. E., et al. (2020). Validity and reliability of subjective methods to assess sedentary behaviour in adults: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 17*, 75. https://doi.org/10.1186/s12966-020-00972-1

Bell, J. A., et al. (2015). Healthy obesity and objective physical activity. *The American Journal of Clinical Nutrition, 102*, 268–275. https://doi.org/10.3945/ajcn.115.110924

Buono, E. W., Vrijens, B., Bosworth, H. B., Liu, L. Z., Zullig, L. L., & Granger, B. B. (2017). Coming full circle in the measurement of medication adherence: Opportunities and implications for health care. *Patient Preference and Adherence, 11*, 1009–1017. https://doi.org/10.2147/PPA.S127131

Burke, B. (1947). The dietary history as a tool in research. *Journal of the American Dietetic Association, 23*, 1041–1046. https://doi.org/10.1016/S0002-8223(21)43949-0

Buzzard, M. (1998). 24-hour dietary recall and food record methods. Cap 4. In W. Walter (Ed.), *Nutritional epidemiology* (2nd ed., pp. 50–73). Oxford University Press.

Camolas, J., Santos, O., Mascarenhas, M., Moreira, P., & Carmo, I. D. (2015). *INDIVÍDUO: intervenção nutricional direcionada aos estilos de vida em indivíduos com obesidade* (pp. 14–21). https://doi.org/10.21011/apn.2015.0303

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports, 100*(2), 126–121.

CDC – Centers for Disease Control and Prevention. (2021). *Type 2 Diabetes*. Centers for Disease Control and Prevention. https://www.cdc.gov/diabetes/basics/type2.html

Chapelot, D. (2011). The role of snacking in energy balance: A biobehavioral approach. *The Journal of Nutrition, 141*(1), 158–162. https://doi.org/10.3945/jn.109.114330

Chokshi, N. P., Adusumalli, S., Small, D. S., Morris, A., Feingold, J., Ha, Y. P., et al. (2018). Loss-framed financial incentives and personalized goal-setting to increase physical activity among ischemic heart disease patients using wearable devices: The ACTIVE REWARD randomized trial. *Journal of the American Heart Association, 7*. https://doi.org/10.1161/JAHA.118.009173

Cohen, J. L., Mann, D. M., Wisnivesky, J. P., Home, R., Leventhal, H., Musumeci-Szabó, T. J., & Halm, E. A. (2009). Assessing the validity of self-reported medication adherence among inner-city asthmatic adults: The medication adherence report scale for asthma. *Annals of Allergy, Asthma & Immunology : Official Publication of the American College of Allergy, Asthma, & Immunology, 103*(4), 325–331. https://doi.org/10.1016/s1081-1206(10)60532-7

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., Pratt, M., Ekelund, U., Yngve, A., Sallis, J. F., & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine and Science in Sports and Exercise, 35*(8), 1381–1395. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Critchley, J. A., & Capewell, S. (2003). Mortality risk reduction associated with smoking cessation in patients with coronary heart disease: A systematic review. *JAMA, 290*(1), 86–97. https://doi.org/10.1001/jama.290.1.86

Cryer, P. E. (2019). *Hypoglycemia in adults with diabetes mellitus*. In I. B. Hirsch & J. E. Mulder (Eds.), *UpToDate*. Retrieved 2019, June 5 from https://www.uptodate.com/contents/hypoglycemia-in-adults-with-diabetes-mellitus

DiCenso, A., Bayley, L., & Haynes, R. (2009). Accessing pre-appraised evidence: Fine-tuning the 5S model into a 6S model. *ACP Journal Club, 151*(3), 5–6. https://doi.org/10.1136/ebn.12.4.99-b

Dipietro, L., Caspersen, C. J., Ostfeld, A. M., & Nadel, E. R. (1993). A survey for assessing physical activity among older adults. *Medicine and Science in Sports and Exercise, 25*(5), 628–642.

