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Clinical Decision Making of Experienced and Novice Nurses

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Decision making is an important daily nursing activity. Given contradictory past findings concerning the ease of use of cognitive schema for reaching decisions among experts and novices, we chose to examine consistency of information as a parameter that may clarify the process of decision making. Ninety-two experienced nurses and 65 nursing students rated their decisional difficulty and levels of certainty in reaching a diagnosis for two scenarios: one including consistent information and one providing information that was partly inconsistent with the given diagnosis. For the consistent information, students showed more difficulty and less certainty in the given diagnosis than the experienced nurses. The inconsistent scenario was perceived as more difficult by nurses in comparison to students. The cognitive processes responsible for these results are discussed.

A nurse's day-to-day work involves many decisions that have to be made within a short time span and have major implications for the well-being of the patient or even his or her life. It is, therefore, important to understand the decision-making process in nursing and the factors that influence it. We have chosen to examine the impact of experience on decisional difficulty and certainty. To do so, we clarify the concepts involved in decision making and those hypothesized to be involved in the experience.

The process of decision making involves a situation in which a person is in a state of uncertainty until a decision is made. The reduction of uncertainty is achieved by either "piecemeal" or cognitive structuring processes. Piecemeal processes involve vigilant behavior that includes a systematic and effortful search for relevant information, its evaluation, and unbiased assimi-

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lation (Driscoll, Hamilton, & Sorrentino, 1991). Cognitive structuring (CS) processes are defined by Neuberg and Newsom (1993) as the "use of abstract mental representations (e.g., schemata, prototype, scripts, attitudes, and stereotypes)—representations that are simplified generalizations of previous experience" (p. 113).

CS, when applied in an early stage of the decision-making process, allows individuals to attain certainty most efficiently because it is relatively automatic, effort-free, and faster than the vigilant behavior or analytical processing (Brewer, 1988; Shiffrin & Schneider, 1977). The categorization process facilitates reaching certainty by filtering out inconsistent or irrelevant information (Fiske & Linville, 1980; Koriat, Lichtenstein, & Fischhoff, 1980). CS may also add previously stored information necessary to attain certainty concerning the validity of the inference (Fiske & Linville, 1980). Even when a person uses a piecemeal process, the information has to be assimilated into his or her knowledge structures to become useful. Thus CS is essential in achieving certainty, regardless of the stage of the decision-making process that it is applied in. In this vein, Bunder (1962) postulated that uncertainty is caused by individuals' inability to adequately structure or categorize information. Maximal use of existing cognitive schema is therefore an efficient method for decision making because it requires the least cognitive resources.

One factor influencing the efficiency of CS is the level of expertise. A major difference between experienced and novice professionals lies in the development of cognitive schema through past experiences and acquisition of past knowledge, which then affect decision making (Benner, 1984; Jones, 1992). As stated by Ruohomaki (1992), expertise is based on well-organized knowledge structure and processing abilities gained by training and experience that help experts solve problems faster than novices.

Research concerning the process of problem solving indicates differences between an expert and a novice (Jones, 1992). The experts' knowledge base is more organized, abstract, and structured (Glaser, 1984; Manjon & Carretero, 1992; Schraagen, 1993; VanLehn, 1989). Experts therefore organize information better than novices; they distribute the information better into categories and are better able to generalize, which helps them in properly matching their activities to different situations (VanLehn, 1989). An expert uses a combination of hypothetical conclusion drawing and arguments based on structured and organized information (Corcoran-Perry & Narayan, 1995). In contrast, novices tend to deal with one issue at a time, attend to more irrelevant information, and expend much energy over conscious and effortful processing (Benner & Tanner, 1987; Jones, 1992; Ruohomaki, 1992).

In nursing, as in other health professions (Elstein, Shulman, & Sprafka, 1978; Jones, 1992), the level of training affects the decision-making process.

