

The Application of Mixed Methods Designs to Trauma Research

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Despite the use of quantitative and qualitative data in trauma research and therapy, mixed methods studies in this field have not been analyzed to help researchers designing investigations. This discussion begins by reviewing four core characteristics of mixed methods research in the social and human sciences. Combining these characteristics, the authors focus on four select mixed methods designs that are applicable in trauma research. These designs are defined and their essential elements noted. Applying these designs to trauma research, a search was conducted to locate mixed methods trauma studies. From this search, one sample study was selected, and its characteristics of mixed methods procedures noted. Finally, drawing on other mixed methods designs available, several follow-up mixed methods studies were described for this sample study, enabling trauma researchers to view design options for applying mixed methods research in trauma investigations.

The methods in trauma research are well suited for mixed methods research. Mixed methods is defined as a research procedure involving the collection, analysis, and integration (or combination) of both quantitative and qualitative data to answer research questions (Creswell & Plano Clark, 2007). Trauma research has traditionally emphasized quantitative data collection, e.g., through the PTSD Checklist (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996), the National Women's Study Post-traumatic Stress Disorder module (Ruggiero, Rheingold, Resnick, & Kilpatrick, 2006), the Harvard Trauma Questionnaire (Igreja, Kleijn, & Richters, 2006), and the Posttraumatic Diagnostic Scale (Foa, 1995). At the same time, trauma therapists often employ qualitative data collection and analysis, through gathering individual stories, active listening skills, employment of observational skills, and discerning trends and patterns (Ogden, Mintor, & Pain, 2006; Scaer, 2005). The trauma field is one specialty within the larger health sciences that has increasingly embraced qualitative methods to augment the gold standard of randomized controlled trials (Barbour, 2000; Giacomini & Cook, 2000; Malterud, 2001). Indeed, the health sciences are incorporating qualitative research as part of mixed methods studies in diverse areas such as family medicine (Borken, 2004), nursing (Andrews & Halcomb, 2008; Morse, 1991), palliative care (Wallen & Berger, 2004), and mental health (Rogers, Day, Randall, & Bentall, 2003).

Mixed methods studies have begun to appear in trauma research investigations as well (Banyard & Williams, 2007; Evans, Ehlers, Mezey, & Clark, 2007). A review of *Journal of Traumatic Stress* articles over the 2 years (2007, 2008) found four published articles that incorporated both quantitative and qualitative data sources. However, a general review of these mixed methods trauma studies as well as others in health sciences journals (Arditti, 2003; Feeney & Yivisaker, 2003; Gaskell, 2007; Igreja et al., 2006; Jones & Kafetsios, 2005; Monneuse et al., 2008; Yassi et al., 2004) indicated that these studies are not called mixed methods, do not use explicit systematic mixed methods procedures, and have not been analyzed to use as models for designing mixed methods research on trauma topics. Thus, in this article we identify the core characteristics of mixed methods research, describe four select designs widely used in the mixed methods literature, and highlight for analysis one mixed methods trauma study. Finally, we present follow-up mixed methods studies to this example study to illustrate four additional designs that might be possible in trauma research.

CORE CHARACTERISTICS OF MIXED METHODS RESEARCH

Mixed methods research originated 20 years ago through books and journal articles in the fields of evaluation, sociology,

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education, and management (Creswell, 2009). With the publication of a major handbook in the area (Tashakkori & Teddlie, 2003), the term *mixed methods* became standardized because of the mixing or integrating of both quantitative and qualitative data rather than keeping the data strands separate as in multiple method or multimethod research. Less standardized has been the view of writers about the characteristics of mixed methods. Some individuals focus on mixed methods as a “method” and view the collection, analysis, and integration of quantitative and qualitative data as a clear and concrete way to understand the process. Others view the integration more broadly as combining quantitative and qualitative approaches methodologically across the spectrum of research processes, such as from the philosophical assumptions to the interpretation of the results (Teddlie & Tashakkori, 2009). Still others highlight the broader philosophical assumptions that provide a foundation for this form of inquiry (Greene, 2007). Recognizing that other perspectives offer useful entry points for understanding mixed methods, the approach taken in this discussion will be a method orientation (Creswell & Plano Clark, 2007).

From a method perspective, mixed methods research has several essential characteristics. First, it involves the collection and analysis of both quantitative and qualitative data. Although many discussions exist in the literature about what constitutes these types of data, a useful distinction exists in whether the investigator collects open- or closed-ended data (Creswell, 2008). Instrument data with closed-ended response categories would clearly be quantitative data, whereas interview-focus group data with open-ended responses to interviewer questions would be qualitative data. Granted, some forms of data may be both, depending on the use of open- or closed-ended responses, such as interviews, observations, and chart audits. Second, the quantitative and qualitative data collection must be rigorous and follow procedures for good research designs, such as selection criteria, sampling, sample size, multiple sources of data, and other concerns such as fidelity of procedures, and access and permissions (Creswell, 2008). Data analysis as well should be conducted using rigorous procedures in recording data, inspecting it, analyzing it, representing it in tables and figures, and drawing interpretations from it.

