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## **Methodological Triangulation in Nursing Research**

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### **1. Introduction: Nursing Research and the Philosophy of Science**

Comforting a patient at the bedside, taking a blood pressure in the examining room, or instructing a new mother about breastfeeding, nurses are omnipresent in contemporary health care. Few realize that this frontline work is supported by an autonomous research discipline. Nursing research addresses theoretical and practical problems important to clinical nursing practice. The research domain thus encompasses the full range of human responses to health and illness, including biological and physiological manifestations as well as the emotional, motivational, psychological and social facets of illness. The breadth of these questions motivates the use of a wide range of scientific methods. Because nursing exists within a health care tradition heavily imbued with biomedical theorizing, the methods of epidemiology and the biological sciences have been important tools. Nursing is also interested in human response to illness — what the illness means to the patient — and this motivates the use of interpretive approaches akin to ethnography. Sociological methods of survey and interview are also widely deployed. Nursing thus overlaps methodologically with a number of other disciplines.

The use of methods drawn from both the natural and the social sciences raises a number of philosophically interesting issues. Some of these are being debated by nursing researchers themselves, and this essay will take its point of departure from one such debate. Nurse researchers confront phenomena that admit of, and perhaps require, the application of several different methodologies. The study of patient responses to stress, for instance, may proceed through

physiological assays (analysis of saliva samples, for instance) or through in-depth interviews with the patients. “Methodological triangulation” is the use of two or more different kinds of methods in a single line of inquiry. Nurse researchers have asked about the relationship between these different methods. Must different kinds of method support different kinds of theory, and thus produce two distinct views of the phenomenon? If so, then a study based on “triangulation” is nothing more than two studies packaged as one. Alternatively, can different methods be integrated into a single, unified inquiry? If so, then methodological triangulation might yield results that could not be obtained by either method alone.

There is a clear parallel between these questions and one of the central issues in the philosophy of the social sciences: the relationship between the “natural” and the “social” sciences. One side of this longstanding discussion is that the natural and social sciences are methodologically distinct. This view has been called “methodological separatism” (Henderson 1993). For a variety of reasons, separatists have held that human beings and human societies require methods of inquiry that are different from those methods used to study the non-human world (Collingwood 1946; Davidson 1984; Dilthey 1996; Taylor 1971; Winch 1958). The issue is not about the legitimacy of the social sciences — a separatist holds that methods of the human sciences are as epistemically legitimate as those of the natural sciences. The question is whether there is a natural divide among kinds of methods and the theories they support.

In the debate over methodological triangulation, some nurse researchers have adopted a separatist position concerning the use of different methods in nursing research. On a separatist view, interviews with patients under stress produce a very different kind of theory than, say, an epidemiological analysis of their saliva samples. At best, the two are complementary theories of a complex phenomenon. Others have rejected separatism, holding that widely different methods can be productively combined in a unified study of a phenomenon like stress or pain. In this essay, we

will begin with a close look at the debate over methodological triangulation as it arises in nursing. Then, we will make explicit some of the philosophical presuppositions that underlie the debate. Parties to this debate share a view about the structure of an empirical theory, and corresponding presumptions about how theories are confirmed by evidence and how they are related to background assumptions. These views have been subject to criticism in the philosophy of science, and we will bring the results of this criticism to bear on the nursing debate. We will argue that if some underlying assumptions are modified, the debates about triangulation can be resolved. This conclusion is not only of interest to nursing researchers. In the concluding section, we will suggest that it has ramifications for the way that philosophers think about how the “natural” and “social” sciences are related.

## **2. The Methodological Triangulation Debate**

Nurse researchers have traditionally divided their methods into two kinds: quantitative and qualitative. Roughly, qualitative methods are interpretive and textual. Examples of qualitative methods would include passive observation of the way in which patients and their families interact, participant observation of nurses and patients in a particular hospice, open-ended interviews with patients, or the analysis of patient diaries. Quantitative methods are drawn from the natural and biological sciences. They include statistical analysis of procedure outcomes, biological markers, or questionnaires. Data for a typical quantitative method is expressed numerically and is collected by some means of measurement. The debate over methodological triangulation in nursing has focused on the relationship between “qualitative” and “quantitative” methods.<sup>i</sup> Before jumping into the debate, it will be helpful to have some examples of the ways in which nurses have triangulated with these different kinds of method.

