

Explanation in Nursing Science

E. Carol Polifroni and Sheila A. Packard

Est-il possible d'expliquer ce que nous faisons en sciences infirmières et dans la plupart des sciences humaines? Notre objectif est-il l'explication, la prédiction? Ne devrait-il pas plutôt être la compréhension et l'interprétation? Le but peut-il être en même temps la compréhension et l'explication? En tant que sciences humaines, les sciences infirmières mettent-elles l'accent sur l'individualité ou sur la généralisabilité? Le présent article traite du débat actuel pour ce qui concerne l'explication et la compréhension. On y examine la vue traditionnelle de l'explication de même que la vue dichotomique de la compréhension. On y présente une troisième vue sur l'explication et la compréhension, élaborée par Miller (1983); celle-ci est proposée comme terrain d'entente possible entre deux différentes vues et comme approche des sciences infirmières sous l'angle de sciences humaines.

Is it possible to explain that which we do in nursing and in most human sciences? Is explanation/prediction our goal? Instead, should the goal be understanding/interpretation? Might the goal be both understanding and explanation? Is nursing, as a human science, focused on individuality or generalizability? This paper explores the current debate in relation to explanation and understanding. The traditional view of explanation is addressed as is the dichotomous view of understanding. A third view on explanation and understanding, designed by Miller (1983), is offered as a possible middle ground between the two diverse views as an approach for nursing as a human science.

In recent years, much controversy has arisen within nursing with regard to appropriate and, therefore, fruitful methodological strategies. The frequently cited "methods debate," which purports an extant dichotomy between quantitative/empirical and qualitative/interpretive approaches, is a current example of this controversy. The most frequently posited solution to this schism is triangulated or blended methodology (Packard & Polifroni, 1991). Yet it may be contended that this response does not resolve the more fundamental problem of generalizability of findings, nor does it address basic questions regarding objectivity in scientific enterprises. Disagreement on the intentions or purposes of nursing science (in particular, whether or not to aim for explanation or understanding) is simply reflected in the use of eclectic methodological strategies, and debates about these strategies, throughout the discipline.

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A large part of the controversy over methods within nursing evolves from a fundamental conflict among scholars regarding the nature of scientific explanation in a human science, and whether explanation is even possible in such a science. At the same time, frustration on the part of nurse scientists in attempting to achieve overarching predictive theory, and a pressing need for intermediate-range theory, which may serve to guide practice, lend great urgency to a discussion of explanation in nursing science.

The purpose of this paper is to briefly present the two major opposing views concerning explanation that have, in the authors' opinion, fuelled the fires of controversy regarding the methodological development in nursing. In addition, an elaborated view of the nature of explanation based on the ideas of Miller (1983) will be offered as a means of reframing the debate at this crucial juncture in the evolution of nursing as a science.

Perspectives on Explanation

When is a particular statement or set of propositions an adequate explanation of why a specific phenomenon occurred? Simply stated, an adequate explanation should provide true descriptions of prior conditions. However, it may be argued that this requirement is not enough. The fact that a patient had a restless night is an accurate but insufficient explanation for his falling out of bed the next afternoon. The confusion as to what additional qualifications or characteristics comprise a valid explanation constitutes a fundamental and pervasive dispute in the philosophy of science for all sciences, physical and human. The ramifications of this dispute have led to a suggestion by some scholars that nursing science should aim for understanding rather than explanation/prediction (Benner, 1985). Conversely, other nurse scholars hold that "the ultimate goal of science is to be able to explain the empirical world and, thus, to have increased control over it" (Burns & Grove, 1987, p. 11). The diverse opinions of the aim of science are perhaps best framed as follows: "The real business of inquiry was explanation, whereas interpretive practices were confined to the special domain of the human sciences, the traditional *Geisteswissenschaften*" (Bohman, Hiley, & Shusterman, 1991, p. 2-3). For purposes of clarity, these two disparate perspectives, explanation and understanding/interpretation, will be briefly described in terms of the deductive-nomological and the hermeneutic views.

