Pergamon

Int. J. Nurs. Stud., Vol. 34, No. 5, pp. 325–334, 1997

Printed in Great Britain
0020–7489/97 $17.00 + 0.00

PII: S0020–7489(97)00024–2

Differences in pain assessment and decisions regarding the administration of analgesics between novices, intermediates and experts in pediatric nursing

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(Received 20 September 1996; revised 20 April 1997; accepted 9 June 1997)

Abstract

This article describes a study examining the influence of expertise on nurses' pain assessments and decisions regarding pharmacological interventions in children. In an experimental design, novices ($n = 271$), intermediates ($n = 222$), and experts ($n = 202$) in pediatric nursing, various cases were presented. Each case consisted of a combination of a vignette and a video. Subjects were asked (1) to assess the child's pain intensity, (2) to specify their confidence in the assessment, and (3) to state whether or not they would administer a non-narcotic analgesic. The results indicated that expertise did not influence assessments of pain intensity. However, expertise did have a distinct impact on both the subjects' confidence in their decisions, and the decision to administer analgesics. Experienced nurses were most confident and were most inclined to administer analgesics.

The findings of this study are placed in the context of a general theory on the development of expertise, which assumes that experts' decision-making is based on cognitive structures that describe features of prototypical or even actual patients, so called "illness scripts". From this theory it can be deduced that mainly practical experience is responsible for the (lack of) differences in decision-making between novices, intermediates and experts. © 1997 Elsevier Science Ltd. All rights reserved.

Keywords: Decision making; expertise; pain assessment; intervention; children.

Introduction

Knowledge and experience seem to affect both nurses' pain assessments and their interventions in children (Hamers *et al.*, 1994a). It is generally assumed that education and practical experience increases accuracy in decision-making. Several theoretical approaches to decision-making are, in fact, based on this assumption (e.g. Benner, 1984; Boshuizen, 1989; Schmidt *et al.*, 1990).

In the nursing literature, a number of studies on decision-making with regard to general nursing problems are described which seem to confirm this assumption. In such studies performances of experts are compared with those of novices. Trends found by Corcoran (1986) and Tanner *et al.* (1987) indicate that experts performed better and were more accurate than novices in diagnosing and planning. However, it should be stressed that research on accuracy in decision-making in nursing is hampered since it is often not known what an accurate decision is (Hamers *et al.*, 1994b). Other decision-making studies investigated the assumption that expertise influences problem-solving skills. A study by Itano (1989) demonstrated differences in decision-making between experts and novices; experts used more and different cues than novices. However, Sanford *et al.* (1992) did not find differences in decision-making skills between nurses with different levels of educational preparation. Schmidt *et al.* (1990) report similar results in the medical literature. According to these authors experts do not have superior reasoning skills but their decisions, in contrast to those of novices', are based on cognitive structures that describe the features of prototypical or even actual patients.

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Assessment

Since expertise does influence decision-making it may be expected that experts and novices differ in their decisions regarding pain assessment. One may question how knowledge and experience influence pain assessments. Do experts generally assess pain as more severe than novices? Or is the reverse the case?

Several studies revealed different results. Shapiro (1993) suggested that knowledge and experience do not influence assessments of pain intensity. However, Lenburg *et al.* (1970) suggested that knowledge influences pain assessments; first-year students attributed more pain to hypothetical patients than second-year students. This was supported by Davitz and Davitz (1980) who found that the estimated intensity of patients' physical pain decreases in the course of nursing education. However, Halfens *et al.* (1990) reported conflicting results with regard to the influence of knowledge on pain assessment. They found that assessments of pain increase in the course of eduction; student nurses in the last two years of their education assess pain as more intense than student nurses in the first year of their education.

Mason (1981) suggests that it is not nurses' educational preparation which affects pain assessment, but nursing experience; assessments of pain by nurses with less than one year experience are the highest, assessments of nurses with six to ten years experience the lowest. In other words, Mason's study shows that the assessed intensity of pain decreases with increasing years of experience. However, the assessed intensity of pain increases when nursing experience exceeds ten years, which means that there is an inverted U-shaped relationship between years of experience and assessed intensity of pain. In addition, Halfens *et al.* (1990) reported that student nurses in the last two years of their education assess pain as more intense than registered nurses. However, these authors also found that pain assessments by student nurses in the first year of their education are lower than those of registered nurses.

Although a study by Dudley and Holm (1984) used the same method and materials as Mason (1981), conflicting results are reported. In this study a trend was found which indicated that education may influence pain assessment (the higher the educational preparation the higher the pain ratings), but that there are no associations between experience and pain assessment. In addition, a study by Boonstra *et al.* (1992) indicates that educational preparation influences nurses' pain assessments. Nurses with a specialization in pediatrics appeared to assess pain more accurately (there was a high degree of concordance between nurses' ratings and children's ratings) than nurses without such a specialization.

