ARTICLE

The Recognition of Facial Expression of Pain in Full-Term Newborns by Parents and Health Professionals

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Objective: To determine whether adults can recognize neonatal facial expression of pain.

Design: A cross-sectional study.

Setting: Neonatal intensive care unit, nursery, and outpatient clinic of one university hospital and one private hospital in São Paulo, Brazil.

Patients: Four hundred five adults divided into 2 groups: health and nonhealth professionals.

Intervention: The faces of 3 healthy full-term newborns who needed glucose screening were photographed at rest and during light exposure, heel rubbing, and heel puncture. A series of adults answered a questionnaire on personal and professional data and then they analyzed for 1 minute each of the 3 sets of pictures to answer the following question: "In which picture of this set do you think that the baby is feeling pain?"

Main Outcome Measure: Number of correct answers for the 3 sets of photographs shown to the adults.

Results: Seventy-four percent of the health professionals and 86% of the nonhealth professionals indicated correctly the picture with facial expressions of pain in at least 2 of the 3 sets. Regarding which picture was picked out by the interviewee, 94% of the health professionals and 92% of the nonhealth professionals indicated the picture taken during the heel puncture in set 1. The same observation was made by 53% and 54% of the health professional and by 68% and 66% of the nonhealth professional interviewees for sets 2 and 3, respectively.

Conclusions: Facial expression of pain represents an effective neonatal communication tool. However, the health professional group achieved a lower level of recognition of neonatal facial expressions of pain. Factors related to the personal and professional characteristics of the adults interviewed probably contributed to this result.

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FACIAL MOVEMENTS are one of the most important foci in the study of nonverbal communication. Since the 1960s, several researchers[1(pp103-122),2,3] systematically analyzed the facial anatomical features of adults to evaluate emotional states. The use of varied nociceptive stimuli in adults and the analysis of the judgment made by diverse observers have demonstrated the consistency and validity of facial expression of pain, with the highlighting of 4 actions: lowering the eyebrows; narrowing the eyelids and/or closing the eyes; wrinkling the nose and/or raising the cheeks; and partly opening the mouth and/or extending the lips.[1(pp103-122),3,4]

With the objective of evaluating pain among newborns, Grunau and Craig[5] developed the Neonatal Facial Activity Coding System (NFCS). In their study, the agreement between the observers was 88%, and it was seen that 99% of the newborns submitted to heel puncture presented a consistent set of 4 facial actions: prominent forehead, eyes narrowed, nose-lip furrow deepened, and mouth open.[5] Subsequent studies[6-11] have confirmed that this set of facial actions appears in newborns submitted to pain but does not appear when faced with disagreeable but nonpainful procedures. These alterations in newborn facial expression in response to pain have been observed in full-term newborns,[6,7,10] premature newborns[7,9,11-14] and preverbal infants,[8,15] when the analysis was done using videotape[6,8,9,11,12,14,15] and at the bedside.[7,10,13]

Thus, the analysis of facial expression of newborns can be regarded as a tool that can be coded, quantified, and used as an indicator of behavior toward pain. It appears to provide valid, sensitive, and specific information relating to the nature and

PATIENTS AND METHODS

The protocol followed the directives and norms for research in human beings of the National Council for Health[30] and was approved by the Ethics Committee for Research, Federal University of São Paulo, São Paulo, Brazil. This study was carried out in São Paulo at São Paulo Hospital (a university-affiliated hospital) and Santa Joana Hospital (a private institution).

Adults were selected regarding their professional experience with pain in neonates or their possible familiar experience with pain in their own children. Therefore, 6 subgroups of adults were studied according to the following criteria: (1) physicians and nurses: university graduate professionals acting in the pediatric field; (2) pediatric residents: university graduate professionals, training in the pediatric field; (3) nursing aides: undergraduate health professionals, working in the neonatal intensive care unit; (4) parents of noninterned newborns: fathers and/or mothers of healthy newborns in a rooming-in nursery, and without any professional role in the field of children's health; (5) parents of interned newborns: fathers and/or mothers of sick neonates, and without a professional role in the field of children's health; and (6) parents without newborns: fathers and/or mothers of older children, not including neonates, and without a professional role in the field of children's health.

