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INTRODUCTION

Community-based participatory research (CBPR) provides the field of psychometrics and public health practitioners the opportunity to enhance community-level change. This is achieved by providing communities with an authentic voice through the integration of scientific rigour with the knowledge and experience of community members in identifying, addressing, and measuring the social determinants of health. In South Africa, and elsewhere, there is often a propensity for developing measures linearly, with minimal recognition and integration of local/indigenous knowledges and expertise from communities. Locally generated information can be beneficial and is arguably critical for instrument development and its application in South Africa. By involving community members who are directly affected by the matter under study, CBPR mirrors an inclusive and relational worldview, and safeguards local relevance which can cultivate lasting social change (Salihu et al., 2015; Taliep, Lazarus, Bulbulia, Ismail & Hornsby, 2018).

In contrast to traditional research methods, participatory research engages the communities under investigation in the research process, and in the collection and/or analysis of data, in turn giving them greater responsibility in shaping and defining the outcomes of the research

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(Bleijenbergh, Korzilius, & Verschuren, 2012). Participatory approaches provide an opportunity for non-academic community members to co-construct knowledge about an issue being explored and to obtain a contextual understanding of how the issue occurs in the everyday lives of community members (Billies, Francisco, Krueger, & Linville, 2010). The Delphi Consensus Technique (DCT) is one of a range of diverse participatory research techniques that has been used to ensure optimal participation of community members and key stakeholders as experts.

The DCT is a particularly invaluable method for collecting and validating expert opinion in fields where knowledge is limited (Fletcher & Marchildon, 2018; Hardy et al., 2004), such as in the development and validation of methodologically robust measuring instruments. The technique is intended to transform multiple opinions into group consensus and assumes that ‘pooled intelligence’ improves individual judgment (De Villiers, de Villiers, & Kent, 2005; Ismail, 2018; Munnik, & Smith, 2019; Taliep, 2016). The technique was initially regarded as “a method used to obtain the most reliable consensus of opinion of a group of experts by a series of intensive questionnaires interspersed with controlled feedback (Dalkey & Helmer, 1963, p. 458)”. In their seminal work on Delphi, Linstone and Turoff (2002, p. 3) define it as “a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem”.

The Delphi method consists of multiple rounds that involve the presentation of an issue to a panel of ‘experts’ in a particular field of application, to seek their opinion or appraisal (Taliep, Ismail, Seedat, & Suffla, 2014; Veziari, Kumar, & Leach, 2018). The method is a group facilitation technique comprising of an iterative multi-stage process that presents an opportunity for experts to anonymously convey their opinions based on their knowledge and expertise about a complex problem, to ascertain how their assessment of the issue aligns with other panelists, and to change their views, if desired, after re-assessment of the findings from the different rounds (Kennedy, 2004).

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Historical overview

The DCT was developed by a group of scholars at the RAND Corporation in Santa Monica, California in the 1950s for the systematic study of obtaining consensus among experts' opinions in the military, but later it was used in diverse fields such as economic development planning, information technology, communication, tourism, educational planning, curriculum development, transport, health care, and instrument development (Aigbavboa & Thwala, 2012; Linstone & Turoff, 2002; Ökmen, Şahin, Kiliç, & Adigüzel, 2019; Salihu et al., 2015; Skulmoski, Hartman, & Krahn, 2007; Szpilko, 2014). The technique derived its name from ancient Greek mythology where the oracle at the Delphi Temple, a place of divine inspirations, was consulted to predict the future (Powell, 2003; Okoli & Pawlowski, 2004; Szpilko, 2014). The method espoused by the Rand Corporation research team was based on the premise that subject-matter experts may be asked for their views and judgment about the likelihood of future phenomena or developments (Aigbavboa & Thwala, 2012; Szpilko, 2014).

Key characteristics and uses of the DCT

There are four characteristic features of the DCT that help participants to focus on the issues at hand as well as distinguish the DCT from other group decision-making processes. These four key features of the technique are: anonymity, iteration with controlled feedback, statistical group response, and expert input. Each characteristic has a key role to play in the DCT process and are elaborated on below:

Anonymity

Panelists do not meet face-to-face; the Delphi survey is completed anonymously by research participants who are known only to the researchers. Anonymity guarantees freedom from conformity pressure by the other participants, and decisions are made on their merits and not on who proposed the idea. Anonymity also guarantees the anonymity of the participants' responses, which essentially motivates them to express their opinions freely.

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Iteration/repeatability

The use of two or more rounds of completing sequential questionnaires between which a synopsis of the previous round is shared with and evaluated by panel members, allows panelists to contemplate, re-evaluate, and clarify or change their viewpoints based on the results of the group in the previous round, and it enables the systematic surfacing of a consensus of judgment or opinion.

Controlled feedback

Researchers inform the panelists between rounds about the variety of opinions that emerged from participants, which affords them with an opportunity to clarify and modify their opinions.

Statistical ‘group response’

The statistical aggregation of group responses using frequency distributions to identify patterns of agreement enables the quantitative analysis and interpretation of data (Habibi, Sarafrazi, & Izadyar, 2014; Ismail, 2018; Loo, 2002; Munnik, & Smith, 2019; Shariff, 2015; Skulmoski et al., 2007; Szpilko, 2014).