How can these results be explained? First, conflicting findings could be due to the methods used in the studies. Almost all of the above-mentioned studies on pain assessment employed uncontrolled descriptive designs, and in most of these studies subjects had to assess cases described on paper, leaving the ecological validity outside of consideration.

Second, in different studies subjects with different characteristics were involved, so that different variables were used. Subjects in the study by Davitz and Davitz (1980) were (baccalaureate, associate degree, and diploma) nursing students from different nursing schools. In the studies by Mason (1981) and Dudley and Holm (1984), knowledge and experience (educational preparation and years of practical experience) of registered nurses were the subject of investigation, while in the studies by Lenburg *et al.* (1970) and Halfens *et al.* (1990) student nurses (first and second year in Lenburg *et al.*'s study, and junior and senior in Halfens *et al.*'s study) and registered nurses were compared. This could explain the differences in findings on the impact of education on pain assessment.

Expertise covers both the knowledge and experience one has acquired over time (Boshuizen, 1989). However, many studies mentioned above were limited to the influence of knowledge (education) on pain assessments, while there is growing evidence that mainly practical experience is responsible for differences in decision-making between novices and experts (Schmidt *et al.*, 1990; Tanner *et al.*, 1993; Hobus, 1994; Radwin, 1995). Mason's (1981) study suggested that assessed pain intensity decreases with an increasing level of practical experience. This might indicate that nurses become desensitized to the patient's suffering after repeated exposure to it (Mason, 1981). If this is a valid explanation one might expect that novices would assess more pain than experts. The first aim of the present study is to investigate whether the pattern of decreasing levels of assessed pain intensity with an increasing level of expertise will stand up to replication in a controlled study.

Confidence

Diagnostic tasks often cause uncertainty. Tanner (1984) suggested that especially novices gather (too much) information to reduce this uncertainty. This is also reported in the medical literature (Hobus, 1994). This makes it reasonable to assume that novices are less confident that they are making the right decisions (i.e. assessing children's pain accurately) than experts. A study by Chang and Gaskill (1991) suggested that education improves confidence in problem-solving. However, in a study by Holden and Klinger (1988) novices and experts did not differ in their confidence that they made the right diagnosis. The second aim of this study is to investigate whether expertise increases confidence in the correctness of decisions made.

Intervention

Very few studies have been carried out on differences in decision-making with regard to pain-relieving interventions between novices and experts. A recent

study by Ross *et al.* (1991) suggested that nurses with greater medication knowledge would provide more medication. Since knowledge is achieved by education and practical experience, it is to be expected that experts will have more knowledge on pain management than novices. As a result one might expect that experts also would provide more analgesic medication. However, Fothergill-Bourbonnais and Wilson-Barnett (1992) indicated that there are no differences between novices and experts in knowledge pertaining to theoretical, pharmacological and non-pharmacological aspects of pain and its management. Furthermore, in many studies (Burokas, 1985; Gadish *et al.*, 1988; Halfens *et al.*, 1990; Ross *et al.*, 1991) refresher courses for pediatric nurses are recommended (indicating that experts sometimes do not have sufficient knowledge) regarding pain management. Finally, Cohen (1980) and Sheidler *et al.* (1992) suggested that nurses' knowledge regarding analgesic medication is inadequate.

It may be concluded that there are an increasing number of studies which do not confirm the assumption that experts have adequate knowledge on pain management. These findings might imply that novices and experts would not differ in the administration of analgesic medication. The third aim of this study was to investigate this hypothesis.

Purpose of the study

In summary, the purpose of the present study is to further explore the influence of expertise in decision-making regarding pain assessment and intervention. More precisely an answer was sought to the question whether experts in pediatric nursing differ from intermediates and novices with regard to postoperative pain assessment and pharmacological interventions in hospitalized children.

By means of an experimental design three hypotheses were tested. First, it was hypothesized that novices, intermediates and experts differ in their assessments of postoperative pain in children. Novices were expected to have the highest assessments of pain intensity, followed by intermediates, and then by experienced pediatric nurses. Second, the hypothesis was tested that confidence in pain assessment increases with an increasing level of expertise. Finally, the hypothesis was tested that there would be no differences between novices, intermediates and experts in the postoperative administration of non-narcotic analgesics.

Methods

Design

This study used the materials (videos and vignettes) of a previous study (Hamers *et al.*, 1996). In an experimental design, subjects were presented with four cases, including a practice case. To control for unintended idiosyncrasies of cases, different sets of cases were used. For this reason, subjects were assigned to four different groups. See Fig. 1.

