

CHILD PAIN RATING AFTER INJECTION PREPARATION

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by

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## CHAPTER I

### Introduction

Injections produce the most negative responses of any procedure for a child (Faust, 1953; Eland & Anderson, 1977) and yet most immunizations are injectable and mandatory for all pre-school children. Noxious intrusive procedures such as injections are too frequently performed on children by health professionals without considering the child's feelings. Nurses are the health professionals most frequently present to help the child cope with the experience of pain (McCaffrey, 1972), which is a subjective personal experience (Szasz, 1975). Since the primary focus of nursing is the subjective experience (McBride, 1969) such as the pain from an injection, the child facing this procedure should receive nursing assistance.

Orem stated that nursing is required only when there is a deficit in ability to care for self. Parents ordinarily act as child-care agents and provide this self-care as the child's developmental level requires it. Thus it is only when there is a deficit in the parent's ability to provide therapeutic self care that nursing assistance is required. This assistance in the form of preparing the child for a painful experience benefits both child and parent (Orem, 1971), particularly the parent concerned about the hurt to the child (Szasz, 1959). Nursing agency includes developing methods of preparing the pre-school child for a painful procedure, assisting the

child in communicating pain intensity, and being aware of factors influencing the response to pain.

There are pain measurement tools for adults and many studies have been done using these tools. However, there are few tools to help the child communicate the intensity of pain felt. The measurement tool (Hester, 1976) chosen for this study had been found useful in helping the child 4½ to 6½ years of age describe pain intensity. It also had the advantage of providing a visual component for the child with limited verbal ability, was easily available from a pocket, could be administered in a brief time period, and had a structured procedure thus controlling investigator bias. Hester's recommendation for further study and refinement of the tool prompted comparison with another tool.

The investigator developed a comparative tool and the Happstick booklet using information gained in other pain investigations.

Recalling the usefulness of visual preparation for the child (Vaughn, 1957; Vernon, 1974) the investigator also gave recognition to the many elements involved in pain experience, including the sensory and the emotion components (Johnson & Rice, 1974). A study in which various emotional states were expressed through use of 'pin-man' type figures (Reitman & Robertson, 1950) and the visual perception studies of Fantz (1965) that noted the child's early preference for the human face, led to combining all these factors for a measurement tool and preparation procedure. Advantages of these types of drawings are that they have no age, sex or race--giving them universality. Such a portable tool could have potential as a device to help the child communicate pain intensity in other nursing

situations.

The purpose of this study was to investigate the pre-school child's rating of pain from the immunization injection in relationship to the differing methods of pre-injection preparation. Other factors that may influence the child's perception of pain were also surveyed.

#### Problem Statement

Will the injection pain rating by the pre-school child differ with the method of pre-injection preparation?

#### Operational Definitions

Verbal preparation - the routine spoken preparation done prior to the injection by the person administering it.

Visual-verbal preparation - the Happstick booklet accompanied by spoken script, presented prior to the injection by the investigator.

Pain - the number of chips selected from Hester's Poker Chip tool and/or the picture selected from Four Face tool by the child.

Immunization - the administration of DPT (diphtheria, pertussis, tetanus) into the deltoid muscle.

Pre-school child - any child eligible to begin kindergarten who has no obvious physical or mental handicap.

#### Hypotheses

The following null hypotheses were investigated.

1. There is no difference between the verbal pre-injection preparation group and the visual-verbal pre-injection preparation group relative to pain rating score with Hester's Poker Chip tool;

the alternative is that there is a difference.

2. There is no difference between the verbal pre-injection preparation group and the visual-verbal pre-injection preparation group relative to the pain rating score with the Four Face tool; the alternative is that there is a difference.

3. There is no difference between the pain rating on Hester's Poker Chip tool after verbal pre-injection preparation and the pain rating on the Four Face tool after verbal pre-injection preparation; the alternative is that there is a difference.

4. There is no difference between the pain rating on Hester's Poker Chip tool after visual-verbal pre-injection preparation and the pain rating on the Four Face tool after visual-verbal pre-injection preparation; the alternative is that there is a difference.

#### Assumptions

1. The child is able to perceive pain and has experienced it.
2. The child is able to distinguish levels of pain.
3. Each child's pain experience is unique and personal.
4. The child understands the symbolic representation that Hester's Poker Chip tool and the Four Face tool indicate levels of pain.

## CHAPTER II

### Literature Review

This review of the literature will briefly examine theories, definitions and measurement of pain. It will explore the need to prepare the child for painful procedures and in combination with this will consider verbal and visual-verbal learning styles of the child. The final area investigated will be nursing care for the child with pain and a brief report of some factors that may influence the response to pain.

#### Theories, Definitions and Measurement of Pain

Pain has been the subject of many studies in recent years and much has been learned. However, there is no agreement about a definition or a theory that includes all the complex components of pain. Specificity theory was an early theory that said specific receptors (free nerve endings) pick up specific stimuli (pain) which goes by a specific pathway (A-delta and C-fibers) to a specific part of the spinal cord (dorsal horn) and on a specific route (lateral spinothalamic tract) to a specific part of the brain (thalamus) (Guyton, 1971). This theory failed to explain referred pain, why severing the pathway at a certain level did not stop pain, and other phenomena. In the more recent Gate-Control theory, Melzack and Wall (1965) proposed that the perception of pain could be regulated by a

gate at the central transmission (T) cell. If a painful and non-painful message enter the cord at the same time, the large fiber, non-painful, message gets through the dorsal horn first, excites the substantia gelatinosa (SG) cells which then close the gate at the T-cell and prevent the painful message from getting to the brain. They also contend that a central biasing mechanism in the reticular formation of the brain stem can send impulses down the spinal cord and close the gate to pain messages. This theory remains controversial (Nathan & Rudge, 1974), but it allows explanation of pain relief from massage and electrical stimulation of peripheral nerves (Wall, 1976). The central biasing mechanism may also be the link in relief of pain through acupuncture and hypnosis.

A look at what pain is reveals almost as many definitions as there are factors to influence the response to pain. As co-author of the gate control theory, Melzack (1973) stated that pain involves more than the stimulus; it depends upon "cultural learning, the meaning of the situation and other factors that are unique to each individual" (p. 22). A comprehensive and frequently used definition is that of Sternbach (1968):

Pain is an abstract concept which refers to (1) a personal, private sensation of hurt; (2) a harmful stimulus which signals current or impending tissue damage; (3) a pattern of responses which operate to protect the organism from harm. These responses can be described in terms which reflect certain concepts, i.e., in neurological, physiological, behavioral, and affective 'languages' (p. 12).

However, the concept of pain most relevant for nursing and for this study of the child's evaluation of pain is that "Pain is whatever the experiencing person says it is and exists whenever he says it does"

(McCaffrey 1972, p. 8). This is also in harmony with Lasagna (1960) who stated that "the most reliable index of pain is the patient's verbal report" (p. 28).

There are many difficulties in the measurement of pain; Chapman (1976) declared "Pain is a private event that does not conveniently lend itself to study by means of conventional scientific methodology" (p. 353). Nevertheless, various pain rating instruments have been developed for adults using word descriptors on a continuum such as mild, discomforting, distressing, horrible (Melzack & Torgerson, 1971). That study resulted in the later development of the McGill-Melzack Pain Questionnaire (Melzack, 1975) which had 77 words further divided into sensory, affective and evaluative dimensions. Numerical scales have also been used in pain measurement. Ohnhaus and Adler (1975) compared a Visual Analogue Scale (VAS) consisting of a 100 mm line divided into numerical intervals. The left end of the line at zero denoted "no pain" and the right at 100 was labeled "unbearable pain." Their Verbal Rating Scale (VRS) had five word categories "no, mild, moderate, severe, unbearable." They cited the difficulty of using word descriptor scales because the words did not mean the same thing to each patient and the intervals were not necessarily identical steps in pain intensity. The linear regression line of the correlation of their two rating methods showed the VAS "reflected more precisely the changes in pain intensities" (p. 383).