In their ground-breaking work on the Delphi method, Linstone and Turoff (2002) highlight the following key reasons for selecting the Delphi approach in a study:

- the research problem may not be amenable to precise analytical techniques but can collectively benefit from subjective judgments;
- the research participants may come from diverse backgrounds as regards experience or expertise;
- more participants are required for effective interaction in a face-to-face exchange;
- time, cost, and other logistics may render frequent group meetings unfeasible;
- disagreements among individuals are so intense that the communication process has to be adjudged and/or anonymity assured; and

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- the heterogeneity of the panelists must be preserved to ensure validity of the results, such as to avoid the “bandwagon effect”, i.e. domination by some.

Others note that the Delphi method may be used when there is a paucity of empirical evidence about a particular issue or phenomenon; for studying complex matters, where quantitative data alone does not fully capture the implicit knowledge of experts required to explore a given issue; when causal pressure is exerted by outside factors and the expected incidents do not submit to exact analytical techniques; and to predict the long-term outcomes in an instance of uncertainty (Adler, & Ziglio, 1996; Edwards, 2003; Grisham, 2009; Powell, 2003; Vernon, 2009; Szpilko, 2014). It is a cost-effective method that can be used to engender viewpoints and facilitate consensus among participants who may be geographically dispersed (Hirschhorn, 2019; Polit & Beck, 2008).

Advantages and limitations of the DCT

A unique advantage of the DCT is its adeptness in guiding group opinion toward a final resolution and achieving a sense of closure and accomplishment (Delbecq, Van de Hen, & Gustafson, 1975; McKenna, 1994). Collective wisdom in decision-making can result in more comprehensive and thorough decision-making (Irdayanti, Ramlee, & Abdullah, 2015; Habibi et al., 2014; Powell, 2003), hence the main advantage of DCT is the achievement of consensus on a given phenomenon or area where none previously existed utilising panelists who may not all be located in the same geographical location (Linstone & Turoff, 2002; Mckenna, 1994).

The technique uses the principle of anonymity to solve the problem of conformity pressure where dominant participants may suppress the views and opinions of ‘weaker’ participants, and also facilitates equity of participants through the independent pooling of ideas and judgments (Delbecq et al., 1975; Habibi et al., 2014; Linstone & Turoff, 2002). Anonymity eliminates problems of expression, worry of ‘losing face’ or expressing opinions which may not be appropriate when expressed publicly (Lilja, Laakso, & Palomaki, 2011). The DCT is

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cost-effective since only relevant and useful information is channelled back to panelists, which prevents undue ‘side-tracking’ for participants and unnecessary analyses for the researcher (Mckenna, 1994). At the same time, it overcomes spatial limitations, thereby eliminating or reducing travel costs. Other key advantages include flexibility and simplicity of the design, sharing of knowledge, generating new ideas across disciplines, encouraging freedom of expression, and ease of communication through the use of technology (Avella, 2016).

As with any other research design, the DCT also has limitations. These include that (1) the reliability of the data from the DCT is very much dependent on who is involved, i.e. whether the participants are representative of all the stakeholders and the beneficiaries; (2) study drop-out and poor response rates, which is characteristic of the final rounds of many Delphi studies; (3) the process is not immune to manipulation - due to the influence and level of control the researcher has in the Delphi process, researcher bias may creep into the process, albeit unintentionally; (4) inadequacies of the researcher in adeptness to summarise panel contributions, or researcher tendency to impose his/her preconceptions on participants, particularly with a modified design that utilises researcher literature reviews for the initial round; (5) time delays between rounds during the data collection process; (6) the technique may compel a middle-of-the-road consensus, and (7) participants may get side-tracked by discussions concerning the method instead of focusing on the topic (Avella, 2016; Linstone & Turoff, 2002; Skinner, Nelson, Chin, & Land, 2015).

Applying the DCT to instrument development

Within measurement theory, the Delphi method is an established and commonly used approach for collecting validity evidence by making use of expert panels (Biondo, Nikolaichuk, Stiles, Fainsinger, & Hagen, 2008). The method can be used to generate or prioritise instrument items. It is particularly employed in developing new contextually relevant measures of largely untapped constructs. In developing new instruments, review panels are usually asked to evaluate a data collection instrument with regards to

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predetermined criteria, including relevance and representativeness of the questionnaire items, testing procedures, implementation conditions, and item-scoring criteria (Ismail, 2018; Messick, 1989).

In the ongoing process of instrument validation (Biondo et al., 2008) the Delphi method ensures high content, concurrent, and face-to-face validity of a measure (Baker, Lovell, & Harris, 2006). For example, Biondo et al. (2008) used the DCT to collect content-related validity evidence (i.e. evidence about the extent to which the test accurately represents the target domain) for the construct validity of the Edmonton Classification System for Cancer Pain (ECS-CP) and the Alberta Breakthrough Pain Assessment Tool for Research (ABPAT-R). Salihu and colleagues (2015) developed the Community Priority Index measure to provide practitioners with an intuitive instrument for priority setting in a CBPR context using the DCT. Colton and Hatcher (2004, p. 185) used a web-based DCT to develop and ascertain the “content validity of the Online Adult Learning Inventory”, a measure used in Web-based instruction and training. In another study, Veziari, Kumar and Leach (2018) used the Delphi method to validate and refine a preliminary measurement instrument for identifying, measuring, and assessing the barriers to the conduct and application of research in Complementary and Alternative Medicine (CAM).

OPERATIONALISATION OF DCT: DESIGNING, CONSTRUCTING AND EXECUTING THE DCT

This section provides an outline of the Delphi design and approach, a detailed outline of the processes involved in executing a DCT study and a case study example that applies the DCT within a CBPR framework.

