

10 Questionnaires

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Chapter aims

The aims of this chapter are to present the potential uses of questionnaires and the principles involved in developing an effective and valid questionnaire. It will consider some of the issues involved with the effective development and use of questionnaires as a research tool, their administration and ethical considerations. The information provided in this chapter is not set out to be definitive, but rather, it is presented as an introduction in the development and use of questionnaires in health and physical activity research.

Depending on the intended research methods, the reader may wish to read this chapter alongside ~~those on surveys, focus groups and questionnaires~~, as much of the information presented in these chapters relates and informs the others to provide a more comprehensive coverage. These chapters have been presented in this way to provide an informative coverage of the topic without excessive duplication and repetition of material.

Introduction

A questionnaire is a series of pre-set questions that are designed to address the research aims. This allows the researcher to collect a set of data of the same information, in the same format, from every participant in the sample. Given this, questionnaires are a convenient way to collect data from a large, heterogeneous sample on a wide range of issues.

~~Although their use in health and physical activity is prevalent, researchers often assume that questionnaires are easy to design and use. Without strong rationale, which is clearly thought through and explicitly defined, the use of questionnaires does not always equate with obtaining useful data. Whether the researcher is intending to measure participants' perceived exertion during an exercise task or adherence to an intervention, considerable effort and planning is needed to ensure the data obtained is of sufficient quality to answer the research question(s). For these reasons, key principles must be followed if researchers are to be effective in collecting valid and reliable data.~~

The use of questionnaires in research

Questionnaires may be used in many research contexts, for example:

- They could form the entire means by which data is collected in a survey, such as providing descriptive information, data for the determination of associations between factors and data for comparing groups or scenarios.

- As a screening tool for assessing whether a prospective participant meets the inclusion/exclusion criteria within a larger study design, such as a physical activity intervention.
- To elicit information relating to participants' behaviours, attitudes and beliefs.
- The collection of descriptive data on the characteristics and demographics of participants within a study that also collects data via other means, such as physiological health data.
- The method by which pre- and post-intervention data are collected to determine the effectiveness of an intervention, with the questionnaire providing all the data or being used alongside other measures of health and fitness, such as blood lipids;
- Used in conjunction with interviews and focus groups.

As can be seen from the above, almost every health and physical activity researcher is likely to use a questionnaire of some form at some time. Indeed even the "Participant Information and Consent Form" is a questionnaire.

Designing effective questionnaires

Designing effective questionnaires is important when ensuring precision and accuracy of data. Before a questionnaire can be designed, it is important that the researcher has a clear idea of what they want to investigate (i.e. the domain in question). This may seem relatively straightforward at first, but it can quickly become difficult when scrutinized. For example, if a questionnaire is being developed to measure participants' dependence to exercise, all concepts related to exercise dependency need to be identified and categorized (e.g. withdrawal effects, tolerance and intention). DeVellis (2003) and Lynn (1986) recommend identifying a domain through literature reviews and qualitative methods,^{1,2} such as focus groups and semi-structured interviews (see Chapter 9). When combined, both methods can help generate a list of questions that fully represent the domain in question. After generating a list of items (i.e. questions) for the questionnaire, it is important the researcher check the reliability and validity of it prior to its use.

Validity of questionnaires

A questionnaire must have validity (i.e. the questionnaire measures what it is supposed to measure). It is well known that when asked about their exercise or dietary habits most people will recall one of their good weeks, and commonly over-report their level of activity. Hence the questionnaire may not provide data for a 'typical week'. With the advent and widespread availability of activity monitors the validity of responses can be compared against more objective measures. Although even this has issues, firstly the monitor itself needs to have a proven high validity and there is always the risk that when asked to wear the monitor the person will be more conscientious in their exercise habits – the 'Hawthorn effect', and hence will record activity levels for that week that are better than their typical week's activity. In order for a researcher to have confidence in the interpretation of their data, they must be assured that the questionnaire is valid. There are many forms of validity, with the most common types briefly addressed below:

- *Content validity*: Once a questionnaire has been designed, the researcher must determine whether the questionnaire actually measures what it is intended to

measure. For example, if a questionnaire aims to determine changes in self-esteem following a bout of exercise, the items on the questionnaire should measure self-esteem. The most effective way of examining content validity is through expert opinion. Once a questionnaire is designed, experts within the field should examine the content validity of the items and ensure that the questionnaire measures what it intends to measure.