One of the few instruments found to measure pain of the child was designed to help nurses focus their observational skills and involved recognizing behavior indicating the presence of pain

(Smith, 1976). A visual tool for subjective pain rating by the child was developed by Eland (1974). It used cartoon pictures of a dog to help the child aged 4 to 8 communicate the intensity of pain experienced. Ward (1975) and Hester (1976) used similar projective instruments in later nursing studies. Hester also developed a visual pain rating instrument consisting of four white poker chips which the child 4 years 7 months to 6 years 8 months was able to use successfully. In conclusion, pain measurement instruments are often difficult for adults to use and the few available for the child are new and in need of further study.

Summary. Of the many pain theories, the earlier theory of specificity continues as a useful explanation despite its failure to explain some pain phenomena. The gate control theory allows for more physiological and psychological influences but is also controversial and not fully accepted. The concept of pain most useful to nursing is the report of that subjective event by the experiencing person. Finally, there are many pain measurement instruments but few constructed for the child.

#### Preparation for Painful Procedures

There is common agreement that the child should be prepared for painful procedures (Faust, 1953; Luciano & Shumsky 1975; McCaffrey, 1972; Smith, 1976; Watson, 1976) but the methods for doing this are not conclusive. It is said that the pre-school child's verbal language ability is not reliable as a method of communicating (McBride, 1977; Smith, 1976). This is in harmony with Vaughn's (1957)

finding that verbal preparation done before surgery did not as effectively benefit the younger child. Cramer (1976), Jones (1973), and Underwood (1969) have found in their studies of the young child that memory for material studied as pictures was better than for that studied as words. However, Rohwer (1970) found that the ability to use verbal means to store information emerged earlier than ability to use the visual process and he delineated 4.5 to 5 years as the transition period from use of verbal to visual storing of information.

In preparing for painful procedures it was found that providing information about sensations to be expected decreased distress (Johnson, Kirchhoff, & Endress, 1975) and that providing only a partial description of sensations to be expected reduced stress as much as giving a detailed explanation of all the sensations to be expected (Johnson & Rice, 1974). Vernon (1974) reported that the group of children that viewed a film wherein the child expressed moderate emotional response of temporary duration to an injection, later tolerated the injections better than the group given unrealistic preparation or the group given no preparation. It was hypothesized that those prepared with honest information about the experience perceived it as less painful and were less upset.

Summary. While it is believed that the child should be prepared for painful procedures, many question whether verbal language is a reliable method of communicating with the pre-school child. Several studies found that the child's memory for pictures was better than for words while another said verbal memory is primary, with a transition from verbal to visual occurring at 4.5 to 5 years of age. It was also

reported that honest sensory information helped the child tolerate the painful procedure.

### Injections

In his study of hospitalized children Faust (1953) found that "the most traumatic procedure was the use of needles" and for the child over 3 years old it was "emotionally preferable to give injections when possible in the arm rather than the buttock or leg" (p. 96). Eland (1974) found that 49% of hospitalized children aged 4 to 8 said that "shots" hurt the most. A more recent study of hospitalized children aged 4 to 12 (Hester, 1978) reported that invasive procedures that involved the use of needles were most frequently stated to hurt the most. Varying aspects of the child's injection experience have been examined including physiological responses (Torrance, 1968) and behavioral responses (DeFee & Himelstein, 1969; Hester, 1976; Kassowitz, 1958; Ward, 1975) which were dependent upon the judgement of the observer. Hester's study also included the child's subjective rating of the pain experience with the use of the poker chip tool.

Summary. Injections for the child are accompanied by negative responses which have been observed and quantified in various ways. Few studies have been done on the child's report of pain from injections.

### Nursing for the Child with Pain

Nursing attention is usually given to behavioral responses (Davitz, Sameshima, & Davitz, 1976) when assessing pain and planning interventions. These of course require consideration, but in caring for the child with pain the nurse also needs to assist the child in

communicating his pain experience. Orem (1971) described nursing as the giving of assistance when there is a deficit in some aspect of self care. From her list of methods of assisting, those which would be useful to help the child cope with a painful procedure would be "guiding, supporting, teaching, and providing an environment that promotes personal development in relation to becoming able to meet present or future demands for action" (p. 72). Preparing the child for immunization would be providing assistance in one small part of the total environment. The nursing situation would be oriented to the child's period of growth and development as "care is planned for promoting health and for protecting against specific diseases and injuries" (p. 145). The child with a deficit in ability to cope with the painful procedure of immunization injection would then be assisted by using the supportive-educative nursing system.

#### Factors Influencing Pain Response

Some of the many factors that may influence pain response include physical condition and neural development (Madonick, 1954; Swafford & Allan, 1968), growth and development (McBride, 1977; Smith, 1976), emotional condition (Hamburg, 1953; Szasz, 1959), cultural background (Davitz et al., 1976; Sternbach, 1965; Woodrow, Friedman, Giegelaub, & Collen, 1972; Zborowski, 1952), and suggestion (Blaylock, 1968; Craig, 1975; Hedberg & Schlong, 1973; Johnson & Rice, 1974; McCaffrey, 1977). The following are brief notes on other factors surveyed in this study.

Sex. A study of neonates (Lipsitt & Levy, 1959) found that girls

reacted to a lower intensity of electrotactal stimulation than boys. Beyond the new-born age sex differences may be culturally induced i.e. it is all right for a girl to cry but a boy is encouraged to be brave (Eland & Anderson, 1977; Schultz, 1971).

Age. An individualized response to painful stimuli is present until 3 months of age but beyond that the response begins to be modified by the child's care-taking environment (Poznanski, 1976). The response to injections becomes intense from 6 months of age until the 4th year. Beginning at the 4th year an increasing percentage of children show outward signs of self-control (Kassowitz, 1958).

Birth order. First-born children were found to have a greater behavioral response to injections (Vernon, 1974) and dental situations (DeFee & Himmelstein, 1969). Johnson, Dabbs and Leventhal (1970) also found that first-born evaluate pain as more severe.

Number of siblings. In a study of patients with pain problems Gonda (1962) found that younger children in large families more frequently had pain complaints. He attributed this to the younger child having a larger number of people available to give attention and relief to any discomfort. However, Eland and Anderson (1977) in noting the differing response of the first born and later born child observed that it may be due to the first born's lack of "opportunity to rehearse their responses or to integrate and learn from the experience of someone else such as a sibling" (p. 468).

Handedness. In a study of pain thresholds using ice water immersion of hands it was incidentally found that the non-dominant hand was more sensitive to pain (Wolff & Jarvik, 1964).

Iris color. A dental study (Sutton, 1959) was done on reactions to preparation of the tooth cavity on subjects 3 to 50 years of age. It was found that 53% of the patients with dark brown eyes required local anesthetic, while 30% of the brown eyed, only 2% of the grey-blue or green-grey eyed and none of the blue eyed subjects required local anesthetics.