Because of better knowledge of the situation, the expert nurse finds it easier to reach a decision in comparison to a novice (Larvee & Hunt, 1992). Similarly, students find it much harder to make a right choice in clinical situations, and they lack the capability to discern the useful information (Thiele & Holloway, 1991). Effective decision making must involve cognitive structuring to achieve clinical effectiveness. For instance, the cardiac expert nurse, in comparison to a student, recognizes better developmental patterns of heart rhythm without using advanced technological equipment; that is, the nurse doesn't need to see each component separately to understand the underlying pattern and reach conclusions because she has generalized previous perceptions and an advanced structured cognition as compared to a student (Jacavone & Dostal, 1992). The novice is more likely to be cautious and hesitant and is inclined to collect irrelevant information without enough experience to distinguish between the needs emerging from different situations (Dreyfus & Dreyfus, 1986; Klein & Hoffman, 1993).

Whereas the literature indicates that the experts use more efficient methods to achieve decisions and would therefore be expected to experience less decisional difficulty and more certainty than the novice, the literature also shows that novices tend to use more simplistic schema and crude categorization than experts and would therefore be expected to achieve decisions more easily. Wicklund and Braum (1987) demonstrated that novices tend to use more crude categories, heuristic thinking, and stereotypical information in their judgments than do experts. Similarly, Fiske, Kinder, and Larter (1983) found that experts focused on inconsistencies to a greater extent than did novices, and given mixed information, their inferences were more moderate than those of novices. In contrast, novices focus on information consistent with the expectation provided. This energy-saving processing, which is based on a very limited amount of information, leads to a lower decisional difficulty and higher certainty. Thus the novice nurse, because of lack of knowledge, may experience less decisional difficulty by using simplistic schema and by not considering alternatives with which he or she has no experience.

A possible explanation of the conflicting results concerning ease of processes among experts and novices may be related to factors affecting the ease or difficulty of CS use. One factor is information consistency. We assume that schema-inconsistent information is harder to be combined with or assimilated into the schema than schema-consistent information. This assumption was validated by ample research showing that information that is incongruent with an initial impression is more likely to be recalled than congruent information (Hastie, 1980; Srull, 1981). The idea is that the incongruent information is remembered better because it requires longer and more elaborate processing to be integrated in the impression. Schema-

inconsistent information is harder to be combined with or assimilated into a schemata than schema-consistent information. When applying this explanation, it is possible to clarify the inconsistency described earlier in the following way: Because expertise implies more use of CS and because consistent information allows effective use of cognitive structures, experienced nurses are expected to have an easier time with consistent information than novices. Experienced nurses who have inconsistent information may require more time to explore alternative hypotheses of which novice nurses may not be aware. Therefore, experienced nurses may have greater difficulty in decision making and will be less certain than novices. To examine this hypothesis, the present study examines the effect of diagnosis information consistency on experienced nurses and nursing students in their senior year.

METHODS

Participants

Participants were 65 students in their senior year of an academic nursing school program in Israel and 92 hospital nurses who had been working for at least 3 years (average seniority = 17.4 years; $SD = 9.9$). All participants were female, and the mean age was 26 years for the students and 41 years of age for the nurses. More than half of the hospital nurses (54 of 92) were staff nurses on the units.

Procedure

Nursing students and experienced nurses received two scenarios, each containing either a consistent or an inconsistent set of symptoms, as well as a possible diagnosis. Their task was to evaluate their certainty that the described patient was indeed suffering from the diagnosed disease and to describe their difficulty in reaching this decision.

Instruments

Description of the two scenarios. Each participant received two brief case descriptions. The inconsistent description read as follows: "On a very hot day a 78-year-old woman is brought into the emergency room with suspected dehydration. Her symptoms are dry skin, dry tongue, high urea, a smell of acetone from her mouth, estimation of glucose 430, and vaginal scrub" (the

inconsistent symptoms are numbers 5 and 6). This information is inconsistent because it points to the possibility that the dehydration diagnosis is incorrect.