- *Criterion validity:* This refers to the effectiveness of the questionnaire in measuring what it is intending to measure. A newly developed questionnaire should be assessed against a direct and independent measure of what the new questionnaire is designed to measure. For example, if a questionnaire aims to examine participant physical activity levels, the criterion validity of the questionnaire can be assessed by the actual amount of physical activity performed, which may be measured by accelerometer data, for example.
- *Construct validity:* This type of validity refers to the extent to which the questionnaire relates to existing constructs being measured. This type of validity represents one of the greatest challenges in questionnaire development. Convergent validity and discriminant validity are two forms of construct validity that can be assessed to demonstrate construct validity.
 - *Convergent validity:* This type of validity concerns the degree to which two measures of similar theoretical constructs relate to each other. For example, a questionnaire that measures clinical depression should be correlated with other questionnaires that measure depression. Convergent validity can be assessed by estimating the correlation coefficient between two questionnaires.
 - *Discriminant validity:* This concerns whether the questionnaire can indicate differences between two or more types of populations. For example, it could be hypothesized that people who exercise have more favourable attitudes towards exercise than those who don't. If the questionnaire indicates differences in attitudes between exercisers and non-exercisers, the questionnaire exhibits discriminant validity.
- *Face validity:* While this does not really refer to validity, face validity generally refers to the appearance and how easy the questionnaire is to read and interpret. A questionnaire must be clear and unambiguous. The questions may take many forms and elicit a variety of responses (e.g. free text-boxes, a list of options, yes/no responses) and it is important that the participant can easily answer each question. The questionnaire should avoid the use of technical language or terms that may not be understood by the 'lay-person' who has not undertaken extensive study in the field of health and physical activity. Therefore, the format of the questionnaire determines how easy it is for participants to read and understand the questions.

While there are numerous methods in providing validity for questionnaires, there is no 'gold standard' by which questionnaires can be validated. Instead, the validation of any questionnaire requires multiple procedures, which are employed sequentially at different stages of its development. Validity is thus built into the test at the outset rather than being limited to the last procedure/stage of questionnaire development. Each of these stages can be seen as fundamental to the validity of a questionnaire.

Reliability of questionnaires

Reliability, or reproducibility, indicates accuracy or precision of a questionnaire and whether it performs consistently. We describe three forms of reliability in this chapter:

- *Cronbach's alpha*: The first and arguably most common form of reliability in questionnaire development is the calculation of Cronbach's alpha. This calculation provides an estimate of internal consistency that describes the extent to which all questions on the questionnaire measure the same construct. Cronbach's alpha is expressed as a number between 0 and 1, and can be calculated on most statistical software. The closer the number is to 1, the higher the internal consistency. However, higher Cronbach's alpha scores do not necessarily mean high degree of internal consistency. Generally, coefficients above 0.95 may suggest that the questions are very similar and may need modifying. Coefficients above 0.70 and close to 0.90 are suggested to have good internal consistency. Further, it is important to consider that the alpha scores reported on a questionnaire on one set of participants may be different to that of another sample. Therefore, researchers should calculate Cronbach's alpha each time the test is administered.
- *Test-retest*: This type of reliability measures the stability of responses over time. A questionnaire with good test-retest reliability will have similar results when administered to the same person on two separate occasions, when there has been no intervention, activities or events that may affect the responses occurring between the two testing occasions. To assess the test-retest reliability, researchers can calculate the correlation coefficient between the two administrations of the questionnaire.
- *Split-half*: This type of reliability examines the consistency within the questionnaire when questions are measuring a similar construct. The questions of the questionnaire are split into two equivalent halves (usually by odd and even numbers or by first and second half) and correlation between the two halves is assessed. The higher the correlation, the greater reliability. Researchers must be aware that the split-half method cannot be used when the questionnaire assesses more than one construct (e.g. vigour and self-esteem).

Deciding the type of response

Researchers must decide on how the respondent will answer each question. There are a range of response types that researchers can use in their questionnaire. In health and physical activity research, Likert-type and frequency scales are most commonly used.

Generally, a Likert-type scale attempts to quantify a person's attitude towards various statements on a scale from 1 to 5, with 3 being a neutral midpoint. The scale is often anchored from strongly disagree to strongly agree. For example, an item could ask participants to rank their agreement on a scale from 1 (strongly disagree) to 5 (strongly agree) with the following statement: "It is important that the food I eat keeps me healthy". Further items of a similar construct would be asked and the responses are either summed or averaged to produce a single value. Using Likert-type scales allows the researcher to economically administer the questionnaire with ease to a large sample and allows comparison between participants' final scores. However, despite this, the use of Likert-type scale constrains the research to numerical data, which may be difficult to translate into actual real-world practices.