Prior injection experience. Levy (1960) found that before 6 months of age a negative response was not observed but after that age the child seemed to remember cues from the injection environment and responded more intensely. Levy's behavioral observations also revealed that other variables affecting response were the needle, inocula and technique. "Presence" (Fagerhaugh & Strauss, 1977) may also be related to technique. The person with this quality is "able to help lessen pain simply by acting in reassuring ways" using "non-verbal gestures" or doing "some kind of action which is significant to the person in pain" (p. 147). Some nurses administering injections have this characteristic.

Parent contact and nearness. Infants held in the mother's arms during injection cried with less intensity and for shorter duration than those lying on the examination table (Hallstrom, 1968). Subjects aged 2 to 6 years who were accompanied by the mother during induction of anesthesia for tonsillectomies were less upset than those separated from the mother (Schulman, Foley, Vernon, & Allan, 1967). Verbal and non-verbal communication between parent and child may cause an increase or decrease in the distress depending upon prior interaction of parent and child (Szasz, 1959).

### Summary

Despite many pain studies and much new knowledge in recent years, there are many unknowns about the experience of pain. The child's self rating of pain is best described by "Pain is whatever the experiencing person says it is and exists whenever he says it does" (McCaffrey, 1972, p. 8). The pre-school child's aversive response to injections, coupled with limited verbal ability affirms the need for continued exploration of methods to prepare the child for painful procedures. By designing supportive-educative nursing systems to enhance coping with pain experience, nursing assistance would promote health, and help assure normal growth and development for the child. In preparing the child for these procedures the nurse should also recognize other factors which influence the child's pain response and use this information to help reduce this response and improve communication about pain intensity. A few studies have demonstrated a correlation between pain reaction and other variables. Data will be collected concerning these variables but no hypotheses will be tested.

## CHAPTER III

### Methodology

The child says injections cause more hurt than anything. The nursing literature continually cites the need to prepare the child for painful procedures and yet few studies have been done to determine the best way to prepare the child. Proceeding from the finding that there was more benefit from the visual than the verbal preparation in some settings, this research studied verbal and visual-verbal preparation of the pre-school child for DPT immunization. Selection of the pre-school child as subject was influenced by the fact that health laws require certain immunization levels prior to school attendance. The DPT booster required at this age level then became the painful procedure in need of a method of preparation. Since this age child was found to be more upset by injections in the buttock and leg, the study was limited to arm injections. The response measures were obtained on two pain rating tools designed for the child.

#### Design

Limiting subject selection to the child beginning kindergarten gave a narrow age range with many available subjects from the pre-school population. A posttest-only control group design (Campbell & Stanley, 1963) was selected for control of the interaction of testing and treatment. It also assured "lack of initial biases between groups"

(p. 25) through random assignment. The design was for two treatment conditions using two measurement tools on each. Some variables that are believed to influence response to pain experience were included in the data collection.

#### Description of the Sample

A sample of 60 subjects who presented for DPT injections at the offices of a group of pediatric physicians was selected for the study. Subjects were randomly assigned to two groups and data was collected on 73 subjects. Subjects not included in the study were the 9 given the DPT injection in the leg, 3 given the injection when the investigator was not present, and 1 who said there was no pain and did not make a choice on either tool. As each of these subjects was eliminated the subject number was reassigned to the next pre-school child presenting for DPT injection. The final sample size was 60 subjects. Data was collected from July 13, 1978 through August 31, 1978.

The 60 subjects ranged in age from 4.8 years to 5.9 years with a mean age of 5.3 years. The age range and mean for subjects in group 1 (control) and group 2 (experimental) were the same as for the sample as a whole. Attributes of subjects in group 1 and group 2 is presented in Table 1 (Appendix A). There was no attempt to balance groups by sex; however this factor and others were evenly distributed between groups with the exception of siblings older and younger.

Prior pain experience relative to injections is presented for both groups in Table 2 (Appendix A). "Few" meant the child had experienced 5 or less injections. It was the dividing line because the

minimum number for maintaining the immunization level at those doctors' offices was the initial series of 3 DPT during infancy, the MMR (measles, mumps, rubella) after age one, and a DPT booster before age two. TB Tine tests were not counted as injections. The "other" injections were all administered in the hospital relative to tonsillectomies, polyethylene ear tubes, cryptorchidectomy, and pneumonia.

Mechanical and environmental aspects of the injection procedure are presented in Table 3 (Appendix A). Note that distribution of these factors was also balanced between groups. The number of children requiring restraint corresponds with Kassowitz' (1958) findings that an increased self-control is observed between 4 and 5 years of age; only 10 of 60 subjects required restraint.

#### Research Instruments

Hester's Poker Chip tool (1978) was used to assess the intensity of pain from the immunization experience (Appendix B). Hester found it to have face validity for the child 4 years 7 months to 6 years 8 months. The vocal, verbal and eye responses were positively correlated with the Poker Chip rating. Facial expressions and motor behavior were negatively correlated with the Poker Chip tool which could support the possibility that these behaviors are "gating mechanisms to abate pain" (Hester 1976, p. 41). Hester's Poker Chip tool was used in a more recent study with hospitalized children ages 4 through 12 (Hester, Davis, Hanson, & Hassanein, 1978). In that study there was no correlation between the choice of color chosen to rate the intensity of pain, and Hester's Poker Chip tool.

The Four Face tool was developed for this study and consisted of four drawings of faces (Appendix B). A pilot study to see whether pre-school children would see a progression of hurt in the four faces and to establish validity and reliability was done with 10 children, 5 boys and 5 girls. A test-retest with a five day intervening time period was done. The time for administration of both tests was 10:00 A.M. Each child was escorted from his classroom to a quiet room with only the investigator and child in the room. The child was asked to place the faces in a row, from the most happy, most comfortable looking face at one end (left) to the most unhappy, most uncomfortable looking face at the other end (right). In Test 1 nine of the children placed the faces in 1,2,3,4 order; one child placed the faces in 1,3,2,4 order. In Test 2 all ten children placed the faces in 1,2,3,4 order. The children ranged in age from 4 years 9 months to 5 years 5 months. The 4 year 9 month aged child placed the faces in 1,3,2,4 order in Test 1.

#### Procedure

Physicians' permission to do the study in their offices was given on the condition that the procedures would not upset patients or the usual expediting of the office visit. An inquiry about having all nurse injectors use a uniform procedure for position of child and parent was discouraged since there was satisfaction with the usual procedures and some concern that a new procedure would upset office routine.

Upon arrival at the office, the parent registered the child with the receptionist who then informed the investigator that a possible

subject was available. The investigator introduced self to parent and child, briefly explained the study and asked if he/she would give written consent for inclusion of the child in the study. Following the reading and signing of the consent form (Appendix B), parent and child were interviewed for the information on the data collection sheet (Appendix B). Next the subject number card was consulted to find the random assignment to group. The group number was placed on the data sheet and if the subject was in group 1 (control) the investigator explained before departing that they would be seen again at the time of immunization. If the subject was in group 2 (experimental) the Happstick booklet (Appendix B) was administered in the following way. The investigator sat beside the subject holding the booklet open before the child and speaking the script for each page (Appendix B). The investigator explained before departing that they would be seen again at the time of immunization.

Each nurse injector had a different, consistent, injection procedure (Appendix B) which was used for all subjects; spoken words in procedures are paraphrased. All DPT immunizations were .5 ml in volume, injected with a 5/8 inch, 25 gauge needle. The investigator observed the administration of each injection and, 30 seconds after the needle was removed from the subject's arm, administered the first tool. The second tool was administered immediately following the first, and pain scoring by the child was immediately recorded. Comfort and/or leave-taking measures by nurse injector and/or parent filled the 30 second time period between needle removal and the first measurement tool.