A Covering Law: The Deductive-Nomological View

Carl Hempel (1965), in *Aspects of Scientific Explanation*, identifies four models of covering law. They are deductive nomological, causal explanation, deductive statistical, and inductive statistical. Each model is intended to represent a single law that addresses all phenomena. The deductive nomological covering-law model answers a *why* question. "The kind of explanation whose logical structure is suggested by schema will be called the deductive-nomological explanation...; for it effects a deductive subsumption of the explanandum under principles that have the character of general laws" (Hempel, 1965, pp. 336-337).

Causal explanation, as a covering-law model, focuses on the underlying reason something happened as an effect. Deductive-statistical explanation and inductive-statistical explanation address explanation within the parameters of probability and the likelihood that a specific event will or will not occur. The two statistical models differ in terms of the method of probability determination: deductive or inductive.

Although Hempel addresses four models of covering law, in this century the more widely held analysis of explanation has come to be known as the deductive-nomological, or covering-law, view. For the remainder of this paper, the term *covering law* should be read as the deductive-nomological view of explanation.

Basically, this covering-law view makes explanation, whether in the human or natural sciences, a matter of subsumption under general laws. A valid explanation of an event ought to contain characteristics of the situation leading up to the event and general empirical laws indicating that when such characteristics are realized, an event of that particular kind always (or almost always) follows.

Hempel elaborates on the deductive-nomological covering law in great detail, postulating that explanation in any and all fields of science must meet the following specific conditions of adequacy: (a) the conclusion must be a logical consequence of the premises (it must be deducible from the information contained in the premises); (b) the premises must contain at least one general law, and this law must be required for derivation of the conclusion; (c) the premises must have empirical content, which is to say they must be capable (at least in principle) of test by experiment or observation; and (d) the sentences in the premises must be true.

Hempel (1965) summarizes the arguments put forth by skeptics regarding the application of this criteria to the non-physical sciences as: (a) the contention that the activities of human beings have a peculiar uniqueness and irrepeatability that makes them inaccessible to causal explanation; (b) the belief that the establishment of scientific generalizations for human behaviour is not possible because reactions of an individual are at least partially dependent on the individual's previous history; and (c) the supposition that purposive behaviour calls for reference to motives and thus necessitates teleological rather than causal explanation. As a counter to these arguments emanating from social science, Hempel states that events in physical science are no less unique than human activities. And phenomena studied in physical science also have a history, which must be taken into account in the generation of general regularities. In addition, he has submitted that motivations involved in human behaviour, while referring to the future, are actually situated prior to activity and, therefore, may be classified as among the antecedent conditions in a causal explanation.

Skeptics aside, the deductive-nomological covering law has dominated the practice of science, including that of non-physical fields (Miller, 1983). For example, major thinkers in sociology, such as Durkheim (1938) and Weber (cited in Gerth and Mills, 1946), regarded subsumption under general laws as the means for making the study of social life truly scientific. In much the way that nursing has struggled to take its place among the sciences, concern has centred to some extent on the formulation of causal explanations. Norbeck, in her 1987 article "In Defense of Empiricism," asserts that a reliance on systematically gathered objective data drawn from relatively large numbers of individuals will yield predictive models and causal explanation.

Gortner (1990) expresses the notion that meeting the requirements of the covering-law model will legitimize nursing as a science:

Explanatory power is proposed as another premise of philosophy of science in nursing. Human science activities cannot rest only with increased understanding; nor can understanding be taken as the sole criteria for explanation Human patterns and regularities and perhaps even "laws" characterize the human state and undergird the whole enterprise of society and human life . . . explanation in the sense that is being proposed here must suggest what might occur the next time the event or phenomenon occurs. Thus temporality and predictability are assumed in scientific explanations that are within the definition of explanatory power. (p. 104)

The Hermeneutic View

Most opponents of the deductive-nomological covering-law model in nursing espouse a perspective going back at least as far as Wilhelm Dilthey (1883-1911). To Dilthey (cited in Copleston, 1965), the natural and the human sciences are both empirical, but the former deals with the outer experience of nature, while the latter are based on inner, "lived" experience, which provides a direct awareness of human life. The difference in aims of the natural versus human sciences (as opposed to the stance taken by Gortner, 1990) is characterized as that between explanation and understanding. The natural sciences seek causal explanations of nature that connect representations of outer experience through generalizations and abstract laws. The human sciences aim at an understanding of the fundamental structures of life found in the lived experience. The human sciences thus place an equal value on understanding of both individuality *and* universality. In contrast, the natural sciences are thought to place value solely on ever more comprehensive generalizations without concern for or attention to the individual.