Dowd, K. P., Szeklicki, R., Minetto, M. A., Murphy, M. H., Polito, A., Ghigo, E., et al. (2018). A systematic literature review of reviews on techniques for physical activity measurement in adults: A DEDIPAC study. *International Journal of Behavioral Nutrition and Physical Activity, 15*. https://doi.org/10.1186/s12966-017-0636-2

Dulloo, A. G., Jacquet, J., & Montani, J.-P. (2012). How dieting makes some fatter: From a perspective of human body composition autoregulation. *Proceedings of the Nutrition Society, 71*(03), 379–389. https://doi.org/10.1017/S0029665112000225

Esposito, K., Kastorini, C. M., Panagiotakos, D. B., & Giugliano, D. (2011). Mediterranean diet and weight loss: Meta-analysis of randomized controlled trials. *Metabolic Syndrome and Related Disorders, 9*(1), 1–12. https://doi.org/10.1089/met.2010.0031

Ezekowitz, J. A., O'Meara, E., McDonald, M. A., Abrams, H., Chan, M., Ducharme, A., et al. (2017). 2017 comprehensive update of the Canadian cardiovascular society guidelines for the management of heart failure. *Canadian Journal of Cardiology, 33*(11), 1342–1433. https://doi.org/10.1016/j.cjca.2017.08.022

Feig, E. H., Harnedy, L. E., Celano, C. M., & Huffman, J. C. (2021). Increase in daily steps during the early phase of a physical activity intervention for type 2 diabetes as a predictor of intervention outcome. *International Journal of Behavioral Medicine, 28*(6), 834–839. https://doi.org/10.1007/s12529-021-09966-0

Forbes, C. A., Deshpande, S., Sorio-Vilela, F., Kutikova, L., Duffy, S., Gouni-Berthold, I., & Hagström, E. (2018). A systematic literature review comparing methods for the measurement of patient persistence and adherence. *Current Medical Research and Opinion, 34*(9), 1613–1625. https://doi.org/10.1080/03007995.2018.1477747

Frühbeck, G., Busetto, L., Dicker, D., Yumuk, V., Goossens, G. H., Hebebrand, J., Halford, J., Farpour-Lambert, N. J., Blaak, E. E., Woodward, E., & Toplak, H. (2019). The ABCD of obesity: An EASO position statement on a diagnostic term with clinical and scientific implications. *Obesity Facts, 12*(2), 131–136. https://doi.org/10.1159/000497124

Fu, J., Liu, Y., Zhang, L., Zhou, L., Li, D., Quan, H., Zhu, L., Hu, F., Li, X., Meng, S., Yan, R., Zhao, S., Onwuka, J. U., Yang, B., Sun, D., & Zhao, Y. (2020). Nonpharmacologic interventions for reducing blood pressure in adults with prehypertension to established hypertension. *Journal of the American Heart Association, 9*(19), Article 19. https://doi.org/10.1161/JAHA.120.016804

GINA – Global Initiative for Asthma. (2021). *Global strategy for asthma management and prevention – Update 2021*. https://ginasthma.org/wp-content/uploads/2021/05/GINA-Main-Report-2021-V2-WMS.pdf

GOLD – Global Initiative for Chronic Obstructive Lung Disease. (2020). *Global strategy for prevention, diagnosis and management of COPD 2020 report*. https://goldcopd.org/gold-reports/

GOLD – Global Initiative for Chronic Obstructive Lung Disease. (2021). *Global strategy for prevention, diagnosis and management of COPD 2022 report*. https://goldcopd.org/2022-gold-reports-2/

Guerreiro, M. P., Strawbridge, J., Cavaco, A. M., Félix, I. B., Marques, M. M., & Cadogan, C. (2021). Development of a European competency framework for health and other professionals to support behaviour change in persons self-managing chronic disease. *BMC Medical Education, 21*(1), 1–14. https://doi.org/10.1186/s12909-021-02720-w

Hawks, L., Himmelstein, D. U., Woolhandler, S., Bor, D. H., Gaffney, A., & McCormick, D. (2020). Trends in unmet need for physician and preventive services in the United States, 1998–2017. *JAMA Internal Medicine, 180*, 439–444. https://doi.org/10.1001/jamainternmed.2019.6538

