

## Answers

### 1. Definition of a construct

When defining the construct of physical activity, a clear description should be given of *what* it is that a questionnaire is intended to measure. The following issues should be taken into account:

Firstly, physical activity should be distinguished from physical functioning. Physical activity refers to what people actually do (performance), whereas physical functioning refers to what people are able to do (capacity).

A. Different types of physical activity can have different effects on health. The type of physical activity that is of interest depends on the aim of the intervention. For example, if the aim is to prevent overweight, the focus will be on measuring total energy expenditure. If the aim is to prevent joint problems, the focus will be on activities which are related to joint problems.

B. The relevance of the activities to be measured also depends on the intervention. If the aim of the intervention is to increase total energy expenditure, it is important to try to measure all possible activities. But, if the aim is to prevent joint problems, it is important to measure activities that are related to joint problems.

The setting in which to measure physical activity (work, transport, leisure time) will also depend on the aim of the intervention.

C. Physical activity comprises three aspects: frequency, duration, and intensity, but the purpose of the measurement and the content of the intervention determines whether or not it is necessary to measure all three aspects. For example, if the aim is to increase total energy expenditure, all three aspects should be measured, but if the aim is to increase the time spent on physical activity, then only the frequency and duration need to be measured.

D. If the purpose of the measurement is evaluation, the measurement should focus on activities that are likely to change as a result of the intervention. An example could be transportation to work if the intervention aims to motivate people to cycle or walk to work instead of driving to work.

Finally, the recall period (e.g. past week, usually, life-time) over which the physical activity is being measured should be taken into consideration.

### 2. Choice between objective and subjective measurements

2.A To assess the construct 'walking ability', we may decide to develop a multi-item questionnaire containing questions referring to walking ability. We could ask questions such as: 'Can you walk indoors?', 'Can you

walk outdoors?', 'Can you walk on uneven surfaces?', 'Can you walk for half an hour?'. We might also decide to ask whether the patient experiences difficulties when walking indoors, walking outdoors, on uneven surfaces, etc.. However, in theory we are measuring the construct 'perceived ability' here. We assume that this perceived ability gives a good indication of the construct of 'walking ability'.

An objective instrument that could be used to measure walking ability is a timed walking distance test. The surfaces can be varied and obstacles can be included. Gait analysis tests are more sophisticated, and focus more on the quality of walking than on the walking distance.

2.B It is impossible to say which is the best: it depends on what you want to know.

2.C An example of a study in which the patient's perception of walking ability is an important outcome is an intervention study which is intended to improve the patient's self confidence in walking by exercising on a training circuit with a number of obstacles and other difficult situations, such as talking or carrying a bag while walking.

An objective walking ability test is preferred if the rehabilitation programme consists of an exercise programme to improve the physical condition, the coordination, and the walking ability of the patients. Here we see that the aim of the rehabilitation programme determines which outcome measure is the most appropriate.

### **3. Choice between a reflective and a formative model**

3A. The assignment, and also the underlying paper, lack an explicit description of the conceptual model and the conceptual framework. However, it is strange to compare the two strategies, because the conceptual framework will point either to a reflective or a formative model. This choice should have been made before the items were chosen. So, instead of comparing these two strategies, the authors should have thought about the conceptual framework (thought test) and then decided on the appropriate strategy.

3B Thinking about the conceptual model post hoc, the most logical conclusion is that the items used as an example in the assignment follow a formative model, because these items are not the manifestations or reflections of quality of life. Note that if these items were used to assess the severity of the asthma, then the items would be based on a reflective model, because they might be reflections of the severity of the asthma. Fortunately, in an earlier paper the authors had chosen for a method that corresponded with a formative model for the development of this questionnaire (Juniper et al., 1992).

#### **4. Cross-cultural adaptation of an item**

- 4.A If the item is one of 10 items in a scale to assess physical functioning, based on a reflective model, replacement by another item which shows a high correlation with this bicycle item is the most appropriate solution.
- 4.B If the scale forms a hierarchy in difficulty (IRT), replacement by another item which represents the same difficulty and discrimination is the most appropriate solution
- 4.C If the item is one of 10 items in an index concerning social participation, the bicycle item is based on a formative model, and is much more difficult to replace. In the Netherlands, a bicycle is often used for short distances, so one has to think of other means of transportation that are used in the USA for short distances (e.g. a car or taxi)

#### **5. Use of sum scores**

- 5.A It is not forbidden to sum the scores of the individual items, but the sum score is difficult to interpret. Moreover, it has implicitly been decided that all items are equally important.
- 5.B For such items, consisting of symptoms and activities that may be problematic, it is difficult to decide post hoc whether the developers had a reflective model or a formative model in mind. It was a reflective model if their reasoning was that in patients with neck complaints all these symptoms are present and activities are problematic, and the degree of problems is a reflection of the severity of the neck complaints. However, if their reasoning was that with neck complaints some symptoms are present, but some activities are still possible, for example depending on the type of neck disorder (overuse, stress-related or whiplash), the assessment of which symptoms are present and which activities are still possible leads to the conclusion of how severe or far-reaching the neck complaints are. In that case, the disability questionnaire is based on a formative model.
- 5.C In a reflective model, the scores of the individual items can be summed, because these items measure the same construct. In a formative model, one might consider weights: do all symptoms and activities have equal weights, or are some more important than others?