# Minimizing the Pain Intensity of Preoperational Children Receiving an Injection

by

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# Chapter I

## Introduction

Pain, though experienced universally, is a highly individualized, subjective experience. For many children an injection or "shot" is the worst pain they can think of (Eland & Anderson, 1977). However, most children, healthy and ill, experience injections. Most states require a completed series of immunizations before entering school. In addition, children experience additional pain from needles if they are sick and require medications or procedures such as venipunctures or intravenous catheter placements.

In addition to the neurological-sensory aspect of pain, the developmental level of the child influences the cognitive-affective aspect of pain (Beyer & Byers, 1985). Using Piaget's schema for cognitive development, children between 2-7 years of age are in the preoperational stage. The preoperational stage is characterized by fantasy and egocentric thought. Research has shown that children at this developmental level often view an injection as punishment for a misdeed (Abu-Saad, 1981; Varni, Katz & Dash, 1982). Magical thinking is not limited to injections. For instance, preoperational children may

decide an illness was caused by the sun or clouds. Magically linking cause and effect is normal for this developmental level (Bibace & Walsh, 1981). Due to the preoperational child's propensity to think magically, this age group is especially vulnerable to the pain associated with injections.

The combination of neurological-sensory and cognitive-affective pain associated with injections presents a challenge for nursing. As a child advocate, the pediatric nurse is interested in minimizing traumatic experiences for children. Therefore, an important advance for nursing would be to be able to administer or assist with a necessary painful procedure with the least discomfort for the child.

The purpose of this study was to evaluate the effectiveness of using a topical anesthetic prior to an injection in decreasing the pain-distress experienced by the preoperational child. Information from the study will increase knowledge to help minimize the pain associated with a common painful procedure for the preoperational pediatric population.

## Review of the Literature

### Pain

Pain has been a subject of research for many years by various members of professional disciplines. It is an elusive concept, one that has never been satisfactorily defined or understood. In an effort to establish a universal definition, Bonica (1979) defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" (p. 250). An assumption underlying Bonica's definition is the belief that pain is personal and subjective. Pain is a multi-faceted phenomenon. It is a combination of neurological-sensory and cognitive-affective components. These two components will be discussed separately in this literature review.

Neurological-Sensory component of pain. A function of the human nervous system is the processing of sensory information. Nociception, or the transmission of painful stimuli, is one of the many sensory experiences transmitted to the central nervous system (CNS). Nociception can occur when there is damage to tissue from physical injury which can be from mechanical, thermal or chemical origin (Chapman, 1984; Iggo, 1972). Pain receptors (nociceptors) are free

nerve endings of A delta and C fibers widely distributed in the skin, muscle, subcutaneous tissue, and various other structures. Once stimulated, these receptors tramsmit the impulses along peripheral fibers to the CNS where the interpretation of pain is made (Chapman, 1984; Melzack, 1973; Porth, 1982). There is much controversy regarding the actual physiological mechanism involved in the experience of pain (Chapman, 1984; Melzack, 1973; Weisenberg, 1977), however, it is clear that pain has a neurological-sensory component.

Cognitive-Affective component of pain. While not disputing the influence of neurological-sensory factors on the experience of pain, most experts recognize the impact of cognitive-affective factors as well (Beecher, 1956; Bonica, 1966; Melzack, 1973; Melzack & Dennis, 1978; Nigl, 1984). Cognitive-affective factors influencing the perception of pain include the following: cognition - what is thought about the experience, affective - what emotional feelings are associated with the experience, and personality - training from family and culture on how to respond to the experience (Merskey, 1978; Nigl, 1984). In his classic study, Beecher (1956) demonstrated that the significance of the wound can be a greater factor in the experience of pain than the

actual tissue damage done. This was his conclusion based on a study comparing civilian men undergoing surgery and soldiers who had received war wounds. Of 215 soldiers seriously injured in battle, only 25% requested a narcotic for pain relief. In contrast, over 80% of the civilian men requested a narcotic. The difference was attributed to the significance of the wound. For the soldiers it signified a ticket to safety; for the civilians, it meant disaster.

The experience of pain is believed to be created by a combination of physiological and psychological factors. Management of pain can take place by intervening at either or both of these levels.

Pain in Children

Researchers have studied the concept of pain for many years; however, most of the studies have been conducted with adult samples. Children and adults often differ in their understanding and reactions to events. Therefore, the knowledge of pain in adults should not be generalized to children. Recently researchers have begun the task of empirically studying the phenomenon of pain in children.

A few studies have examined infants' reactions to pain. Researchers have studied infants' response to

circumcision (Williamson & Williamson, 1983), heel lance (Owens & Todt, 1984), and DPT immunizations (Dale, 1986; Izard, Hembree, Dougherty & Spizzirri, 1983; Levy, 1960). In addition, researchers have studied the school age child's experience of pain (Savedra, Tesler, Ward, Wegner, & Gibbons 1981; Schultz, 1971). The findings of these studies support the theory that infants and school age children experience pain in a variety of situations and are able to communicate the presence of pain to another.

## Pain in the Preoperational Child

Developmental considerations. The preschool age child is generally considered to be in Piaget's preoperational stage of cognitive development. Children at this level are dominated by egocentrism, the inability to take another person's perspective, and magical thought, i.e., a belief that the child's thoughts are all powerful (Cowan, 1978; Piaget, 1966). Preoperational children do not think logically. Their idea of causation is not based upon logic, but upon their perception of the experience. Therefore, the child may mysteriously link cause and effect in ways unexpected or incomprehensible to an adult. If an understandable explanation of an event is not given, the child will create an explanation that is acceptable to him or her (Whaley & Wong, 1979). Other characteristics of

this developmental level include the child's inability to understand the concepts of conservation, the idea that mass can change size, shape or length without losing or adding to the original mass, and reversibility, the idea of returning a quantity to its original state to verify its sameness (Boyle, 1969; Cowan, 1978). In addition, preoperational children do not understand the abstract concept of time. For them, time is understandable only in relation to concrete events, such as mealtimes or bedtime. The concept of the future is also too abstract to have meaning to a child of this developmental level. Therefore, the timing of any intervention must be closely related to the event.

While the ability to conceptualize is developing, the preoperational child is still very concrete. The ability to make deductions or generalizations is not present at this time (Boyle, 1969). Preoperational thought is dominated by what the child sees, hears, or otherwise experiences. Therefore, a visible, experiential pain intervention would be most appropriate for this concrete thinking child.

Injections in Children

Researchers report that children have identified a "shot" or injection as a stressful or painful event

(Melamed, 1979; Sorenson & Roth, 1973; Venham & Quatrocelli, 1977). Nevertheless, children are subjected to injections in many different health care environments as a normal part of therapy. Venham & Quatrocelli (1977) studied children's responses to repeated dental procedures over time. The procedures studied included the following: response to a mirror and explorer exam, response to four injections, and response to cavity preparation. Twenty-nine preschool children, 14 boys and 15 girls, ranging in age from 2 to 5 years, comprised the sample. None of the predominantly lower middle class children had previous dental experience. Eleven children were white; 18 were black. The children's responses to the procedures were measured by the following: heart rate, ratings of clinical anxiety, and cooperative behavior. Ratings of clinical anxiety and cooperative behavior were made by three judges independently viewing video tapes of the visits. Interrater reliability ranged from .78 to .98. The researchers found that while repeated dental visits apparently made no change in the child's response to cavity preparation and appeared to desensitize the child to mirror and exploration portion of the visit, repeated visits appeared to sensitize the child to the injection. These findings suggest that children can differentiate

between noxious and non-noxious stimuli over time, and point to the need for tested interventions designed to decrease the pain and anxiety associated with injections. In addition, the study suggested that knowledge alone does not reduce the anxiety and pain of an event.