## CHAPTER IV

### Results

The subjective rating of pain, while using numbers to denote degree of intensity cannot assume equal intervals. The relation among scores is simply that of greater or lesser than, yielding ordinal data which may be rank ordered. Non-parametric tests may be used for rank ordered data because fewer assumptions are made concerning population distribution (Ferguson, 1976).

### Data Analysis

The non-parametric tests used were the Wilcoxon rank sum analysis for the independent samples in hypotheses 1 and 2. The Wilcoxon matched-pairs signed-ranks test was used for the paired observations in hypotheses 3 and 4.

Hypothesis 1 stated there is no difference between the verbal pre-injection preparation group and the visual-verbal pre-injection preparation group relative to the pain rating score with Hester's Poker Chip tool. The Wilcoxon rank sum analysis was  $p > .10$  therefore, the null hypothesis is accepted. Hypothesis 2 stated there is no difference between the verbal pre-injection preparation group and the visual-verbal pre-injection preparation group relative to the pain rating score with the Four Face tool. The Wilcoxon rank sum analysis was  $p > .10$  therefore, the null hypothesis is accepted.

The analysis of hypotheses 1 and 2 revealed no significant difference in the verbal preparation and the visual-verbal preparation relative to the pain rating scores on Hester's Poker Chip tool and the Four Face tool. This finding suggests that the visual-verbal preparation did not describe the sensations to be expected or provide the modeling effect that had been noted in previous studies.

Hypothesis 3 stated there is no difference between the pain rating on Hester's Poker Chip tool after verbal pre-injection preparation and the pain rating on the Four Face tool after verbal pre-injection preparation. Wilcoxon signed-ranks test was  $p < .01$  which was significant. Therefore, the null hypothesis was rejected and the alternative hypothesis that there is a difference was accepted. The analysis revealed a significant difference in the pain rating scores on the two tools after the verbal pre-injection preparation. Hester's Poker Chip tool tended to have smaller values; that is, the child made a lower pain rating with it than he did on the Four Face tool.

Hypothesis 4 stated there is no difference between the pain rating on Hester's Poker Chip tool after visual-verbal pre-injection preparation and the pain rating on the Four Face tool after visual-verbal pre-injection preparation. Wilcoxon signed-ranks test was  $p < .01$  which was significant. Therefore, the null hypothesis was rejected and the alternative hypothesis that there is a difference was accepted. The analysis revealed a significant difference in the pain rating scores on the two tools after the visual-verbal pre-injection preparation. Hester's Poker Chip tool tended to have smaller values, thus lower pain rating scores than the Four Face tool.

## CHAPTER V

### Discussion and Recommendations

The purpose of this study was to examine the pre-school child's rating of pain from the immunization injection in relationship to the differing methods of pre-injection preparation. It was believed that the development of a visual aid for preparing the pre-school child for immunization injections would decrease the child's pain response (Johnson et al., 1975; Vaughn, 1957; Vernon, 1974). Prior studies required sophisticated equipment such as movie projector, screen and tape recorder. The aim of this study was to use equipment the nurse could carry on her person and use in a brief interval, thus making it practical in a clinic situation. The general distribution of the data as well as the statistical analysis was used in examining the results.

The finding of no difference in pain rating following the verbal preparation and the visual-verbal preparation is compatible with those of Rohwer (1970). He found that age 4.5 to 5 was a period when the child's storing of information changes from verbal to visual and that the younger child's memory for verbal information is better than for visual. Since many of the subjects were near that age group it could have been a factor contributing to the similar results for verbal and visual-verbal preparation. The environmental circumstances surrounding the administration of the visual-verbal preparation could also have been an influencing factor. This preparation was done whenever time-space

was not in conflict with the regular progression through the office visit. It was usually done in a large waiting area surrounded by other persons moving about and talking. Subjects arriving for immunization only, were given this visual-verbal preparation quickly while the nurse injector was ready to administer the immunization. The time interval between administration of the visual-verbal preparation and the injection varied from 5 seconds to almost an hour. Additionally, pain experience is very personal and varies highly among all people. There are many factors involved in the preparation for an intrusive painful procedure besides the ability to store information verbally or visually and the pain sensation. The number and type of input from any of the previously mentioned factors that influence pain response would also contribute. For example, in talking briefly to the parent, relating that the study was interested in how the pre-school child would respond to the immunization, the parent with child beside her said, "I can tell you right now what he's going to do. He's going to holler!" The child did fulfill her expectations. Some parents by verbal and non-verbal communication expected the child to maintain self-control and he did. Other parents were apprehensive, had not told the child what to expect and felt that the picture book would be helpful. They wondered if participation in the study could be contingent upon having the picture book read to the child. Through these illustrations the multiple factors contributing to each response becomes evident. The lack of difference between the preparation procedures could also have resulted from the inability of the pain measurement tools to discriminate the effect, or the treatment effect may not have been powerful enough to overcome or neutralize the other factors.

The finding of a significant difference in the pain rating tools could suggest that the two tools measure different components of the pain experience. It was noted during administration of the tools that the crying child would point to the crying face (Face 4) for the amount of hurt experienced. However many subjects did not cry but also chose Face 4 as the pain score. When administration of both tools had been completed, these subjects were asked what caused them to choose that face since they had not cried. Most subjects did not respond to this question but those who did so, said it hurt enough to cry, or they had felt like crying. Another observation during administration of the tools was that it seemed that subjects took a longer time period to decide upon the "pieces of hurt" vs. "the face that looks like she had the same amount of hurt."

A summary distribution of pain scores on both tools for both groups is presented in Table 4. Distribution of scores is notably different. The predominant number of subjects in both groups chose one chip on Hester's Poker Chip tool with one choosing 3 chips. Face 4 was chosen most frequently on the Four Face tool and there was a balanced distribution of scores among the other three faces. One possible explanation for this distribution was that the child was able to identify with the faces more easily and was able to discriminate levels of pain. The poker chips require the ability to take the concept of pain and transfer it to another modality, i.e. number of chips. Thus the child's developmental level would strongly influence the performance of this task.

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Insert Table 4 about here

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Other factors said to influence the response to pain were recorded and analyzed. The level of significance for these factors was set at .05. These factors are presented according to the statistical tests used. Handedness was not statistically analyzed; summary distribution revealed 57 subjects were right handed, 2 were ambidexterous and 1 was left handed. It is interesting to note that since all injections were given in the left arm, most subjects received the injection in the non-dominant side which is said to have increased sensitivity to pain (Wolff & Jarvik, 1964). The Spearman's rho (Table 5, Appendix C) was used to analyze the pain rating scores as correlated with the subjects older siblings. A negative correlation of - .32 with a p value of .01 revealed that as the number of older siblings increased, the pain rating score decreased on Hester's Poker Chip tool. These later born children with lower pain rating scores are in harmony with those studies which found that first born respond with greater intensity (DeFee & Himelstein, 1969; Johnson et al., 1970; Vernon, 1974). This also supports Eland and Anderson's (1977) observation that this increased response may be related to lack of opportunity to learn from siblings. The time since last injection was also analyzed with Spearman rho but revealed no significant correlation with the pain scores.