Frequency scales are similar to Likert-type scales and can be used to understand how often a type of behaviour occurs. A question may ask “how often do you take part in moderate physical activity in a week”. Respondents may be asked to provide numerical data (e.g. 4 hours) or to select a choice of responses (e.g. less than 1 hour, 1–3 hours, 3–5 hours etc.). An important aspect to consider for frequency scales is the wording of the question. Ambiguous statements may affect the quality and nature of responses and depending on how the question is framed, may influence responses in unintended ways. For example, if the question asks “how often have you exercised recently”, participants may interpret ‘recently’ differently.

Other less common types of response formats include the Guttman and Rasch scale, which presents a number of items to which the respondent is asked to rank in order of agreement; the Thurstone scale, which measures attitudes of agreement towards specific statements; and knowledge-based questions, which can evaluate how well a person understands a certain topic.

Piloting of the questionnaire

Having developed a draft questionnaire, it’s important to pilot with a ‘convenience’ sample who ideally should be from the same demographic group as the intended sample in the population. This should bring to light any issues with language, the clarity of the questions and how long the questionnaire takes to complete. For examples of questionnaire development and validation in health and physical activity, see examples from Armstrong and Bull (2006),³ Craig et al. (2003)⁴ and Hurst et al., (2017).⁵

Recruiting and ethical considerations of questionnaires

As with all forms of research the characteristics of participants will be determined by the nature of the research and the research questions being addressed. Consequently the eligibility and inclusion/exclusion criteria will need to be determined, which could include age, sex, existing injuries and known medical conditions. If a particular group is being targeted for the research, then the researcher(s) may collaborate with organizations such as hospitals, medical clinics or organizations that focus on a particular condition, such as heart disease or diabetes. ~~However undertaken, the recruitment process needs to sample a representative population of the targeted group. Otherwise there is a risk of bias due to some members of a particular group being over- or under-represented.~~ Indeed there is always a risk of bias in any research that involves recruitment as it is common for participants to volunteer for interventions in topics for which they already have a high interest. Thus to determine the representativeness of recruited participants, researchers may compare the characteristics of participants with databases on the demographics and patient characteristics of other groups reported in the literature, such as national surveys.

When planning the recruitment strategy the researcher must be cognizant of any ethical considerations. For example, if intending to recruit via a GP’s surgery there may be a risk of unintended coercion or a power relationship between doctor/researcher and potential participants. The same would apply if a university lecturer sought to recruit students of their university. Such relationships would not preclude these people from being recruited, but the design of the study and the recruitment process would need to build in a means by which the risk of coercion or perceived risk due to the power relationship was minimized.

The recruitment process will need to be approved by the relevant ethics committee. Many questionnaires will be deemed to be of low or negligible risk, although others that may involve sensitive topics, vulnerable groups and issues of privacy and confidentiality may be classified as more than low risk. Furthermore, as indicated above, the potential risk of coercion or power relationships in the recruitment process will need to be considered as part of the ethics review.

If a questionnaire deals with a sensitive topic, it is possible that it may cause the participant some distress or discomfort when answering the questionnaire. Researchers should be aware of this potential risk and have in place reasonable strategies to deal with it. This may include providing contact details within the questionnaire of organizations that specialize in the topic and/or distress, and have services available. A question checking that the questionnaire has not caused distress to the respondent could be included at the end of the questionnaire. Other possible risks associated with undertaking any research, including questionnaires, is that of uncovering illicit or illegal activities. Here again, the researcher should be aware of the procedures that they need to follow in these circumstances. Typically these can be attained through the relevant ethics committee/organization through which the research would be approved, and such safeguards would need to be written into the ethics submission.

Other issues for consideration are how consent is attained, and this will need to be incorporated into the questionnaire process, as will the participants final agreement for their responses to be used in the analyses. Hence at the end of the questionnaire there needs to be an option for them to withdraw their consent. As part of the consenting process, participants should be informed about how their data will be stored, how its security will be assured and how privacy will be maintained. Each ethics committee will have its own specific requirements for these. Common examples may be that data is stored on password-protected computers and servers, which are owned by the researchers' employing organization. In the case of hard copies these may be in locked cabinets that only the research team will have access to. Data will be required to be kept for a specified duration by the ethics committee and by any journal publishing a manuscript derived from the study. Health and medical data is commonly required to be kept for longer than other data, with 10 years being typical. For all of the above, the researcher needs to specify in the information and consent forms who will have access to the data, and this would typically be restricted to the research team. This may also specify when any data would be destroyed and provide the participant with the option of having their data destroyed if they so wish, although this may be limited to the point before it has been included in any publications.