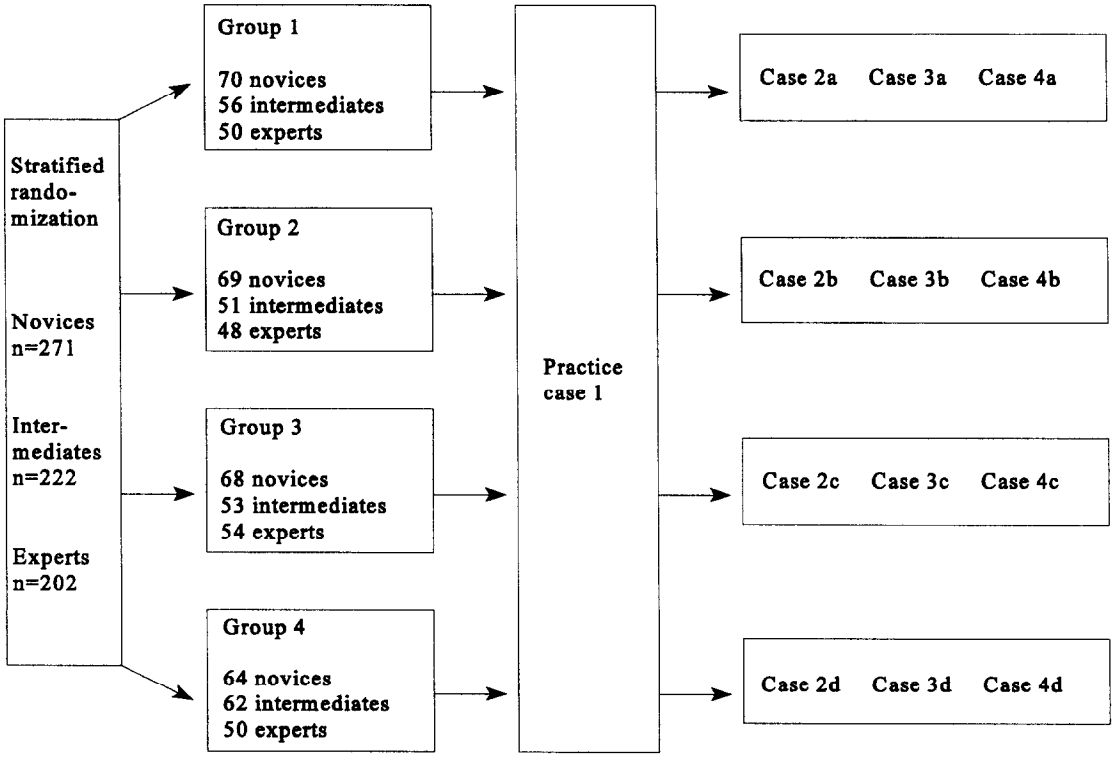

Fig. 1. Illustration of the study design.

Subjects

In this study 695 subjects participated. The population was composed of three samples: novices, intermediates and experts in pediatric nursing. In the literature the concepts that indicate different levels of expertise are operationalized differently. In the present study, novices were first year students, intermediates were fourth year nursing students, and experts were pediatric nurses.

Novices were 271 nursing students (239 females and 32 males), who were attending the first year of a Baccalaureate Nursing (B.S.N.) -program. They were selected from six nursing schools in different regions of The Netherlands. Their mean age was 19.4 years (SD = 2.1; range = 17–35).

Intermediates were 222 nursing students (194 females and 28 males), who were attending the fourth year (graduation year) of a B.S.N. -program. They were selected from five nursing schools in different regions of The Netherlands. Their mean age was 22.2 years (SD = 2.2; range = 20–43).

Experts were 202 pediatric nurses (180 females and 22 males) from 11 hospitals in The Netherlands, who participated in a previous study (Hamers *et al.*, 1996). Their mean age was 32.1 years (SD = 7.0; range = 22–56).

The novices and the intermediates were randomly assigned to four experimental groups after prestratification for nursing school. The experts were assigned to the experimental groups after prestratification for experience (0–3; 4–7; 8–11; 12–15; $\geqslant$16 years in pediatrics), knowledge (specialized education in pediatrics: yes or no), and type of hospital (ward).

Procedure

As can be seen from Fig. 1, each of the 695 subjects was presented with four different cases. A case consisted of a vignette and a video scene (lasting about 30 s). Although the subjects were unaware of it, the first case was a practice case, so that they were able to get used to the task.

Each vignette contained standardized information about the child's name, age, type of surgery, prescription of analgesic *pro re nata* (PRN). The video scene showed a hospitalized child recovering from surgery. It should be noted that the video provided both visual and audio data. An example of a vignette is given in Table 1.