Hebert, J. R., Clemow, L., Pbert, L., Ockene, I. S., & Ockene, J. K. (1995). Social desirability bias in dietary self-report may compromise the validity of dietary intake measures. *International Journal of Epidemiology, 24*(2), 389–398. https://doi.org/10.1093/ije/24.2.389

Horne, R., & Weinman, J. (2002). Self-regulation and self-management in asthma: Exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventer medication. *Psychology and Health., 17*(1), 17–32. https://doi.org/10.1080/08870440290001502

Hu, F., & Willett, W. (2018). Current and future landscape of nutritional epidemiologic research. *JAMA, 320*(20), 2073–2074. https://doi.org/10.1001/jama.2018.16166

Hussain, T., Awan, A. U., Abro, K. A., Ozair, M., & Manzoor, M. (2021). A mathematical and parametric study of epidemiological smoking model: A deterministic stability and optimality for solutions. *The European Physical Journal Plus, 136*(1), 1–23.

IDF – International Diabetes Federation. (2021). *IDF diabetes atlas 10th*. ISBN: 978-2-930229-98-0. Available at www.diabetesatlas.org.

Izawa, K. P., et al. (2014). Association between mental health and physical activity in patients with chronic heart failure. *Disability and Rehabilitation, 36*, 250–254. https://doi.org/10.3109/09638288.2013.785604

Jaarsma, T., Arestedt, K. F., Mårtensson, J., Dracup, K., & Strömberg, A. (2009). The European heart failure self-care behaviour scale revised into a nine-item scale (EHFScB-9): A reliable and valid international instrument. *European Journal of Heart Failure, 11*(1), 99–105. https://doi.org/10.1093/eurjhf/hfn007

Jang, B. N., Kim, H. J., Kim, B. R., Woo, S., Lee, W. J., & Park, E. C. (2021). Effect of practicing health behaviors on unmet needs among patients with chronic diseases: A longitudinal study. *International Journal of Environmental Research and Public Health, 18*(15), 7977. https://doi.org/10.3390/ijerph18157977

Klompstra, L., Jaarsma, T., Strömberg, A., & van der Wal, M. H. L. (2019). Seasonal variation in physical activity in patients with heart failure. *Heart & Lung, 48*, 381–385. https://doi.org/10.1016/j.hrtlng.2019.06.004

Knuuti, J., Wijns, W., Saraste, A., Capodanno, D., Barbato, E., Funck-Brentano, C., et al. (2020). 2019 ESC guidelines for the diagnosis and management of chronic coronary syndromes: The task force for the diagnosis and management of chronic coronary syndromes of the European Society of Cardiology (ESC). *European Heart Journal, 41*(3), 407–477. https://doi.org/10.1093/eurheartj/ehz425

Krebs-Smith, S. M., Pannucci, T. E., Subar, A. F., Kirkpatrick, S. I., Lerman, J. L., Tooze, J. A., Wilson, M. M., & Reedy, J. (2018). Update of the healthy eating index: HEI-2015. *Journal of the Academy of Nutrition and Dietetics, 118*(9), 1591–1602. https://doi.org/10.1016/j.jand.2018.05.021

Lam, W. Y., & Fresco, P. (2015). Medication adherence measures: An overview. *BioMed Research International, 2015*(217047). https://doi.org/10.1155/2015/217047

Leischik, R., Schwarz, K., Bank, P., Brzek, A., Dworrak, B., Strauss, M., et al. (2021). Exercise improves cognitive function—A randomized trial on the effects of physical activity on cognition in type 2 diabetes patients. *Journal of Personalized Medicine, 11*, 530. https://doi.org/10.3390/jpm11060530

Liguori, G. (Ed.). (2021). *ACSM's guidelines for exercise testing and prescription* (11th ed.). EUA: Wolters Kluwer Health.