Habermas (1989) submits that the deductive-nomological covering law does describe the goal of natural science — a pursuit of general laws with an interest in instrumental control over the environment. However, Habermas and his followers contend that this deductive-nomological approach neglects to recognize the insights offered by other sources of knowledge more important to the human sciences, such as the recognition and inclusion of understanding and interpretation.

While Bohman, Hiley, and Shusterman (1991, p. 5) do not specifically address explanation as a topic, they do state: "The issue is further compounded, because the human sciences are 'doubly hermeneutic.' They do not give interpretations, they are interpretations of interpretations." In other words, the human sciences are not necessarily concerned with general laws, but rather their focus is on interpretation of human experience to achieve understanding about the individual without concern for generalizability. Additionally, the interpretation (and subsequent understanding) is coloured and shaped by the lived experience of the interpreter (doubly hermeneutic).

The emphasis in human science is on understanding instead of on explanation, and the understanding is based on the lived experience of interpretation. Nurse disciples of Dilthey-Habermas point to the failure

of the covering-law model to validate hermeneutic understanding. This understanding, felt to be the aim of a human science such as nursing, refers to the capacity to interpret the words, acts, and symbols of others in the interest of mutual understanding and self-reflection.

The opposing positions of the deductive-nomological covering law and the hermeneutic view regarding the aims of human sciences place nursing in a quandary as it moves into the 21st century. "The hermeneutic stress on the narrative features of... explanation aggravates rather than resolves the question of how such narrations influence behavior (on the assumption that they sometimes do)" (Roth, 1991, p. 183). This polarity of perspectives is alluded to by Moccia (1988, p. 6) in asking,

Is science intended to legitimize nursing as a scientific discipline by expanding and refining the ability to predict and prescribe human behavior? Or is it intended to be useful in helping the non-scientific population to understand and explain their experiences in the world? Is there a science to be developed that might combine these polarities?

A Middle Ground in the Explanation Debate

In light of Moccia's query, is it possible to construct a way of looking at explanation that will allow for the future expansion of nursing science? Miller (1983) proposes such an approach in considering the position of human sciences. Fundamentally, Miller's alternative theory of adequate explanation employs causal notions, not notions of regularity or of accessibility to hermeneutic faculty. Simply put, an adequate explanation is seen as a true description of underlying causal factors sufficient to bring about the phenomenon in question. Three important distinctions from the previously discussed perspectives on explanation (model of covering law and hermeneutics) are inherent in this explication of scientific explanation: (a) an explanation must describe causal factors sufficient to bring about the phenomenon in question under the circumstances at hand, (b) causal factors must possess sufficient depth, and (c) the explanation is appropriate for only this particular event within this context (the phenomenon in question). A discussion of each of these distinctions will convey the usefulness of Miller's theory of explanation.

When might causal factors be deemed sufficient to bring about the phenomenon in question? It is suggested that particular rules of causal sufficiency are inherent in theoretical frameworks, subject to empirical

debate. Value judgements may affect the assessment of explanatory adequacy, in as much as they affect the choice of research question. In other words, acceptance of sufficient explanation is inseparable from theory. Furthermore, explanation in nursing science is best viewed not from a single source, but rather from multiple sources within physical and human sciences, given that nursing science is multidimensional (Gortner, 1993).

In a pragmatic sense, an explanation must describe those factors that led to the phenomenon under study, bounded by the circumstances at hand — the context. For example, a sufficient explanation could indicate that lack of maternal experience in combination with fear of failure may lead to difficulties in establishing a breast-feeding regimen among a population of inner-city adolescents in the United States. However, to require a description of all the causally relevant factors, factors that taken together would produce the phenomenon in question no matter what the further circumstances, is to reimpose the covering-law model (Miller, 1983). In the example cited, the factors of lack of experience and fear of failure are meant to be considered causal only in the circumstances at hand. There is no statement of a general law in the explanation. Difficulties in establishing a breast-feeding regimen may arise from other factors, given other circumstances — a different group of mothers in terms of age and nationality, or a different point in time. The explanation offered may give clues pertaining to different circumstances but is not intended to serve as a universal explanation.