Data was collected by two researchers during 15-min sessions. At each session, standardized instructions were given about the procedure. Special attention was paid to the correct way of filling in the rating scales and to the fact that subjects were not allowed to communicate with each other during the task.

The procedure for all cases was as follows: (1) subjects read the vignette, (2) the video was shown, (3) subjects answered three questions (see measurements).

Table 1.
Example of a vignette

Jef is a boy.
He was admitted with the indication "tonsillectomy" (surgical removal of the tonsils). He underwent surgery this morning. Jef may have paracetamol (rectally), 240 mg p.r.n. to reduce pain, a maximum of four times a day.
Jef is 5 years old.
With this information you enter Jef's room. At that time it is several hours after surgery.

The time to answer each question was restricted by the researcher: subjects had to record their answers immediately after the researcher had asked the question aloud.

Measurements

Subjects rated their answers to the following questions on a 100 mm Visual Analog Scale (VAS):

- Please rate the pain experienced by the child in this case;
- How sure are you that your pain assessment is correct?;
- Would you administer an analgesic to the child in this case?

The scales ranged from "0, no pain at all" to "100, extreme pain", from "0, completely unsure" to "100, completely sure", and "0, would definitely not administer" to "100, would definitely administer", respectively. The distance from zero to the vertical mark of the subject was measured in millimeters.

Reliability and validity

In order to improve reliability and validity, the vignettes and the accompanying video scenes (each lasting about 30 s) were developed systematically, according to guidelines comparable to those proposed by Lunney (1992).

After written parental consent was obtained, children recovering from minor operations (e.g., adenoidectomies, tonsillectomies) in an outpatient ward in a general hospital were videotaped. Videotapes of seven children were edited into 21 videoscenes. In a first pilot study, these scenes were randomly shown to 18 registered nurses, who were asked to rate their answer to the following questions on a 100 mm VAS: (1) Please, estimate the possibility that the child is in pain; (2) Please rate the pain that is experienced by the child. Additional questions were further posed regarding the child's age [would you be surprised knowing the this child is "x" years old (x = 3, 4, 5, 6, 10, 16 years old)] and to the type of surgery [does it

seem likely to you that this child is recovering from a "type of surgery" (type of surgery = adenoidectomy/tonsillectomy/appendectomy/heart surgery/renal surgery)]. Based on their answers and their verbal comments, six videoscenes from four children were selected to represent the natural setting.

After editing and selecting the tapes nine simulated vignettes were developed. As mentioned above, the vignettes contained information about the child's name, the child's age, the type of surgery, and the prescription of non-narcotic analgesics PRN. The amount of information was limited, so cases would be applicable in different hospital settings. The vignettes were based on the results of a review of the literature and a qualitative study (Hamers *et al.*, 1994a), and were judged by two experts in pediatric nursing and one expert in pain in children. The combination of six videoscenes and nine vignettes resulted in 13 different cases (see Fig. 1).

Seven pediatric nurses and six nurse researchers participated in two separate pilot studies which aimed at testing the face and content validity of the combination vignettes and videoscenes. Based on their comments and feedback, the vignettes were revised. Finally, the combination of revised vignettes and videoscenes were tested in a fourth pilot study in which 16 pediatric nurses from a university teaching hospital participated. Based on the nurses' comments and feedback, and based on the positive experiences using the VAS's (see measurements), no further revisions were needed, and it was decided that the materials were reasonably reliable and valid to use in the main study. It should be mentioned that the hospitals where the pilot studies took place did not participate in the main study.

Analyses

The mean VAS scores were analyzed by means of "expertise" × "group" ANOVAs. The variable "group" was included because each group was shown a different series of cases. If ANOVA revealed significant findings, indicating that at least two mean scores differed, Tukey's multiple comparisons procedure was applied in order to detect which means differed.

Results

Subjects

The distribution of subjects over the four research groups is summarized in Fig. 1. Randomization and stratification were successful. For both novices and intermediates, chi-square test revealed no differences in nursing school and experience with hospitalized children between the four experimental groups. Regarding the experts in the four experimental groups, Scheffe's multiple range test revealed no significant differences in level of specialized education and hospital in which nurses are employed.

Hypothesis on pain assessment

The hypothesis regarding the influence of expertise on pain assessment was not supported. Contrary to this hypothesis, Fig. 2 suggests that there were no systematic differences in pain assessments between novices, intermediates and experts; the expertise main effect was not significant.

However, a main effect was found for group ($F_{3,683} = 6.95$; $P < 0.001$), indicating that certain characteristics of the cases shown to the subjects were responsible for differences in their pain assessments. As can be seen from Fig. 2, the assessment scores in group 3 were the highest.