The Delphi design and approach

Delphi is a qualitative technique that combines the knowledge and judgments of experts to obtain an informed consensus on a difficult or complex issue (Szipilko, 2014). The Delphi design is rooted within the ambit of ‘consensus development techniques’, which falls within

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the domain of action research approaches (Vernon, 2009). Very few studies have, however, used the Delphi method for participatory action research (Fletcher & Marchildon, 2018), and fewer still have used the Delphi method within a CBPR approach to develop questionnaires. A CBPR approach to questionnaire design and development allows for co-learning and co-creation of knowledge, ensures research relevance and mutual benefits, and acknowledges indigenous voice, worldview and ways of knowing, as well as ensures research validity and rigor (Taliep et al., 2018). Invalid and unreliable measures may result in biased interpretations for certain groups. This is particularly important in LMIC contexts such as South Africa where legislation (Employment Equity Act 55 of 1998) governs the utilisation of any psychometric measure. Assessment measures are permissible with a particular population only if the scientific validity of such measures have been established in the South African context (Government Gazette, 1998). Participatory approaches with Delphi have been applied in programme development (Taliep, 2016), in higher education, for learning priorities for health-care providers and cerebral palsy management (Fletcher & Marchildon, 2018; Kezar & Maxey, 2016) and for instrument development (Biondo et al., 2008; Ismail, 2018; Salihu et al., 2015; Veziari et al., 2018).

Three general approaches of Delphi are commonly used, i.e., classical (elicits opinion and obtains consensus), policy resolutions (elicits divergent or opposing views on policy but is not focused on generating consensus), and decision approach (structures decision-making and creates the future in the here and now as opposed to predicting it) (Linstone & Turoff, 2002; Szpilko, 2014; von Zolingen & Klaassen, 2003). Conventional Delphi designs utilise a group communication process aimed at achieving consensus of informed opinion by means of a series of questionnaires provided to expert panel members in multiple iterations until consensus is achieved (Hsu & Sandford, 2007). This research process is rooted in four key principles: (1) a group of participants (experts) are recruited for their expertise in the focus area of the study; (2) a process of multiple iterations is conducted through which expert opinions are collected, synthesised and consensus is reached; (3) feedback is provided to the expert panelists for interaction and reflection via the questionnaire, whilst at the same time

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ensuring anonymity and limiting extraneous information; and (4) information generated by panelists' contributes to the development of a solution, or to forecast (Plummer & Armitage, 2007).

Hasson and Keeney (2011) highlight that with the increasing utilisation and modifications of the method, ten different variations of Delphi have come into existence. However, with the evolution of the method, modified techniques, and their various adaptations draw considerable criticism. The assertion is made that the modified versions of the DCT might threaten the capacity to establish the validity and reliability of the method. In a Modified Delphi design, expert panels are typically not consulted to generate answers in the first round. Rather, the researcher collates the initial answers to a set of questions using different methods (e.g. literature reviews or Nominal Group Techniques (NGT)) and presents them to the expert panel to commence the consensus-seeking process (Avella, 2016). Importantly, the Delphi method adopted is situational since it is directed by the research problem instead of by the requirements of a technique (Hasson & Keeney, 2011).

Process in executing a DCT

The DCT process comprises multiple sequential phases. The following figure outlines the various phases in the Delphi study.

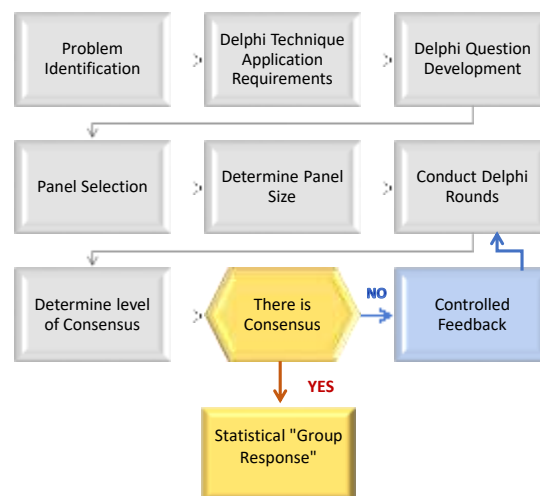


Figure 1. The Delphi phases (Source: Author)

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Problem identification

Identifying the problem seems somewhat obvious as all research starts off with the identification of the research problem. Depending on the research study, researchers may be provided with a topic to research, in which case the choice is already made for them. In most cases, researchers have the opportunity to decide upon a topic themselves. In these cases, consideration must be given to a range of factors including the resources available and the researchers' experiences and proficiencies. It is at this initial stage that the problem is evaluated and reviewed to determine whether the use of the DCT is appropriate (Linstone & Turoff, 2002). Therefore, research that lends itself to the use of group involvement may be considered appropriate.

Turoff (1970) delineated four research aims that necessitate the utilisation of the DCT:

1. to explore or expose underlying assumptions or information leading to differing judgements;
2. to seek out information which may generate a consensus on the part of the respondent group;
3. to correlate informed judgements on a topic spanning a wide range of disciplines; and
4. to educate the respondent group as to the diverse and interrelated aspects of the topic.

The DCT is only suitable to examine and explore particular research problems. Careful consideration should thus be given to the nature of the problem prior to selecting this methodology. Comprehending the nature of the research problem as well as the logistical considerations that result from the subject matter under investigation, need to be ascertained before electing to use this methodology. Other data collection methods should be considered such as surveys, questionnaires or interviews. Reid (1988) asserts that the decision by any researcher to employ this technique centres upon the appropriateness of the available alternatives.