Between December 1, 1997, and August 31, 1998, all neonatal intensive care unit medical staff of both hospitals, all pediatric residents of the university hospital, and all nursing aid staff of both hospitals were studied. A convenience sample of all parents who fit the previously described criteria, who were present in both hospital nurseries at the days of interview, and who agreed to participate in the study was selected. Within this period, the days of interview were randomly chosen by one of us (R.C.X.B.).

To facilitate the analysis of the data collected, the 6 subgroups were fused into 2 large groups: health (physicians, nurses, residents, and nursing aides) and nonhealth (fathers and/or mothers who had not previously worked, nor were working at the time of the interview, in pediatrics and/or neonatology).

In accordance with prior statistical planning, it was stipulated that at least 10 cases would be required for each variable in the study.[31] As the study included 25 different variables, the minimum sample size was thus defined as 250 cases.

SELECTION OF THE NEWBORNS FOR THE PHOTOGRAPHS TAKEN

For newborns to be photographed, the following criteria were used:

1. Written consent from the mother.
2. Healthy term newborns aged between 6 and 24 hours.
3. The presence of a risk factor for hypoglycemia on the first day of life, needing a heel stick for blood collection. However, none of the neonates could present proved hypoglycemia.[32]
4. Interval between taking the pictures and last handling and/or breastfeeding of 30 to 60 minutes, to ensure that the neonate was reactive without irritability, discomfort, or hunger.
5. Newborns on alert state immediately before taking photographs.[33]
6. Neonates whose mothers had not used opiates or general anesthetics during labor or delivery.

TAKING THE PHOTOGRAPHS

All photographs were taken in the nursery of the São Paulo Hospital, always in the same room, and by the same physician. A series of photographs was taken in the following sequence:

1. Rest: the neonate was kept in an ordinary cradle under ambient lighting, without having received any handling for 1 minute. After this minute of rest, the photograph was taken.
2. Light stimulus: the patient was exposed to the sunlight entering through the window for 5 seconds and the photograph was taken.
3. Rest: the neonate was kept without handling for a further minute, and was then photographed.
4. Friction: the patient received friction on the external lateral surface of the heel via circular movements of cotton wool soaked in 70% alcohol for 10 to 15 seconds. During the friction movements, the face of the child was once again photographed.
5. Friction: the newborn was submitted to friction in the same way as before. During the friction movements, another photograph was taken.
6. Rest: the neonate was kept without handling for a further minute, and was then photographed.
7. Puncture: the external lateral surface of the heel was punctured using a 25×8-gauge needle for the collection of blood (approximately 20 µL). The picture was taken immediately after the introduction of the needle.
8. Rest: the neonate was kept without handling for a final minute, and was then photographed.

It was decided to have only one puncture picture because the goal of the study was to verify if an observer could recognize the facial pain features and discriminate them from various degrees of discomfort. Therefore, 3 different sources of distress were included: light, friction, and pain. Different degrees of the same distress were also included: the

intensity of the pain and to promote effective communication between the newborn and the caregiver.[1(pp103-122)]

THE DECODING OF THE NEWBORN'S PAIN BY ADULTS

Individual experiences can be coded into characteristic behaviors, such that it becomes possible for an observer to infer, interpret, and translate from these behaviors.[16]

Various studies[17-21] have demonstrated that the behavior of newborns is fully exploited by the nursing staff and that modifications in vital parameters that are routinely controlled by nurses are generally associated with the observation of pain.

Studies in the 1990s have demonstrated that many physicians believe newborns, even when premature, are capable of feeling pain in a similar or even in a more intense manner than adults. Nevertheless, pain relief

neonates experienced friction twice because the second friction could potentially elicit a stronger facial response.

Flash was not used when taking the photographs, as the incidence of an intense and short-term light stimulus could alter the facial movements of the newborn. In developing the photographs, matte paper was chosen so as not to prejudice the observation and analysis of the photographs.

The neonates who met inclusion criteria could be pictured only in the afternoon of sunny winter days, when the light of the sun invaded the room chosen to take the pictures, and the room light, with closed window screens, was enough to attain good-quality photographs without the use of flash.