The Wilcoxon rank sum test was used to analyze those factors with two independent samples; analysis is presented in Table 6 (Appendix C). The test did not reveal significant differences between the pain scores of girls and boys. Analysis of birth order revealed a

Table 4  
Frequency Data of Pain Scores

<u>Measurement Device</u>	<u>Pre-injection Preparation</u>	
	<u>Group 1</u>	<u>Group 2</u>
Hester's poker chip tool		
Chips		
One	20	18
Two	6	9
Three	0	1
Four	4	2
Four face tool		
Face number		
One	4	6
Two	6	6
Three	8	5
Four	12	13

significant difference in scores on Hester's Poker Chip tool ( $.02 < p < .05$ ). The later born child tended to have smaller scores or rated the experience as less painful. This agrees with prior studies (DeFee & Himmelstein, 1969; Johnson et al., 1970; Vernon, 1974) and Craig's (1975) finding that social modeling does influence the reporting of pain. The number of prior injections did not reveal a relationship to pain scores. There was a significant difference in the pain rating scores on the Four Face tool for those children requiring restraint. Their pain rating scores were much higher on the Four Face tool. This could suggest that the Four Face tool measured another component of the injection experience. Another explanation is that the less mature child, as demonstrated by lack of self control, can understand the task when graphic visual stimuli are used but not when a less concrete tool is used. As noted earlier the child's developmental level is an important determinant for discrimination.

The Kruskal-Wallis' analysis of variance by ranks was used to test those factors having more than two independent samples, and is presented in Table 7 (Appendix C). There was no relationship between the nurse injectors procedure and the pain rating scores. This was consistent with the observation that the nurse injectors were experienced, had good technique and "presence." Parent and child position had no relationship to pain rating. Perhaps "contact comfort" (Hallstrom, 1968) is not an influential factor with the pre-school child. However, the amount of contact comfort included in one nurse injector procedure and thus distributed among the child and parent positions could have been a confounding element.

### Recommendations

There is a need for continued exploration into the usefulness of pain measurement tools for the child. Studies of the older child using Hester's Poker Chip tool could further refine its use.

Comparative studies to weigh the influence of developmental status in the use of Hester's Poker Chip tool and the Four Face tool would also contribute to knowledge of pain measurement for the child.

Additional studies with both tools should be done to establish their reliability for various age groups.

A related study of parent attitudes toward injections would also be informative. Informal conversation disclosed that parents' negative childhood experiences with injections were communicated to the child.

### Implications for Nursing

Orem's (1971) framework activates nursing agency (the power of the nurse to use her knowledge in nursing action) following a deficit in self-care agency of the child. This study confirmed the need to direct nursing agency to parent and child with the health focus on the life cycle and how it influences "powers for symbolization, thought, voluntary movement and engagement in various kinds of deliberate action" (p. 125). The ability to symbolize, influenced by the child's developmental level seemed in turn related to the differing pain scores of the two pain measurement tools. Thus nursing agency in the care of the child with pain must include knowledge of developmental levels and factors influencing response as well as the physiological mechanisms of pain.

Use of the supportive-educative nursing system is important in preparing the child for an injection. Based on this study the informal verbal preparation was as effective as the visual-verbal preparation for the child 4.8 years to 5.9 years of age in this setting. Therefore, the nurse could continue to just give verbal preparation to the child and provide an adequate supportive-educative nursing system.

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## Appendix A

Table 1  
Frequency Data of Personal Attributes

Factor	Pre-injection Preparation	
	Group 1	Group 2
Sex		
Boys	15	15
Girls	15	15
Birth Order		
First born	14	19
Later born	16	11
Siblings		
Older	26	16
Younger	8	17
Hair Color		
Blond	16	17
Brunet	13	12
Red	1	1
Iris Color		
Blue	14	14
Green	2	1
Hazel	3	4
Brown	8	9
Dark brown	3	2
Handedness		
Right	28	29
Left	1	0
Ambidexterous	1	1

Table 2  
Frequency Data of Injection Experience

Factor	Pre-injection Preparation	
	Group 1	Group 2
<b>Prior injections</b>		
Many <sup>a</sup>	10	8
Few <sup>b</sup>	20	22
<b>Type of last injection</b>		
Antibiotic	3	3
Immunization	23	25
Other	4	2

<sup>a</sup>Six or more injections.

<sup>b</sup>Five or less injections.

Table 3  
Frequency Data of  
Mechanical and Environmental Aspects

Factor	Pre-injection Preparation	
	Group 1	Group 2
<b>Nurse injections</b>		
N-1	16	12
N-2	5	14
N-3	9	4
<b>Parent position</b>		
Out of sight	3	1
Beside child	18	20
Touching child	9	9
<b>Child position</b>		
Standing	17	13
Sit on examining table	13	15
Parent's lap	0	2
<b>Restraint required</b>		
Yes	4	6
No	26	24