Qualitative research methods are often used to explore a phenomenon that has not been previously well described. The results are then used to develop survey instruments. The survey

instruments yield results that can be analyzed statistically. Fleury's research provides an example (1991; 1993; 1998). Fleury focuses on the concept of self-regulation in relation to cardiac risk reduction. Self-regulation is a process of controlling one's motivations through selectively processing information, monitoring one's own behavior, judging performance, and self evaluation. Self-regulatory mechanisms are thought to be crucial to understanding the volitional aspects of behavioral change. They reflect the ways in which people attempt to behave in accordance with personal health goals. Fleury (1991) initially used qualitative methods and interviewed 29 individuals who were attempting to initiate and sustain programs of cardiac risk factor modification. These qualitative data were analyzed into six dimensions in which individuals regulated self and environment. These six dimensions and the qualitative data were then used to frame items developed in a 6-point Likert scale for a quantitative instrument, the Index of Self Regulation (Fleury 1993; 1998).

A different sort of example where patient interviews were integrated with quantitative measures is a recently completed pilot study on migraines in perimenopausal women (Moloney MS). It is currently believed that hormonal migraines are due to estrogen shifts during this transitional time, but very little work has addressed this problem. There is also research showing that quality of life in migraineurs in general is as poor as that of persons with other chronic diseases such as diabetes mellitus. A qualitative approach was employed that used interviews and a questionnaire with open-ended questions. This was supplemented with a questionnaire where the answers were standardized by numeric scales, and a standardized quality-of-life questionnaire. The patients also kept a diary that combined both quantitative and qualitative items. In this pilot study, themes in the qualitative data centered around keeping on with one's life in spite of headaches, and refusing to permit headaches to interfere with daily life. However, the standardized quality-of-life

questionnaires revealed unexpected anger and resentment about having to cope with headaches. This information, not apparent in the interviews, helped to clarify and deepen the qualitative data.

Sometimes, the project is driven by an explicit, explanatory theory and complemented by qualitative methods. Dunbar et al. (1999) provides an example of this form of triangulation. This study examined factors associated with the patients' recovery process within the first three months after they had received an implantable cardioverter defibrillator (ICD). These patients were considered at risk for cardiac arrest from abnormal heart rhythms, and approximately 25% had been successfully resuscitated from cardiac arrest while the remainder were considered at high risk for a life-threatening arrhythmia. The internal defibrillator, a box that was surgically implanted beneath the skin of the chest wall like a pacemaker, prevented cardiac arrest by monitoring the heart rhythm and delivering a shock to convert the heart back into a normal rhythm. A variety of standardized questionnaires were used to evaluate the patients' adjustment to this procedure. Qualitative interview data were also coded and compared with scores obtained from a questionnaire that measured mood states. One of the unexpected findings was that patients who had experienced sudden cardiac arrest had a better mood level one month after the procedure than the group that had not. This finding was explained by the qualitative data, which showed that the ICD provided a sense of security for this group, whereas those who had not experienced sudden cardiac arrest expressed more uncertainty about the need for the device.

There are three rationales frequently given for using methodological triangulation. The first is *completeness*. Quantitative methods can further develop findings derived from qualitative research (and vice versa). The methods complement each other, providing richness or detail that would be unavailable from one method alone. This is exemplified by both the Dunbar and Moloney studies above. The second might be called *abductive inspiration*. As in Fleury's research, described above, qualitative research is often used where a phenomenon is poorly understood. Interviews with

patients can orient the investigators to the material. The results may suggest hypotheses to be tested by quantitative methods. Qualitative investigation can also help organize quantitative data that has already been gathered or suggest ways new of approaching the phenomenon. The final, and most controversial, rationale for triangulation is *confirmation*. In its most modest form, qualitative methods can clarify the results of quantitative research, such as apparently inconsistent findings. More tendentially, qualitative and quantitative results are sometimes thought to support each other. Triangulation would thus yield a stronger result than either method could yield alone.