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DCT application requirements

Day and Bobeva (2005) note that whilst previous research recognised that preparatory tasks are necessary prior to the start of the Delphi rounds; it does not differentiate this preparatory work as a separate stage. They argue that the development of the initial foundation of knowledge has been traditionally regarded as a first-round; however, the starting point for the Delphi (the initial version of the questions) could be either exploratory or confirmatory. The exploratory form of Delphi is best implemented by obtaining the views of participants via initial open-ended questions or preliminary interviews, and the confirmatory form's initial stage is traditionally done by sending out a predefined list of questions or issues to the panel (Day & Bobeva, 2005).

It is essential to develop a timeline for planning and conducting the Delphi study by outlining key activities from start to completion. The timeline should include the following key steps prior to the implementation of the Delphi study (Avella, 2016; Biondo et al., 2008):

- describe the main aim for conducting the Delphi process;
- identify study team members;
- describe the eligibility criteria for membership of the expert panel;
- decide on design approach to be used (conventional or modified);
- plan the survey(s) design, format and distribution;
- formulate strategies to foster high response rates;
- predetermine criteria to define consensus;
- decide on the number of iterations required (the number of iterations only become evident once the process has commenced); and
- determine a procedure to inform panelists of the final results.

Delphi question/s development

Prior to starting the Delphi process, the research team constructs question/s that will generate ideas and draw out the panel's feedback on the issue being investigated. The compilation of the content of the questions for the initial questionnaire can be based on a review of the

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existing literature (Polit & Beck, 2008). The initial set of questions can either be broad and open-ended to evaluate a more comprehensive research area, or they can be well-defined and structured to guide the panelists to a predetermined objective (Skinner et al., 2015). The broad open-ended approach elicits a broader response range than the structured approach and this could lead to a large amount of data, which in turn can become burdensome and time-consuming to analyse (Skinner et al., 2015).

A key method-related limitation to developing the questions or questionnaire is biased feedback, so the questions or measure must be focused on eliminating the potential for biased feedback (Skinner et al., 2015). Table 1 below outlines eight forms of bias and control measures identified by Hallowell and Gambatese (2010).

Table 1. Forms of bias that may occur in a Delphi process and counter measures

BIAS	DEFINITION	CONTROL/COUNTER MEASURE
Collective Unconscious	This bias may occur when an individual is compelled by social forces to comply with a majority position.	Ask panelists to provide response justification during all rounds.
Contrast Effect	This bias may occur when panelists' evaluations are affected by prior exposure to similar criterion of considerably higher or lower value.	For every round/expert, randomise question order. Report final results as a median.
Neglect of Probability	This bias may occur when panelists disregard the role of probability when making an appraisal of uncertainty.	Independently record probability/severity ratings for each risk identified.
Von Restorff Effect	This bias may occur when panelists overestimate probability values due	Ask panelists to provide response justification during all

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	to recall of more extreme events when making a subjective judgment.	rounds. Implement multiple survey rounds.
Myside Bias	This bias may occur when panelists generate one-sided arguments only or when they are averse to considering alternative views.	Ask panelists to provide response justification during all rounds. Report final results as a median.
Recency Effect	This bias may occur when panelists artificially inflate risk ratings due to a similar incident that occurred recently outside the study.	Exclude individuals who have experienced similar events recently, disregard outlying observations, conduct multiple rounds, and report final results as a median.
Primacy Effect	This bias may occur when panelists unconsciously assign importance to initial observations or questions at the beginning of the Delphi process to the detriment of the final observation.	For every round/expert, randomise question order.
Dominance	This bias may occur when one panelist intimidates other panelists to accommodate his or her viewpoint.	Ensure anonymity of panelists.

Once potential bias concerns have been addressed, the starting point for the Delphi questionnaire will be governed by whether the design of the questionnaire is exploratory or confirmatory (Skinner et al., 2015). Exploratory questions are most appropriately applied by obtaining the viewpoints of informants via initial open-ended questions or by means of a set number of initial interviews (Hasson et al., 2000), whilst confirmatory questions are applied

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by providing the Delphi panelists with a predefined list of questions or concerns (Day & Bobeva, 2005).

Panel selection

Panelists are the most essential component for a Delphi study and are generally selected based on their perceived expertise on a topic. However, it is precisely the selection of the expert panel that solicits methodological concerns (Keeney, Hasson, & McKenna, 2006). Baker, Lovell and Harris (2006) argue that within consensus techniques, such as Delphi panel methods, the use of ‘experts’ is vital to reliability. Yet, very little time is committed to a discussion in the literature on the practicalities of defining ‘experts’ for usage within Delphi panel research. There is a lack of clarity in the literature on who is an expert (Baker et al., 2006). Moreover, Linstone and Turoff (2002) refer to the drawbacks of ‘illusory expertise’ stating that the so-called specialist is not necessarily the best forecaster and neither layman nor expert can be expected to be free of bias. Baker et al. (2006, p. 67) remind researchers that knowledge does not equate expertise, “that experts are multi-faceted and there will continue to be difficulties in defining and justifying their selection”. Delphi research frequently focuses on professional (qualification and experience) proficiency, which often excludes community members or service users (Baker et al., 2006).

Participatory approaches assume an epistemological stance that values experiential knowledge as reliable and trustworthy (Billies et al., 2010). A CBPR approach to the Delphi process affirms community-centred knowledges, voices and cultural articulations alongside academic experts in the instrument development process, thus allowing for the construction of culturally sensitive and contextually congruent and relevant assessment measures. Using a ground-up participatory approach in the research design affirms and allows access to local knowledges that engenders the co-construction of knowledge production from a plurality of sources. Active ‘grassroots’ involvement in the Delphi process leads to greater acceptance of the results than more top-down approaches (McKenna, 1994).