Lopes, D., Ribeiro, I. S., Santos, D. C., Lima, F., Santos, A. A., Souza, D., Lopes, D. N., Prado, A. O., Pereira, Í. S., Santos, D. P., Santos, G. S., & Silva, R. (2021). Regular physical activity reduces the proinflammatory response in older women with diabetes and hypertension in the postmenopausal phase. *Experimental Gerontology, 152*, 111449. https://doi.org/10.1016/j.exger.2021.111449

Maddison, R., Pfaeffli, L., Whittaker, R., Stewart, R., Kerr, A., Jiang, Y., Kira, G., Leung, W., Dalleck, L., Carter, K., & Rawstorn, J. (2015). A mobile phone intervention increases physical activity in people with cardiovascular disease: Results from the HEART randomized controlled trial. *European Journal of Preventive Cardiology, 22*(6), 701–709. https://doi.org/10.1177/2047487314535076

Marcos-Pardo, P. J., González-Gálvez, N., López-Vivancos, A., Espeso-García, A., Martínez-Aranda, L. M., Gea-García, G. M., Orquín-Castrillón, F. J., Carbonell-Baeza, A., Jiménez-García, J. D., Velázquez-Díaz, D., Cadenas-Sanchez, C., Isidori, E., Fossati, C., Pigozzi, F., Rum, L., Norton, C., Tierney, A., Äbelkalns, I., Klempere-Sipjagina, A., Porozovs, J., et al. (2020). Sarcopenia, diet, physical activity and obesity in European middle-aged and older adults: The LifeAge study. *Nutrients, 13*(1), 8. https://doi.org/10.3390/nu13010008

Martinez Aguirre-Betolaza, A., Mujika, I., Loprinzi, P., Corres, P., Gorostegi-Anduaga, I., & Maldonado-Martín, S. (2020). Physical activity, sedentary behavior, and sleep quality in adults with primary hypertension and obesity before and after an aerobic exercise program: EXERDIET-HTA study. *Life (Basel, Switzerland), 10*(8), 153. https://doi.org/10.3390/life10080153

McDonagh, T. A., Metra, M., Adamo, M., Gardner, R. S., Baumbach, A., Böhm, M., et al. (2021). 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: Developed by the task force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) with the special contribution of the Heart Failure Association (HFA) of the ESC. *European Heart Journal, 42*(36), 3599–3726. https://doi.org/10.1002/ejhf.2333

Mihaltan, F., Adir, Y., Antczak, A., Porpodis, K., Radulovic, V., Pires, N., de Vries, G. J., Horner, A., De Bontridder, S., Chen, Y., Shavit, A., Alecu, S., & Adamek, L. (2019). Importance of the relationship between symptoms and self-reported physical activity level in stable COPD based on the results from the SPACE study. *Respiratory Research, 20*(1), 89. https://doi.org/10.1186/s12931-019-1053-7

Miller, T. M., Abdel-Maksoud, M. F., Crane, L. A., Marcus, A. C., & Byers, T. E. (2008). Effects of social approval bias on self-reported fruit and vegetable consumption: A randomized controlled trial. *Nutrition Journal, 7*, 18. https://doi.org/10.1186/1475-2891-7-18

Morisky, D. E., Ang, A., Krousel-Wood, M., & Ward, H. J. (2008). Predictive validity of a medication adherence measure in an outpatient setting. *Journal of Clinical Hypertension (Greenwich, Conn.), 10*(5), 348–354. https://doi.org/10.1111/j.1751-7176.2008.07572.x

Morita, A. A., Silva, L., Bisca, G. W., Oliveira, J. M., Hernandes, N. A., Pitta, F., & Furlanetto, K. C. (2018). Heart rate recovery, physical activity level, and functional status in subjects with COPD. *Respiratory Care, 63*(8), 1002–1008. https://doi.org/10.4187/respcare.05918

Panizza, C. E., Shvetsov, Y. B., Harmon, B. E., Wilkens, L. R., Le Marchand, L., Haiman, C., Reedy, J., & Boushey, C. J. (2018). Testing the predictive validity of the healthy eating Index-2015 in the multiethnic cohort: Is the score associated with a reduced risk of all-cause and cause-specific mortality. *Nutrients, 10*(4), 452. https://doi.org/10.3390/nu10040452

Pedersen, B. K., & Saltin, B. (2015). Exercise as medicine – Evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scandinavian Journal of Medicine & Science in Sports, 25*(Suppl 3), 1–72. https://doi.org/10.1111/sms.12581