The first 7 neonates who met the selection criteria were photographed at the 8 times previously defined. The 8 photographs focusing on the face of the neonate at the 8 different times were designated a "set." After taking the 7 sets of photographs, a choice was made between the sets based on the quality of illumination, clarity of the face, and presence of the specific facial expression of pain at the time of the puncture.[18] The sets of photographs chosen were those in which at the time of puncture the face of the newborn showed, from the 8 NFCS variables, at least the presence of 4: prominent forehead, narrowed eyes, deepened nose-lip furrow, and partly open lips or lips extended vertically or horizontally. During heel friction or light stimulus, the neonate could present some of the facial features previously described, but not all 4 of them together. This process resulted in the selection of 3 sets, each with 8 photographs. The NFCS scores at the different procedures for each set of pictures were as follows:

1. Set 1: the NFCS score was 1 at light stimulus; 0 and 2 at first and second friction, respectively; and 4 at puncture.
2. Set 2 (**Figure**): the NFCS score was 2 at light stimulus, 0 at both frictions, and 6 at puncture.
3. Set 3: the NFCS score was 1 during light stimulus, 0 at both frictions, and 4 at puncture.

INTERVIEWS

Before the interview, the interviewer presented herself (R.C.X.B.), explained the main goal of the study, and asked the adults to participate. Then, each adult was required to answer the following:

1. Personal data: age; sex; race; marital status; religion; number of previous hospitalizations; and number of children, including alive and dead.
2. Professional data: number of years of school completed and profession.
3. Socioeconomic data: economic classification of each interviewee, using the new Brazilian Economic Classification Criteria (National Association of Enquiry Companies, 1997).

At the end of the interview, the 3 sets of photographs of newborns were presented to each interviewee, always in the same order. The interviewee was given 1 minute to observe and analyze each set. At the end of this period, the interviewee was asked to reply to the following question: "In which photograph on this board do you think the newborn is feeling pain?" A maximum time of 1 minute was stipulated for the analysis of each set, which corresponds to 7 to 8 seconds per photograph. This time was judged sufficient for observing the facial features of pain, based on studies[5,6,12] in which the facial expression of the neonate was videotaped.