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It is thus important that clear inclusion criteria be outlined and applied in order to ensure that the content of the instrument is valid for the target population. The key ‘expert’ requirements for participant selection include sufficient knowledge and experience of the topic under investigation, ability and willingness to participate, adequate time to participate in the study, and effective communication skills (Adler & Ziglio, 1996). Scheele (1975) recommends that the panel should be chosen from ‘experts’ or informed individuals with applicable experience, participants who will be directly affected, and professionals in the field under study to ensure valid results. Sahari, Tinggi, Cheuk and Nordin (2018) note that whilst knowledge may be the main criterion for panelist selection, availability and willingness are also important. Even more important is the selection of potential panelists from diverse backgrounds and positions to ensure that key perspectives on the topic are represented. In practice, participants who are willing to be involved and engage in the DCT discussion, are those individuals directly affected by the results of the research or topic of interest. When individuals are personally affected by the topic under discussion, they will most likely be and remain involved in the Delphi study (Keeney et al., 2006). Thus, panelists’ commitments are linked to research relevance and their involvement with the question or problem being addressed (Keeney et al., 2006).

Determine panel size

Sample size and heterogeneity is contingent on the purpose of the study, design chosen and time frame for collecting data (Keeney et al., 2006). The panel size may also differ as per the focus of the research and the nature of the diverse perspectives involved (von Zolingen & Klaassen, 2003), the availability of ‘experts’, and the required geographic representation (Hallowell & Gambatese, 2010). Whilst there is disagreement concerning the exact number of participants to include in a Delphi panel, there is a general consensus that the minimum number of panelists is seven or eight experts (Hallowell & Gambatese, 2010; Phillips, 2000; Sahari et al., 2018). Others have contended that the size of a Delphi panel may be determined by the availability of time and money, however, it should not be less than eight to ten panelists (Mitchell & McGoldrick, 1994), and it can go up to 30, 50, or more (Baldwin & Trinkle,

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2011; Colton & Hatcher, 2004; Daniel & White, 2005). This said, Lilja and colleagues (2011) have argued that the interactivity and recursivity, essential to the Delphi process, may suffer if the panel is too large. It has been suggested that if different groups are participating (e.g. individuals representing groups with distinct roles of interests in the issue being studied), then a larger sample is recommended to ensure that the multitude of different perspectives is represented (Kezar & Maxey, 2016). It is also important to make provision for participant drop-out, and so it would be more suitable to select a slightly larger sample than the bare minimum.

Conducting Delphi rounds

The Delphi process is implemented by means of a sequence of iterative rounds, with no set limit to the number of rounds that may be executed. The number of rounds depends on the aims, objectives and complexity of the study and is executed at the discretion of the researcher (Giannarou & Zervas, 2014). The number of rounds can range from two rounds (Bradley & Stewart, 2003; Keeney et al., 2006) to as many as 10 rounds (Lang, 1994), with three rounds being the most common and most recommended (Linstone & Turoff, 2002; Skumolski et al., 2007).

Each round comprises the panelists answering a number of predetermined questions, using either the paper and pencil method or by completing an online questionnaire on the topic of interest. Once all responses are received after each round, the data are analysed and compiled into an anonymised summary to share with panelists in the following round (Colton & Hatcher, 2004). The panelists are required to complete a succession of questionnaires until consensus is reached (Shariff, 2015). The Delphi method essentially entails a time-lapse between rounds, because the results from one round are processed and aggregated for the following round questionnaires (Berg, 2004). Depending on the responses of a current round, the following round is implemented by incorporating the feedback from the previous questionnaires for the next round of feedback and responses from the panelists. There is

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normally a reduction in response rates for the second round of a paper-based Delphi, particularly when using volunteers, as they may lose interest (Colton & Hatcher, 2004).

Determine the level of consensus

Consensus is usually determined through utilising similarity functions that indicate how similar experts' views or preferences are. Similarity functions are outlined based on the use of a statistical derivation or metric illustrating the distance between experts' opinions or preferences (see Ismail, 2018). Thus, in practical terms the midpoint of responses can be statistically categorised by utilising the median score. Succeeding rounds of the DCT will in all probability result in a decrease of the range of responses by the panelists, with the median progressing towards what is considered to be the 'correct' answer (Grobbelaar, 2007). This level of consensus is determined by the researcher through predefined criteria, for example, through achievement of consensus (see Ismail, 2018). A high degree of consensus between experts can be regarded as evidence of strong content validity.

Applying a modified Delphi in a PAR framework: Case study example

The aim of the study was to develop a psychosocial assessment tool for determining *willingness to participate* in safety interventions utilising a community engagement approach, specifically in a low-income community in South Africa.

This study drew on the central tenets of participatory research to explore the construct of willingness to participate and the development of an assessment tool. The participatory approach highlights the essential role of individuals and communities in social transformation, and how they perceive, interact and reshape physical, cultural, historically constructed, and socially organised forces (Giroux, 2004). Research that contributes to the empowerment of participants through participatory processes demonstrates the following attributes: 1) contextual – addresses community-centred issues; 2) responsive - issues explored are of relevance to participants themselves; 3) emergent - the knowledge that emerges from the research should contribute to the knowledge base of the particular field of

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study (that is, safety interventions); 4) participatory - the mutual involvement of participants in all aspects of the research process; 5) critical - the hidden meanings of what is being investigated is unearthed; and 6) praxiological – considers theoretical and practical considerations in research that need to be purposefully addressed and represented (Le Grange, 2002).