Third, a central component of mixed methods research is the integration (or combination) of quantitative and qualitative data. In mixed methods terms, this procedure is called *mixing*, and it can occur in three ways: merging, connecting, or embedding (Creswell & Plano Clark, 2007). Merging means that the distinctiveness of each database dissolves. For example, a discussion section in a journal article will first report quantitative statistics about a trauma construct and then provide supportive qualitative themes or quotes that will confirm or disconfirm the statistical results. Called a *side-by-side comparison* (Creswell & Plano Clark, 2007), the unique forms of both sets of data dissolve into a discussion section. At a more complex level, merging might assume the form of a table (called a *joint matrix* in the mixed methods literature) in which a quantitative categorical variable (e.g., type of provider) is

arrayed against qualitative themes (e.g., themes about alternative ways of using intake-screening forms). In effect, the tables present a merger of the two databases. Another form consists of counting qualitative themes (called *data transformation*) and merging the converted qualitative database into the quantitative data collected in a study. Connecting means that the results from one database are used to inform the data collection procedures of a second database. For example, a trauma researcher might first conduct a survey of a random sample of a population, analyze the results, and then use the results to purposefully select individuals and to identify appropriate questions for a follow-up qualitative study. Embedding means that an investigator nests a supportive database within a major database for augmenting the major database. For example, a trauma researcher embeds a small qualitative database (e.g., focus group interviews) into a clinical trial prior to the experiment so that detailed information about the participants can be gathered and used to design a workable intervention.

These mixing possibilities lead to a fourth characteristic about the implementation of the two databases. The databases can be implemented concurrently and independently at the same time in the study or implemented sequentially with one form of data building on the other. In addition, the emphasis placed on each database may be equal or different in a study. Determining the amount of emphasis is certainly a subjective assessment, but readers of mixed methods studies can assess this criterion by looking at factors such as the amount of detail brought to the quantitative and qualitative procedures, whether the study begins from a deductive or inductive theoretical drive (Morse & Niehaus, in press), or simply the extent of the discussion of the quantitative and qualitative arms in a mixed methods study.

SELECT MIXED METHODS DESIGNS

These characteristics can combine to form designs that provide procedures for conducting mixed methods studies. Many design typologies have been advanced in the literature (see Creswell & Plano Clark, 2007, for 12 typologies), and more recent design possibilities are suggested by Teddlie and Tashakkori (2009) and Morse and Niehaus (in press). For this discussion, we suggest a parsimonious set of four that can be applied in trauma research.

A concurrent design (or triangulation or parallel) has been so-named because the investigator collects both quantitative and qualitative data simultaneously (i.e., at roughly the same period in a single phase) in the study. Both forms of data are then analyzed separately, and the results are merged in the results or in the interpretation. Because both forms of data are collected concurrently, this design is considered a single-phase study. Typically, both forms of data are given equal emphasis in the study. An example would be to collect both survey and focus group data on the concept of retraumatization, and to examine how the trends in the quantitative data and the more detailed quotes from the qualitative focus groups serve to corroborate the evidence, diverge,

or contradict each other. The intent of this design is to understand a construct from the perspective of two different types of evidence. The mixing in this design requires the investigator to merge the two databases using one of the merging procedures as identified earlier: side-by-side comparisons, joint matrices, or data transformation. The merging discussion appears towards the end of the study in the Results or Discussion section.

An explanatory sequential design means that the investigator first gathers and analyzes quantitative data, and then uses a qualitative follow-up data collection and analysis to help explain the quantitative results. Explaining initial results and using a sequence of procedures gives this design its name. This type of study is considered a two-phase study. For example, in the first phase, the investigator might select an instrument to measure the construct of retraumatization, and administer the instrument to a sample of a population. This administration could be a correlational or survey design. The investigator then uses a second, qualitative phase 2 to help explain the quantitative results about retraumatization from phase 1. This type of study is often quantitatively driven and the quantitative phase is emphasized. Typically, mixed methods researchers examine the results from phase 1, and use the information to purposefully select participants for the phase 2 data collection and to specify the types of questions for the phase 2 qualitative procedures. Because the intent is to explain the phase 1 results in more detail, the participants chosen for phase 2 are a subset of the phase 1 individuals. The mixing in this design involves connecting the data analysis procedures of the quantitative phase 1 with the qualitative data collection procedures of phase 2. Investigators using this design need to consider carefully what quantitative results need follow-up, such as significant or nonsignificant findings, outlier cases, group comparisons, or important demographic variables.