Hypothesis on confidence in making correct decisions

The pattern of the influence of expertise on the subjects' confidence in their decisions is presented in Fig. 3.

As expected, a main effect was found for expertise ($F_{2,683} = 21.91$; $P < 0.001$). However, as can be seen from Fig. 3, the hypothesis on confidence in decisions was only partly supported. Experts were indeed most confident that their pain assessments were correct ($P < 0.01$). However, intermediates were expected to be more confident than novices, but we found the reverse pattern, which proved to be statistically significant ($P < 0.01$).

Hypothesis on decisions regarding the administration of analgesics

The hypothesis regarding the lack of influence of expertise on decisions regarding the administration of analgesics was not supported. A main effect was found for expertise ($F_{2,682} = 26.91$; $P < 0.001$), indicating that novices, intermediates and experts differed in their decisions to administer analgesics. As can be seen from Fig. 4, experts were more inclined than both novices and intermediates to administer analgesics ($P < 0.01$).

As was the case with assessment, a main effect was found for group ($F_{3,682} = 9.97$; $P < 0.001$). This means that certain characteristics of the cases that were shown to the subjects seem to influence their decisions regarding the administration of analgesics. However, this group effect was moderated by a statistically significant interaction with expertise ($F_{6,682} = 3.59$; $P < 0.01$). As can be seen in Fig. 4, novices in the four groups did not differ in their decisions regarding the administration of analgesics. This means that they were inclined to administer an analgesic, irrespective of the characteristics of particular cases. However, it can also be seen in Fig. 4 that the intermediates and experts from groups 3 and 4 were more inclined to administer analgesics than

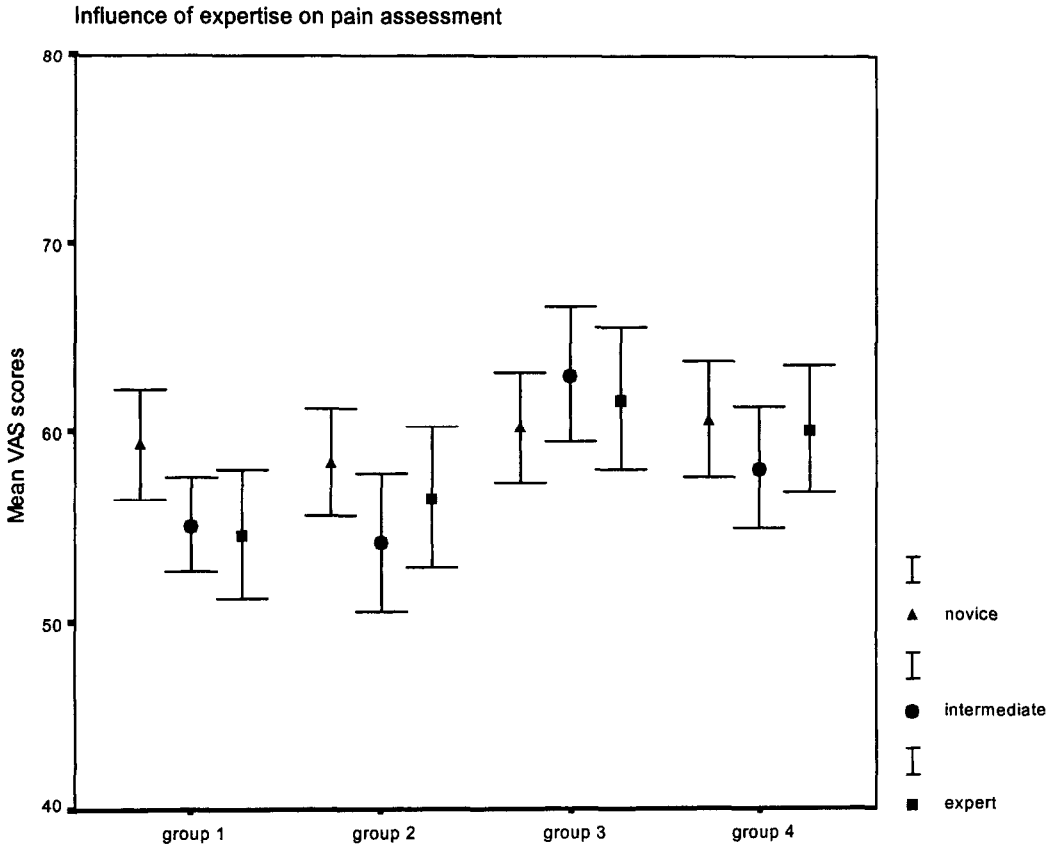

Fig. 2. Mean (±SD) VAS (0–100) ratings of pain assessments of novices, intermediates and experts for four different groups of cases. *Note.* Tukey's multiple comparisons test revealed statistically significant differences between groups 1 and 3, 1 and 4, 2 and 3, and 3 and 4 ($p < 0.01$).

those in groups 1 and 2. Furthermore, experts appear to be influenced most by certain characteristics of the cases in their decisions about the administration of analgesics.

