Archives of Surgical Research | Perspective

Bread & Butter of Instrument Design in Health Sciences

Rizwan Qaiser Danish

IMPORTANCE Information from respondents can be gathered through various sources and instrument or questionnaire or scale is one of these. One researcher can look from different perspectives just like an artist can see a seen and take his brush to capture it on canvass at the same time he has choices of oil or water or mixed medium. you first choose subjects but at the same time you have to consider proper methodology so that your focus may be on the right things you want to measure. Your personal beliefs and opinions ma y distort the independence and impartiality that need to be considered when getting responses from audience. The development of questionnaire starts from brainstorming from where you get the pool of items to be included.

KEY WORDS Instrument design, health sciences, survey design, questionnaire

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Perspective

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Information from respondents can be gathered through various sources and instrument or questionnaire or scale is one of these. One researcher can look from different perspectives just like an artist can see a scene and take his brush to capture it on canvass at the same time he has choices of oil or water or mixed medium. you first choose subjects but at the same time you have to consider proper methodology so that your focus may be on the right things you want to measure. Your personal beliefs and opinions ma y distort the independence and impartiality that need to be considered when getting responses from audience. The development of questionnaire starts from brainstorming from where you get the pool of items to be included.

This item stock can be obtained through various techniques but before that there must be clear purpose in mind regarding the study. Extensive review of literature is required for generating the themes whatever method focus group, interview, content analysis or any other is used. Purpose of study and aim of instrument must be articulated which later on can be testified for various type of validities which is actually the strategy of driving the nail aright. If you develop a statement of purpose you can get feedback and invite expert opinions on it to further refine your themes and items. Your development and design of instrument is reflective of your objectives. Of course, thinking process and creativity is necessary for starting the process of scale development. Psychologists suggest that the creative process occurs in a series of stages: preparation, incubation, inspiration, and verification (Lubart, 2001).

However, this process in intangible in nature and occurs as mental activities unconsciously. Literature review is the prime step that is indicative of previous research that has already been conducted in the area where scale needs to develop, here medical surgeries, on the assumptions that knowledge accumulates and it is necessary to develop credibility by the researcher being investigated. Literature also specifies the previous theories in medical field for the explanation of phenomenon. Moreover, methodologies are also studied in literature which describes the appropriateness of each method based on purpose and objectives of study.

In medical field normally mixed method study is conducted for development of instrumentation where first themes are generated on the basis of interviews, focus group discussion observation or any other method of primary data collection. Then pools of items is generated with the help of words, pictures, narrative and non-verbal cues and further tested numerically in form of quantitative results at scale that is admissible in such studies for establishing generalizability. Literature is also important to study because in it you can also find some questions related to your purpose and nothing is wrong in adopting questions from other articles. However, you should consider local setting and respondents to fit the questions accordingly before revising and adopting it. For example, if you want to study quality of learning environment in operation theater, you may gain help from quality of learning in school class room but caution should be made about the choice of proper terminology and jargons of the subject matter. The work should be referred

properly and the data on the basis of your instrument should be tested again for reliability and validity because previously reported validity and reliability was for another setting and context.