An exploratory sequential design reverses the phases of the explanatory sequential design. In an exploratory sequential design, the intent of the research initially is to explore a construct because it is not adequately addressed in the literature, is poorly measured or conceptualized, or is being studied in a population for which the research questions are unknown. After the initial qualitative exploration, the investigator follows up with a quantitative data collection phase to determine if the qualitative findings can be generalized to a sample of a population. This is a two-phase project: the initial exploration of the sequential nature of data collection provides the name for this design. A popular application of this design is to use these procedures to design, develop, and test an instrument with sound psychometric properties (Vogt, King, & King, 2004). This type of design is often qualitatively driven by the first phase, although the second quantitative phase may be emphasized as well. The investigator mixes the data from the initial qualitative findings in phase 1 to the quantitative data collection of phase 2. It is at this point of interface (Morse & Niehaus, *in press*) that researchers need to assess carefully what findings to build into the quantitative phase, and to then use the findings in

a rigorous procedure that will best assess the generalizability of the qualitative findings. For example, when using this design to develop a new instrument, researchers can use quotes for items, codes for variables, and themes for scales in designing an instrument. Then the researchers employ rigorous scale development procedures addressing content and construct validity and reliability considerations (DeVellis, 2003).

The final design is an embedded design. This design is popular in clinical trials in the health sciences (see Creswell, Fetters, Plano Clark, & Morales, 2009). It involves embedding a supporting database collected using one form of data in a larger study that employs a different form of data. A prime example of this would be a clinical trial in which qualitative data are embedded (or nested) within a larger experimental trial. Variations would be a longitudinal correlational study with a smaller qualitative component or a larger qualitative study (e.g., an ethnography) with a supportive, smaller quantitative database. Using the experimental design as a model, an investigator collects qualitative, personal data before the experiment begins to help design the intervention, obtains qualitative data during the experiment to assess the "process" experiences of experimental participants and augment the "outcome" experimental data, or after the experiment to help explain the outcomes (Sandelowski, 1996). In this way, the qualitative data flow (or are embedded, thus providing the name for this design) into the trial concurrently or sequentially. The emphasis in such a study is placed on the major design of the study, such as the experiment, and the mixing of the data can either be sequentially (before or after the experiment) or concurrently during the experiment.

Each design could be discussed more extensively if space permitted. However, Table 1, includes some additional information about each design. An investigator can design a mixed methods research question that responds to the overall intent of the design being used (see Creswell & Plano Clark, 2007). In all mixed methods studies, the investigator needs to advance quantitative hypotheses or research questions and qualitative central questions and subquestions. In addition, a mixed methods question can also be advanced, a new type of research question not found in standard methods texts. Table 1 provides examples of types of questions being asked with each mixed methods design. In addition, the data presented in this table suggests that the type of quantitative and qualitative research design might differ (Creswell, 2008) depending on the mixed methods approach. Although this point might be argued from the perspective of specific methods (e.g., focus groups, one-on-one interviews, observational checklists, attitudinal instruments; see Morse & Niehaus, *in press*), this discussion highlights broader types of designs. For example, the major designs in quantitative research are surveys, experiments, and correlational studies, whereas those in qualitative research are narrative studies, phenomenology, grounded theory, ethnography, and case studies (Creswell, 2007, 2009). This table also focuses on methodological and validity issues attendant to each type of design. Methodological discussions about types of mixed methods designs are beginning to

Table 1. Additional Elements of Four Mixed Methods Designs

	Concurrent design	Explanatory sequential design	Exploratory sequential design	Embedded sequential/concurrent design
Type/Example of mixed methods question	Quantitative and qualitative results compared: Do the quantitative and qualitative results converge, diverge, or present contradictory evidence?	Qualitative data collection helps explain quantitative results: How do the qualitative findings help to explain the quantitative results in more depth?	Initial qualitative exploration leads to improve quantitative data collection and results: Can the qualitative themes be generalized to a sample of a population?	A supportive database enhance a major database: How does qualitative data added to an experiment improve/enhance the experimental findings?
Designs suitable	Qualitative: grounded theory, case study Quantitative: survey, correlational, experiment	Quantitative: survey, correlational, experiment Qualitative: case study, grounded theory	Qualitative: case study, phenomenology Quantitative: survey, correlational	Quantitative: experiment, correlational Qualitative: case study, phenomenology
Validity/Methodological issues	Unequal sample sizes; Divergent, contradictory information; Lack of parallel quantitative and qualitative measures	Inadequate selection of participants for follow-up; Inadequate use of quan results for follow-up	Inadequate use of quantitative results in qualitative follow-up; Using less-than-adequate rigorous procedures in quantitative follow-up (e.g. poor scale development)	Concurrent design (issues attendant to concurrent design, bias introduced); Sequential design (issues attendant to sequential designs, bias introduced)
Advantages of design	Makes sense intuitively; Efficient for data collection; Provides multiple “angles” on a problem	Easily conceptualized in phases; Manageable for single researcher; Quantitatively driven	Easily conceptualized in phases; Manageable for single researcher; Qualitatively driven	Permits use of qualitative within experimental designs; Improves major design (e.g., experiment, correlational study)
Disadvantages of design	Quantitative and qualitative results may diverge, be contradictory; Extensive data collection	Phases take time; Not qualitatively driven	Phases take time; Not quantitatively driven	Devalues supporting database in supporting role; New, underconceptualized