ASSESSMENT OF THE RESULTS AND STATISTICAL ANALYSIS

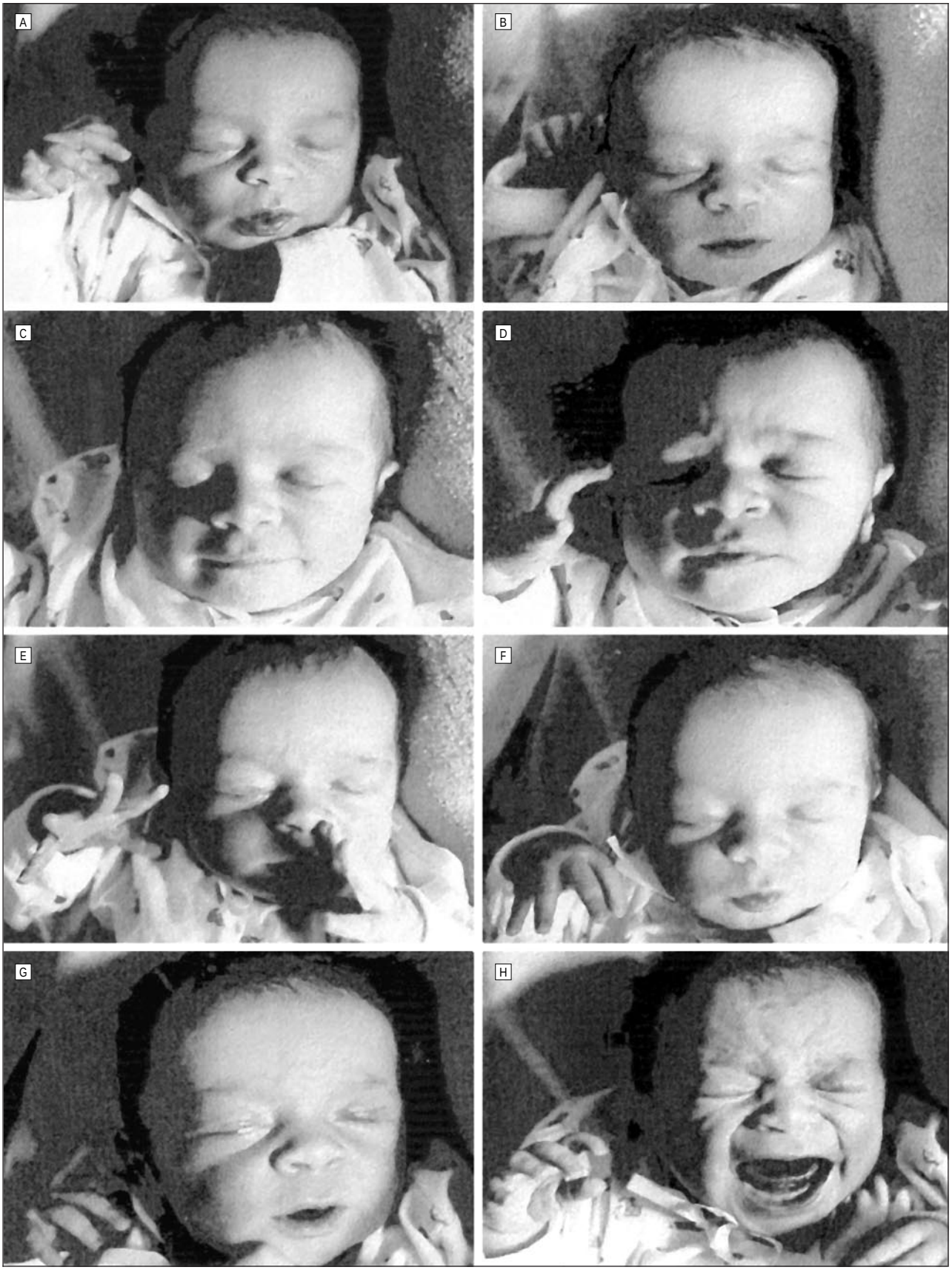
After 405 interviews, the number of correct responses for the 3 sets of photographs was calculated for each interviewee. Then, for each set of photographs, a note was made of the procedure (puncture, friction, light stimulus, rest, or no photograph) corresponding to the photographs that each adult interviewed judged to be showing pain.

The following statistical tests were performed using Statistical Product and Service Solutions (version 8.0) software (SPSS Inc, Chicago, Ill). The rejection level for the null hypothesis was set at .05.

1. *t* Test, to compare numerical variables between the health and nonhealth professional groups; and χ^2 test, to compare category variables between the 2 groups.[34]
2. χ^2 Test with an exact solution via the Monte Carlo method,[35] to test the homogeneity between the subgroups regarding the number of right answers obtained and regarding the different frequency distributions in relation to the responses obtained for each of the 3 sets of photographs.
3. Partition of the χ^2 test,[34] with an exact solution via the Monte Carlo method[35] ($r \times s$ tables) and via the Fisher exact test[34] (2×2 tables), to locate the significant differences between the subgroups of interviewees regarding the number of correct responses obtained (0, 1, 2, or 3) and regarding the responses (puncture, friction, light stimulus, rest, and none) assessed in each of the 3 sets of photographs.
4. Multiple linear regression analysis[34] to analyze the relation between the different independent demographic variables and the number of correct answers given by the interviewees. This regression adjusted first the complete model with all demographic variables included, and then, in a stepwise manner, the nonsignificant ones were withdrawn, according to a partial *t* test.

measures are not often used.[22,23] According to Owens,[24] physicians who routinely carry out harmful procedures reduce their sensitivity to the feelings of patients via cognitive restructuring, becoming more skeptical toward the subjective responses to pain and stress expressed by these patients. Furthermore, several studies[16,25,26] have shown that physicians generally attribute less pain to the individual they are examining than does the individual.