The consistent information scenario was as follows: "You work on the night shift on an internal medicine unit, and you are called to the bathroom, where the patient, M.N., fell on the floor. You notice the following symptoms: paralysis of half the face, weakness in the same side of the body (hand and leg), slow and unclear speech, confusion, dizziness, blood pressure 220/160." The diagnosis suggested was a cerebrovascular accident (CVA).

Certainty index. For both scenarios participants were requested to indicate their level of certainty in percents, where 100% indicated absolute certainty in correctness of diagnosis, and 0% stood for absolute certainty that it was incorrect. Because on such a scale 50% represented the highest uncertainty, the certainty index was calculated as the absolute difference between 50 and the score given by the participant.

Decisional difficulty. This was measured by an index derived from the average score on the following four items: "How difficult is it for you to decide whether the patient suffers from a CVA?" "To what extent do you require additional information to reach certainty as to whether the patient does suffer from a CVA?" "If you had to reach a diagnosis, how much time would you have to spend to decide whether this patient suffers from a CVA?" "If you had to reach a diagnosis, to what extent would you contend with it after reaching a decision?" Each item was rated on a 6-point scale, where 1 denotes "not at all" and 6 denotes "to a very great extent." Internal consistency reliability for this scale was measured through Cronbach's alpha, which was .87 for the consistent scenario and .90 for the inconsistent scenario.

RESULTS

To test the hypothesis that decisional certainty and difficulty are affected by both level of expertise and by situational information consistency, we performed two two-way ANOVAs. Each ANOVA included the between factor of participants' expertise (students vs. nurses) and the within-subject factor of information consistency (diagnosis consistent vs. inconsistent information). The first analysis examined decision difficulties ratings. The analysis yielded a main effect of information consistency in which the decision involving consistent information was perceived as significantly less difficult ($M = 2.74$, $SD = 1.15$) than the decision based on inconsistent information ($M = 3.39$, $SD = 1.38$) ($F_{(1, 154)} = 21.98$, $p < .01$). In addition, the analysis yielded a significant interaction effect ($F_{(1, 154)} = 9.03$, $p < .01$). Figure 1 presents the cell means for decision difficulty and reveals an

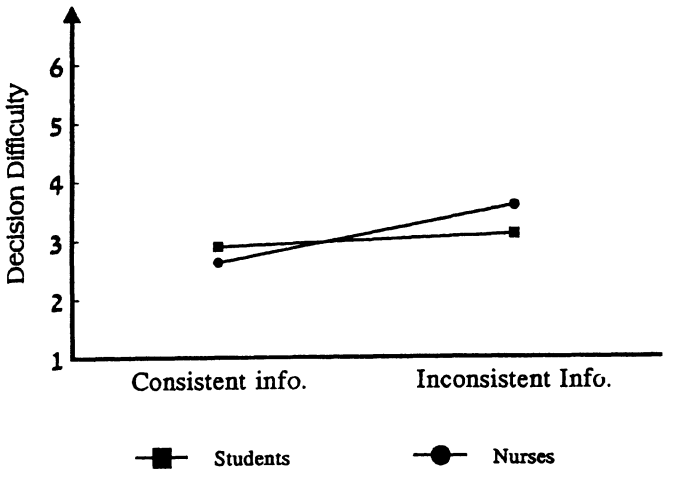

Figure 1: Mean decision difficulty as a function of information consistency and subjects' expertise.

interaction pattern in which, in accordance to the hypothesis, diagnosis based on consistent information is perceived as easier by nurses (M = 2.63, SD = 1.20) than by students (M = 2.90, SD = 1.07). In contrast, in the case of diagnosis based on inconsistent information, nurses perceived the decision as more difficult (M = 3.59, SD = 1.38) than did the students (M = 3.11, SD = 1.38). The Tukey/b a posteriori test revealed that both comparisons are significant.