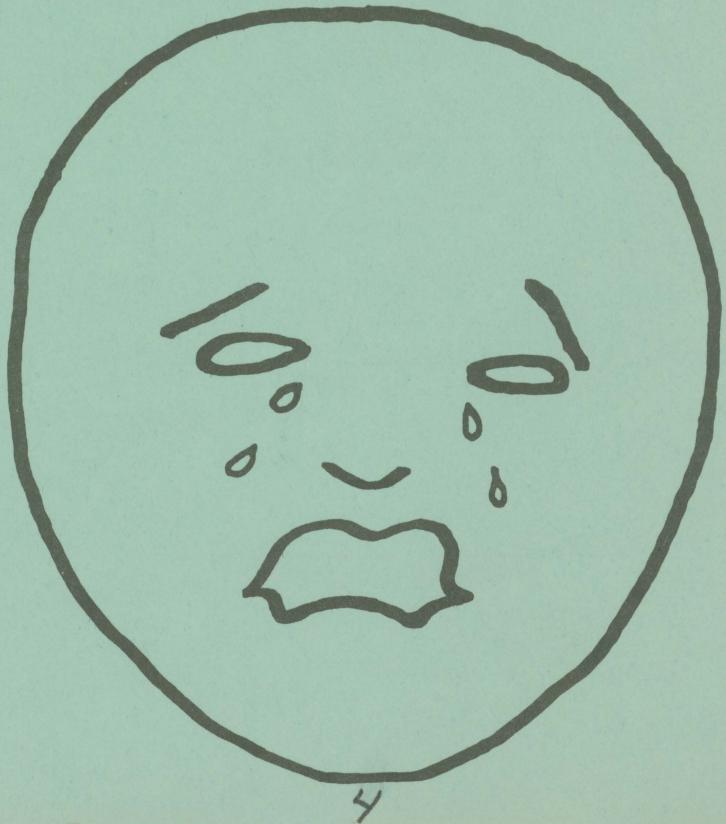
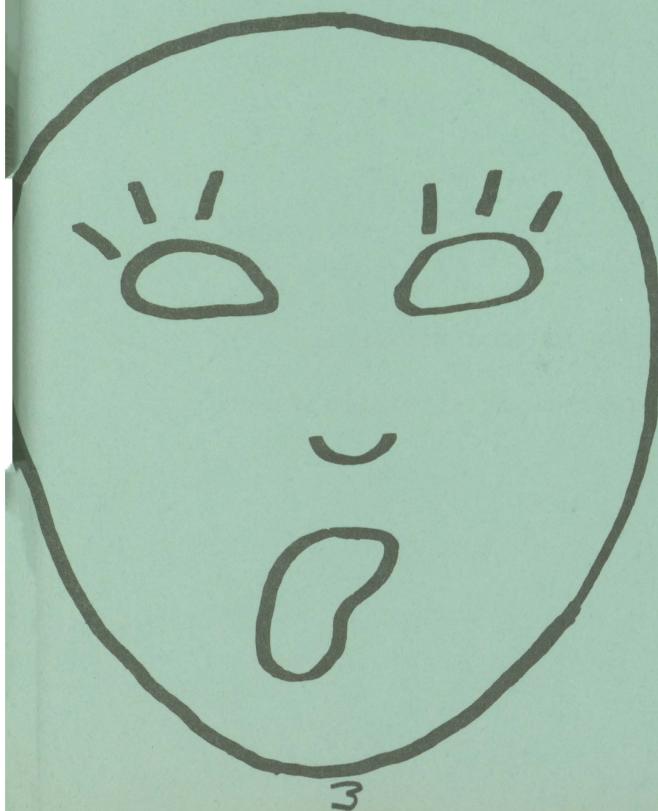
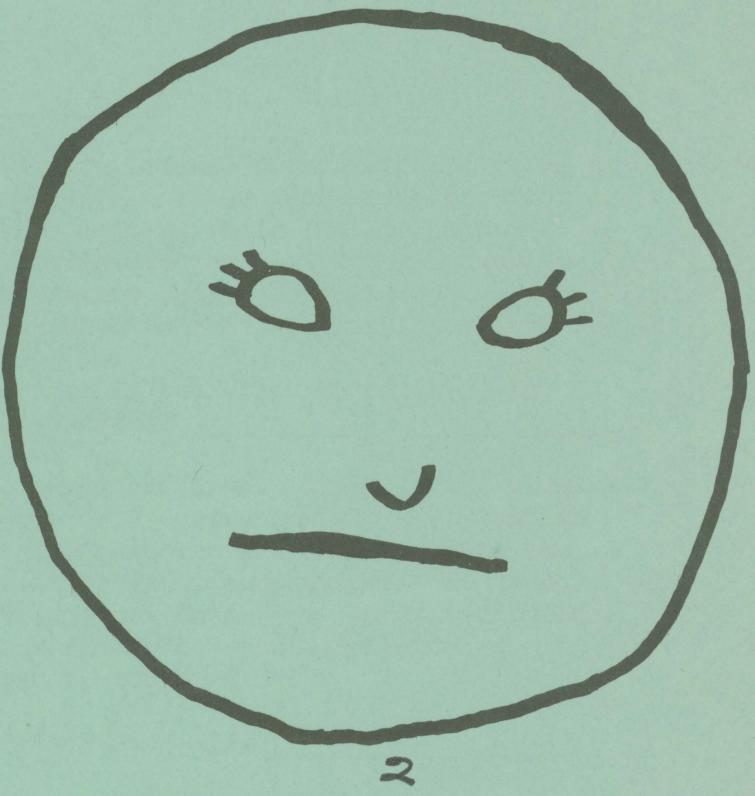
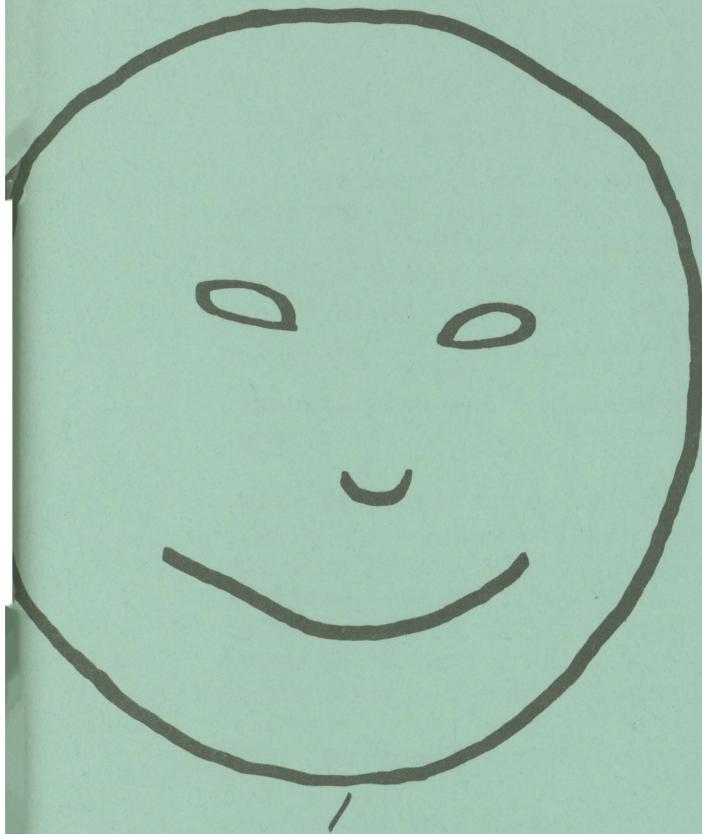
## Appendix B

### Hester's Poker Chip Tool

"These are pieces of hurt--one chip is a little bit of hurt and four chips are the most hurt you could ever have." The child will be asked, "How many pieces of hurt did you have in this spot?" Record number of chips.

Four Face Tool

"These faces were made after some hurt. Look at all of the faces, then point to the face that looks like (he, she) had the same amount of hurt you had in this spot." Record the face number.



Consent Form

Dear Mr., Mrs., Miss \_\_\_\_\_:

My name is Bertha Alyea, I'm a registered nurse, and I'm doing a research project to find out whether or not the fear and discomfort that small children experience when getting their routine immunizations can be decreased by explaining the immunization procedure while using a specially designed picture book. Your child, \_\_\_\_\_, is scheduled to receive (his) (her) routine

Name

immunization and I will appreciate it if you allow (him) (her) to participate in this project. If you agree, \_\_\_\_\_

Name

will be placed in one of two groups of children. Group 1 will receive the routine, spoken preparation for (his) (her) immunization that is usually given. Group 2 will receive a spoken preparation using the picture book referred to above. After the immunizations are given, both groups of children will have a short interview (about 5 minutes) with me so that I can estimate the discomfort that the children experience. The results will then be compared.

You have absolutely no obligation to allow \_\_\_\_\_  
Name  
to participate in my project.

The results of my project may be published but neither you nor any member of your family will be identified in any such publication.

If you are willing to allow \_\_\_\_\_ to partic-  
Name  
ipate, please sign the statement at the bottom of this page.

\_\_\_\_\_ Bertha Alyea, R.N.

I hereby consent to allow my child \_\_\_\_\_ to  
Name  
participate in the research project described above.