The debate about triangulation on which we will be focusing has occurred among those nurse researchers who think that triangulation is possible and useful. The issues concern the underlying rationale for mixing methods and the degree to which the methods can be “mixed” at all. This position, which we will call the “blending view,” contends that methodological triangulation can yield all three benefits mentioned above: completeness, abductive inspiration, and confirmation. Critics respond by arguing that qualitative and quantitative methods are based on deeply different assumptions about the objects studied. Proponents of this “building block view” thus contend that different methods and their results must remain independent. Since the methods do not support each other, triangulation can not yield confirmation. Triangulation is useful, but only for completeness and abductive inspiration. The principle point of contention between the building block view and the blending view is thus whether the use of different kinds of methods can together confirm the results of a study to a greater degree than either method alone.

Most parties to the debate over methodological triangulation take methods to be closely tied to the kinds of theories they support, as well as background assumptions and standards for evaluation. The result is similar to Kuhn’s conception of a paradigm, and nurse researchers have adopted this language. Qualitative and quantitative methods are said to be embedded in different paradigms (cf. Haase and Myers 1988). The quantitative and qualitative paradigms have distinct

motivations and goals of inquiry. In articulating their blending view, Haase and Meyers align the quantitative—qualitative distinction with the distinction between explanation and description:

In order to gain understanding, the empirical-analytic paradigm has emphasized confirmation of theory by explaining. The human science paradigm, also in search of understanding, has emphasized discovery and meaning by describing. (Haase and Myers 1988: 130)

Part of what is being expressed by the use of the word “paradigm” is a difference in the structure of theory. Theories supported by quantitative data are hierarchically structured systems of laws. The explanation of a phenomenon or a regularity is a deduction of that phenomenon from laws, initial conditions, and bridge laws. It is thus no surprise to find nurse researchers referring to the paradigm that drives quantitative methods as “positivist” (Duffy 1987; Haase and Myers 1988; Shih 1998).

Both the building block theorists and the blending theorists argue that the quantitative and qualitative paradigms include fundamental ontological presuppositions about the object of inquiry, and the relationship between the inquiring subject and her object. Quantitative inquiry presupposes that its object and all of the relevant properties and relationships can be measured. Qualitative inquiry takes its object to be a subject — a being for whom things can be meaningful and valuable. Finally, the qualitative and quantitative paradigms encompass different evaluative orientations. Methodologically, each has its own global criteria according to which any scientific work is to be evaluated, and specific criteria for the evaluation of particular kinds of research. Quantitative research is evaluated in terms of concepts like predictive power and statistical significance. Since these notions do not apply comfortably to interpretations, qualitative research is evaluated in terms of its internal coherence and the degree to which the subjects think the result is an accurate portrayal of their experience.

Building block theorists argue that the depth and the nature of the differences between qualitative and quantitative paradigms make them incommensurable. First, they argue that there is a

difference in the way that theory and data are related within qualitative and quantitative paradigms.

Morse, a building-block theorist, writes:

Thus, in methodological triangulation, the key issue is whether the theory that drives the research ... is developed *inductively* from the research per se or used *deductively* as in quantitative inquiry. (Morse 1991: 121)

What Morse means by “inductive” and “deductive” is clear enough from the context.<sup>ii</sup> Deductive research begins with a theory, ideally articulated as a body of laws or universal generalizations. A hypothesis is derived from this theory, and it is tested against observation. Inductive research begins with observations alone — untheorized and without hypotheses. It proceeds to distill descriptive claims from the observations. Theorists like Morse take this difference to entail a difference in the kinds of theory that can be supported by qualitative and quantitative methods. Quantitative methods are necessary to support explanatory theories that are structured as hierarchies of laws. Qualitative interpretations are variously said to be “holistic,” “dynamic,” or “subjective” (Dootson 1995; Duffy 1987; Haase and Myers 1988). Interpretations, which are supposed to be neither explanatory nor nomological, must be supported by different kinds of methods. Finally, the building block theorists argue that the standards of evaluation in each paradigm yield nonsense when applied to the other. Interpretations are not appropriately evaluated in terms of statistical significance, and it makes no sense to ask whether the analysis of a blood sample coheres with the blood’s point of view.

The building block theorists take these differences in the relation of theory to data, the structure of theory, and the standards of evaluation to entail that the qualitative and quantitative components of a triangulation study must be kept distinct. Failure to do so will result in incoherence or outright inconsistency (Dootson 1995; Foster 1997; Morse 1991). In a triangulation study, the qualitative and quantitative components must support theories with different logical structures. Moreover, an individual research method should be expected to withstand scrutiny on its

own merits. These proponents of triangulation thus insist that the methods be kept distinct and the results of each judged on their own criteria. It follows that confirmation cannot be an appropriate goal of triangulation. There is no hypothesis or set of hypotheses that could be supported by both methods. Triangulation can be used only for abductive inspiration or for completeness.