Some studies have also analyzed how parents assess painful phenomena in their children. Reid et al[27] examined the indicators that parents used in evaluating postoperative pain in their children. The following variables were highlighted: state of alertness, appetite, emotional state, activity level, quality and quantity of sleep, paleness, sweatiness or redness, crying, grimacing, and motor agitation. McGrath et al[28] analyzed the indicators used by parents in assessing pain in mentally retarded children. Of the 31 items



One set of 8 photographs of the face of a term newborn infant was taken at 4 different situations: rest (A, C, E, and G), during a light stimulus (D), during heel friction (B and F), and during heel puncture (H).

identified, the following were highlighted: crying; refusing food; body rigidity; diminished activity; irritability; and facial expression of pain, characterized by eyes firmly closed and grimacing. Other studies have demonstrated that mothers are capable of distinguishing the facial expressions of sadness, anger, and pain in their children from photographs and videotape images, even in the absence of vocal expression. Also, their attitudes toward giving comfort to their children are more intense and urgent when facial indications of pain are present.[29]

THE RECOGNITION OF PAIN EXPRESSION IN NEWBORNS BY ADULTS

Neonatal facial features of pain are used in the most diverse coding systems by researchers and individuals with prior training. Furthermore, they are presented as an indicator for the evaluation of pain used by untrained adults who are responsible for the daily care and comfort of preverbal infants. In this context, the question arises of whether the facial expression of pain in the neonatal period may be considered as a means of effective communication between the newborn and adults. Thus, the objective of the present work was to verify whether adults, with or without personal or professional experience with pain in the neonatal period, were capable of recognizing the facial expression of pain among newborns from photographs.

RESULTS

GENERAL CHARACTERISTICS OF THE POPULATION STUDIED

None of the adults approached refused to participate in the study. Of the 405 adults interviewed, 191 were in the health group, of which 70 were physicians and nurses; 50, residents in pediatrics; and 71, nursing aides. The other 214 were in the nonhealth group, of which 71 were parents of noninterned newborns; 70, parents of interned newborns; and 73, parents without newborns. The main demographic data for the health and nonhealth groups are given in **Table 1**.

COMPARISON OF THE GROUPS REGARDING THE NUMBER OF CORRECT RESPONSES

There were 2 or 3 correct responses by 79% of the physicians and nurses, by 74% of the residents, by 69% of the nursing aides, by 86% of the parents of healthy newborns, by 87% of the parents of interned newborns, and by 77% of the parents without newborns (**Table 2**). A difference was thus observed in the behavior of the subgroups regarding the number of correct responses.

The numbers of physicians and nurses, residents, and nursing aides who selected the photograph corresponding to heel puncture as the one in which the newborn was feeling pain, in 0, 1, 2, or 3 of the sets presented, were statistically similar ($P=.74$, χ^2 test). Also, it was observed that the subgroups of parents with noninterned newborns, parents with interned newborns, and parents without newborns were homogeneous regarding the number of correct responses for the 3 sets of photographs ($P=.33$, χ^2 test).

Continuing in the attempt to localize the heterogeneity presented in Table 2, it was decided to compare the number of correct answers between the health and nonhealth groups (**Table 3**). From this analysis, a significant difference could be seen to exist between the 2 groups. Fewer individuals in the health group identified

Table 1. Demographic Characteristics of the Interviewees of the Health and Nonhealth Groups*

Characteristic	Health Group (n = 191)	Nonhealth Group (n = 214)	*P*
Age, mean ± SD, y	31 ± 7	29 ± 7	.003
Female sex	180 (94)	175 (82)	<.001
White race	153 (80)	152 (71)	.03
Catholic	142 (74)	164 (77)	.59
Has a stable partner	77 (40)	192 (90)	<.001
No. of children, mean ± SD	1 ± 1	2 ± 1	<.001
Hospitalizations, mean ± SD	1 ± 1	2 ± 2	<.001
Length of education, mean ± SD, y	17 ± 4	8 ± 4	<.001
Income per month, mean ± SD, $	1315 ± 958	416 ± 458	<.001
Socioeconomic class A or B†	153 (80)	59 (28)	<.001

*Data are given as number (percentage) of interviewees unless otherwise indicated.

†Based on scale of A to E, with A and B representing highest (richest) classes.