\_\_\_\_\_ Parent Signature

Data Collection Sheet

Subject\_\_\_\_\_

Group\_\_\_\_\_

Birth: Month\_\_\_\_\_ Date\_\_\_\_\_ Year\_\_\_\_\_

Sex: M\_\_\_\_\_ F\_\_\_\_\_

Birth Order: First Born\_\_\_\_\_ Later Born\_\_\_\_\_

Siblings: Age and Sex of each

Hair Color: Blond\_\_\_\_\_ Brunet\_\_\_\_\_ Red\_\_\_\_\_

Iris Color: Blue\_\_\_\_\_ Green\_\_\_\_\_ Hazel\_\_\_\_\_ Brown\_\_\_\_\_ Dark Brown\_\_\_\_\_

Handedness: R\_\_\_\_\_ L\_\_\_\_\_ Both\_\_\_\_\_

Prior Injection Experience: Many (6 or more)\_\_\_\_\_  
Few (5 or less)\_\_\_\_\_

Date of most recent injection\_\_\_\_\_

Type of most recent injection: Antibiotic\_\_\_\_\_  
Immunization\_\_\_\_\_  
Allergy\_\_\_\_\_  
Other\_\_\_\_\_

Nurse Injector\_\_\_\_\_

Site of Injection: L. Arm\_\_\_\_\_ R. Arm\_\_\_\_\_

Parent Position: Out of sight\_\_\_\_\_  
Beside\_\_\_\_\_  
Touching\_\_\_\_\_Child Postion: Standing\_\_\_\_\_  
Sit on exam table\_\_\_\_\_  
Sit on parent lap\_\_\_\_\_

Restraint Required: Yes\_\_\_\_\_ No\_\_\_\_\_

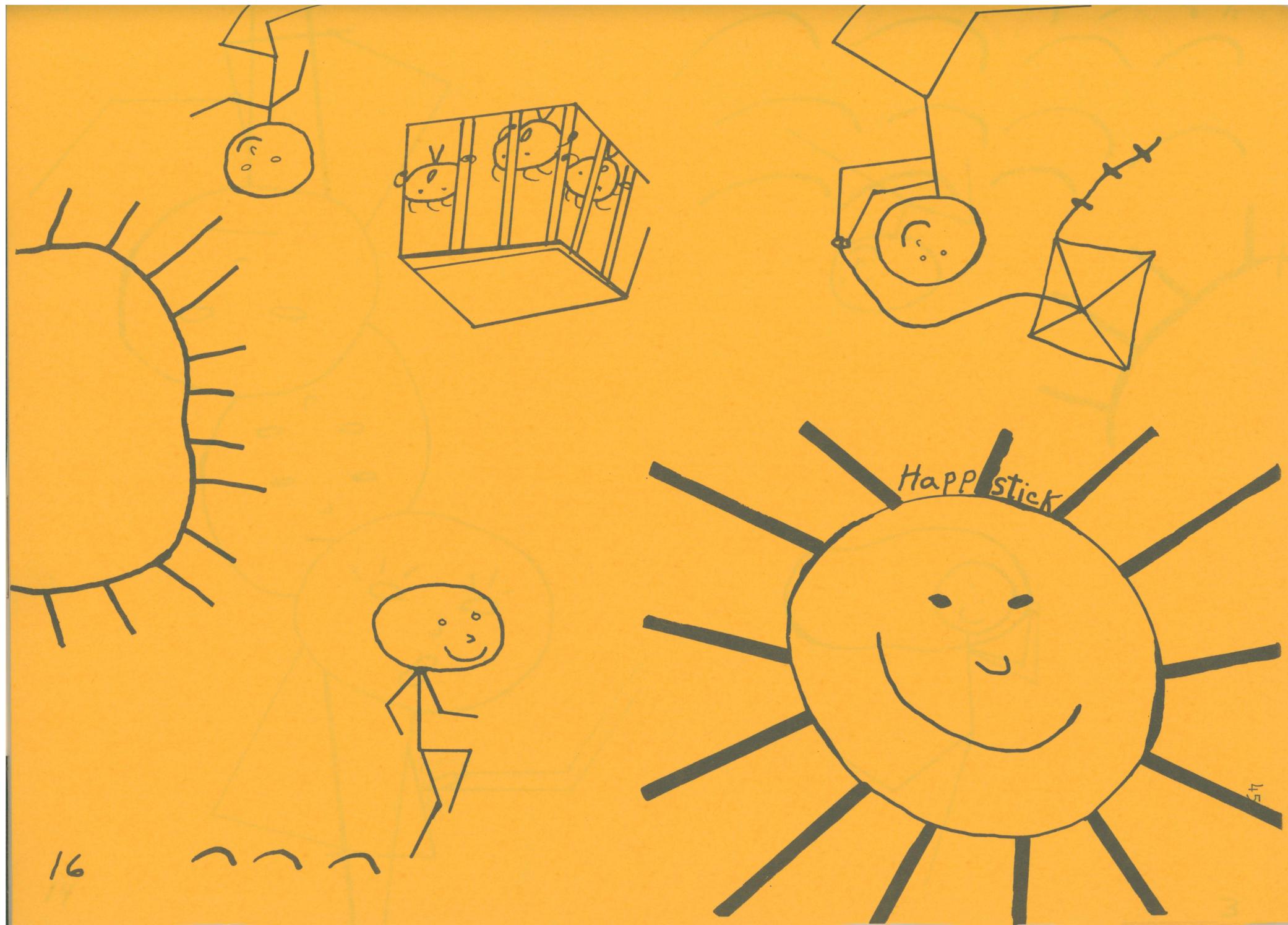
Order of Instruments: I &amp; II\_\_\_\_\_ II &amp; I\_\_\_\_\_