The second analysis, which examined participants' certainty, was similar to the first. The analysis yielded two main effects and an interaction. As in the first analysis, participants were more certain in the diagnosis that was based on consistent information (M = 36.78, SD = 14.79) than on that based on inconsistent information (M = 28.24, SD = 17.05) ($F_{(1, 153)} = 15.87$, $p < .01$). In addition, nurses were more certain (M = 34.19, SD = 9.86) than students (M = 30.17, SD = 10.18) ($F_{(1, 153)} = 5.90$, $p < .05$). Finally, the interaction term was significant ($F_{(1, 153)} = 14.15$, $p < .01$). Figure 2 presents the cell means of decision certainty. The figure shows that, as in the first analysis, nurses were more certain in the diagnosis based on consistent information (M = 41.47, SD = 9.77) than students (M = 30.29, SD = 17.89). In contrast, nurses (M = 26.92, SD = 18.16) were less certain when their decision was based on symptoms that were inconsistent with the diagnosis than were the students (M = 30.06, SD = 15.34).

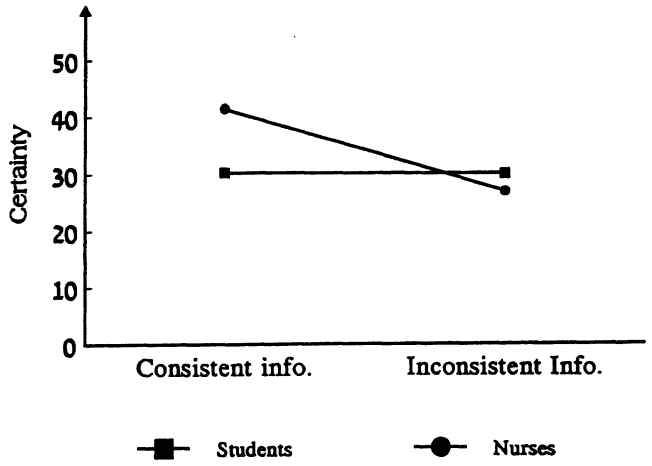

Figure 2: Mean decision certainty as a function of information consistency and subjects' expertise.

The above data concerned participants' certainty regardless of whether they agreed with or rejected the suggested diagnosis. This examination, however, does not portray the full picture because participants could express not only their level of certainty in the original diagnosis but also their level of confidence in an alternative diagnosis (differential diagnosis); a preference for an alternative diagnosis is indicated by a score of less than 50. In this range, the lower the number, the higher the participant's certainty that the original diagnosis is *incorrect*, presumably because a different diagnosis is correct. To explore this further, participants were divided into three groups, as follows: those expressing uncertainty (scores of 40-60), those expressing certainty in the original diagnosis (above 60), and those expressing certainty in a differential diagnosis (below 40). Chi-square (2 × 3) tests (two levels of expertise and three certainty zones) were performed for the consistent data and inconsistent data scenarios. Both tests yielded significant results ($x^2_{(2)} = 22.54, p < .01$) and ($x^2_{(2)} = 16.52, p < .01$, respectively), indicating a relationship between expertise and certainty. Table 1 shows that, in the consistent information scenario, the main difference between the two group stems from the fact that although 28% ($n = 18$) of the students fall in the uncertainty zone, only 2.2% ($n = 2$) of the nurses were in this zone. In the inconsistent information scenario, there are more nurses (31%, $n = 28$) in the uncertainty zone than students (18%, $n = 12$).

TABLE 1: Participants' Responses as a Function of Level of Expertise and Information Consistency

	Consistent Information		*Inconsistent Information*	
	Scenario		*Scenario*	
	Students	*Nurses*	*Students*	*Nurses*
Uncertainty	18	2	12	28
	27.7%	2.2%	18.5%	30.8%
Certainty in original diagnosis	47	88	44	32
	72.3%	96.7%	67.7%	35.2%
Certainty in differential diagnosis	0	1	9	31
	0%	1.1%	13.8%	34%
Total	65	91	65	91
	100%	100%	100%	100%