Panel selection

In this study, potential experts were selected using a snowball sampling method. Individuals in particular specialist fields, such as community psychology, were identified through their research endeavours. These endeavours included, for example, whether the researcher had worked with these individuals on previous projects; whether they had published in peer-reviewed journals in the area of community psychology; whether they had authored books or chapters in the field; or whether they had been extensively involved in community-engaged intervention work within disadvantaged communities in South Africa. In addition, published literature related to community-based interventions, community psychology and community participation were specifically utilised to identify additional academics. Lastly, some academics were asked to recommend other colleagues with expertise in specific domains. Fifteen academics were invited to be part of the review panel as experts in an effort to ensure that a minimum of 10 academics agreed to participate. An attrition rate of three academics occurred, which resulted in 12 academics participating as expert reviewers. The academic panel consisted of community psychologists, one educational psychologist, three clinical psychologists and two research psychologists all with a background in community engagement and working in communities. Two of the panelists had expertise in psychometry and scale development.

Panelists from the community were also selected as ‘experts’. Each community expert was selected in terms of varying minimum criterion which depended on the specific aims and objectives of the study or research. In the study example a group of 10 community experts were invited to participate in the review panel in order to augment the academic panel. Each

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community expert was required to meet four minimum criteria. These criteria included: 1) residency - had lived or was living within one of the communities in the Helderberg Region for at least 5 years or more; 2) knowledge - had knowledge and/or experience of interventions and community engagement in low-income communities in South Africa; 3) experience - had a history of or was performing consultation services for an organisation (that is, the Violence, Injury and Peace Research Unit; an NGO, an intervention agency; government); and 4) willingness - panel members must have been prepared to fully participate in the entire Delphi review process. An attrition rate of six community members occurred, which resulted in four community members agreeing to participate. Whilst the number of community members might appear to be outnumbered by academics, it should be noted that the academics were purposively selected for their expertise in their particular field (i.e. psychometry and scale development; community, educational, clinical, and research psychology). A total of 16 experts were, therefore, part of the Delphi review. Panelist reviews were strictly confidential and were not divulged to any outside party, including to other panelists.

Throughout the DCT Process key CPBR principles were included and incorporated into the various stages, such as foregrounding the community as a focus, the co-construction of knowledge as well as research relevance. This was achieved by selecting panelists from the community as ‘experts’, to co-construct the dimensions of the construct in question and the indicators for the questionnaire. When conducting research on the ground, the inclusion of community members is important because it recognises and affirms the experiences and contributions of local community members to knowledge production (Taliep et al., 2018). This way of co-creating knowledge by academics and community members recognises the importance of epistemic justice in the knowledge production process and ensures research relevance.

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Illustration of a data collection procedure during the Delphi review panel

In this study the Delphi panel review was employed to firstly enhance the trustworthiness of the data and secondly, to establish content validity. In particular, the aim of the Delphi panel review was to achieve consensus on the indicators of the construct *willingness to participate in interventions* in round one and two. Round three of the Delphi panel review required agreement by the panel of experts on the items developed for the Willingness to Participate Questionnaire (see Ismail, 2018). It is postulated that the utilisation of experts in the content domain of a measure increases the content validity of an instrument (DeVellis, 2012).

As indicated previously, the Delphi process occurs in various rounds. In this study, three iterations of the DCT was utilised as indicated by figure 2.



Figure 2. Delphi review panel procedure (Source: Author)

Round one

In the first round, panelists were provided with a questionnaire to assess the indicators extrapolated from the literature, individual interviews with community members and NGT with community members, stakeholders and community leaders, for content validity. The first step involved sending out invitations to serve on the expert panel. These invitations were sent either via email or hand-delivered and included an information pack. The information pack consisted of a formal invitation to serve on the review panel, a brief description of the

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study, information pertaining to serving as a reviewer, and the first round of documents to be reviewed. The return of the first round of documents by the invited expert panelist was an indication of the panelist's agreement to act as a reviewer for the study. The review panelists were required to complete specific demographic information such as: professional title, areas of expertise, occupation, and affiliation in their follow-up email. The completion of this information served as informed consent on the part of the panelist.

Panelists were informed that the process could last up to three iterations, depending on their feedback and comments. In this study, three iterations were required before a draft version of the assessment tool was finalised. The reviewers were urged to answer all questions, and reviewers were given the opportunity to revise their answers in subsequent rounds. In the reviewing rounds, reviewers were asked to comment on, evaluate and review indicators related to the construct. Where appropriate, a space was also provided for the reviewers to comment on the underlying reasons for their responses. The researcher also included guiding questions for panelists as a framework within which they would evaluate the various indicators. Table 2 below provides an example of guiding questions utilised in the case study.

Table 2. Guiding questions to assist panelists in assessing indicators

The following questions might be helpful in guiding your assessment of the value of each indicator:

- a) Is the indicator useful for guiding intervention developers in assessing community members' willingness to participate in interventions?
- b) Is the indicator helpful in identifying psychosocial factors that deter willingness to participate?
- c) Is the indicator useful for guiding intervention developers in reducing the barriers that prevent willingness to participate in interventions?
- d) Is the indicator useful for guiding intervention developers in managing how they would implement an intervention successfully in communities?