Table 2. Comparison of the Frequency Distributions Between the 6 Different Subgroups, Relating to the Number of Correct Answers to the Questions Posed for the 3 Sets of Photographs*

Correct Answers	D & N (n = 70)	RE (n = 50)	NA (n = 71)	PNINB (n = 71)	PINB (n = 70)	PWNB (n = 73)
0	2 (3)	0	2 (3)	1 (1)	4 (6)	3 (4)
1	13 (18)	13 (26)	20 (28)	9 (13)	5 (7)	14 (19)
2	32 (46)	21 (42)	31 (44)	27 (38)	25 (36)	27 (37)
3	23 (33)	16 (32)	18 (25)	34 (48)	36 (51)	29 (40)

*Data are given as number (percentage) of each group. χ^2 (Monte Carlo method) = 26.024 (P = .03). D & N indicates physicians and nurses; RE, residents in pediatrics; NA, nursing aides; PNINB, parents of noninterned newborns; PINB, parents of interned newborns; and PWNB, parents without newborns.

Table 3. Comparison of the Frequency Distributions Between the Health and Nonhealth Groups, Relating to the Number of Correct Answers to the Question Posed for the 3 Sets of Photographs*

Correct Answers	Health Group (n = 191)	Nonhealth Group (n = 214)
0	4 (2)	8 (4)
1	46 (24)	28 (13)
2	84 (44)	79 (37)
3	57 (30)	99 (46)

*Data are given as number (percentage) of each group. χ^2 (Monte Carlo method) = 15.918 (P = .001).

Table 4. Comparison of the Frequency Distributions Between the Health and Nonhealth Groups, Relating to the Responses Obtained for Sets 1, 2, and 3 of the Photographs*

Set	Health Group (n = 191)	Nonhealth Group (n = 214)
1		
Puncture	180 (94)	197 (92)
Friction	0	1 (0.5)
Light	2 (1)	1 (0.5)
Rest	4 (2)	11 (5)
None	5 (3)	4 (2)
2		
Puncture	101 (53)	145 (68)
Friction	7 (3)	2 (1)
Light	74 (39)	59 (27)
Rest	8 (4)	7 (3)
None	1 (1)	1 (1)
3		
Puncture	103 (54)	141 (66)
Friction	3 (1)	7 (3)
Light	4 (2)	1 (1)
Rest	28 (15)	31 (14)
None	53 (28)	34 (16)

**Data are given as number (percentage) of each group. χ^2 values (Monte Carlo method) were as follows: set 1 = 4.2, P = .40; set 2 = 11.1, P = .02; and set 3 = 12.4, P = .01.*

the photographs with the typical facial expression of pain in the 3 sets presented.

COMPARISON OF THE GROUPS REGARDING THE RESPONSES OBTAINED

For set 1, it was observed that 98% of the physicians and nurses selected the photograph in which the newborn was being punctured, as did 98% of the residents, 89% of the nursing aides, 94% of the parents of healthy newborns, 89% of the parents of interned newborns, and 94% of the parents without newborns. Comparing the health and nonhealth groups regarding the picture selected as having characteristics of pain, it was observed that 94% of the interviewees in the health group and 92% of the individuals in the nonhealth group selected the photograph relating to puncture as the one showing facial expression of pain (**Table 4**). Hence, the 2 groups were homogeneous regarding the response obtained for set 1.

For set 2, it was observed that 54% of the physicians and nurses selected the photograph in which the newborn was being submitted to puncture as the one corresponding to facial features of pain, as did 52% of the residents, 52% of the nursing aides, 72% of the parents of healthy newborns, 68% of the parents of interned newborns, and 65% of the parents without newborns. The responses obtained from the health professionals were different from those given by individuals in the nonhealth group (Table 4). A significant statistical difference was observed between the 2 groups regarding responses selecting friction ($P = .04$, χ^2 test) and light stimulus ($P = .007$, χ^2 test). For the other responses investigated (rest and none), there was no difference between the groups.

For set 3, it was observed that 58% of the physicians and nurses selected the photograph in which the neonate was being submitted to puncture as the one corresponding to facial features of pain, as did 54% of the residents, 51% of the nursing aides, 66% of the parents of healthy newborns, 78% of the parents of interned newborns, and 55% of the parents without newborns. Responses given by health professionals were statistically different from those obtained from individuals in the nonhealth group (Table 4). The difference between the 2 groups regarding the responses puncture and none was shown to be significant ($P = .004$, χ^2 test). Regarding the other responses obtained (friction, light stimulus, and rest), there was no difference between the 2 groups.