Piercy, K. L., Troiano, R. P., Ballard, R. M., Carlson, S. A., Fulton, J. E., Galuska, D. A., George, S. M., & Olson, R. D. (2018). The physical activity guidelines for Americans. *JAMA, 320*(19), 2020–2028. https://doi.org/10.1001/jama.2018.14854

Pinto, T. F., Fagundes Xavier, R., Lunardi, A. C., Marques da Silva, C., Moriya, H. T., Lima Vitorasso, R., Torsani, V., Amato, M., Stelmach, R., Salge, J. M., Carvalho-Pinto, R. M., & Carvalho, C. (2020). Effects of elastic tape on thoracoabdominal mechanics, dyspnea, exercise capacity, and physical activity level in nonobese male subjects with COPD. *Journal of Applied Physiology (Bethesda, Md. : 1985), 129*(3), 492–499. https://doi.org/10.1152/japplphysiol.00690.2019

Piopoli, M. F., Corrà, U., Adamopoulos, S., Benzer, W., Bjarnason-Wehrens, B., Cupples, M., Dendale, P., Doherty, P., Gaita, D., Höfer, S., McGee, H., Mendes, M., Niebauer, J., Pogosova, N., Garcia-Porrero, E., Rauch, B., Schmid, J. P., & Giannuzzi, P. (2014). Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery: A policy statement from the cardiac rehabilitation section of the European Association for Cardiovascular Prevention & rehabilitation. *Endorsed by the Committee for Practice Guidelines of the European Society of Cardiology. European Journal of Preventive Cardiology, 21*(6), 664–681. https://doi.org/10.1177/2047487312449597

Pound, C. M., Zhang, J. Z., Kodua, A. T., & Sampson, M. (2021). Smoking cessation in individuals who use vaping as compared with traditional nicotine replacement therapies: A

systematic review and meta-analysis. *BMJ Open, 11*(2), e044222. https://doi.org/10.1136/bmjopen-2020-044222

Ramirez-Marrero, F. A., Miles, J., Joyner, M. J., & Curry, T. B. (2014). Self-reported and objective physical activity in postgastric bypass surgery, obese and lean adults: Association with body composition and cardiorespiratory fitness. *Journal of Physical Activity & Health, 11*, 145–151. https://doi.org/10.1123/jpah.2012-0048

Ratamess, N. A. (2021). *ACSM's foundations of strength training and conditioning* (2nd ed.). Wolters Kluwer Health.

Reedy, J., Lerman, J. L., Krebs-Smith, S. M., Kirkpatrick, S. I., Pannucci, T. R. E., Wilson, M. M., Subar, A. F., Kahle, L. L., & Tooze, J. A. (2018). Evaluation of the healthy eating Index-2015. *Journal of the Academy of Nutrition and Dietetics, 118*(9), 1622–1633.

Reid, R. D., Morrin, L. I., Beaton, L. J., Papadakis, S., Kocourek, J., McDonnell, L., Slovinec D'Angelo, M. E., Tulloch, H., Suskin, N., Unsworth, K., Blanchard, C., & Pipe, A. L. (2012). Randomized trial of an internet-based computer-tailored expert system for physical activity in patients with heart disease. *European Journal of Preventive Cardiology, 19*(6), 1357–1364. https://doi.org/10.1177/1741826711422988

Riegel, G. R., Martins, G. B., Schmidt, A. G., Rodrigues, M. P., Nunes, G. S., Correa, V., Jr., Fuchs, S. C., Fuchs, F. D., Ribeiro, P. A., & Moreira, L. B. (2019). Self-reported adherence to physical activity recommendations compared to the IPAQ interview in patients with hypertension. *Patient Preference and Adherence, 13*, 209–214. https://doi.org/10.2147/PPA.S185519

Rodrigues, B., Encantado, J., Carraça, E., Sousa-Sá, E., Lopes, L., Cliff, D., Mendes, R., Silva, M. N., Godinho, C., & Santos, R. (2022). Questionnaires measuring movement behaviours in adults and older adults: Content description and measurement properties. A systematic review. *PLOS One, 17*(3), e0265100. https://doi.org/10.1371/journal.pone.0265100