emerge in the field of mixed methods research (see Creswell, Plano Clark, & Garrett, 2008). Rigorous mixed methods studies require that investigators attend to quantitative validity (threats to internal validity, external validity, and design validity) as well as qualitative validity (trustworthiness, authenticity, member checking, and so forth; see Creswell, 2009). However, validity discussions in mixed methods also relate to specific forms of validity issues that arise from the procedures used in mixed methods. Some of these issues are highlighted in Table 1. A more extensive discussion of mixed

methods validity issues can be found in Onwuegbuzie and Johnson (2006).

MIXED METHODS DESIGNS IN TRAUMA RESEARCH

To explore the design and procedures in trauma mixed methods studies, a search was conducted in the trauma research literature. The words “trauma,” “qualitative,” and “quantitative” were used as search terms to explore PsychInfo (<http://www.apa.org/psycinfo/>),

PubMed (<http://www.ncbi.nlm.nih.gov/pubmed/>), and PILOTS (<http://www.ptsd.va.gov/professional/pilots-database/pilots-db.asp>) databases. From a review of articles published from 2003–2008 the search netted 29 mixed methods studies in PsychInfo, 14 in core clinical journals of PubMed, and 23 in PILOTS. Many studies overlapped in these three databases and there were 49 unique studies identified. A preliminary review of these articles indicated a frequent use of the explanatory sequential design, an example of which is a study by Banyard and Williams (2007) on functioning resilience for women coping from child sexual abuse. This study was selected for close inspection because it illustrated this type of design.

A Sample Study

The Banyard and Williams (2007) study was a quantitative longitudinal study of 61 women with a qualitative follow-up with 21 of the 61 who survived childhood sexual abuse and evidenced resilient functioning across 7 years of adulthood. The quantitative data was collected in two waves, in 1990 and then again in 1997. At each point, a 13-item scale was computed to assess functioning resilience to trauma. This scale was based on (a) the Trauma Symptom Checklist (TSC-40; Briere & Runtz, 1989) and subscales on anxious arousal, depression, anger, disassociation, and others; (b) a self-esteem scale (Middlesex Hospital questionnaire; Bagley, 1980); (c) a history of severe illness or surgery after age 17; (d) current drug or alcohol use; (e) friendships and relationships with men; (6) sexual functioning; (7) biological children living with the participant; (8) abuse of participants' children; (9) friendships with women; (10) social activity; (11) self-reported arrests; (12) income level; and (13) fulltime working status. The authors also collected quantitative data on correlates of resilience: optimism and life satisfaction, coping, and social connections. They further gathered quantitative data about traumatic life experiences between 1990 and 1997. Results showed that resilience was a good predictor of resilient functioning, and the women's resilience tended to be stable between the data collection points of 1990 and 1997. What seemed to lower resilience during this period was the retraumatization of participants. However, those who improved in resilience had positive connections with others, networks of social support, and involvement in their communities.

Based on these quantitative results, the authors next conducted qualitative follow-up interviews with 21 of the women to understand their resilience. The authors did not comment on whether they were blind to the quantitative findings, but in this type of sequential design, the intent is to develop a nuanced understanding of the quantitative findings through the qualitative data. The interview questions focused on the process of recovery and the turning points that led to recovery in the lives of the women. Some of the themes to emerge related to spirituality, social support, and opportunities in the environment.

Model 1: Sequential Qualitative Follow-Up to a Quantitative Study

As an explanatory sequential mixed methods design, the qualitative interviews were used to help explain the quantitative results. This study is considered a mixed methods investigation in that the investigators collected both quantitative and qualitative data and mixed the data through connection between the quantitative and qualitative phases. Although the authors did not provide a diagram of their procedures, one can be drawn based on the mixed methods notation advanced in the literature (Ivankova, Creswell, & Stick, 2006; Morse, 1991). As seen in Figure 1, the diagram for Model 1 contains several elements. The design consists of two major phases, a quantitative phase followed by a qualitative phase. Arrows indicate how one phase builds on the other. The labels QUAN and QUAL are placed in capital letters to indicate that both forms of data are given equal emphasis in this study. Specific procedures are bulleted to indicate both data collection and data analysis. An interpretation is provided at the end of the study, and this interpretation is introduced in the same sequence as the design with the quantitative results summarized first, followed by the qualitative findings. Finally, the procedures are detailed below the major steps to provide readers with the activities accomplished in each phase. A diagram such as Figure 1 can be used for several purposes, such as conveying the procedures in a journal article, specifying the steps in a proposal for funding, or presenting a complex mixed methods design to a conference audience.