Discussion

Assessment

A remarkable finding in this study is that expertise does not influence pain assessments. The expectation that assessed pain intensity would decrease with an increasing level of expertise was not supported. Novices, intermediates and experts did not differ in their assessments of childrens pain intensity in 12 different cases. Several explanations could be suggested. First, it could be argued that the simulations (vignettes and videos) are not comparable with real-life situations. However, this is unlikely because several pediatric nurses participating in the study remarked that the cases closely resembled reality. These remarks were supported by the high ratings on the VAS when these nurses were asked how confident that they were that their assessment was correct. Another explanation could be that the cases were too uncomplicated; it is quite clear in the vignette and the video scene whether the child is in pain or not. However, it is hardly reasonable to assume that this was the case for all 12 different cases.

Furthermore, there are several theoretical explanations. The level of expertise, probably, does not determine final pain assessments, but may determine how fast one reaches a decision regarding assessment. In a study by Hamers *et al.* (1993) it was indicated that expertise influences the amount of time needed to come to a decision; experts make up their minds more quickly. This finding is consistent with the results in Schmidt *et al.* (1990), who suggested that intermediates require more time to carry out a task. Although the time needed to make a decision was restricted in this study, no differences were found between novices and experts to support the results mentioned earlier. Although, time limits in the present study were rather arbitrary, it is noteworthy that intermediates from two different nursing schools argued that they did not have enough time to make their assessments.

As mentioned before, there is growing evidence that mainly practical experience is responsible for differences in decision-making between novices and experts (Schmidt *et al.*, 1990; Tanner *et al.*, 1993; Hobus, 1994; Radwin, 1995). Schmidt *et al.*'s (1990) theory