Rossen, J., Larsson, K., Hagströmer, M., Yngve, A., Brismar, K., Ainsworth, B., Åberg, L., & Johansson, U. B. (2021). Effects of a three-armed randomised controlled trial using self-monitoring of daily steps with and without counselling in prediabetes and type 2 diabetes-the Sophia Step Study. *The International Journal of Behavioral Nutrition and Physical Activity, 18*(1), 121. https://doi.org/10.1186/s12966-021-01193-w

Sallis, J. F., Haskell, W. L., Wood, P. D., Fortmann, S. P., Rogers, T., Blair, S. N., & Paffenbarger, R. S. (1985). Physical activity assessment methodology in the Five-City project. *American Journal of Epidemiology, 121*(1), 91–106.

Schlenk, E. A., Fitzgerald, G. K., Rogers, J. C., Kwoh, C. K., & Sereika, S. M. (2021). Promoting physical activity in older adults with knee osteoarthritis and hypertension: A randomized controlled trial. *Journal of Aging and Physical Activity, 29*, 207–218. https://doi.org/10.1123/japa.2019-0498

Schmidt, C., Santos, M., Bohn, L., Delgado, B. M., Moreira-Gonçalves, D., Leite-Moreira, A., & Oliveira, J. (2020). Comparison of questionnaire and accelerometer-based assessments of physical activity in patients with heart failure with preserved ejection fraction: Clinical and prognostic implications. *Scandinavian Cardiovascular Journal: SCJ, 54*(2), 77–83. https://doi.org/10.1080/14017431.2019.1707863

Schröder, H., Fitó, M., Estruch, R., Martínez-González, M. A., Corella, D., Salas-Salvadó, J., Lamuela-Raventós, R., Ros, E., Salaverría, I., Fiol, M., Lapetra, J., Vinyoles, E., Gómez-Gracia, E., Lahoz, C., Serra-Majem, L., Pintó, X., Ruiz-Gutierrez, V., & Covas, M. I. (2011). A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. *The Journal of Nutrition, 141*(6), 1140–1145. https://doi.org/10.3945/jn.110.135566

Schutz, D. D., Busetto, L., Dicker, D., Farpour-Lambert, N., Pryke, R., Toplak, H., Widmer, D., Yumuk, V., & Schutz, Y. (2019). European practical and patient-centred guidelines for adult obesity management in primary care. *Obesity Facts, 12*(1), 40–66. https://doi.org/10.1159/000496183

Silbert, R., Salcido-Montenegro, A., Rodriguez-Gutierrez, R., Katabi, A., & McCoy, R. G. (2018). Hypoglycemia among patients with type 2 diabetes: Epidemiology, risk factors, and prevention strategies. *Current Diabetes Reports, 18*(8), 53. https://doi.org/10.1007/s11892-018-1018-0

Sousa Junior, A. E., Macêdo, G., Schwade, D., Sócrates, J., Alves, J. W., Farias-Junior, L. F., Freire, Y. A., Lemos, T., Browne, R., & Costa, E. C. (2020). Physical activity counseling for adults with hypertension: A randomized controlled pilot trial. *International Journal of Environmental Research and Public Health, 17*(17), 6076. https://doi.org/10.3390/ijerph17176076

Svarstad, B. L., Chewning, B. A., Sleath, B. L., & Claesson, C. (1999). The brief medication questionnaire: A tool for screening patient adherence and barriers to adherence. *Patient Education and Counseling, 37*(2), 113–124. https://doi.org/10.1016/s0738-3991(98)00107-4

Tasnim, S., Tang, C., Musini, V. M., & Wright, J. M. (2020). Effect of alcohol on blood pressure. *Cochrane Database of Systematic Reviews, 7*. https://doi.org/10.1002/14651858.CD012787.pub2

Tesfaye, N., & Seaquist, E. R. (2010). Neuroendocrine responses to hypoglycemia. *Annals of the New York Academy of Sciences, 1212*, 12–28. https://doi.org/10.1111/j.1749-6632.2010.05820.x

Toobert, D. J., Hampson, S. E., & Glasgow, R. E. (2000). The summary of diabetes self-care activities measure: Results from 7 studies and a revised scale. *Diabetes Care, 23*(7), 943–950. https://doi.org/10.2337/diacare.23.7.943