Shapiro (1975) studied the behavior of 12 year old girls receiving anti-rubella injections. The sample included 17 girls from a kibbutz and 19 girls from an Israeli urban area. Measures of stress included heart rate, finger sweat, verbal avoidance, verbal intensity and performance. Each girl was tested the day before the injection, just prior to the injection, and one week after the injection. The results indicated all girls experienced an increased heart rate at the time of injection. However, the girls raised on a kibbutz demonstrated a lower heart rate than those raised in the urban area, which the researchers hypothesized might be due to the a higher level of physical fitness. In analyzing the measures, the researchers concluded that simple physiological measures could reliably assess group differences in fear of needles. Cultural differences between Israeli and American girls limit generalizations made from this study about needle fear.

A study conducted by Vernon (1974) assessed the influence of birth order and modeling on children's response to receiving an injection. Thirty hospitalized children aged 4 to 9 years comprised the sample. The children were randomly assigned to one of three groups: a no-pain-movie group, a pain-movie group and a control group. The children in the no-pain-movie group watched a film depicting children receiving an injection with no apparent pain. The children in the pain-movie group viewed children receiving an injection with evident discomfort. The experience of pain was measured by the Global Mood Scale, a behavioral assessment tool, during the five minutes before and after the preoperative injection. Findings suggested that modeling which conveys accurate information to the child can reduce pain, while modeling that conveys inaccurate information can increase the child's pain. Modeling was effective when the child saw a behavior that was believable to him or her. The role of birth order did not appear to influence the effectiveness of the preparation. Regardless of intervention, all children were assessed as experiencing moderate to high levels of pain with the preoperative injection.

Torrance (1968) compared children's reactions to intramuscular injections given by needle and jet spray and the level of discomfort associated with the injection. The study was designed to evaluate the impact of injection equipment on the amount of pain experienced by the child. The sample consisted of 41 children, 27 males and 14 females who were admitted to the hospital for a tonsillectomy, adenoidectomy or strabotomy. All children were between 3 and 7 years of age. Fifteen children were black; 26 were white. The child's pain was measured by heart rate and the Global Mood Scale, form B. Torrance found no significant difference between those who received an injection by needle and those who received an injection by jet spray. In addition, age did not significantly affect the children's response. A significant difference was noted between the males and females. The females exhibited more distress than the males, with the possible explanation that the females were generally younger than the males in the study.

The above studies provide important information concerning children's experience of pain related to injections. The most poignant finding was that all children found injections to be distressing. This was not affected by the type of injection tool used or birth

order. The variables that appear to affect a child's reaction include the following: sex, type of preparation, culture and amount of exposure to injections. While this information is helpful, studies need to be conducted that use larger samples, valid and reliable measurement tools, and more diverse populations before conclusions can be made about children's experience of pain related to injection. In addition, research on injections during the preoperational period is needed.

Pain Interventions with Preoperational Children

Clinicians and researchers have been interested in reducing patients' painful experiences for many years. Many of the interventions used to minimize pain have been pharmacological, and therefore primarily under the control of the physician. However, nurses have control over the administration of analgesics. Some research suggests that nurses are reluctant to adequately medicate children for pain (Beyer & Byers, 1985; Eland & Anderson, 1977; Taylor, 1983). Questions remain regarding pharmacological management of children's pain (Beyer & Byers, 1985).

There are three broad categories of pain relief interventions: pharmacological, nonpharmacological and cutaneous. Pharmacological measures will not be discussed

in this paper, however, nonpharmacological and cutaneous measures will be described briefly.

There are a variety of nonpharmacological pain relief interventions reported in the literature and employed in practice. The giving of cognitive information and modeling have been reported to be effective interventions with children (Johnson, Kirchhoff & Endress, 1975; Vernon, 1974). Distraction has often been used in various forms in the clinical setting, though little research has been done using distraction with children (Hockenberry & Bologna-Vaughan, 1985; McCaffery, 1979). In addition, other nonpharmacological pain interventions include guided imagery, hypnosis and relaxation (McCaffery, 1979).

Cutaneous stimulation has been used for many years by clinicians, mothers and lay personnel for pain relief. Cutaneous stimulation can be defined as counter-irritation or stimulating skin for the purpose of relieving pain (McCaffery, 1979). Some examples include massaging the skin, pressure, and transcutaneous electical nerve stimulation (TENS) units.

Most of the above mentioned pain relief interventions are non-invasive, carry minimal risk for the patient and can be initiated by nurses. While some have been studied in the adult population, little research has been conducted

in the pediatric population, and much less with the preoperational child. Further evaluation and testing are required before confirmation of their therapeutic use is established.

It is the purpose of this study to examine the effectiveness of using a topical anesthetic as a pain relief intervention with children. Therefore, the use of topical anesthetics will be the only intervention evaluated in depth within this literature review.

The application of ice has been an accepted method of topical analgesia for years (Brown, 1964; Droegemuller, 1980; McCaffery, 1979). Textbooks recommend ice as an effective intervention in reducing pain following an injection (Lewis, 1984; Redman, 1968). Ice has been used clinically for years for pain relief. However, a paucity of research extablishing its effectivness exists, particularly its effectiveness in reducing the pain of injections.

Physiologically, ice reduces pain by decreasing blood flow to the tissues and depressing excitability of free nerve endings, thus increasing the pain threshold (Ritchie & Greene, 1985; Sherman, 1980). Guyton (1986) suggests that cold receptors and pain receptors are the same. Therefore, when ice is held to the skin prior to

an injection, messages of cold are being transmitted to the brain thereby blocking the transmission of pain messages until a certain threshold is reached.

Zavah (1986) studied the effectiveness of using ice after a subcutaneous allergy injection in decreasing the pain experienced by a sample of sixty children ages 6 to 15. Children in the experimental group held an ice cube wrapped in a plastic bag to the skin for thirty seconds following the injection. Upon completion of the intervention, the children were asked to fill out the pain assessment tool. The children in the control group waited for thirty seconds before filling out the pain assessment tool. The pain assessment tool used was an adaptation of Eland's coloring tool for pain assessment (Eland, 1978, 1982). Analysis of results indicate that application of ice after a subcutaneous injection was an effective pain intervention. There were no significant differences in the pain scores related to sex or age. A major limitation of this study is the use of a pain assessment tool that has no reported reliability or validity data.

An intervention study using a topical anesthetic was conducted by Eland (1981) on preschool children. She investigated the effectiveness of two separate nursing interventions on the pain experienced by prekindergarten

children receiving a Diptheria-Pertussis-Tetanus (DPT) injection. Using an experimental 2x2 factorial design, Eland tested the intervention of cognitive information and a cooling agent (Frigiderm). Twenty male and 20 female children between the ages of 4 years 9 months and 5 years 9 months made up the sample of 40. Children were randomly assigned to one of the four treatment groups. Five male and 5 female children were included in each of the four categories.