Blending theorists agree that there are deep differences between qualitative and quantitative research, but they deny that these differences stand in the way of confirmation. Knafl (1991; 1988), Haase (1988), Duffy (1987), Mitchell (1986) and others hold that methodological triangulation increases the reliability, validity, or accuracy of the study. There seem to be two primary arguments in the literature. First, they argue that methods have different strengths and weaknesses (Duffy 1987: 132; Mitchell 1986: 22). Qualitative research tends to focus on a small group of participants. For this reason, it is difficult, sometimes impossible, to generalize the conclusions. Qualitative results can only be applied to new individuals when the context is taken into account. Triangulation with a quantitative methodology can increase the researcher's confidence that her conclusions apply to a larger population. Quantitative methods have their own limitations. The emphasis on standardization and generalizability means that the questions are often narrow. A survey may not capture what is significant to the patient. Consequently, numeric results can be superficial or misleading. Correlation with qualitative interviews can increase the researcher's confidence that a survey has uncovered a meaningful result. Quantitative and qualitative methods each compensate for the other's weaknesses, and a therefore increase the researcher's confidence in the whole study.

A second argument deployed by blending theorists is that triangulation helps eliminate bias (Duffy 1987: 132; Mitchell 1986: 21). Both qualitative and quantitative research is subject to bias. Since the biases occur in slightly different ways, the use of both methods enhances the researcher's confidence that the biases have been identified. For instance, in both kinds of research, the subject may answer in socially desirable ways or in the way she thinks the researcher wants the question to

be answered. In this respect, the important difference between qualitative and quantitative research is in the relative distance between subject and researcher. In a face-to-face interview, the researcher may inadvertently express her attitude through tone, posture, or facial expression. At the same time, the researcher is able to read the body language of her interlocutor, and thus identify questions that make the subject uncomfortable or evasive. A pencil-and-paper questionnaire is relatively anonymous, so, the researcher's presence does not influence the answers. Correspondingly, it is difficult for a quantitative method to determine whether the answers were authentic. Quantitative and qualitative research are thus subject to the same bias in complementary ways. Where the quantitative and qualitative results diverge, the results of one can be used to refine the questions (or the questioner's technique) of the other. If the results of the methods converge, then the researcher can be more confident that social desirability bias is not present. Triangulation therefore increases confidence in the results to a higher degree than the use of either method alone.

### **3. Analysis of the Debate**

It is interesting to note that the blending theorists' response to the arguments against confirmation do not challenge any of the fundamental presuppositions of the argument. Rather, they point out ways in which the use of multiple methods might enhance confirmation *in spite of* the deep differences between what they take to be paradigms of research. We will argue that this is a tactical mistake on the part of the blending theorists. What really needs scrutiny is the idea that the differences among research methods amount to different paradigms. This proposition depends on at least four different presuppositions. When made explicit, it is clear that all are dubious. Our strategy in the remainder of this essay will be to argue that different commitments entail a more satisfactory conception of methodological triangulation. The result will be a version of the blending view that is more robust than previous versions precisely because it does not buy into key claims about differences among "paradigms."

As is obvious from the foregoing discussion, nursing researchers presuppose that:

1. Qualitative and quantitative methods are distinct.

Considering the matter historically, it is true that methods called “quantitative” and “qualitative” have arisen from different traditions. Quantitative research is inspired by the natural sciences and those parts of the social sciences that have empiricist leanings. Qualitative research in nursing was developed partly in conscious opposition to such empirical methods. Drawing on the hermeneutic and phenomenological traditions in philosophy, qualitative researchers argued that the methods of the natural sciences could not elucidate realms of experience crucial to the enterprise of nursing research. The experience of the patient, the meaning of a treatment, and the value of health and illness to the patient must elude detection by questionnaires or biological assays. Qualitative research develops interpretations using means that would be familiar to a literary critic, ethnographer, or historian. In practice, however, the boundaries between qualitative and quantitative research are fuzzy. Interviews are often coded, and the analysis of patterns of word usage is used to support the interpretation. Does coding an interview or videotape make it “quantitative”? Or is it still “qualitative”? Questionnaires are textual, and the words notoriously require careful interpretation, both by the subjects and the researcher. Yet, they yield numeric results that are treated with statistical tools. To add to the confusion, surveys based on questionnaires are sometimes considered the qualitative component of a mixed methodology study.