In addition, more nurses (34%, $n = 31$) switched into the differential diagnosis zone than students (14%, $n = 9$). In contrast, more students (68%, $n = 44$) judged themselves in the original diagnosis zone than did nurses (35%, $n = 32$). To further explore the changes within each group, participants were classified into one of three groups: participants who changed from being certain in the validity of the original diagnosis in the consistent information scenario to uncertainty in the inconsistent scenario, participants who changed from certainty in the original diagnosis to certainty in a differential diagnosis, and participants who moved from the uncertainty zone to certainty in the original diagnosis.[1] A 3 × 2 chi-square test was performed, showing a significant difference between the pattern of nurses and students ($x^2_{(2)} = 29.32$, $p < .01$). Table 2 shows that most students who changed moved from uncertainty in the consistent information scenario to certainty in the given diagnosis of the inconsistent scenario. In contrast, most nurses who changed went from certainty in the original diagnosis to either uncertainty or certainty in the deferential diagnosis. Thus, because the parametric statistical analysis mainly reveals the effect of the information consistency on the nurses but not on the students, who did not seem to be affected by this factor, the nonparametric analysis shows more clearly that students tended to ignore the differential diagnosis and express more certainty in the case of the inconsistent information scenario than in the consistent information one.

TABLE 2: Distribution of Changes in Participants' Responses From the Consistent to the Inconsistent Information by Level of Expertise

	Students	*Nurses*
From certainty in the original diagnosis to uncertainty	11 31.4%	27 45.8%
From certainty in the original diagnosis to certainty in the differential diagnosis	8 22.9%	31 52.5%
From uncertainty in the original diagnosis to certainty in the original diagnosis	16 45.7%	1 1.7%
Total	35 100%	59 100%

DISCUSSION

This study addressed the contradictory research findings concerning the effect of expertise on the use of cognitive schemata for decision making. On one hand, it is often suggested that expert nurses experience less difficulty in their decision making than novices, presumably because the former use cognitive structuring more effectively. On the other hand, empirical findings show more effortful decision-making processes for experts relative to novices. We suggested that the discrepancy may be explained by the nature of information on which the decision is based. The tested hypothesis was that the effect of nurses' expertise on their certainty and ease in decision making is moderated by information consistency. The results of the study support the hypothesis. The results suggest that experienced nurses used cognitive schema based on past experiences to evaluate each scenario. Because the consistent scenario fits well with the experienced nurses' existing cognitive schema, the decision-making process pertaining to consistent information involved high decision certainty and low levels of decision difficulty. But when there was a lack of such fit because of inconsistency in the data, experienced nurses evaluated differential diagnoses and reported, appropriately, lower levels of certainty in the original diagnosis and higher levels of decisional difficulty and certainty in differential diagnoses. These results are consistent with Corcoran's (1986) findings that, when expert nurses were presented with cases of varying complexity, case complexity was positively related to the number of alterna-

tives generated for each case. According to this framework, the more alternatives evaluated, the more difficult the process and the less certain nurses are that the given diagnosis is correct.

It seems that the students did not use the schema effectively in the consistent information scenario and, therefore, many of them (27%) felt uncertain. In the case of the inconsistent information scenario, several processes occurred: Eight students who showed confidence in the diagnosis in the consistent information scenario switched to confidence in a differential diagnosis. This indicates a schema application similar to that seen among the nurses, only occurring in a much lower percentage (12% of students vs. 34% of nurses). Sixteen students changed from uncertainty in the consistent information scenario to certainty in the given diagnosis in the inconsistent information scenario, resulting in levels of uncertainty lower (18.5%) for the inconsistent than those for the consistent information scenario among the students. This behavior is partially explained by mere lack of knowledge. That is, students (novices) may have felt more certainty and less difficulty than nurses (experts) because they could not see the contradiction in the symptoms. Such an interpretation, however, would not fully explain the fact that 16 students, compared to only one nurse, switched from *uncertainty* in the original diagnosis in the consistent information scenario to *certainty* in the original diagnosis in the second scenario. This behavior can be explained by the principle that, when a task becomes too complex, people tend to resort to simplistic schema. For example, Wicklund and Braum (1987) found that those who are inexperienced, incompetent, or unsure of their abilities within a given performance context are likely to use more schematic rather than piecemeal processes. Hughes and Young (1990) found that clinical experts departed from a systematic decision making as the task complexity increased. Similar results were reported by Chinburapa et al. (1993), who reported that physicians shifted from compensatory (piecemeal) to noncompensatory (schematic thinking) when task complexity increased. These conclusions may explain the variety of results reported by different researchers regarding the effect of task complexity and participants' expertise on their decision making. In our case, it seems that because the inconsistent task was too complex for the students, many used a simplistic schema (the one offered in the given diagnosis) rather than analyze the situation.