One half of the children had the cooling agent (Frigiderm) sprayed on the injection site immediately prior to the injection while the other half had aerosol air sprayed on the injection site immediately prior to the DPT injection. The intervention of cognitive information was also given to half of the children. The group receiving the cognitive information was told "I'm going to spray something on your leg before your shot that will not hurt, will make your leg feel cool, and the spray will make this shot hurt less than other shots you've had". The control group was told that the nurse was "going to spray something on their leg before their shot" (Eland, 1981, p. 365). Randomization controlled for the variables of solution, needle size, volume, site of injection and technique.

The assessment tool used to measure pain was Eland's Color Assessment Tool. No reliability or validity data were reported for this tool.

Results of the study indicated a significant difference between children who received the cooling agent (Frigiderm) and those who received aerosol air. Children who received the cooling agent reported significantly less pain ($p = .029$). There was no significant difference noted between children who received the cognitive intervention and those who did not. Eland suggested that the cognitive information made no difference because the nurses did not believe Frigiderm would actually work. Therefore, they were unable to use a convincing tone of voice when giving the child the information. The major limitations of the study are the use of a measurement tool (Eland's Color Assessment tool) without established validity and reliability data, and the relatively small sample size ($n=40$). Results of the study indicate that preschool children reported less pain after receiving a topical anesthetic that created a cooling sensation before the injection. The current investigation was a modified replication of this study using a different topical anesthetic.

Pain Measurement in Preoperational Children

Measurement of pain is difficult due to the subjective nature of the experience. Individuals have unique thresholds at which pain is perceived. In addition, the combination of physiological and psychological variables creates great variety in the perception and expression of pain. Researchers are unable to use an objective measuring device and therefore must rely on the patient's expression of pain. It becomes more complex when the patient is a child since he or she may be unable to verbalize the experience.

Hester (1979) studied two pain intensity tools created for the preschool age population. The two tools compared are Eland's Projective Tool (1974) and Hester's Poker Chip Tool (1979).

Eland's Projective Tool consists of a series of five black and white pictures of a cartoon character dog in five situations. Four pictures attempt to duplicate various painful situations a child might experience, and one picture is made to match the situation the child is in. The child arranges the four pictures from least to most painful and is then asked to place the picture duplicating his or her experience in the position the child feels it

belongs. This allows the researcher to see how the child ranks his or her pain.

Hester's Poker Chip Tool uses four white poker chips equated as pieces of hurt; the more chips, the more the hurt. The child is asked if the shot hurt. If the child answers "no," a zero (0) is his or her pain score. If the child says "yes," the child is given the four poker chips and told: "These are pieces of hurt. One chip is a little hurt, and 4 chips is the most hurt you could have. Did you have 1, 2, 3 or 4 pieces of hurt?" The number of chips selected is the child's pain score.

To compare the tools Hester (1979) studied 44 children ranging in age from 4 years 7 months to 6 years 8 months in two midwestern metropolitan immunization clinics. Each child was given a DPT immunization after which both pain assessment tools were administered. Hester reported a significant difference, though no significant correlation between the two tools. Hester suggested the tools were not measuring the same attribute; additionally, either one or both may not have been measuring the child's pain. No reliability or validity were statistics reported in the literature.

A third promising instrument designed to measure the intensity of the pain experiences of 3-12 year old

The developmental level of the preoperational child significantly affects the cognitive-affective aspect of the pain experience, and, in addition, appropriate methods of intervention. Characteristics of the preoperational child include concrete thinking (i.e., thoughts are a function of what I see, feel, touch and smell), egocentrism, (i.e., the inability to take another's view), and "magical" linking of cause and effect. The preoperational child's concept of time also affects the appropriatness of an intervention. For instance, the preoperational child can not grasp the reality of future benefits; therefore, telling a child that he or she needs an injection to prevent future illness is not an effective cognitive intervention. When a preoperational child sustains physical tissue injury, as with an injection, many cognitive-affective factors influence the perception of pain.

Based on this conceptual framework, the investigator anticipated that an immediate, concrete intervention, one that could be seen and felt, would be especially therapeutic for the preoperational child. It was suggested that a topical anesthetic, such as ice, would intervene physiologically by blocking the peripheral neurons' transmission of nociception, and psychologically by being

children was developed by Beyer (1983). The poster-like instrument, called the "Oucher," has a 0-100 numerical scale on the left, and a six photograph scale on the right. Six vertical photographs reveal the face of a young child in increasing levels of discomfort.

Beyer used a sample of 112 children ages 3-12 years who were hospitalized for a variety of medical and surgical conditions. These children were measured for pain with three different pain intensity tools: the Oucher, Hester's Poker Chip Tool, and a visual analogue scale. Measurements were taken after injury, before and after surgery, procedures, and analgesic administration. This research revealed a promising new instrument for pediatric pain measurement.

## Conceptual Framework

The conceptual framework for this study is based upon the relationships among neurological-sensory component of pain, the cognitive-affective component of pain and the developmental level of the preschool age child.

The experience of pain is composed of neurological-sensory and cognitive-affective components. The neurological-sensory component involves the actual tissue damage. The cognitive-sensory component deals with the perception of the event, past experiences, and personality (including gender, culture and familial training).

an intervention concrete enough to allow the preoperational child to anticipate less pain.

## Research Hypothesis

Piagetian preoperational children who receive a topical anesthetic immediately prior to an intramuscular Diptheria-Pertussis-Tetanus (DPT) injection will report less pain intensity than Piagetian preoperational children who do not receive a topical anesthetic immediately prior to an intramuscular Diptheria-Pertussis-Tetanus injection.

## Operational Definitions

Terms used and operationally defined for the present study include the following:

1. Topical anesthetic was defined as application of an ice cube (1 1/2" X 1 3/4") to the skin at the sie of injection for thirty seconds prior to injection.

2. Pain intensity was defined as the amount of pain the child verbally reported as measured by Beyer's (1983) Oucher tool.

3. Piagetian preoperational children were defined as children between the ages of 3.0 and 6.0 years (Cowan, 1978; Piaget, 1966).

# Chapter II

## Methods

### Design

A randomized control-group post test only experimental design was used to test the effectiveness of a nursing intervention to decrease injection pain with preoperational children. Specifically, in the experimental group an ice cube (1 1/2"x 1 3/4") was placed on the injection site for 30 seconds prior to the injection. The control group received no exprimental intervention prior to the injection.

### Sample

A convenience sample was used for this study. All children in the sample were randomly assigned to either the experimental or control group. Originally, the study was designed to include 60 children: 30 in each group. However, during data collection, only 54 preoperational children meeting the criteria were obtained. Two children were eliminated from the sample of 54 due to their inappropriate answers during preliminary questioning that caused the researcher to believe the children did not understand how to use the Oucher tool. One child was eliminated because of a language barrier.

The final sample consisted of 51 children: 25 in the control group and 26 in the experimental group.

Children who met the following criteria were asked to participate in the study:

1. The child received an intramuscular Diptheria-Pertussis-Tetanus (DPT) or Diptheria-Tetanus (DT) injection only.

2. The child was between the ages of 3 and 7 years.

3. The child was not identified as acutely or chronically ill by the parent or legal guardian.

4. The child was not identified by the parent or guardian as being developmentally disabled.

5. The parent or legal guardian gave informed consent for participation in the study.

6. The child gave verbal or written consent to participate in the study.

Setting

The sample was obtained through the Adams County Health Office located in Othello, Washington. Othello is a small, primarily farming town in central Washington. Approval for proceeding with this research project was obtained from the Oregon Health Sciences Human Subjects Committee and the directors of the Adams County Health Office.