In spite of such vagueness in practice, nurse researchers take the distinction to be conceptually clear and deep. It is hard to deny that there are substantial differences among research methods. One might wonder whether the concepts “qualitative” and “quantitative” capture these differences in an interesting way, but we will not pursue that line of inquiry. The mere distinction between qualitative and quantitative methods is only a small part of what nurse researchers mean

when they talk of qualitative and quantitative paradigms. The full force of this notion is provided by three additional presuppositions.

Nurse researchers extend the qualitative-quantitative distinction from *methods* to *theories*.

They thus presuppose that:

2. Qualitative and quantitative methods support different kinds of theory.

This presupposition is required by the building block view. The “blocks” are bodies of theory, and on this view they must remain distinct. There must be, then, some sort of difference — either in the kind of content or the logical structure of the theory — between the quantitative and the qualitative components. Typical examples of theories called “quantitative” are nursing theories that draw heavily on the biological sciences, epidemiology, or sociology. Typical examples of theories (or better, interpretations) that are called “qualitative” bear a strong resemblance to ethnography or history.

Quantitative theories are conceived in traditional empiricist terms as a body of universal generalizations. Two aspects of the empiricist model of science constitute crucial presuppositions of the triangulation debate:

3. Quantitative theories are structured as hierarchies of deductively related propositions.
4. Quantitative methods confirm hypotheses one-by-one.

These are less obvious elements of the nursing debate than the first two presuppositions.

Nonetheless, they surface explicitly when nurse researchers are discussing quantitative theory and method. For example, when contrasting qualitative and quantitative research paradigms, Duffy writes:

The procedures employed by the quantitative researcher are usually highly structured and designed to verify or disprove predetermined hypotheses. (Duffy 1987: 131)

According to Haase and Meyers, quantitative theories are distinguished by their use of law-like generalizations that have predictive value (Haase and Myers 1988: 135). This conception of quantitative theory is reflected in the nursing research methodology textbooks. In Chin and Kramer's widely used text, they write:

[Research to validate a theory] is usually thought of as a deductive approach. The research starts with an abstract relational statement derived from theory. From the theoretic statement, hypotheses or research questions are created for a specific research situation. (Chin and Kramer 1999: 125)

Chin and Kramer also write that:

A single study is usually based on one or two relational statements from among several that might possibly be extracted from a theory. No one study can test the entirety of a theory. (Chin and Kramer 1999: 124)

Clearly, then, the model of a quantitative theory is one in which a theory is a set of generalizations linked by deductive relationships. More general propositions entail less general propositions. A theoretical proposition is tested by deriving observational statements from it. Theoretical propositions are rejected when their observational consequences are false.

This model of theory structure is quite familiar from mid-twentieth century philosophy of science. As expressed by presuppositions (3) and (4), the model is a crucial part of the notion that there are deep differences between qualitative and quantitative paradigms. Nurse researchers have held that qualitative methods cannot confirm quantitative claims, and central examples of quantitative claims would be the correlation of two values or a causal relationship between two variables. Assuming (3) and (4), confirmation of a quantitative theory must proceed by deducing values for these variables, given initial conditions. Propositions of a quantitative theory thus cannot be tested without some kind of measurement device, and nurse researchers have taken this to be the mark of a quantitative method. Quantitative theory thus requires confirmation by quantitative methods.

It follows from these four presuppositions that there is a very close relationship between a method and the kind of theory it can support. This idea has profoundly shaped the debate over methodological triangulation. Both sides agree that qualitative methods could not confirm a quantitative theory, and vice versa. The issue about confirmation, then, is whether and how quantitative and qualitative theories of a single phenomenon might support each other. Blending theorists point to complementary strengths and resistance to bias. However, in the light of the foregoing analysis, it is no longer clear how these could contribute to confirmation. The kinds of theory are logically independent in the sense that the propositions of the quantitative theory do not entail (nor are entailed by) propositions of the qualitative theory. Therefore, given presupposition (3), there is no larger theory, encompassing both the qualitative and quantitative components, that could be confirmed or disconfirmed. By consenting to the terms of the debate, blending theorists have made it difficult to defend their idea that methodological triangulation might yield some kind of confirmation.