Social desirability: a confounder in the responses to questionnaires

While use of questionnaires in health and physical activity can generate ~~valuable data,~~ the use of this data depends on how accurate it actually is. Ensuring the accuracy of data recorded from questionnaires can be difficult when they are based on self-report. It is typical for participants in health and physical activity research to over- and under-report how healthy and physically active they are. For example, participants tend to under-report sensitive or embarrassing behaviours, such as illicit drug use, and over-report positively viewed behaviours, such as physical activity.

Asking participants about socially desirable responses may generate errors that influence the accuracy and precision of the data. To overcome social desirability,

researchers can use a variety of techniques and procedures such as the random response technique, the bogus pipeline procedure and the unmatched count technique. While it is beyond the scope of this chapter to explain each one in detail, readers can refer to Krumpal (2013)⁶ for more information.

Administering questionnaires

Questionnaires may be administered face to face, via the internet or through other media. Each of these has associated issues of time, accessing participants, number of participants and higher or lower response rates.

Face-to-face administration of questionnaires

Administering a questionnaire face to face should be undertaken at a location that is suitable, convenient and safe for both the participant and researcher. For the researcher this method may be quite time consuming in terms of travel to a location and then working through the questionnaire with the participant; however, it may also be the most productive as any issues with completing the questionnaire such as the clarification of a question can be resolved immediately and hence the researcher is almost guaranteed to attain usable data.

Online administration of questionnaires

Administering a questionnaire via e-mail is perhaps at the opposite end of the spectrum, in that it can be sent to many prospective participants at the click of a button, and the respondents do not have to be within convenient travelling distance of the researcher, but can be located anywhere in the world that has access to the internet. In similar vein, social media platforms such as Facebook and Twitter offer a medium in which to advertise and recruit participants from all over the world of different populations who would be difficult, if not impossible, to reach. Services such as Survey-Monkey and Qualtrics can be used to upload the questionnaire and participants can complete this at a time and place convenient to them.

Online administration can increase anonymity of responses and subsequently improve validity of data. For sensitive topics, participants can sign up to the study without having to provide direct information about who they are. Obtaining informed consent in these circumstances can be achieved using an information letter in lieu of signing informed consent. Thus, researchers can provide all information about the study, including benefits, risks, voluntary nature of participation and any compensation, at the onset of the questionnaire. This anonymity can provide a greater sense of confidence among participants when responding to sensitive topics and decrease social response biases.⁷ If the participant wishes to withdraw their involvement in the research at a later date, this can be achieved by providing contact details of the research team at the start and end of the questionnaire. The same procedure will apply to face-to-face questionnaires, in which participant data is removed with it reprisal.

While there are numerous benefits of online questionnaires, the response rate using an online method is likely to be much lower, and issues such as the clarification of a question are more problematic. Hence it's likely that a much greater number of

prospective respondents will need to be contacted in order to attain the same volume of valid data than if it was collected face to face. Similarly, participants may complete the questionnaire on more than one occasion and may not match the inclusion criteria of the study. To help overcome these issues, researchers could request participants to contact them to obtain a code prior to completing the questionnaire. This can ensure that the participant is who they say they are and that they meet all inclusion criteria for the study. While it may decrease the response rate of the questionnaire, it can minimize the risk of multiple responses from the same participant.

Response rates

Improving response rates of questionnaires can be achieved by providing advance notice, raising awareness and interest in the research, personalizing the initial contact with the participant (e.g. addressing the participant by their name and stressing the importance of their contribution) and offering incentives for their participation (e.g. financial gains or prize draws). While this does increase the resources needed to collect the required sample size, researchers should consider this when administering questionnaires. Non-responses can introduce bias and affect the accuracy and precision of data collected. For further information on how to improve response rates for questionnaires, readers should refer to the Cochrane collaboration for a more in-depth review.⁸

Summary

Questionnaires provide the researcher with an opportunity to collect a large amount of data worldwide at a relatively low cost. Questionnaires can provide meaningful and rich data, which has the potential to inform and shape policy of a variety of topics across the health and physical activity sciences. While a wealth of knowledge can be gained through the use of questionnaires, particular attention should be given to their accuracy and precision. Prior to administration, researchers should check that the questionnaire is appropriate in answering the research question(s) and that it meets acceptable standards of validity and reliability. Researchers should be aware of the potential ethical risks associated with questionnaire use and the influence social desirability can have on participants' responses. Such an approach can help ensure that the data collected are meaningful, which in turn can help inform knowledge and understanding of issues relevant across health and physical activity settings.

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