Content-relevant evidence included restricting indicator and item selection to the measure blueprint and obtaining content validity ratings from the Delphi review panel (see The Standards 1.7, AERA, 1999). The measure blueprint outlines what is to be measured and includes: 1) the content domains; 2) behaviours, or constructs to be drawn on by the instrument; 3) the specific dimensions or objectives of each content domain; 4) behaviour or construct that will be engaged; and 5) an estimate of the number of items that the final instrument should ideally have for each content domain, behaviour, and or construct, and for each of the specific dimensions (Foxcroft, 2004). According to Cohen and Wollack (2010), constructing a measure without a blueprint could cause an over or under-representation of certain objectives on the measure. The reviewers' responses were analysed using IBM SPSS version 24 (Statistical Package for Social Sciences). Minimum score, maximum score, range, mean and standard deviation were calculated for each indicator. Once feedback from this round was received from all panelists, a summary document was compiled with all the indicator rankings as well as recommended changes, modifications or deletions from the panelists.

The initial criteria utilised for retention of indicators in this round was an aggregated expert rating to indicate a sufficient level of content validity of that indicator in relation to *willingness to participate in interventions* or a subset of indicators having a mean rating of three or lower. An indicator that was related to the construct *willingness to participate* was rated with a score of three or lower on a 5-point Likert scale, with one indicating 'most important' and five indicating 'least important'. Those indicators which were given a mean rating higher than three by reviewers were noted in the next round of feedback to panelists in order to understand and ascertain whether these indicators might require modification or elimination. This allowed panelists to confirm whether those indicators selected for retention, modification and/or removal in the second round of feedback should retain their status quo. However, the final decision as to whether or not to retain indicators and items lay at the discretion of the primary researcher of this study, taking into consideration both the data collected from the stakeholders, service providers, community members and Delphi panelists

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as well as the researcher's experience in the community over the past six years. DeVellis (2012) asserts that the final decision to retain items should lie with the researcher, with the result being that the item retention criteria specified in one round could be altered in the next round at the researcher's discretion. This discretion of the researcher is guided by the ground-up approach, the literature review, data collected, the multiple opinions and rounds of the DCT, the defined area of study, and the researcher's own knowledge of the area.

Round two

In round two a summary of the indicator rankings from the various panelists as well as the assessment of recommended changes, modifications or deletions by panelists was collated. A summary of the merged results was then sent to each panelist to review and indicate whether they agreed or disagreed with the results. Panelists also had to confirm whether they agreed with the selection of indicators that were recommended to be added to the measure and those items that were flagged to be removed from the measure. Each indicator was scored on a 5-point Likert scale, from 'most important' to 'least important' (one indicating 'most important' and five indicating 'least important') and items that obtained the lowest mean score based on the ratings allocated by the Delphi panel review after this round, were eliminated. The indicators with the lowest combined mean scores were regarded as more relevant to the construct *willingness to participate* than indicators containing higher scores. The minimum score, maximum score, range, mean and standard deviation for each indicator was calculated. Indicators received mean scores ranging from zero to five. Items with a mean of below three and a standard deviation of below one were retained. Large standard deviations indicate a lack of consensus regarding the relevance of indicators. In contrast, indicators with a standard deviation below one indicated good consensus among reviewers regarding relevancy. Similarly, mean scores below three would indicate relevance, while scores above three would indicate a lack of relevance.

Panelists were in agreement with the collective results obtained in round one of the Delphi panel review. However, in this round, panelists also identified the gaps they were concerned

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about and provided their recommendations. For example, in the case study measuring *willingness to participate*, a recommendation was made for community participation to be viewed as a range of resources. These resources (to foster community participation) could be deployed differently within the overall project. Consideration could be given to recruitment of facilitators or fieldworkers, for example, as some individuals may be excellent trainees, while others may be more astute in positions of organisation, information technology, support, etc. Further suggestions included: having the presence of socially engaged community gatekeepers and leaders; clear and realistic short-term benefits of the intervention; on-going engagement with community social actors; opportunities for community actors to participate in public fora outside the community setting, and so on (see Ismail, 2018 for detailed results).

After discussions, the researchers agreed that some of the recommendations, for example, socio-economic status, gender and age, could be included in the demographic section of the questionnaire. It was also agreed that other recommendations such as the presence of socially engaged community gatekeepers and leaders or on-going engagement with community social actors, needed to be written up as part of the process of implementation and would not be included in the questionnaire. All decisions taken were based on practical expertise and application in the field, readings in the literature, and other case studies.

Once all the reviews from panelists were received, the next step was to group similar indicators together to form a set of overarching indicators from the literature and empirical data. This involved engaging with the datasets and literature until a single set of indicators emerged. During the researcher consultation meetings, all the suggestions made by the Delphi panel review with regards to the indicators in round one and two were discussed, changed, added or removed where necessary. This generated a further discussion on the researchers' part before a consensus on the indicators were reached. Thereafter, the principal researcher examined the set of overarching indicators which had been extrapolated from the literature and empirical datasets. In doing so, it was ensured that the indicators extracted from the literature and the empirical data reflected the comprehensive dataset (i.e. the literature,

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individual interviews and NGTs; see Ismail, 2018) accurately, as well as each indicator’s meaningful fit under the various domains. This process resulted in the reduction of forty indicators to fifteen indicators (see Table 3).

Table 3. Collapsed dimensions after round two reviewer ratings

Collapsed Dimensions of the Construct <i>Willingness to Participate</i>	
1.	Opportunity for personal growth
2.	Cater to the Community’s Needs
3.	Research Approach
4.	Community Perceptions
5.	Expectation and Motivation
6.	Incentives
7.	Competing Priorities
8.	Awareness
9.	Political Climate
10.	Participant-Interventionist Relationship
11.	Entertainment
12.	Personal Factors (i.e. negativity, disinterest, hopelessness...)
13.	Community Cohesion, Networks & Communication
14.	Empathy and feelings of responsibility for safety of children of others
15.	Social Support Systems

The first two rounds of the Delphi review panel produced and concluded with a number of dimensions which formed the foundation for the items developed. The end product was a pool of items that were developed to tap each of the 15 dimensions and these items were subsequently formulated for the draft version of the measure (see Ismail, 2018).