#### **4. Confirmation and the Structure of Theory**

The result of the foregoing section shows that, if triangulation is to yield confirmation, then some of the presuppositions of the debate need to be challenged. Presuppositions (3) and (4) are likely targets, both because they have been subject to so much criticism, and because they have well developed and plausible alternatives. One of the alternatives to (3) is a *coherence* conception of theory structure. The coherence conception differs from the classical, hierarchical view in several ways. The classical view is foundationalist in the sense that observation statements constitute the ultimate justifiers of scientific theory. Predictions are observation statements that are derived from theory. Where the prediction fails, some of the theoretical claims used in its derivation must be rejected. Theoretical statements receive inductive support from some body of observation. If those observations are found suspect, then the theoretical claims which they support must be suspect too.

A theoretical statement, then, is scientifically justified if it is supported in the right way by observation statements. On a coherence view, a statement is justified if it *coheres* with the other statements of the theory, including observation statements. A coherence theory is thus not hierarchical because justificatory support does not run from the observations to the most abstract laws. Rather, the theoretical statements and the observation statements hang together in relationships of mutual support.

The classical view of theories took theoretical claims to be connected by inferential relations. A theory was ideally conceived as a partially axiomatized formal system. On the version of coherence theory we are proposing here, statements of a theory are related as question and answer. For any proposition of the theory,  $P$ , the inquirer can ask “Why  $P$ ?” If the answer to this question is  $Q$ , then the theoretical statements  $P$  and  $Q$  will cohere. Risjord (2000) took why-questions to be the primary kind of question that relates propositions within a coherent theory. Others, such as Thagard (1992; 1999) and Sintonen (1989) are more pluralistic with respect to the forms of question that are taken to structure theory. Differences among these views are not relevant to this essay. If we identify an explanation with the raising and answering of a question, as many authors do (Garfinkel 1981; Lipton 1991; Risjord 2000; van Fraassen 1980), then the coherence in question is explanatory coherence. In a coherent theory, each theoretical statement is either the explanation of, or gets explained by, some other theoretical statement.

Finally, as expressed by presupposition (4), the classical conception of theory structure took confirmation to be a relationship between an individual hypothesis and a definite domain of observation. Low-level hypotheses are directly confirmed or disconfirmed by observations, and more abstract theoretical statements are confirmed or disconfirmed insofar as they entail these low-level hypotheses. On an explanatory coherence view, theories are confirmed or disconfirmed as wholes. If a low-level hypothesis is rejected, other hypotheses that previously depended upon it may

be preserved, if they continue to cohere with the rest of the theory. The question of how a hypothesis is confirmed is replaced by the question of how theories are chosen: Under what conditions should one theory be preferred to another? The answer, roughly, is that the better theory is more coherent. One theory is more coherent than another (again, roughly) if it leaves fewer questions unanswered. This means that the better theory will be more complete — it will account for more of the observations.

For the purposes of this essay, there is a crucial upshot of the coherence understanding of theoretical structure. A coherence view does not demand that every theoretical statement be a natural law, nor every question be a causal question. The question-and-answer theoretical structure can be found in the interpretation of meaning, value, norms, and experience (Risjord 2000). Questions about meaning or lived experience do not arise concerning quantitative data, nor do causes answer questions about human values or norms. Hence, theories about these sorts of phenomena make different claims than theories concerning, say, biological responses to stress. In spite of the different questions asked and claims made, there is no *logical* reason why theories about these different domains may not be combined into a single theory. On an explanatory coherence view, the structure of all theorizing is question-and-answer. A biological theory and a humanistic interpretation of stress, for example, would be combined into a single theory if questions about the biology could be answered by claims about experience of the patients and *vice versa*. The whole would be more coherent than either part alone, so integrating the two would increase the coherence of the whole theory.