Tudor-Locke, C., Craig, C. L., Aoyagi, Y., Bell, R. C., Croteau, K. A., De Bourdeaudhuij, I., Ewald, B., Gardner, A. W., Hatano, Y., Lutes, L. D., Matsudo, S. M., Ramirez-Marrero, F. A., Rogers, L. Q., Rowe, D. A., Schmidt, M. D., Tully, M. A., & Blair, S. N. (2011a). How many steps/day are enough? For older adults and special populations. *The International Journal of Behavioral Nutrition and Physical Activity, 8*, 80. https://doi.org/10.1186/1479-5868-8-80

Tudor-Locke, C., Leonardi, C., Johnson, W. D., Katzmarzyk, P. T., & Church, T. S. (2011b). Accelerometer steps/day translation of moderate-to-vigorous activity. *Preventive Medicine, 53*, 31–33. https://doi.org/10.1016/j.ypmed.2011.01.014

West, R., Hajek, P., Stead, L., & Stapleton, J. (2005). Outcome criteria in smoking cessation trials: Proposal for a common standard. *Addiction (Abingdon, England), 100*(3), 299–303. https://doi.org/10.1111/j.1360-0443.2004.00995.x

Whelton, P. K., Carey, R. M., Aronow, W. S., Casey, D. E., Collins, K. J., Himmelfarb, C. D., DePalma, S. M., Gidding, S., Jamerson, K. A., Jones, D. W., MacLaughlin, E. J., Muntner, P., Ovbiagele, B., Smith, S. C., Spencer, C. C., Stafford, R. S., Taler, S. J., Thomas, R. J., Williams, K. A., et al. (2018). 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and Management of High Blood Pressure in adults: Executive summary: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Hypertension, 71*(6), 1269–1324. https://doi.org/10.1161/HYP.0000000000000066

WHO – World Health Organization. (2003). Diet, nutrition and the prevention of chronic diseases. World Health Organization technical report series, 916.

WHO (2005). *Global Physical Activity Questionnaire (GPAQ). WHO STEPwise approach to NCD risk factor surveillance*. World Health Organization: Prevention of Noncommunicable Diseases Department. Switzerland.

WHO – World Health Organization. (2015). *Guideline: Sugars intake for adults and children*. World Health Organization.

WHO (2020). *WHO guidelines on physical activity and sedentary behaviour*. World Health Organization. Switzerland. ISBN 978-92-4-001512-8 (electronic version). https://www.who.int/publications/i/item/9789240015128

Willet, W. (1990). In W. Willet (Ed.), *Nutritional epidemiology*. Oxford University Press.

Williams, B., Mancia, G., Spiering, W., Agabiti Rosei, E., Azizi, M., Burnier, M., et al. (2018). 2018 ESC/ESH guidelines for the management of arterial hypertension: The task force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). *European Heart Journal, 39*(33), 3021–3104. https://doi.org/10.1080/08037051.2018.1527177

Witschi, J. C. (1990). Short-term dietary recall and recording methods. In W. Willet (Ed.), *Nutritional epidemiology* (pp. 52–68). Oxford University Press.

Yates, B. C., Pozehl, B., Kupzyk, K., Epstein, C. M., & Deka, P. (2017). Are heart failure and coronary artery bypass surgery patients meeting physical activity guidelines? *Rehabilitation Nursing, 42*(3), 119–124. https://doi.org/10.1002/rnj.257

Ye, F., Yale, S., Zheng, Y., Hu, H., Zhou, L., Fanning, J., Yeboah, J., Brubaker, P., & Bertoni, A. G. (2021). Trends in physical activity among US adults with heart failure, 2007–2016. *Journal of Cardiopulmonary Rehabilitation and Prevention, 41*(5), 351–356. https://doi.org/10.1097/HCR.0000000000000578

Yumuk, V., Tsigos, C., Fried, M., Schindler, K., Busetto, L., Micic, D., & Toplak, H. (2015). European guidelines for obesity management in adults. *Obesity Facts, 8*(6), 402–424. https://doi.org/10.1159/000442721