Based on the above analysis, the difference between novices and experts stems also from the level of complexity at which they encounter the inconsistent information. A decision that involves inconsistent information may cause the experts to switch from CS mode to a piecemeal process to achieve certainty. In contrast, inconsistent information, because it may be perceived by the novices as not enabling them to achieve certainty using piecemeal

processing, may drive them to use CS. On a more general level, it is possible to conclude that people use effortful processing to achieve certainty when an appropriate schema is not available and the dilemma is not too difficult for applying piecemeal processing. On the other hand, the use of CS occurs when subjects either have the appropriate schema or they perceive the problem to be too difficult to be solved by piecemeal processing. Such a conclusion is supported by the research finding that clinicians, particularly experienced nurses, use intuition[2] as well as analytical processes to make clinical decisions (Benner, 1984; Benner & Tanner, 1987). In the present terms, experienced nurses use intuition (CS processes) because their experience enables them to develop the appropriate schemata and use analytical processing because schematic processing is not suitable, and the problem at hand is not too difficult. This, however, may challenge Benner's conclusion that nurses new to an area of practice use more analytical processes. Novice nurses may use more analytical processes *only* to the extent that they perceive the problem at hand to be not too difficult for analytic processing. When the information is too complex, the amount of information is too large, or the decision is made under time pressure, novice nurses will use more cognitive structuring, which may be manifested in heuristic thinking (Chaiken, 1980; Fiske et al., 1983). Because heuristic thinking is associated with cognitive biases such as preference for confirming and avoiding diagnostic information (Beattie & Baron, 1988; Skov & Sherman, 1986), it is important to note that under certain circumstances, novice nurses differ from experts not only in relying on more effortful processing but also in basing their decision on biased information search strategies that may lead them to wrong conclusions.

To conclude, the present research demonstrated that although experts shift from *effortless* cognitive structuring to more *effortful* analytical processing as a function of information consistency, some of the novices, in contrast, shift from analytical processing when they encounter consistent information to cognitive structuring processing when faced with a more complicated decision. Because the development of expertise requires acquiring a good knowledge base (Klein & Hoffman, 1993), the immediate implication is that nurses in training should stress this domain more with a special emphasis on differential diagnosing process. This conclusion is further strengthened when taking into account that although students, more than nurses, tended to ignore the inconsistent information and the differential diagnosis, there were, nevertheless, enough nurses (35.2%) who did the same. Knowledge base, however, is a necessary though not sufficient factor for developing proficiency. Because the present research shows the clear difference between experienced and novice nurses, it seems that the education of the latter should also capture

those aspects of decision making that are developed mainly through experience. To do so, it is necessary to use techniques of knowledge elicited from experienced nurses (Corcoran-Perry & Narayan, 1995; Hoffman, Shadbolt, Burton, & Klein, 1995) and training strategies such as drawing analogies, thinking aloud, studying paradigm cases, and asking novices to predict experts' clinical decisions (Corcoran-Perry & Narayan, 1995; Klein & Peio, 1989).

NOTES

1. Because the purpose of the analysis was to examine changes in certainty from the consistent information scenario to the inconsistent information scenario, only participants who switched categories were included in this analysis.

2. By intuition we mean activities related to cognitive structuring, such as sensory grasp of the whole situation within a particular context, pattern recognition, similarity recognition, commonsense understanding, skilled know-how, and sense of salience (Benner & Tanner, 1987).

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