Model 2: Sequential Quantitative Follow-up to a Qualitative Study

Assume that investigators want to follow-up the Banyard and Williams (2007) study with another mixed methods project using a different design. This design is Figure 2, Model 2, an exploratory sequential mixed methods design, in which the investigators start with qualitative data collection and analysis and build on the results with quantitative data collection and analysis. As shown in this figure, the follow-up project has a study aim of understanding resilient functioning by building on the qualitative themes that emerged during the initial study. The themes of spirituality, social support, and opportunities in the environment were key findings to emerge and they are placed in the initial qualitative phase 1 in this model. Instead of stopping at this qualitative theme development phase, the researchers want to use these qualitative themes to develop an instrument for determining whether the themes can be generalized to a large sample of trauma clients. Thus, the qualitative themes of phase 1 become a starting point for designing a good psychometric instrument to measure positive functioning in phase 2. The instrument design follows good procedures for scale construction (DeVellis, 2003). In phase 3, this instrument would be tested with a large sample of a population in a quantitative phase of the study.

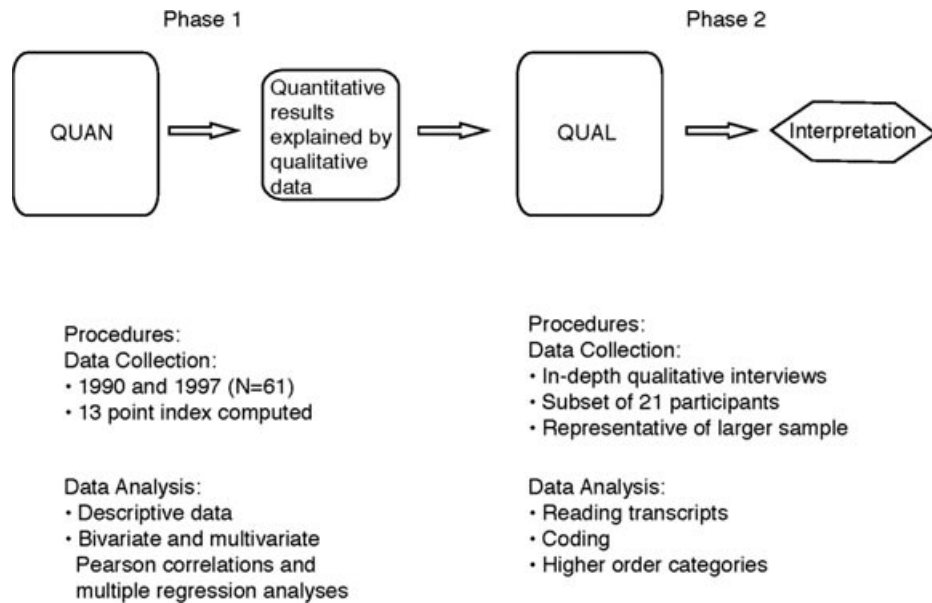


Figure 1. Model 1: Explanatory sequential design (as illustrated by Banyard & Williams, 2007). QUAN = quantitative; QUAL = qualitative.

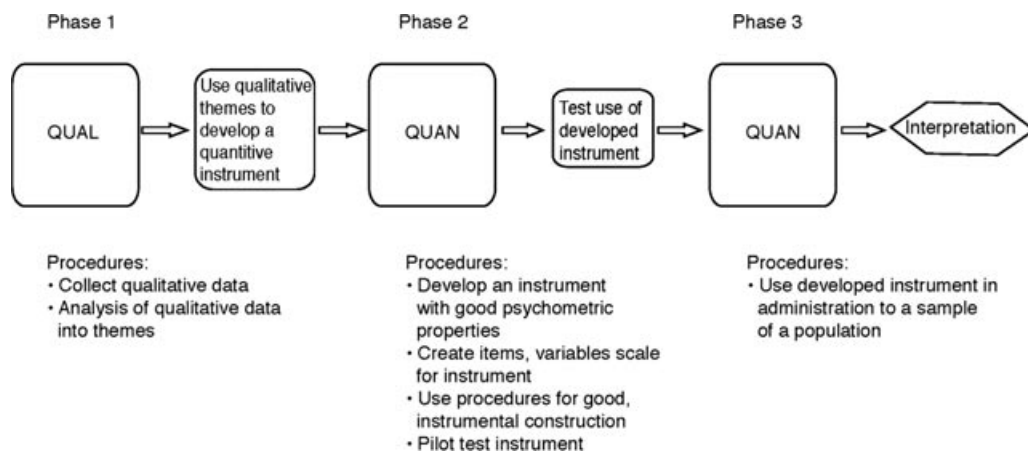


Figure 2. Model 2: Exploratory sequential design (modified from Banyard & Williams, 2007). QUAN = quantitative; QUAL = qualitative.