Rejecting presuppositions (3) and (4) and adopting a coherence account of theory structure and confirmation has important consequences for the methodological triangulation debate. Since all theory is structured as a body of claims made coherent by relationships of question and answer, there are not deep, logical differences between qualitative and quantitative theory. This is not to say

that there are no differences between the theories that provide paradigmatic examples of “quantitative” and “qualitative” theory, only that these are not logically different kinds of theorizing. It follows that presupposition (2) — that qualitative and quantitative methods support different kinds of theory — must be rejected. The absence of presuppositions (2), (3), and (4) breaks the link between theory and method that had been assumed by all parties to the methodological triangulation debate. A given theory does not require a particular kind of method. There are, of course, differences among methods.<sup>iii</sup> And the best answer to a given question must be determined with methods appropriate to the question. The choice of qualitative or quantitative methods, however, is no longer a *global* choice in the sense that it determines (or is determined by) the researcher’s whole “paradigm.” Rather, it is a local choice that depends on the particular question an inquirer is asking. A theory may be composed of a number of questions for which different kinds of methods are suitable. Where this is the case, methodological triangulation will be necessary.

## **5. How to Blend Different Research Methodologies**

Methodological triangulation can thus be conceived as the use of different kinds of methods to answer different questions arising from a single theory. When we look at examples of triangulation in nursing research, we would expect to find the results of qualitative and quantitative research methods building on each other. Questions answered by qualitative methods will have to arise out of answers generated by quantitative methods, and questions demanding quantitative methods will have to arise out of answers generated by qualitative methods. Looking back at the examples from section 2, this is precisely what we find.

Qualitative nursing research builds on the results of quantitative methods in obvious ways. Nursing research occurs in a health care context where the questions are typically causal and answered by quantitative methods. This quantitative research provides the topics and presuppositions of qualitative questions. In Moloney’s migraine study (Moloney MS), she

administered a standardized quality-of-life questionnaire. This instrument yielded a numeric score for things like anger and resentment. The point of this questionnaire was to understand how migraineurs compared to persons who suffered from other conditions. This quantitative method yielded a surprisingly high level of anger and resentment. It prompted Moloney to ask why migraineurs were feeling this way, and how these feelings motivated the migraineurs in their ways of coping with the migraines. Answers to these questions drew on interviews and open-ended questions in the patient's daily diary. The questions prompted by quantitative data received answers provided by qualitative methods.

On a building block model of triangulation, such as Morse's (1991), Moloney's use of quantitative methods is understood as providing only a bit of detail to a qualitative study. The understanding of triangulation we are presenting exposes the deeper connections among the methods. Moloney's questions about the patient's anger may not have arisen in the absence of the quantitative instrument. The quantitative research thus provided a basis for qualitative questions. Answering these questions by interviews and diary analysis confirms the results of the quality of life questionnaire by making these results cohere with other things known about migraineurs. Here we have an understanding of triangulation that lives up to its name — the two methods provide a perspective unattainable by using one alone.

The results of qualitative research can similarly provide the topics and presuppositions of questions that need numeric answers. Nurse researchers often ask questions that inquire into the patient's point of view. They ask what the experience of a particular kind of patient is like, or how families respond to the illness of a member. These questions are naturally answered with interviews or other textual data gathering methods. One result of these questions is that the nurse researcher becomes aware of the ways in which the patient is conceptualizing her illness. Any question has to mobilize some concepts. Qualitative research provides concepts that are drawn from the patient's

experience. Thus, by deploying these conceptions, questions that demand quantitative answers may be more precise, marking distinctions that are relevant to the patient's motivation, emotional outlook, or behavioral response. The researcher's confidence in the numeric scores is increased by the fact that the concepts appearing in the questions cohere with other aspects of the theory. The studies by Fleury (1991; 1993; 1998) and Dunbar (1999) reveal this sort of interplay among questions. As discussed above, Dunbar's research concerned patients who had received an implant that would shock the heart back into a normal rhythm should an abnormal rhythm begin. A standardized instrument for measuring mood revealed, unexpectedly, that patients who had experienced sudden cardiac arrest had a better mood level than those who had not. This quantitative result raised questions that were naturally answered by qualitative means. Interviews with patients revealed that the presence of the implant gave them a sense of security. Security is a concept that might not have arisen except for the interviews. Once in place, it may become the topic of questions that ask for quantitative answers. For instance, what is the relationship among cardiac patients' sense of security, illness appraisal, other treatment outcomes, and severity of arrhythmia?