The 51 children comprising the sample included 24 males and 27 females. Ages ranged from 3 to 6 years; however 41 of the 51 children were 5 years old. The children were predominately from low socio-economic status homes. Of the 51 children, 39 were caucasion and 12 were hispanic. All children reported limited experience with painful procedures. Only 23 of the 51 children could remember receiving an injection in the past, and, of those, only 6 considered the experience more than mildly distressing. Nine children reported experience with other painful procedures and four of those considered the experience more than mildly distressing. Few children were prepared for the injection in advance by their parents. Most parents considered their child to be mildly to moderately anxious about receiving an injection. See Tables I and II for a summary of sample characteristics.

Instrumentation

Patient background questionnaire. The instrument used to collect demographic, historical and preparational data on the child was created by a study group for a similiar study conducted on children receiving DPT injections (Burns, Gedaly-Duff, Filmore, Plummer, Dyer, in progress). The tool consisted of twenty-one questions

Table 1
Demographic Characteristics of Sample

| | TOTAL (N=51) | GROUP 1 (N= 26) | | | GROUP 2 (N= 25) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | N | M | (SD) | N | M | (SD) | t | p |
| Age in Years | | | 5.0 | (5.6) | | 4.84 | (.55) | 1.02 | .1565 |
| 3.0 - 3.9 | 2 | 1 | | | 1 | | | | |
| 4.0 - 4.9 | 4 | 1 | | | 3 | | | | |
| 5.0 - 5.9 | 41 | 21 | | | 20 | | | | |
| 6.0 - 6.9 | 4 | 3 | | | 1 | | | | |
| Sex | | | 1.53 | (.51) | | 1.52 | (.51) | .13 | .4490 |
| Male | 24 | 12 | | | 12 | | | | |
| Female | 27 | 14 | | | 13 | | | | |
| Ethnicity | | | 1.80 | (1.35) | | 1.60 | (1.22) | .57 | .2845 |
| Caucasion | 39 | 19 | | | 20 | | | | |
| Hispanic | 12 | 7 | | | 5 | | | | |
| Religion | | | 1.69 | (1.08) | | 2.72 | (1.64) | -2.64 | .0550 |
| Catholic | 11 | 8 | | | 3 | | | | |
| Mormon | 5 | 1 | | | 4 | | | | |
| Protestant | 25 | 15 | | | 10 | | | | |
| None | 10 | 2 | | | 8 | | | | |
| SES | | | 35.84 | (15.05) | | 31.80 | (13.69) | .98 | .1655 |
| Low | 25 | 12 | | | 13 | | | | |
| Middle | 17 | 8 | | | 9 | | | | |
| High | 9 | 6 | | | 3 | | | | |

Note: Group 1= Children who received ice to the skin prior to injection
Group 2= Children who did not receive ice to the skin prior to injection

$p < .05$ All p values were nonsignificant

Table 2
Characteristics of Sample In Terms of History of Painful Injections

| | TOTAL (N=51) N | N | GROUP 1 (N=26) M | (SD) | N | GROUP 2 (N=25) M | (SD) | t | p |
|---|---|---|---|---|---|---|---|---|---|
| Remembered Shots | | | .62 | (.98) | | .52 | (.58) | .42 | .3385 |
| 0 | 28 | 15 | | | 13 | | | | |
| 1 | 20 | 9 | | | 11 | | | | |
| 2 | 1 | 0 | | | 1 | | | | |
| 3 | 1 | 1 | | | 0 | | | | |
| 4 | 1 | 1 | | | 0 | | | | |
| Time of Last Shot | | | 3.00 | (1.33) | | 3.75 | (.46) | -1.52 | .075 |
| Within 1 day | 2 | 2 | | | 0 | | | | |
| Within 1 week | 1 | 1 | | | 0 | | | | |
| Within 1 month | 3 | 1 | | | 2 | | | | |
| Within 1 year | 11 | 5 | | | 6 | | | | |
| Missing data | 6 | 2 | | | 4 | | | | |
| Data not applicable | 28 | 15 | | | 13 | | | | |
| Pain of Last Shot | | | 2.34 | (1.58) | | 2.30 | (1.25) | .05 | .480 |
| not distressing | 7 | 4 | | | 3 | | | | |
| mildly distressing | 6 | 2 | | | 4 | | | | |
| moderately distressing | 0 | 0 | | | 0 | | | | |
| severely distressing | 5 | 2 | | | 3 | | | | |
| extremely distressing | 1 | 1 | | | 0 | | | | |
| missing data | 4 | 2 | | | 2 | | | | |
| data not applicable | 28 | 15 | | | 13 | | | | |
| Last Painful Procedure | | | .27 | (.61) | | .40 | (.96) | -0.59 | .2805 |
| none | 42 | 21 | | | 21 | | | | |
| stitches | 5 | 3 | | | 2 | | | | |
| minor surgery | 4 | 2 | | | 2 | | | | |

Table 2 (continued)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time of Last Painful Procedure | | | 4.00 | (.00) | | 3.25 | (.96) | 1.78 | .0590 |
| within 1 day | 0 | 0 | | | 0 | | | | |
| within 1 week | 1 | 0 | | | 1 | | | | |
| within 1 month | 1 | 0 | | | 1 | | | | |
| within 1 year | 7 | 5 | | | 2 | | | | |
| data not applicable | 42 | 21 | | | 21 | | | | |
| Pain of Last Procedure | | | 3.20 | (1.31) | | 2.00 | (1.42) | 1.08 | .1645 |
| not distressing | 1 | 0 | | | 1 | | | | |
| mildly distressing | 2 | 2 | | | 0 | | | | |
| moderately distressing | 2 | 1 | | | 1 | | | | |
| severely distressing | 1 | 1 | | | 0 | | | | |
| extremely distressing | 1 | 1 | | | 0 | | | | |
| missing data | 2 | 0 | | | 1 | | | | |
| data not applicable | 42 | 21 | | | 21 | | | | |
| Preparation | | | 1.65 | 1.74 | | 1.56 | (1.56) | .20 | .4200 |
| none | 17 | 9 | | | 8 | | | | |
| alerted child to shot | 15 | 7 | | | 8 | | | | |
| cognitive | 1 | 1 | | | 0 | | | | |
| affective | 11 | 5 | | | 6 | | | | |
| strategy | 3 | 1 | | | 2 | | | | |
| won't hurt | 4 | 3 | | | 1 | | | | |
| Anxiety of Child | | | 2.65 | (1.43) | | 2.87 | (1.57) | -0.51 | .3070 |
| not anxious | 15 | 7 | | | 8 | | | | |
| mildly anxious | 5 | 4 | | | 1 | | | | |
| moderately anxious | 11 | 5 | | | 6 | | | | |
| severely anxious | 8 | 4 | | | 4 | | | | |
| extremely anxious | 8 | 3 | | | 5 | | | | |
| missing data | 4 | 3 | | | 1 | | | | |

Note: Group 1= Children who received ice to the skin prior to injection
Group 2=Children who did not receive ice to the skin prior to injection
$p < .05$ All p values were nonsignificant.

of varying format (see Appendix A). The variables assessed were those the review of literature identified as potentially influencing a child's pain intensity related to injections. These variables include the following: culture (Shapiro, 1975), sex (Torrance, 1968), amount of exposure to injections (Venham & Quatrocelli, 1977), and type of preparation (Johnson, Kirchhoff & Endress, 1975; Vernon, 1974). The addition of an anxiety scale was made by the researcher to the origonal tool of Burns et al. (in progress). The anxiety scale consisted of the following components: the question "How anxious is your child today about this shot?" and a five point scale ranging from 1= "not distressed" to 5= "extremely distressed". The five point scale was adapted from the scales used by Burns et al. (in progress). The child's anxiety was rated according to the parent's report only. The addition of the anxiety scale was made by the researcher after completion of the pilot study.