A causal description sufficient to bring about a phenomenon is not an explanation if the causal factors included are lacking in depth. The description may be inadequate because of two kinds of shallowness: The factors in the explanation may lack depth in that had they not been present something else would have occurred, filling in the causal role and thus producing the same effects (Miller, 1983). If it may be shown that the same sorts of difficulties in establishing a breast-feeding regimen could occur to the group of young mothers when there is a weak support system, then lack of experience and fear do not explain the phenomenon. It must be assumed that there exists a deeper underlying cause.

The second issue related to depth of factors depends on a sort of causal priority. There are frequently relationships among the concurrent factors producing a phenomenon. It may be that a particular factor is sufficient to bring about the phenomenon of concern only because of the other factor (Miller, 1983). With regard to the case in point, it may

be that fear of failure is in fact produced by maternal inexperience. Therefore, the shallower cause (fear of failure) is a means by which the deeper cause (lack of maternal experience) produces its effect.

In essence, then, any scientific explanation is intrinsically comparative. In accounting for how a phenomenon was produced, we must also deny that another, "deeper," causal process is involved. Appraisal of scientific explanation using such criteria provides an assurance that rigour prevails.

Van Fraassen (cited in Rubin, 1993, p. 287) summarizes this new view of explanation by simply stating, "An explanation is not the same as a proposition, or an argument, or list of propositions; it is an *answer*." The explanation is an answer to a question, which has been framed within the context of "why." Therefore, a theory of explanation may be viewed as a theory of why-questions.

Value to Nursing

While the above example is perhaps a simplistic representation of explanatory power in nursing, it serves to illustrate the value of a different approach to the issue. Several points may be made regarding the departure from the present polarity in viewing explanation.

The proposed theory moves away from the deductive-nomological perspective, which, Hempel's (1965) arguments to the contrary, has proven to be problematic for human sciences. Phenomena of concern to nursing often comprise numerous factors. In addition, it is hard to imagine situations that are not too idiosyncratic to be governed by universal laws. In reality, this is frequently the case in physical science as well. Explaining why there are topographical formations on earth in no way implies an identical process on Mars. The covering-law model has placed nursing science in a seemingly impossible situation. Gortner (1990) acknowledges the frustration involved in trying to accommodate the science of nursing to standards derived for physical science. She states that "perhaps concern with the mechanistic philosophy of science has prompted the reaction against explication of patterns" in nursing science (p. 104).

Furthermore, the proposed theory of explanation provides an avenue for scientific aims beyond that of hermeneutic interpretation. It is submitted that this alternative stance does not nullify or oppose the potential contribution of hermeneutic understanding, but rather allows

for the value placed on the identification of universal experience. Explanation appraised through empirical debate as opposed to rules of logic (as in the deductive-nomological view) anticipates diversity in theoretical grounding. Opportunity is provided for a variety of conceptual approaches in the recognition that all are not equally valid. The governing principle is simply that a theoretical approach is invalid if the science guided by it is an inferior source of further discoveries. It is assumed that over time the more relevant frameworks will be the more productive. When one is searching for an answer, the context of the phenomenon becomes the guiding principle and the answer is the explanation.

Perhaps the greatest benefit of a different notion of scientific explanation has to do with shifting the attention of the discipline away from debates on methodology. Focus may then be placed on the aims and the products of science in nursing.

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In Memoriam

Sheila Packard died peacefully, April 23, 1995, after a courageous battle with metastatic cancer. Sheila will be remembered for her keen intellect, her wit, her love of life and her pursuit of truth. She was a dedicated and committed nurse and educator who envisioned the nurse/professor as a healer engaged in a dialectic with those whom s/he served. Sheila will be deeply missed, but her legacy will last forever.