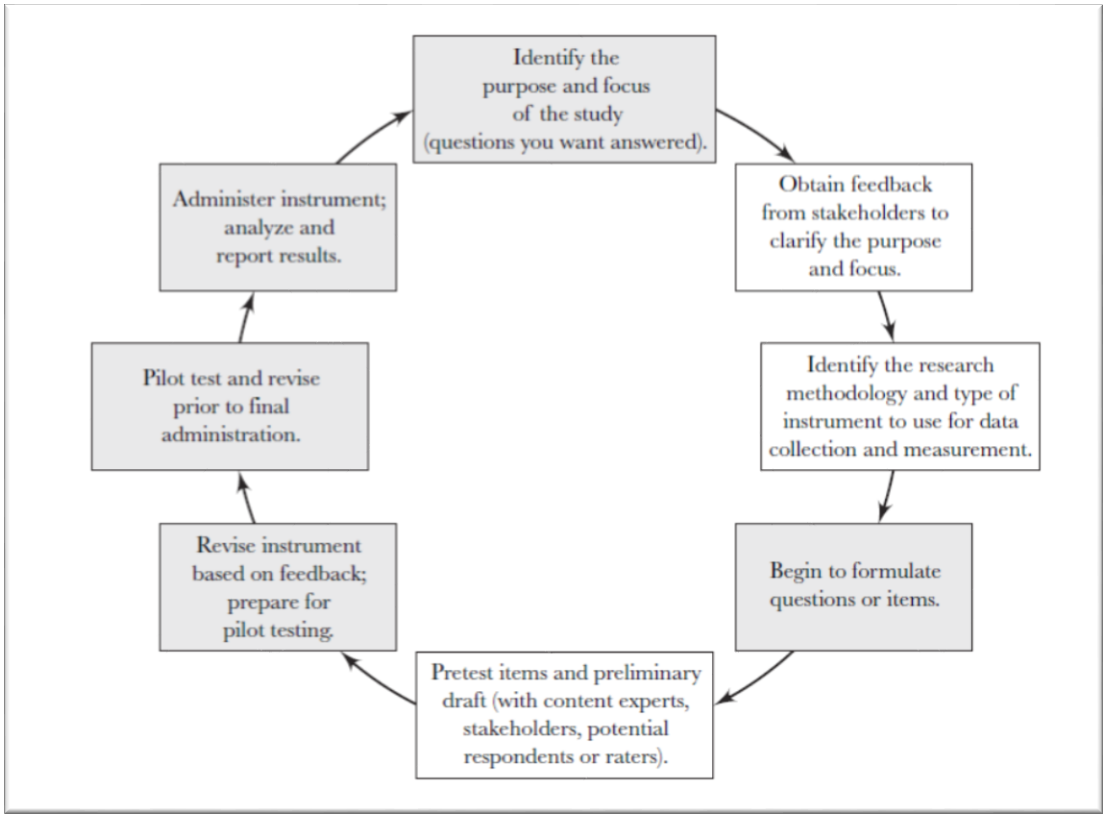
Behavior and attitudes in medical research can only be studied with the help of perceptions of respondents as converse to the more quantitative and rigid methods like experimentation where personal opinion doesn't matter. Perceptions are necessary to understand as our reactions are based on perceptions and not on reality as Kurt Lewin suggested (1935)

The question of sample size is based on the subject matter, for example some researchers focus on saturation point where themes start to repeat while others focus on number of responses on the basis of items, i. e. response to item theory (Hambleton & Swaminathan, 2013) and some others focus on 50 responses per theme for obtaining more generalizability. When themes are theorized the next step is to convert themes and sub themes into different items which need to establish face validity. Panel of experts may again be involved at this step. Pilot testing is necessary for cross validation and viewing if there are any problem regarding language, contents, formatting, structure and most importantly, indigenized requirements of the developed scale. The sample size for pilot testing generally consist of 20-40 observations but may vary for very large sample surveys and the purpose is not to test the statistical accuracy at this stage.

Instruments about perceptions are generally self-reported but they may also be based on observation and supervisor, subordinate or peer-based ratings. The word survey, questionnaire or poll is used interchangeably. A typical instrument generally consists of six basic elements but not limited to these, are, title, introduction, instructions for filling, items, demographic and closing section. The typical process of instrument design includes the following steps (Fig 1).

Figure 1: Processes in instrument development

Adopted from: Colton, D., & Covert, R. W. (2007). Designing and constructing instruments for social research and evaluation. John Wiley & Sons.



When a questionnaire is developed various types of validity and reliabilities are required to test for making it generalizable and credible for further use. Validity of an instrument refers to the extent to which we measure for what an instrument was purport to measure. As it is based on data so closer the data to your suggested theme, better would be the validity of an instrument. Various types of validity included but not limited to are:

Face validity: Is an instrument apparently appropriate for measuring desired information?

Construct validity: whether a theme is agreed upon on a certain understanding by the researcher and the respondent?

Content validity: whether an instrument measures the topic or process under investigation?

Criterion validity: how close the measured concept is with the external standard?

Predictive validity: can you predict the results of one variable from another measured variable?

Multicultural validity: whether a respondent of a particular culture understands what the question is purport to measure? (such as proposed by Kirkhart, 1995).
Reliability is "the extent to which an instrument produces the same information at a given time or over a period of time". (Colton and Covert, 2007).

Various methods in statistics are used for the evidence of reliability and validity depending upon the processes used to construct items for an instrument and level of measurement it opts (nominal, ordinal, interval, ratio)..

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