RELATION BETWEEN DEMOGRAPHIC VARIABLES AND NUMBER OF CORRECT ANSWERS

The multiple linear regression analysis resulted in a model in which the greater number of correct answers was associated with the following characteristics of the interviewee: presence of a stable partner, number of children greater than 2, and being a nonhealth professional, according to the equation: number of correct answers = 1.61 + 0.19(stable partner) + 0.36(children > 2) + 0.19(nonhealth professional).

COMMENT

In the present study, most adults correctly identified the facial expression characteristic of pain in newborns. Thus, the analysis of facial expression appears to constitute an effective method for communication of pain in neonates. In considering the definition of effectiveness of given instruments for evaluating pain,[1(pp5-20)] facial movements meets such criteria as it is a safe and reliable method that manifests itself via a real effect. It is easily recognized and interpreted by the observing adult and does not in general depend on previous knowledge and/or training of the observer.

In addition, pain facial features of preverbal patients appear to constitute a language recognizable universally, ie, in a manner common to all who observe it, independent of the diversity of personal, cultural, professional, and socioeconomic characteristics of the interviewees. Facial expression of pain in newborns was recognized by most of the population studied.

In this study, most adults interviewed recognized the photographs in which the facial expression of the neonates indicated pain. However, this recognition was not total, as 26% of the health professionals and 17% of the adults in the nonhealth group did not indicate the photographs in which the patient presented facial expression of pain in any set, or indicated this in only 1 of the 3 sets of photographs presented.

The frequency of correct responses was progressively reduced in subsequent sets for the health and nonhealth groups. There were probably some factors occurring in the 2 groups to modify the instinctive decoding of the facial expression of pain in newborns by the individuals interviewed, with some being more

pronounced in and perhaps others exclusive to the health professionals.

For the first set of photographs, the responses obtained were similar in the 2 groups. In the second set of photographs, the interviewees in the health group hesitated more. For this set, there was frequent questioning by health professionals regarding the possibility of the existence of more than one photograph as the correct response, even though the question formulated by the researchers was always posed in the singular. For the third set of photographs, more individuals in the health group did not identify any photograph as suggesting facial expression of pain. It may be inferred that, especially among the health professionals, the adults responded to the first set, hesitated in the second, and questioned the third and final set. This hypothesis could be better analyzed if the study had a different design, ie, if the 3 sets of pictures were offered to the interviewees in random orders, instead of a fixed order. This methodological limitation does not permit a definitive conclusion about an order effect in the correct recognition of neonatal pain facial features by adults. New studies should address this concern.

When searching in the literature for a theoretical basis for justifying the differences encountered, references to diverse variables that could alter the interpretation by the adult of the language of pain of the newborn were seen.[17,36-40]

The 3 neonates who were photographed had similar gestational and postnatal ages, and were all white. Some researchers[36,41] have demonstrated that observers tend to recognize better the presence and intensity of the painful phenomenon in female adults and children. Despite the newborn of set 2 being female and of set 3 being male, the percentages of errors made by interviewees in each group were similar for the 2 sets. Also, debilitated and unattractive physical appearances among patients could induce the health professional to diagnose the presence and intensity of pain more often.[39] The newborn of set 2 showed a physical appearance typical for patients who are small for gestational age. It was, therefore, expected that a smaller, weaker, and/or more debilitated patient would give rise to more attention from the observer. However, 47% of the interviewees in the health group and 32% of the nonhealth group selected the pictures corresponding to friction, light stimulus, and rest, or did not select any photograph, as relating to facial expression of pain in the neonate in question.

Given that the variables linked to the newborn possibly had little influence in explaining the differences found between the groups, speculations may be made as to whether these differences could have been influenced by the characteristics of the adult interviewees.

The influence of the observer's age in the perception of facial expression of pain in newborns is controversial.[17,23,26,37,42] In this study, it would be hard to implicate the slightly more advanced ages of the health professionals in the differences in identification of the facial expression of pain in full-term newborns between the 2 groups.