As part of the cultural variable, socio-economic status was measured by Hollingshead's (1975) Four Factor Index of Social Status. This tool measures socio-economic status by the four factors of: education, occupation, sex and marital status. Hollingshead has completed methodological research on his tool citing

validity statistics for income by occupation and sex (r= .781 for males and r= .672 for females) and for education by occupation and sex (r=.835 for males and r= .849 for females). Hollingshead does not delineate the scores into low, middle or high socio-economic status. The researcher divided the scores into equal thirds and labeled the sections low, middle and high (see Table I).

Pain intensity instrument. Beyer's (1983) pain measurement tool, the "Oucher," was used. The Oucher is a self-report tool used to measure pain intensity in 3-15 year old children. It can be used by parents or health care providers in a variety of settings. The Oucher is a poster-like device with a 0-100 numerical scale on the left and a six photograph scale on the right. The 0-100 numerical scale is used if the child can count to 100; if not, the photographic scale is used. The six vertical photographs reveal the face of a young male child in increasing levels of discomfort. The "0" photograph pictures the child as solemn. This posture is an appropriate neutral since a child receiving an immunization would not be expected to be cheerful or smiling.

After the child received the injection, the child was told "the bottom picture (0) is no hurt; the top

picture or (100) is the biggest hurt you could ever have". The child is asked to show how much hurt the child would have in two different situations: one that is generally considered painful, and one that is generally considered not painful. Once it is established that the child understands how to use the Oucher, the child is asked "How much hurt do you have right now?" If the child uses the 0-100, scale the number given is the score; if the photographic scale is used, the picture the child points to is converted to the appropriate predetermined score shown on the Oucher (0, 20, 40, 60, 80, or 100).

Methodological studies have been conducted on the Oucher by Beyer (1983). Beyer used a sample of 112 children ages 3-12 years who were hospitalized for a variety of medical and surgical conditions. These children were measured for pain with 3 different pain intensity tools: the Oucher, Hester's Poker Chip Tool, and a visual analogue scale. Measurements were taken after injury, before and after surgery, procedures, and analgesic administration. Results provide evidence of its content validity (Kendall's coefficient of concordance = .726), construct validity and test-retest reliability (Pearson's r = .965 for the 0-100 scale and a Gamma coefficient = .789 for the photographic scale). (Aradine,

Beyer & Tompkins, 1986; Beyer & Aradine, 1986a, 1986b, 1986c).

The Oucher is currently the most sensitive pain measurement tool available for pediatric use. For the older child, a 0-100 point scale is available. The photographic scale uses a 0-5 point scale as does other pediatric pain intensity scales. Though developmentally appropriate, the use of a 0-5 point scale may not be sensitive enough to adequtely measure pain in the preoperational child.

The Oucher is practical for both research and clinical use. It takes only a few minutes to administer, and, due to its standardized form, is easy to use in the manner for which it was developed. (The Oucher is available through the Hospital Play Equipment Company, PO box 6011, Evanston, IL 60606. Current cost is $9.95 per tool).

The Oucher is an ethical tool to use with children. It is not invasive and is unlikely to cause emotional harm. It is developmentally appropriate and relies on the responses of children, not those of supervising adults.

In light of the reliability and validity statistics, the Oucher is a useful tool for research, and a promising tool for practice. The Oucher is limited in its

usefulness by the use of a caucasion male as the child to be identified with in the photographs. Further research needs to be done with a mixed ethnic population and analysis of any gender differences to determine its generalizable use with children.

Intervention

Throughout history, ice has been used as a method of decreasing pain. It has been documented as an effective first aid measure for pain relief (Brown, 1964; Droegemuller, 1980; Lewis, 1984; McCafffery, 1979; Redman, 1968). Ice decreases blood flow to tissues and depresses excitability of free nerve endings and peripheral fibers, thus increasing the pain threshold (Ritchie & Greene, 1985; Sherman, 1980). Guyton (1986) suggests that cold receptors and pain receptors are the same. Therefore, when ice is held to the skin, messages of cold are being transmitted to the brain blocking transmission of pain messages until a certain threshold is reached. The use of ice has been promoted for its effectiveness in decreasing the pain associated with injections (Zavah, 1986).

The ice used in this study consisted of a 1 1/2 inch x 1 3/4 inch ice cube made from plain tap water. The ice cube was wrapped in a 2x2 gauze and held to the skin for 30 seconds. This time period was chosen upon completion

of the pilot study. Ice was shown to cause satisfactory anesthesia, a numbing effect tested by a needle point, after 30 seconds of application without the pain of tissue ischemia caused by prolonged application of cold.

Pilot Study

Prior to the pilot study with children, the researcher tested the effectiveness of the originally proposed topical anesthetic, Bactine on herself. It was concluded that Bactine would not anesthetize the area sufficiently, and therefore, would be an inappropriate intervention. Once the use of Bactine was ruled out, other topical anesthetics including Frigiderm were tested by Burns et al. Frigiderm was found to be very effective in anesthetizing the area; however, it was found to cause excessive freezing and skin sloughing on two of the testers, and on three others to cause an "achy" pain up to 30 minutes following application. It was concluded that Frigiderm was too risky a product to use on children. At this time ice was tried as an anesthetic measure and satisfactory results obtained.

A pilot study was conducted at the Adams County Health Office in Othello, Washington to assess the immunization protocol, the use of ice as the topical anesthetic and the protocol's consistency with office

routines. Seven children were part of the pilot study. The researcher found that there was sufficient time to obtain the parental consent and demographic data without the need for a research assistant. In addition, using ice on children did not show any untoward side effects. The only change made in the proposed study was the inclusion of a question at the end of the information questionnaire concerning the parent's perception of the child's anxiety about receiving an injection. Due to the minor change in the study, the decision was made to include the children from the pilot study in the study sample.

Procedure

Upon arrival at the immunization clinic the parent and child were informed of the study and their consent for participation in the study was obtained. Once the consent form was signed (see Appendix B), demographic information about sex, age, race and socio-economic status was asked of the parent. The child waited to be called for the injection. Prior to data collection in the clinic, the researcher randomly assigned identification numbers of all children in the study to either the control or experimental group by using a table of random numbers. Therefore, when it was the child's turn to receive the DPT injection, the nurse administering the injection consulted

the table that listed the identification number and the group to which the child had been assigned. This kept the researcher blind as to which group the child belonged to. When the child's turn came to receive the injection, the nurse implemented the immunization protocol consistant with the group the child belonged to (see Appendix C).