Round three

The third and final round centred around assessing the draft version of the questionnaire by focusing on item appropriateness and relatedness to the indicators outlined in Table 3.

In order to review the questionnaire format and item pool, the researcher sent a preliminary version of the questionnaire to the Delphi review panelists, for the third round of feedback. Panelists were once again sent an email with the information sheet of what was required of them and the draft questionnaire for their review. Panelists were asked to evaluate each item on the questionnaire for its relevance, the response format applicability, clarity, item wording and ambiguity (DeVellis, 2012). Panelists were also required to identify any redundant items, and if identified, panelists had to indicate whether these items should be removed, retained or revised. The Delphi review panel was further asked to insert any items they felt had been inadvertently omitted. The panelists also provided input on the tense of items and instructions for completing the questionnaire. In other words, qualitative content validity was determined based on item ambiguity, difficulty and/or irrelevance.

Each response option in the three areas in which the items were being reviewed was dichotomous in nature and thus had only two possible answers, that is, relevant or not; applicable or not; and retain or not. Due to the dichotomous nature of the review, items were eligible to receive scores ranging from one to two. The item scores were aggregated for each option and decisions on item relevance, response format applicability, and retaining an item were based on these scores. Scores were calculated in terms of minimum score, maximum score, mean and standard deviation for each item in the three areas under review. Since each item was scored dichotomously, items that received a high mean score based on the ratings allocated by the Delphi panelists were removed. Items with a mean of above 1.50 and a standard deviation below 1 were retained. Large standard deviations indicated a lack of consensus regarding the relevance, appropriateness of response format and retention of items. In contrast, indicators with a standard deviation below 1 indicated good consensus among reviewers regarding relevancy of items, the appropriateness of the response format and the

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likelihood of retaining items. Similarly, mean scores below 1.50 indicated lack of relevance and appropriateness of response format and pointed to the removal of the item, while scores above 1.50 indicated relevance and appropriateness of the response format and the retention of items. Thus, items with a 75 percent majority agreement (a mean of 1.5 and above) across the three areas of review were included in the final draft of the questionnaire.

Even though only one item was identified for removal from the questionnaire, panelists also completed a qualitative component where general comments and recommendations were made with regards to items. While the vast majority of panelists stated that they were generally satisfied with the items in the questionnaire, a few participants reported issues relating to question difficulty ($n = 2$); phrasing of items ($n = 3$) and inclusion of additional items ($n = 1$). The general comments on the items and overall questionnaire indicated that panelists were satisfied with the questionnaire. Based on the ratings and feedback by panelists (see Ismail, 2018) in the three areas of review as well as recommendations made by the Delphi panel review, items were grammatically corrected, rephrased or reworded, replaced, removed or added.

A few recommendations were made by the Delphi panel review that did not result in changes. The recommendations were discussed with an expert in the field of instrument development as well as with a fellow researcher who concurred that these recommendations should not result in changes. Two panelists suggested that certain items were repetitive or similar in nature and could be removed. Consultation on this matter with a fellow researcher indicated that items were there to allow for the testing of response bias. It was agreed that the items were to remain in the questionnaire for further analysis. Two panelists also stated that they found some questions contradictory, and these items were also retained in the questionnaire for further analysis. The apparent contradiction emanated from the individual interviews with community members and the NGTs with community members, stakeholders and community leaders, which resulted from scalar opposites (see Ismail, 2018).

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Once the final analysis of the feedback of the Delphi panel review had been concluded, the draft version of the questionnaire was compiled and consisted of 46 items (44 items met inclusion criteria, one item was recommended to be removed but was retained for the validation phase, and one item was added on recommendation from the Delphi panel review). See Ismail (2018) for a draft version of the questionnaire.

ETHICAL PRINCIPLES RELEVANT TO DCT

When there is contact and interaction between the researcher and the people that they are studying, the researcher is guided by particular ethical principles (Department of Health, 2004) in order to protect the rights and well-being of these individuals. These ethical principles serve as a benchmark for researchers to evaluate their conduct within a study (Strydom, 2005).

Reflexivity

A vital component of qualitative research is the notion of situating oneself as the researcher and making the research process more visible and open to scrutiny. Even though studies might only be in part qualitative in nature, as with all other qualitative techniques, it is advisable for the researcher to remain reflexive regarding his/her own bias in the selection of participants, in the formulation of questions and in the interpretation of results from the different rounds (researcher contribution to the construction of meaning throughout the research process). Researchers need to be mindful of their positionality, reflexivity, and the production of knowledge and the power relations that were inherent in the research process (Sultana, 2007).

CONCLUSION

This chapter illustrated the process, utility and value of the DCT utilising a CBPR approach in instrument development. This approach affirms community-centred voices and cultural articulations alongside academic experts in the instrument development process, allowing for the construction of culturally sensitive and contextually congruent and relevant assessment

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measures. The chapter demonstrates how community-engaged DCT promotes transparency and accountability, power-sharing and shared responsibility amongst the researchers and Delphi panel comprising academics and community members in the instrument development process. The chapter further shows how using a ground-up approach in the research design affirms and allows access to local knowledges that engenders the co-construction of knowledge production from a plurality of sources.

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