In Section 2, we argued that confirmation was the pivotal issue between the building block and the blending views of triangulation. Building block theorists insisted that triangulation can only be used to increase the completeness of a study, never for enhancing confirmation. Blending theorists held that triangulating methods resulted in mutual confirmation. Given their presuppositions, both sorts of views had difficulty understanding how the results of different methods could hang together in a single theory. Adopting a coherence understanding of theory structure and confirmation permits the resolution of these issues. Since confirmation is a matter of maximizing coherence, and since a more complete theory is more coherent, the goals of confirmation and completeness collapse into one another. On a coherence view, the building block

theorists' goal of comprehensiveness amounts to mutual confirmation. Both the quantitative and qualitative blocks are parts of a theory that is better confirmed than either of its parts (because the whole is more complete). The two kinds of research hang together into a single theory because quantitative and qualitative methods are now understood as different ways of answering questions. Insofar as these questions and their answers interlace into a coherent body of theory, both kinds of method can contribute. A coherence understanding of theory structure thus supports a blending view of triangulation that goes much farther toward revealing the real value of triangulation than other blending views.

## **6. Conclusion: the Fate of Separatism in the Philosophy of Social Science**

What lessons can a philosopher of social science take home from the foregoing discussion of triangulation in nursing theory? The dispute over methodological triangulation both mirrors and draws upon the philosophical debate about the relationship between the natural and social sciences. The grounds for holding that the natural and social sciences must have different methods are diverse. The issue about the structure of theory, on which we have focused, is only one facet of the issue. Others include the character of explanation, the role of causality in understanding human behavior, and the relevance of norms and meaning to scientific inquiry. The philosophical discussion of these issues has typically contrasted different disciplines, such as physics and history. Separatism is challenged by nursing research, because the domain of inquiry seems to need both natural scientific and interpretive approaches. The first ramification of attending to nursing research is that the debate over the relationship of the natural and social sciences needs to respond to domains where there are live issues about how different sorts of methods might fit together.

A second, deeper, ramification of the foregoing discussion is that separatism has consequences for the way in which nursing research is conducted. If the picture of nursing inquiry resulting from separatism is unsatisfactory, and if better views of nursing inquiry are made possible

by alternatives to separatism, then separatism itself has been found wanting. The proponents of the building block view of triangulation have explicitly adopted a separatist understanding of the relationship between the natural and social sciences. Moreover, the debate among nursing theorists over triangulation has presupposed many elements of a separatist view. A consequence of separatism is that quantitative and qualitative methods could not mutually support one another. While this is not a dire consequence, it is an unfortunate one. It is independently plausible that convergence among results of different methods should make a study more reliable. Wimsatt, for instance, has called this phenomenon “robustness.” In his essay, “Robustness, Reliability, and Overdetermination” (1981), Wimsatt argued that the multiple determination of results is found in a variety of scientific contexts. Throughout scientific inquiry, robustness provides grounds for judgments of the objectivity of postulated entities, and it permits confidence in heuristics that are known to be fallible. The possibility of determining results by multiple methods thus is desirable, and a philosophical view of nursing research that precluded it is less plausible than a view that permitted triangulation and provided its philosophical foundation.

It is our position that nursing inherited a mistake from the philosophy of social science. As we argued above, replacing the hierarchical conception of the structure of theory with one based on explanatory coherence undermines a crucial presupposition of the nursing debate. The result is a blending understanding of triangulation that accounts for the way in which multiple determination of a result can enhance confirmation. It also provides for a richer understanding of the way in which nurse researchers have used qualitative and quantitative research, and gives guidance on the practical issues that arise in these contexts. The upshot for philosophers of social science, then, is that we need to radically reconsider the notion that the natural and social sciences have irreconcilable methods.<sup>iv</sup>

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## Endnotes

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<sup>i</sup> The nursing debate thus presupposes that there is a clear and useful distinction between “qualitative” and “quantitative” methods. We will acquiesce in the distinction for the moment, and scrutinize it in the next section.

<sup>ii</sup> Nurse researchers typically use “inductive” and “deductive” in this way. It is consonant with nineteenth century usage (*cf.* the OED entry for “induction”), but importantly different from its use in contemporary philosophy.

<sup>iii</sup> We may once again simply avoid the question of whether “qualitative” and “quantitative” is the best way of capturing these differences. We will continue to use this terminology, but the argument will not require a sharp distinction among kinds of method.

<sup>iv</sup> The authors would like to thank Paul Roth, Alison Wylie, William Wimsatt, and the other participants in the 2000 Philosophy of Social Science Roundtable for their very helpful discussion and criticism.