When the child arrived in the room where the researcher was, the researcher greeted the child by name and introduced him or her to use of the Oucher. After the use of the Oucher was explained, the child was asked to show on the Oucher how much hurt there would be if the child fell down and skinned their knee. Next, the child was asked to show on the Oucher how much hurt there would be to have a birthday party. Once the researcher established the child's ability to use the Oucher, the child was asked "how much did your shot hurt?" The picture the child pointed to was correlated with the numerical rating and that became the child's pain score.

Analysis

Analysis of data was done on the demographic, historical and preparational factors and to test the hypothesis. Preliminary analysis to detect a difference between the control and experimental groups on demographics, historical and preparational factors was

done using a one-tailed t-test with the alpha level set at .05. An additional one-tailed t-test with the alpha level set at .05 was used to test the hypothesis: Piagetian preoperational children who receive a topical anesthetic immediately prior to an intramuscular Diptheria-Pertussis-Tetanus injection will report less pain intensity than Piagetian preoperational children who receive no intervention immediately prior to an intramuscular Diptheria-Pertussis-Tetanus injection.

# Chapter III

## Results and Discussion

Data were collected on 51 preoperational children from a rural setting. All children received a DPT injection. Children in the experimental group received an ice cube held to their skin for 30 seconds prior to injection, while children in the control group received no experimental intervention prior to injection.

### Results

Data were analyzed using t-tests to determine differences in demographic, historical, and preparational factors between children who received a topical anesthetic prior to injection and those who had no intervention prior to injection. The result of the t-tests indicate that there were no significant differences between groups (see Table I).

A t-test was used to test the hypothesis that preoperational children who received a topical anesthetic immediately prior to an intramuscular Diptheria-Pertussus-Tetanus (DPT) injection would report less pain intensity than preoperational children who did not receive a topical anesthetic immediately prior to an intramuscular Diptheria-Pertussus-Tetanus injection. The result of the t-test indicated no significant difference between the group that

Table 3
Comparison of Oucher Scores

| | TOTAL (N= 51) | | GROUP I (N= 26) | | | GROUP 2 (N= 25) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | N | M | (SD) | N | M | (SD) | t | p |
| Oucher Score | | | 30.00 | (36.33) | | 33.6 | (36.84) | -0.51 | .3070 |
| 0 | 23 | 13 | | | 10 | | | | |
| 20 | 7 | 2 | | | 5 | | | | |
| 40 | 4 | 3 | | | 1 | | | | |
| 60 | 8 | 4 | | | 4 | | | | |
| 80 | 3 | 1 | | | 2 | | | | |
| 100 | 6 | 3 | | | 3 | | | | |

Note: Group 1 = Children who received ice to the skin prior to injection.

Group 2 = Children who did not receive ice to the skin prior to injection.

$p < .05$

received the intervention and the control group (p= .3635, df= 49, t= -0.35). Therefore, the hypothesis was not supported (see Table III).

Discussion

While the experience of pain is unique to every person, pain itself is a universal experience. For many children the worst pain they can think of is an injection or "shot" (Eland & Anderson, 1977; Lewis, 1978). Past studies have suggested that the pain experience is comprised of neuro-sensory and cognitive-affective components (Beecher, 1956; Chapman, 1984; Melzack, 1973). In addition, when pain is experienced through the eyes of a child, the developmental level of that child can greatly affect the pain experience (Beyer & Byers, 1985; Varni, Katz & Dash, 1982).

The present study was conducted to determine if use of a topical anesthetic would minimize the pain intensity of preoperational children receiving a Diptheria-Pertussus-Tetanus injection. Subjects were divided into two groups: children who received a topical anesthetic immediately prior to an injection, and children who received no topical anesthetic prior to an injection. Data from the study showed no significant difference between children who received the intervention and those who did not. Results

do not support studies that have reported the effectiveness of using a topical anesthestic in minimizing pain associated with injections (Eland, 1981; Zavah, 1986).

Methodological issues. An anxiety question had been added by the researcher to the patient background questionnaire after the pilot study. It was anticipated that the child's anxiety would affect his or her pain experience. However, when parents were asked "How anxious do you think your child is today about this shot", many of them responded with comments such as "Oh, I think he is pretty excited, he wants to go to school". By the answer, it was clear to the researcher that the parents did not understand what was being asked. While the question was repeated using the word nervous, it was still not clear that the parents understood the concept the researcher was attempting to measure. Because of the questionable validity of the parents' responses, the anxiety scale was not analyzed further.

Another measurement issue was the children's use of the photographic scale on the Oucher. None of the children in the study were able to count to 100, therefore, the photographic scale was used to measure the child's pain intensity. This is consistant with Beyer's research.

Beyer noted evidence of the validity of the photographic scale (Aradine, Beyer & Tompkins, 1986; Beyer & Aradine, 1986a, 1986b, 1986c). However, since the photographic scale is a 0-5 scale rather than a 0-100 scale, the sensitivity of the photographic scale may not be sufficient.

In the present study, the use of a topical anesthetic did not significantly affect the pain intensity reported by the preoperational children. This may be due, in part, to the pain relief techniques used by the nurse on all children. These techniques include the following: the use of a sharp needle, the speed of injection, the pain of a DPT injection and the use of visual and/or verbal distraction.

The study nurse giving the injection used several techniques aimed at decreasing the pain of the injection as part of her normal practice. One of these techniques was the use of a sharp needle. After drawing up the DPT solution, the needle was changed to insure its sharpness. With a very sharp needle there is a small, clean puncture resulting in less trauma to the tissues during injection. The sharp, distinct pain often associated with injections is carried by the A-delta fibers to the spinal cord and on to the brain (Chapman, 1984; Weisenberg, 1977). The A-delta fibers only transmit noxious impulses that are

caused by very strong stimuli which are potentially or actually damaging to tissues (Chapman, 1984). By keeping the tissue damage to a minimum during an injection, the noxious stimuli may not be strong enough for the A-delta fibers to transmit the sensation of pain to the brain.

In addition to insuring the sharpness of the needle, the nurse was extremely quick in performing the injection. The time from preparation of skin to completion of the injection was only 1-2 seconds. By the time the child realized that he or she was getting the injection, it was over.

Another variable to consider is the actual pain of a DPT injection. When giving a DPT injection, the nurse routinely used a short (5/8 inch), small bore (25 gauge) needle. In addition, a small amount of solution was injected into the muscle (0.5 cc). The small, clean puncture made by the needle may not cause enough tissue damage to trigger the A-delta fibers to transmit the message of pain. Due to the small amount of solution being injected into the tissues, the pressure on the C fiber nociceptors is minimal. Therefore, the combination of a short, small needle and small amount of solution may render the pain of a DPT injection to be minimal.

The last technique used by the nurse to minimize the pain of the injection was the use of verbal and/or visual distraction during the injection itself. Distraction can be defined as focusing one's attention on stimuli other than the pain sensation (McCaffery, 1979). To use distraction, the nurse has the child focus on an objective or physical stimulus already present in the room, such as a television program, or he or she asks the child personal questions. Preoperational children are particularly susceptible to distraction. They are single-minded and focus on one thing at a time. Therefore, while the nurse has the child's attention focused on the picture posters in the room or talking about school, the child is not concentrating on the injection. By the time the child realizes the injection is taking place, the nurse has completed the injection.