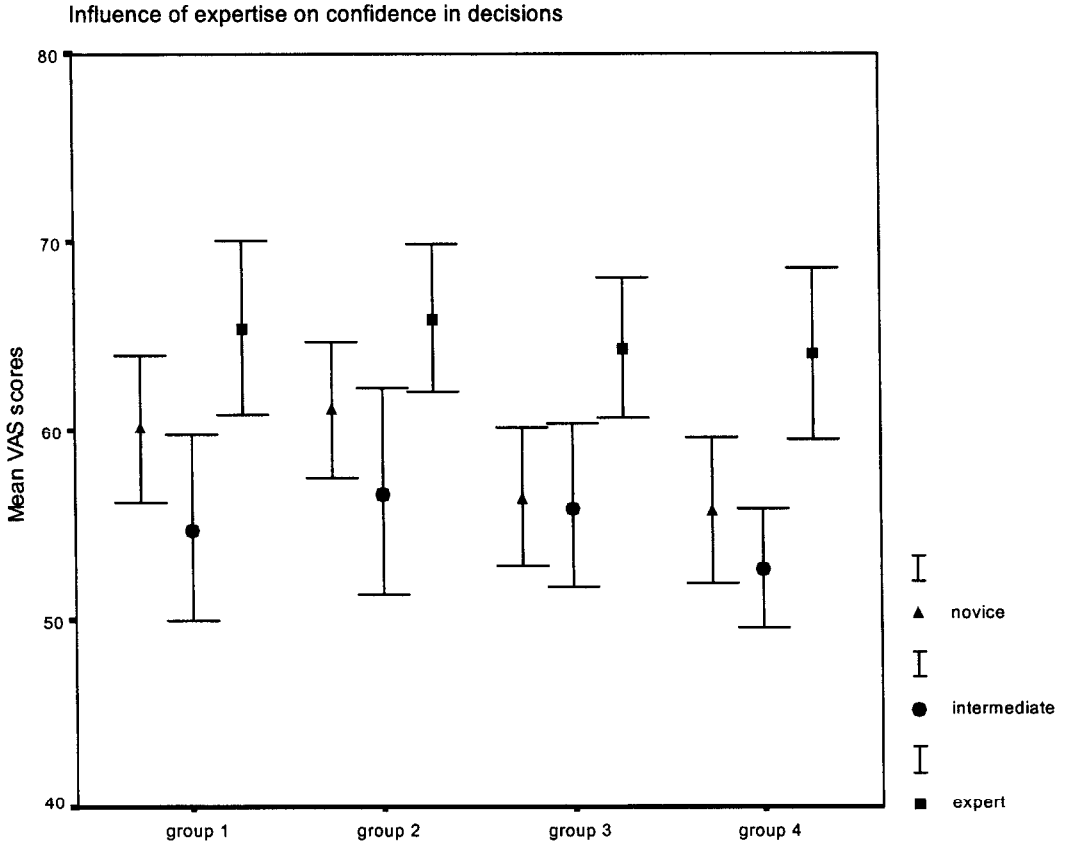

Fig. 3. Mean (±SD) VAS (0–100) ratings representing subjects' confidence in their decisions for four different groups of cases. *Note.* Tukey's multiple comparisons test revealed statistically significant differences between experts and intermediates, between experts and novices ($p < 0.01$), and between novices and intermediates ($p < 0.01$).

on the development of expertise assumes that experts' decision-making is based on cognitive structures that describe the features of prototypical or even actual patients, so-called "illness scripts", which contain a wealth of clinically relevant information about disease, its consequences, and the context under which illness develops. Illness scripts consist of three parts: enabling conditions, the fault and consequences (Boshuizen, 1989; Schmidt *et al.* 1990). Enabling conditions, or contextual information (Hobus, 1994), are factors (e.g., age, sex, risk behavior, social class) that make the occurrence of a disease more likely. The fault is a description of the malfunction. The consequences are the signs of symptoms (e.g., laboratory data, complaints) that arise from the fault. The assumption is that experts for each disease do have an illness script. Furthermore, this theory on medical expertise implies that experts only have scripts about diseases in which they have practical experience. In other words, one becomes an expert as certain scripts become available to one. In the present study experts were pediatric nurses who were working in different fields (e.g., general surgery, oncology, ear nose and throat (ENT), intensive care) of pediatrics, while the cases presented in the experiment were almost all related to the ENT-field. As a result, it could be that the nurses in the present study actually were not experts. This might explain why pediatric nurses and novices and intermediates did not differ in their pain assessments.

Next, in recent studies Hobus (1994) has demonstrated that experts' decision-making is highly based on the usage of contextual information. Differences in accuracy in decision-making between experts and novices decreased when no contextual information was given. The fact that in the present study limited contextual information was given may also explain why there were no differences in pain assessments between novices, intermediates and experts.

A final explanation for this finding could be that the subjects in the experimental study were not asked to make a diagnosis (e.g., the child is in pain, the child misses his mother, the child is sick) but to estimate the child's pain intensity. This might have reduced the novices' and intermediates' cognitive strains, and as a result they were able to perform the task on a level which comes close to the level of the expert.

In conclusion it can be said that more research will be needed on the impact of both knowledge and experience on pain assessments.