I. Hester Poker Chip score:

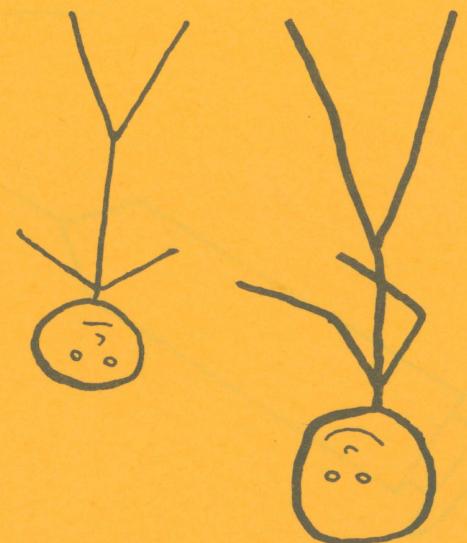
1      2      3      4

II. Four Face score:

1      2      3      4



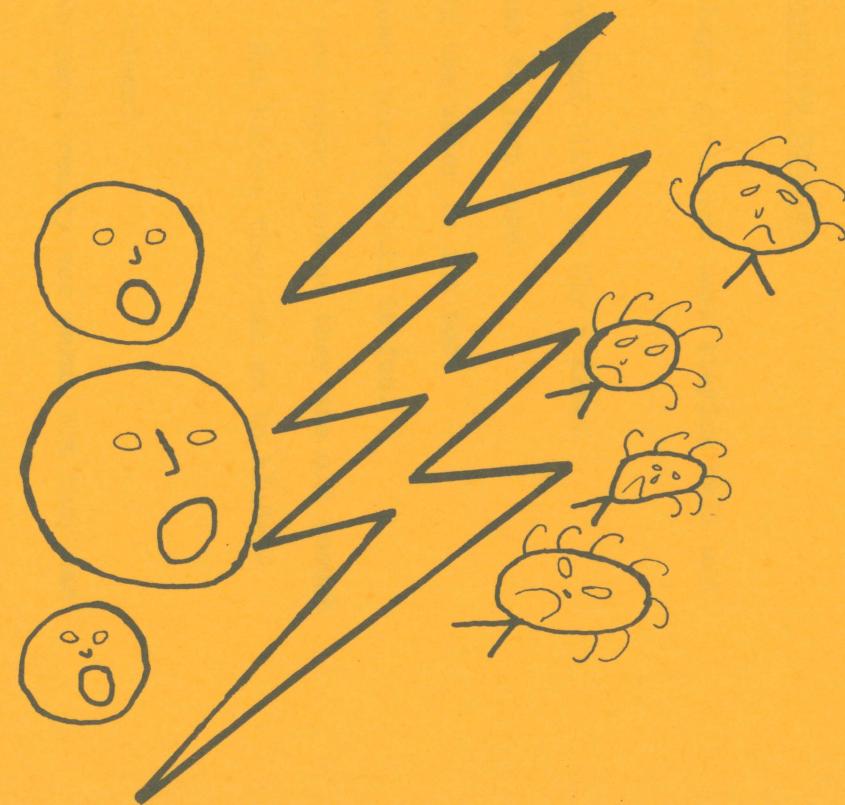
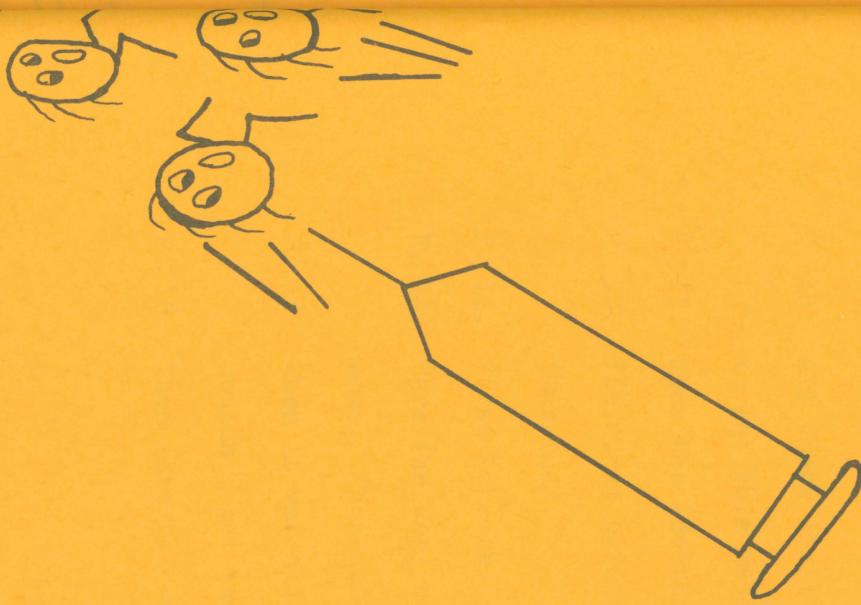




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Script for Happstick Booklet

- P. 1. This is a story about happy girls and boys staying well and healthy.
- P. 2. This (girl/boy) is happy and likes to fly a kite.
- P. 3. Sometimes (she/he) likes to jump rope.
- P. 4. Playing and swimming in the water is fun too.
- P. 5. When someone else is near, playing ball is fun.
- P. 6. All these (boys/girls) are happy because they are old enough to go to kindergarten. But before they can go to kindergarten-----
- P. 7. Ohh!! What are those things?
- P. 8. They are bad germs. We can't really see germs but they can make girls and boys sick.
- P. 9. Girls and boys don't need to get sick from some germs because there is medicine that keeps them away.
- P. 10. All these girls and boys are waiting at the doctors office to get this medicine.
- P. 11. Soon the (doctor/nurse) comes to see (her/him).
- P. 12. The nurse brings the medicine and (she/he) can stay close to (Mom/Dad).
- P. 13. First (she/he) feels something wet and cold on (her/his) arm.
- P. 14. Here (he/she) holds very still and says 'ow' because it hurt some. Then quick as a wink it was all done!
- P. 15. When it was all done, those germs were all locked up! They couldn't get near (her/him).
- P. 16. Then (she/he) went hippity-hop off to kindergarten.

Nurse Injector Procedure

Nurse Injector 1 sat down, then asked child to come stand in front of her with child's left arm and side closest to nurse. As the child's deltoid area was rubbed with alcohol sponge she said "I have some medicine for you that will hurt some. You can say ouch or cry but you must hold still. If you jerk away and the needle comes out I will have to stick you again. First there will be a stick---say 'ouch'---then a sting--- there it's all done."

Nurse Injector 2 had the child sit on the examining table, moved in close so each of child's knees was to each side of her hips, placed her left arm around the child's torso and while rubbing the child's left deltoid area with alcohol sponge said, "I have some medicine for you that will hurt some. You can cry if you want and I will help you hold still. There, it's all over."

Nurse Injector 3 had the child sit on the examining table, then asked the parent to "come give (child's name) a hug". The parent then moved in close, facing the child with the parents' left arm hugging the child's right arm to the child's body and parents' right arm around child's left waist. This prevented movement away from the nurse holding the child's left arm and swabbing it with alcohol. "I have some medicine for you that will hurt some. You can say 'ouch' or cry but you have to hold still. There, that didn't take long. All done."

All three nurse injectors gave hugs and verbal comfort and praise when the procedure was finished.

## Appendix C

Table 5  
Spearman rho  
Analysis of Factors Related to Pain Response

Factor	Test score		p value	
	Hester	4 Face	Hester	4 Face
TiSLI <sup>a</sup>	-.06	-.03	.6	.8
NSO <sup>b</sup>	-.32	-.08	.01	.5

<sup>a</sup>Time since last injection.

<sup>b</sup>Number of siblings older.

Table 6  
Wilcoxon Rank Sum  
Analysis of Factors Related to Pain Response

Factor	<u>n</u>	Rank sum		p value	
		Hester	4 Face	Hester	4 Face
<b>Sex</b>					
Boys	30	823.5	847	>.10	>.10
Girls	30	1006.5	983		
<b>Birth order</b>					
First	33	1159.5	1057.5	<.02 p < .05	>.10
Later	27	670.5	772.5		
<b>Prior inj exp<sup>a</sup></b>					
Many	18	567.5	566	>.10	>.10
Few	42	1262.5	1264		
<b>Restraint req<sup>b</sup></b>					
Yes	10	362	461	>.10	<.01
No	50	1468	1369		

<sup>a</sup>Prior injection experience.

<sup>b</sup>Restraint required.

Table 7

## Kruskal-Wallis

## Analysis of Factors Related to Pain Response

	<u>n</u>	df	Rank sum		Test and p value	
			Hester	4 Face	Hester	4 Face
<b>Hair Color</b>						
Blond	33		920	1076		
Brunet	25	2df	871	719.5	.3.08 or $p > .2$	1.87 or $p > .2$
Red	2		39	34.5		
<b>Iris Color</b>						
Blue	28		769.5	883.5		
Green	3		111.5	62		
Hazel	7	4df	224	126.5	.3.61 or $p > .2$	5.97 or $p > .2$
Brown	17		513.5	568.5		
Dark br	5		211.5	189.5		
<b>Nurse Inj</b>						
N-1	29		774	869.5		
N-2	16	2df	517	476.5	.3.00 or $p > .2$	.22 or $p > .2$
N-3	15		539	485		
<b>Parent Pos</b>						
OOSight <sup>a</sup>	4		116	160.5		
Beside	38	2df	1116.5	1103.5	.61 or $p > .2$	1.53 or $p > .2$
Touch	18		597.5	566		
<b>Child Pos</b>						
Stand	30		793.5	916.5		
ExTable <sup>b</sup>	28	2df	997.5	880.5	.4.81 or .05< $p < .1$	1.36 or $p > .2$
P lap <sup>c</sup>	2		39	33		

<sup>a</sup>Out of sight.<sup>b</sup>Sit on examining table.<sup>c</sup>Sit on parent lap.

The undersigned, appointed by the Dean of the Graduate Faculty, have  
examined a thesis entitled CHILD PAIN RATING AFTER INJECTION  
PREPARATION

presented by Bertha Christensen Alyea

a candidate for the degree of Master of Science (Nursing)

and hereby certify that in their opinion it is worthy of acceptance.

Carol L. Panuccio RN PhD  
  
Kamala R. Khan  


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