The combination of techniques used and the actual pain of a DPT injection may account for the lack of significant difference between the groups. The experience of pain is multi-dimensional, with neuro-sensory and cognitive-affective components. The techniques involved in giving the DPT injection and the sharpness of the needle intervened at the neuro-sensory component of pain. Likewise, the speed of injection and the use of distraction

intervened at the cognitive-affective component of pain. By using a combination of interventions, one may be more likely to effectively relieve the pain of an injection since interventions are aimed at both pain components.

Theoretical issues. This study was an attempt to replicate the findings of Eland's (1981) study using a different topical anesthetic. In Eland's (1981) study a topical anesthetic (Frigiderm) was reported to make a significant difference in the pain intensity reported by preoperational children. In comparing the two studies the main difference noted is in the present study's use of distraction. In this study, distraction was part of the nurse's standard practice. There is no evidence that distraction was or was not a part of Eland's (1981) study in any form. While the use of distraction has not been researched in the pediatric population, distraction has been reported to be an effective pain relief intervention with adults.

Barber & Cooper (1972) studied the effectiveness of three different distractors on experimentally induced pain. The sample included 56 female nursing students who were given experimental pain by having the Forgione-Barber pain stimulator placed on either the right or left index finger. Each subject was tested for pain tolerance

over a two minute period followed by a pre-treatment pain test. Pain was measured by the subjects rating the intensity of pain on a 0-10 scale and by estimating the percentage of time spent thinking about their finger. After completion of the first test each subject was assigned to an experimental distraction group and again given pain stimulation from the Forgione-Barber pain stimulator. The three groups consist of the following distraction techniques: listening to a story, adding aloud and counting aloud. After the two minute pain experience each subject was again asked to complete the pain measurement questions. Results indicate that listening to a story and adding aloud significantly reduced the pain intensity of the subjects during the first minute. However, by the end of the second minute, the interventions were no longer significant. This points to the effectivness of verbal and auditory distraction in reducing the pain of a very short experience.

Kanfer & Goldfoot (1966) studied the effects of several behaviors in the tolerance of a noxious stimuli by sixty female students. Each subject was asked to immerse her hand in cold water and keep it there as long as possible. The sixty subjects were divided into the following five groups: control, verbal-negative set,

verbal-talk, external distraction-clock, external distraction-slide. Subjects were stopped when their hand had been in the cold water for five minutes. Following this, each completed a questionnaire which asked them to rate their pain on a scale of 1-8, to describe any coping techniques, rate the effectiveness of the behavior assigned to her group, rate her everyday pain tolerance and to estimate total duration of having her hand in the water. Findings indicated external distraction was more effective than verbal devices in increasing the pain tolerance of subjects. The verbal devices used asked the subject to focus on the pain sensations, and therefore are not synonymous with verbal distraction. This study does point to the effectiveness of using distraction with an adult population.

Lavine, Buchsbaum & Poncy (1976) studied the analgesic effects of auditory stimulation. Ten men and ten women comprised the sample of twenty. Subjects rated pain responses to shock stimuli of varying intensity on a four point scale. Prior to the experiment, the suggestion was made to each subject that listening to music could block the perception of pain. Half of the subjects received the control condition first, followed by the music condition of listening to taped music during

the shocks. The other half received the music condition followed by the control condition. Results of the study indicate that subjects who heard music with the suggestion that it would reduce pain were found to require more intense shocks before rating them uncomfortable. It is unclear if the intervention reduced pain or increased the subject's tolerance to pain.

The above studies provide important information concerning the use of distraction with adults. It appears that distraction is an effective pain relief intervention through either the visual, auditory or verbal channels (Barber & Cooper, 1972; Kanfer & Goldfoot, 1966; Lavine, Buchsbaum & Poncy, 1976). Distraction has been used with children in clinical practice for years (Hockenberry & Bologna-Vaughan, 1985; McCaffery, 1979). It may be that in the present study, distraction had a large effect on the children's pain intensity thereby masking any effect the topical anesthetic and external devices used by the nurse had on the children's pain intensity.

The existing literature presents contradictory findings with regard to children's reported pain with injections. In the present study, 23 of the 51 children rated the pain of their injection as "no hurt". These children all pointed to the bottom picture on the Oucher

that indicated "no hurt". When a child pointed to the "no hurt" picture, the researcher, seeking to validate the child's choice, asked the child "It didn't hurt at all?" All children choosing the "no hurt" picture reinforced their choice of "no hurt" in response to the researcher's probe. Several responded "I didn't even feel it". These findings agree with the findings of Gedaly-Duff (1984) and Zavah (1986) that the majority of children experience only a "little hurt" from an injection. However, in the study of Vernon (1974) the children reported moderate to high levels of pain with an injection. The difference in the reported levels of pain may be due in part to the use of different measurement tools and different types of injections. In addition, the children in Vernon's (1974) study were all hospitalized, while children in the present study, Gedaly-Duff's (1984) and Zavah's (1986) studies were in an outpatient setting. There may be a difference in how hospitalized children and non-hospitalized children view injections.

Many children state injections to be the most painful experience they can think of (Eland & Anderson, 1977; Lewis, 1978; Savedra, Tesler, Ward, Wegner & Gibbons, 1981). While children may say injections are the most painful, the way they rate the pain of their injection may not

support their belief (Gedaly-Duff, 1984; Vernon, 1974). Preoperational children's level of development precludes generalization (Boyle, 1969). Children learn through the mechanisms of assimilation and accomodation (Cowan, 1978; Piaget, 1966). It is through these two mechanisms that children add new concepts to existing ones (assimilation), and change existing concepts to fit the child's new understanding of reality (accomodation). Both of these changes take place over repeated exposure to experiences. Within the framework of assimilation and accomodation, the incongruity between a child's rating a particular injection as little pain, and that child's belief that injections are the most painful experience, is understandable. It will take repeated exposure to minimally painful injections before a child's belief system about the pain of injections is altered.

An alternative explanation is that measurement approaches to assessing pain in children are not sufficiently sensitive to pick up children's pain experience. However, children of this developmental level can understand only limited numerical relationships and a numerically sensitive self-report scale may not be practical with a preoperational child who does not count.

This study was an attempt to assess the relative strength of the variable topical anesthetic, to other variables. It is the conclusion of the researcher that the contribution of the previously unidentified variable of distraction was of greater significance in the experience of pain than that of the topical anesthetic.

# Chapter IV

## Summary

The universal experience of pain is a highly subjective and individual one. Pain in children is a complex phenomenon consisting of neuro-sensory and cognitive-affective components. The purpose of this study was to evaluate the effectiveness of using a topical anesthetic prior to an injection in minimizing the pain intensity of preoperational children.

The experience of pain in children has been of interest to nurse researchers for over a decade. Children report injections to be the most painful experience they can think of (Eland & Anderson, 1977; Gedaly-Duff, 1984), yet they are subjected to injections as a common part of clinical practice. Some researchers suggest the child's level of cognitive development influences the pain experience through the cognitive-affective pain component (Beyer & Byers, 1985; Gedaly-Duff, 1981). Other research reported the effectiveness of using a topical anesthetic in minimizing the pain intensity of children receiving an injection (Eland, 1981; Zavah, 1986). The present study attempted to replicate the findings of Eland's (1981) study with a different topical anesthetic.