The observation in the literature[36,43] that women are more sensitive than men regarding the recognition of the presence and intensity of pain in adult, child, and neonate patients does not explain the results encountered. In the present study, the group who least identified the facial features of pain in full-term newborns had the largest percentage of women.

Individuals of diverse cultures and races show themselves to be able to distinguish the presence of pain in patients, although the intensity of the diagnosis of pain may vary in accordance with the race or ethnicity of the observer and the patient observed. For example, whites judge pain in white patients more intensely and pain in other patients less intensely.[38,44] In this matter, the results herein disagree with the literature. The newborns observed and the health professionals were white, and many adults in this group did not recognize correctly the presence of facial movements of pain in neonates.

Regarding the marital status and number of children of the interviewees, it was observed that the health professionals were more frequently single and had fewer children than the interviewees in the nonhealth group. Some studies[17,37] have demonstrated that neither marital status nor the fact of having or not having children had any influence on the recognition of pain expressed by adults and older children. The regression analysis of our data, however, showed that these factors per se can have some relation with the recognition of the neonatal facial features of pain by adults. New studies should be done to clarify the influence of marital status and number of children in the adult perception of the pain expressed by newborns.

The health professionals, who recognized the presence of the facial features of pain in full-term newborns less, were more educated than individuals in the nonhealth group. This finding fits in with some other work[16,42] that demonstrated that the greater the theoretical knowledge and professional experience, the more chance there will be for this adult to underestimate the pain of the patient. Perhaps the professional experience and the years of clinical practice, more than the length of education or the theoretical knowledge of the observer, could be responsible for the lower identification of pain by adults among preverbal patients.[42,45] In this way, the present study underlines that the greater educational baggage, more intense professional experience, and living in close proximity with patients' pain may together modify the perception of physicians and the nursing team regarding the recognition of pain in newborns. It is tempting to hypothesize that neonatal intensive care unit professionals, who work in close contact with pain, death, and malformations, develop coping mechanisms to defend their psychological integrity, interfering with their ability to recognize pain in the work setting.[24,46] The better socioeconomic level of the individuals in the health group appears to be a result of their professional qualifications and, again, this professional contact with the day-to-day life of critically ill newborns is capable of interfering in the perception of pain among newborns by the adult caring for them.

The present analysis found also that the health professionals had fewer previous hospitalizations than individuals in the nonhealth group. From this, it may be deduced that the former had had less personal experience of pain or with potentially painful procedures. Perhaps this lesser personal contact with their own pain could have interfered in the recognition of pain in others. Other studies[2,23] have related such findings, emphasizing that per-

sonal experience of pain increases the sensitivity and attention of the observer toward noticing the presence of pain in patients of diverse age groups, including preverbal patients.

It is interesting to compare our results to research regarding adult perception of pain through neonatal cry. Researchers[47(pp83-101)] showed that pain cries were recognized best by adults who had previous experience with infant cries, but also that mothers could recognize the cry of their own infant after they had listened to it once. Other studies[47(pp187-215)] showed that contact-comfort kinds of responses to neonatal cry were more prevalent among parents; parents found the pain cry less aversive compared with nonparents; and mothers were more capable of identifying their own child's cry of pain than another infant's cry. These findings indicate that cry elicited by pain and facial features of pain are not a unidirectional event. The adult's perception and response to these events are affected by infant state, patterns of cry or facial features, a complex understanding of adult interpretative processes, contextual factors, and cultural influences, among others.[47(pp187-215)]

In summary, it is possible that there is not just one isolated variable modifying recognition by adults of the facial expression of pain in full-term newborns, upward or downward, but rather a set of interdependent factors. To understand the role of the different factors in the adult recognition of facial features of pain, a regression analysis was processed. The results affirm the relation between the recognition of neonatal facial features of pain and the profession of the adult observer (health or nonhealth professional), even in the presence of other variables.

The main methodological limitation of the present study is that an artificial situation was created, with adults actively looking for pain features in static picture frames. To know whether the findings observed in this "in vitro" situation are real, future studies should try to observe what really happens in the daily care of sick neonates. Their results will help to define educational targets to improve pain treatment in preverbal infants.

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