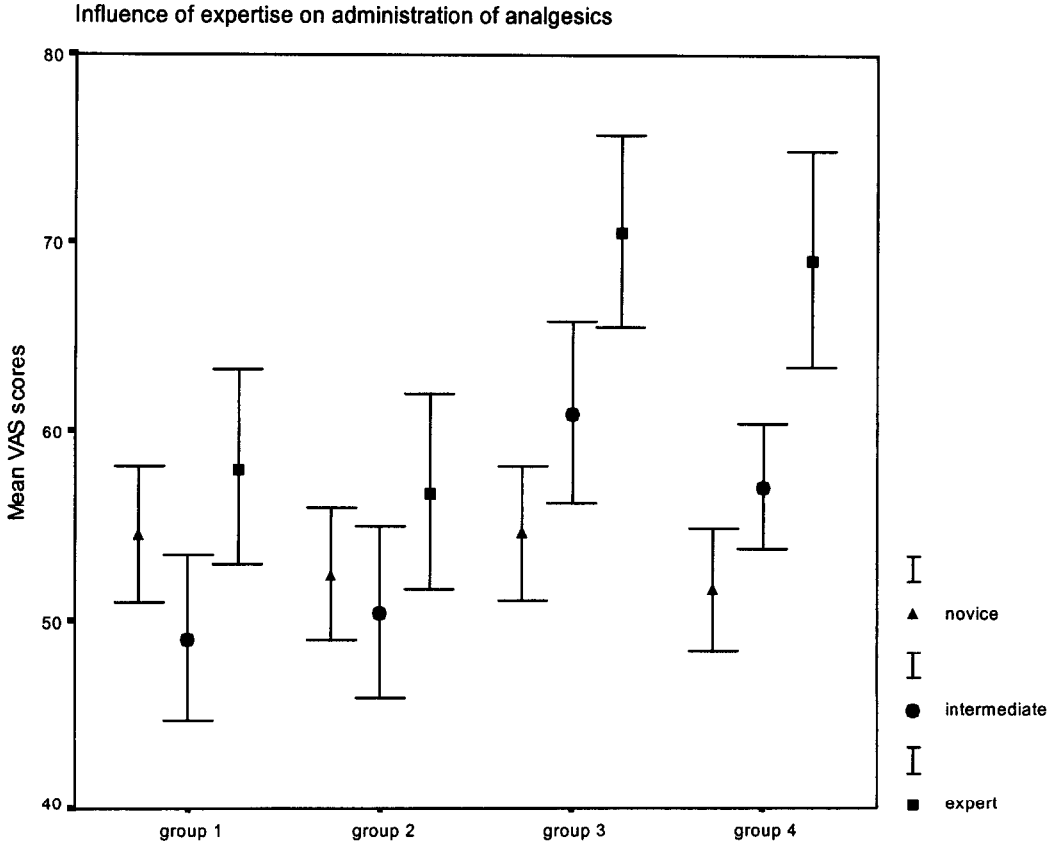

Fig. 4. Mean (±SD) VAS (0–100) ratings regarding the administration of analgesics by novices, intermediates and experts for four different groups of cases. *Note.* Tukey's multiple comparisons test revealed statistically significant differences between experts and both intermediates and novices ($p < 0.01$). Furthermore, statistically significant differences were found between groups 1 and 3, 2 and 3 ($p < 0.01$), 1 and 4, and 2 and 4 ($p < 0.05$).

Confidence

The observation that experienced nurses were most confident that their pain assessments were correct, is in line with our assumption. However, the results of this study have shown that there is no linear relationship between level of expertise and subject's confidence; novices were more confident of the correctness of their decisions than intermediates. In other words, the subjects' confidence in their decisions seems to decrease during their education. This pattern is consistent with general theories on decision-making (Benner, 1984; Schmidt *et al.*, 1990).

While novices in this study make their assessments off the cuff, intermediates compare data again and again before they come to a final decision. During the data-collection sessions intermediates from two different nursing schools were the ones who argued that they had to make their assessments too quickly; they would have liked more time to think their decisions over.

Nursing students are probably taught to make decisions systematically, and to use all kinds of data, so that they pass through every stage of the decision-making process consciously. Furthermore, the students may have learned that assessing patients' pain is a complicated matter and that the experience of pain may be influenced by many factors. It is possible that the intermediates struggle with the information about the cases, because they are taught to be careful when judging a patient's situation.

Experienced nurses, on the other hand, do not go through the stages in the decision-making process consciously. As Benner (1984) states, experts no longer use roles or formulas to guide their practice. Pediatric nurses have already seen many children in pain, and they often have to assess their pain. This practical experience has given them confidence in their decisions.

Intervention

Although this was not hypothesized, the level of expertise had a distinct impact on the administration of analgesics. Experienced nurses were more inclined to administer analgesics than both novices and intermediates, which might indicate that differences in knowledge and experience account for this finding. However, with respect to knowledge acquired during

basic nursing education, no differences were found in the decisions regarding the administration of analgesics between novices and intermediates. Although it was hypothesized that this would be the case, this finding is still remarkable because in the literature a lack of knowledge is mentioned as one of the causes of the insufficient administration of analgesics. These results suggest that mainly practical experience is determining decision-making regarding the administration of analgesics. However, with respect to the influence of knowledge (acquired during education) it should be mentioned that the literature reported that formal nursing educational programs inadequately cover pain management and analgesics (Sheidler *et al.*, 1992).

Furthermore, of importance to note is that an effect was found for group, which was moderated by level of expertise. This means that experts, in particular, were influenced by characteristics of some cases. These characteristics and their relationship with assessment and intervention have been reported before (Hamers *et al.*, 1996). As was shown in Fig. 4, intermediates and experts in groups 3 and 4 administered analgesics sooner than those in groups 1 and 2. This finding could be due to sampling errors. But this explanation is not plausible mainly for two reasons. First randomization and stratification were successful. Experts form the different research groups had the same amount of practical experience in pediatric nursing as well as the same kind of specialized education. Furthermore, stratification for type of hospital (ward) was done, because the pain policies of (wards in) the hospitals could be different. Second, a clear pattern in the data was found. While novices did not differ in the administration of analgesics over all cases, there was an increase in the administration of analgesics with an increase of expertise in groups 3 and 4.

Seeing that experienced nurses were more inclined to administer analgesics to children than nursing students are, is gratifying. This may be related to the nurses' practical experience, but also to the knowledge obtained through specialized (pediatric) education.

In the last decade, the literature has often suggested that nurses' knowledge about analgesics should be improved and that nurses administer analgesics insufficiently. The results of the present study may indicate that the administration of analgesics by pediatric nurses has improved. However, further research will be needed to answer this question.

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