Thus, this design involves collecting both qualitative and quantitative data, and connecting the two datasets by using the findings from the qualitative phase to develop a quantitative instrument.

Model 3: Concurrently Merging Quantitative and Qualitative Data

Another hypothetical study can be designed to follow the sample study that will illustrate a Concurrent Design, as shown in

Figure 3, Model 3. Assume that the followup study aims to understand resilient functioning in more depth. The intent in this Concurrent Design is to use the strengths of both quantitative and qualitative data to establish a combined analysis of resilient functioning. As shown in Figure 3, the investigators collect both instrument data and open-ended interview data at the same time with participants from the same population (e.g., a within-subjects design) to assess positive functioning. The investigators need to find an instrument to measure positive functioning (or develop such as instrument as in Model 2). The quantitative arm of this

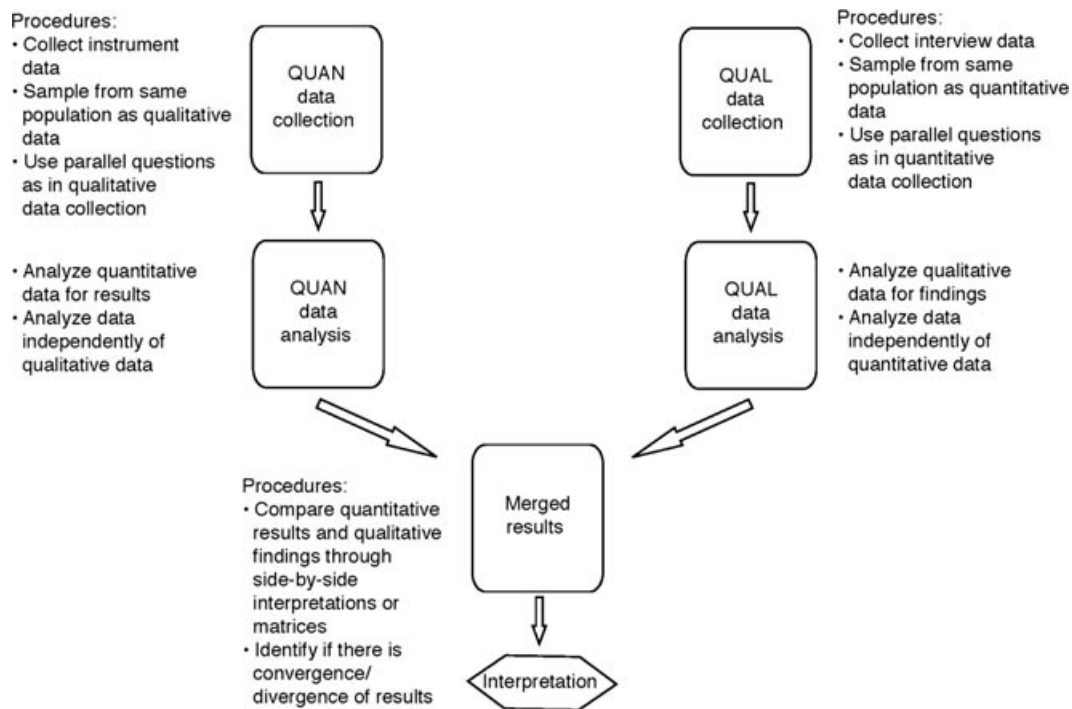


Figure 3. Model 3: Concurrent or triangulation design (modified from Banyard & Williams, 2007). QUAN = quantitative; QUAL = qualitative.

research, such as scales on the instrument measuring community support, become the basis for asking open-ended qualitative interview questions in the qualitative arm of the study. In effect, parallel questions are used for both arms of the study. Next, the investigators gather the instrument and interview data on positive functioning, and analyze both datasets independently. Then they merge the results in order to examine whether the results from both databases are similar, dissimilar, or contradictory. This merging might occur by comparing the results from both databases side-by-side in an interpretation, or it might assume the form of matrices that combine themes from the interview data with key questions from the instrument (e.g., different types of positive functioning). In this way, the follow-up concurrent design provides a more complete understanding of positive functioning than that provided by either the instrument or interview data alone.

Model 4: Embedding Qualitative Data Within an Experiment

Another follow-up mixed methods study would be to conduct a clinical trial embedding qualitative data and analysis into the trial, an embedded design. As shown in Figure 4, Model 4, an experiment with pre- and posttest measures and an intervention are

located at the center of this design. Before the experiment begins, the investigators collect and analyze qualitative data. They also gather and analyze qualitative data after the experiment has concluded. The before-trial qualitative data on positive functioning helps to design the intervention on positive functioning, such as an educational program for women on the importance of community support. Then, based on the designed intervention, women who have experienced trauma are assigned to experimental and control conditions. Both groups would complete an instrument measuring positive functioning before the experiment begins and at the conclusion of the experiment. The intervention would be given to the experimental group. After the experiment has been completed, the outcome measures of positive functioning would be assessed to determine if the intervention made a significant difference in scores between the two groups. The researchers at this point would have statistical data to confirm or disconfirm the hypothesized impact of the intervention. However, the quantitative data provide only a rough indicator as to why the intervention worked or did not work. Qualitative interviews would be gathered in the final phase to assess why the results occurred, and to provide a fine-grained understanding that the instrument data may not yield. Thus, the investigators decided to use qualitative data to help inform the design of the intervention as well as to follow-up on the quantitative outcomes in order to explain the results.

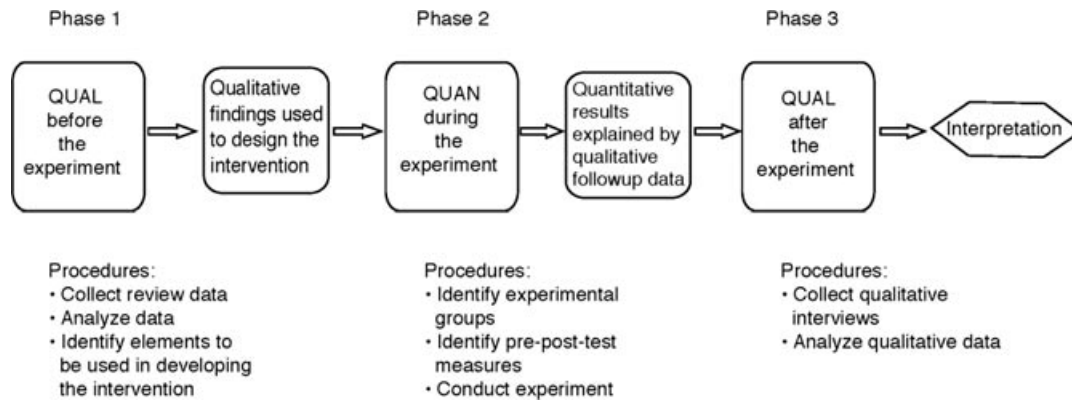


Figure 4. Model 4: Embedded design (modified from Banyard & Williams, 2007). QUAN = quantitative; QUAL = qualitative.

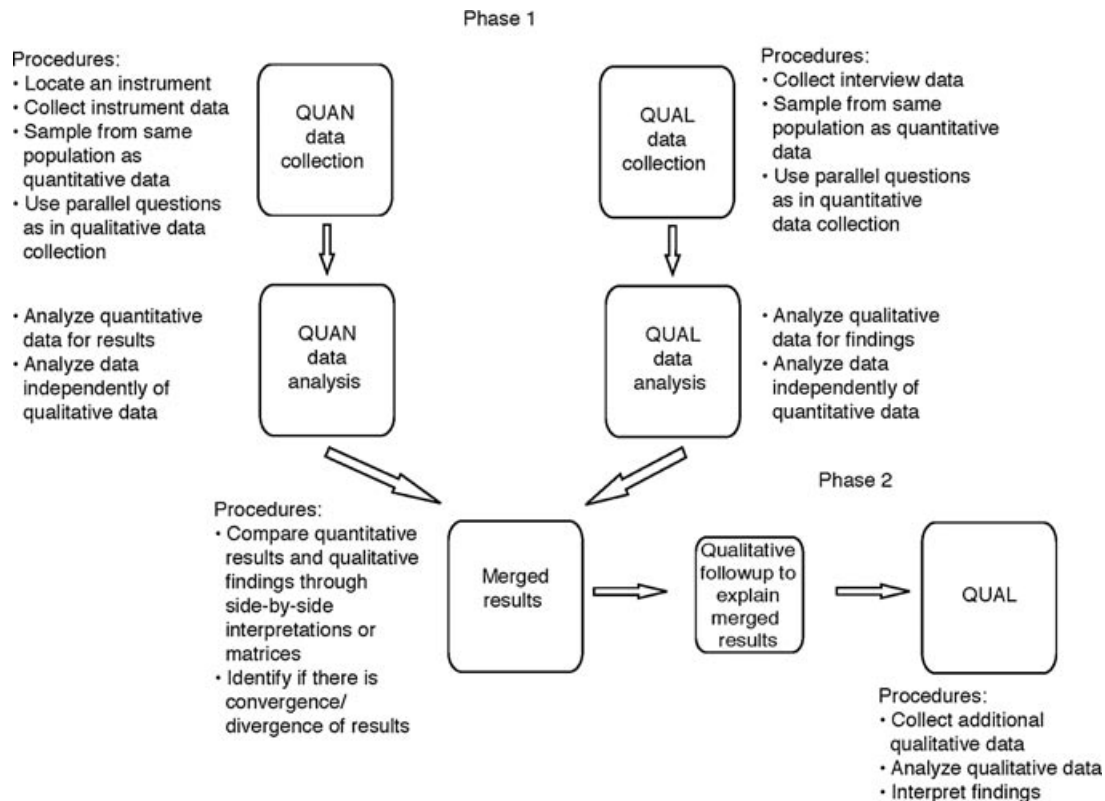


Figure 5. Model 5: Combined concurrent and sequential design (modified from Banyard & Williams, 2007). QUAN = quantitative; QUAL = qualitative.

Model 5: Combined Concurrent and Sequential Data Collection

Figure 5 illustrates a final mixed methods design possibility: a combined concurrent and sequential mixed methods design. This

is a more complex design than earlier models in that it combines both concurrent and sequential components. Thus, phases of the research illustrate both merging concurrently quantitative and qualitative data as well as employing sequentially one form of data to explain an initial database. This design requires more

resources and time than a one- or two-phase project. As a follow-up to the original sample study, phase 1 in this design involves collecting both instrument data and interview data about positive and negative functioning from individuals representing the same population. This phase requires locating an instrument to measure positive and negative functioning (or using Model 2 to design one) and concurrently gathering interview data assessing parallel concepts in the qualitative interviews as the constructs being measured with the instrument. This phase is followed sequentially by a second qualitative phase (using the same or a subset of individuals participating in phase 1) in which any differences, similarities, or contradictions from merging the two databases in phase 1 are explored to explain differences and similarities in the results. This design requires that the investigator be familiar with both concurrent and sequential models, recognize the role each plays (comparing data and building on data), and have resources available to conduct multiple research phases. This design is more advanced than the others, and may require a team effort to collect the many forms of data. The multiple stages of design in this model are typical of designs carried out within large funded projects and evaluation studies (Morse & Niehaus, in press).

SUMMARY

The basic content of the Banyard and Williams (2007) trauma study can be supplemented with additional mixed methods studies to illustrate different designs. The five designs mentioned in this discussion, of course, do not exhaust the possible variants within mixed methods (see Creswell & Plano Clark, 2007, for 10 variants). As applied to trauma research, however, these designs build upon a need to bridge research and practice in addressing trauma issues. Despite the dominance of quantitative methods in trauma research, the field can profit by incorporating qualitative data and incorporating it in a way that respects both quantitative and qualitative approaches. Of the mixed methods trauma studies found in a literature review, the explanatory sequential design was the most popular design used. In this design, qualitative data are used to help explain preliminary quantitative results. This model makes sense in that the quantitative data provide only a rough indicator of trends and a follow up with qualitative data can explore in more detail why the trends might have occurred. However, other design possibilities might be considered by trauma researchers, designs with other outcomes and intents such as exploring initially to develop measures that might not be available in the literature, merging the quantitative and qualitative data to provide a more complete understanding of a problem, embedding qualitative data in an experimental trial to generate a useful intervention or to explain the experimental results, or engaging in qualitative data collection to help explain the potential differences that may occur between instrument responses and interview comments.

The larger message here is that although the trauma research field has already begun using mixed methods approaches, a need

now exists to explore the array of possible procedures that hold promise for rigorous designs. This discussion could be enhanced by a more thorough review of mixed methods trauma studies, and a more indepth analysis of methodological and validity issues. No attention has also been given in this discussion to important topics such as ethics, the philosophical assumptions that provide a foundation for mixed methods research, and the specific designs (see Greene, 2007). Also, the adaption of qualitative software programs (such as MAXQDA, see Kuckartz, 2007) for qualitative grounded theory design use has already begun (Corbin & Strauss, 2008). It is a matter of time before applications designed for mixed methods data analysis will begin to emerge from software developers (Creswell & Plano Clark, 2007). However, future research can address these issues in more depth and provide methods that extend procedures familiar to trauma researchers. Despite these needs, this discussion maps the core elements that researchers might consider in designing trauma-focused, mixed methods studies, and hopefully encourages investigators to apply mixed methods to trauma research.

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