The study used a randomized control-group post test only experimental design to test the effectiveness of the topical anesthetic to minimize the pain intensity of preoperational children receiving a DPT injection. Fifty-one preoperational children comprised the study sample. Data from a demographic, historical and preparational questionnaire were analyzed to insure comparability of the two groups. Pain intensity was measured by Beyer's Oucher tool (1983) following the injection. Results of the study indicated the topical anesthetic made no significant difference on the reported pain intensity of preoperational children.

Limitations

A number of limitations hamper generalizability of the findings to other populations of preoperational children. These include the use of a convenience sample and the small sample size (N=51). Only children coming into a community health office from August 18, 1986 through August 29, 1986 were included in the sample. A larger sample drawn randomly during a greater time period would have been more representative.

Recommendations

The results of this study suggest areas for further research. While it was the intent of this study to

evaluate the effectiveness of using ice as a topical anesthetic in minimizing the pain intensity of preoperational children, it is possible that the combination of techniques used by the nurse giving the injection may have masked this variable.

The therapeutic use of ice should be investigated due to its practicality. Ice is an available, inexpensive and easy to use intervention. If it is effective in reducing the pain of injections, it could easily be incorporated into practice. There may be children who are not receptive to a cognitive-affective intervention such as distraction. For these children, a tested neuro-sensory intervention should be available.

The present study suggests that distraction may be an effective nursing intervention to reduce the expressed pain intensity behavior of an injection for preoperational children. Research using distraction as a pain intervention has been done mainly with the adult population. Research in children is particularly useful because it is believed young children have not learned to disguise their behavior. Therefore, further research using distraction with preoperational children may help researchers and clinicians determine if distraction increases a child's pain tolerance or if it reduces the sensation of pain.

In addition, the ability to therapeutically intervene at both the cognitive-affective and neuro-sensory components of pain may more effectively relieve the pain intensity experienced by a vunerable population. Therefore, the study should be replicated using distraction and ice as pain interventions.

Replication should include the use of a more painful injection than the DPT injection and a larger sample to be able to detect what might be a small effect. In addition future pain studies should include multiple measures of the child's pain intensity to allow for better pain assessment.

An accurate pain measurement tool is critical for valuable research on children's pain. Further research on the Oucher should include establishing reliability and validity with a mixed ethnic population. In addition, the sensitivity of the Oucher as well as any gender differences should be analyzed.

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# APPENDIX A

# PATIENT BACKGROUND QUESTIONNAIRE

PATIENT BACKGROUND DATA

column

1. Case no._____ (1-2)

2. Study Group_____ (3)
   (Ice=1)
   (No Ice=2)

3. Age in Yrs:____, mo.____ (4-6)

4. Sex: ____ (7)
   (M=1, F=2)

5. Ethnic Group: _____ (8)
   (1=white, 2=black, 3=asian, 4-hispanic,
   5=native american, 6=other)

6. Religion: _____ (9)
   (1=Protestant, 2=Catholic, 3=Jewish, 4=none,
   5=other_____)

7. Age of mother in years: ____ (10)

8. Age of father in years: ____ (11)

9. Occupation of mother: _____ (12)

10. Occupation of father: _____ (13)

11. Educational level of mother - highest grade of regular school completed: _____ (14-15)

    | grade school | high school | college |
    |---|---|---|
    | 1,2,3,4,5,6,7,8 | 9,10,11,12 | 13,14,15,16 |

    grad. school
    17,18,19,20

12. Educational level of father - highest grade of regular school completed: _____ (16-17)

    | grade school | high school | college |
    |---|---|---|
    | 1,2,3,4,5,6,7,8 | 9,10,11,12 | 13,14,15,16 |

    grad. school
    17,18,19,20

# APPENDIX B

# CONSENT FORM

Oregon Health Sciences University

CONSENT FORM

You are being asked to allow your child to participate in an experimental study entitled "Minimizing the Pain Intensity of Preschool Age Children Receiving an Injection". This study is being done in partial fulfillment of the requirements for a Master's degree in Nursing for the principal investigator, Linda Casebolt, R.N. She is working under the direction of Sheila Kodadek, R.N., PhD.

The purpose of this study is to evaluate the effectiveness of using a topical anesthetic before an injection in minimizing the pain experienced by preschool age children.

You will be asked to fill out a form describing your child's background, including sex, race, age and sociologic status. Your child will be assigned by chance to receive either a topical anesthetic (an ice cube held to the skin for 30 seconds) or no intervention just before receiving the shot. After the shot, your child will be asked to rate how much that shot hurt. This should take only a few extra minutes. There should be no risk involved; however, if complications should occur, your child will be treated immediately. The only benefit to your child might be a less painful shot. All information you or your child provide will remain confidential.

The Oregon Health Sciences University, as an agency of the State, is covered by the State Liability Fund. If your child suffers any injury from the research project, compensation would

be available to you only if you establish that the injury occurred through the fault of the University, its officers or employees. If you have further questions please call Dr. Michael Baird, M.D., at (503) 225-8014.

I understand I may refuse to allow my child to participate, or withdraw my child from this study at any time without affecting my relationship with, or treatment at, the Oregon Health Sciences University and the Public Health Clinic. Neither my child's name nor his or her identity will be used for publication or publicity purposes. I will not be required to pay for the costs of the treatment.

Linda Casebolt has offered to answer any questions I might have. I have read the foregoing and agree to allow my child to participate in this study.

_____

Parent/Guardian's Signature Date

_____

Witness' Signature Date

# APPENDIX C

# IMMUNIZATION PROTOCOL

# IMMUNIZATION PROTOCOL

A. Control Group (standard procedure)

1. Teach parent about the purpose, side effects, and home management of the child following immunization.

2. Prepare the injection by drawing up 0.5cc of DPT serum into a 1cc syringe. Replace the needle with a 5/8 inch long, 25 gauge needle.

3. Have the child sit on the parent's lap with left arm toward the nurse.

4. Prepare the child by saying "I have a shot for you. I want you to hold real still".

5. Prepare the site by rubbing with alcohol.

6. The injection: Talk with child about the Garfield posters in the room or about going to school while giving the injection within approximately 3 seconds.

7. Follow up: "All done". Put a "Snoopy" or "Care Bears" bandaid on the site. Instruct the child and parent to go to the room where the researcher will have the child rate the pain intensity of the injection.

B. Experimental Group (treatment procedure)

1. Teach the parent about the purpose, side effects, and home management of the child following immunization.

2. Prepare the injection by drawing up 0.5cc of DPT serum into a 1cc syringe. Replace the needle with a 5/8 inch long, 25 gauge needle.

3. Have the child sit on the parent's lap with left arm toward the nurse.

4. Prepare the child by saying "I have a shot for you. I want you to hold real still".

5. Prepare the site by rubbing with alcohol.

The intervention: Say "I'm going to put this on your arm and see if it makes your shot hurt less". Hold the ice cube to the injection site for 30 seconds.

6. The injection: Talk with the child about the Garfield posters in the room or about going to school while giving the injection within approximately 3 seconds.

7. Follow up: "All done". Put a "Snoopy" or "Care Bears" bandaid on the site. Instruct the child and parent to go to the room where the researcher will have the child rate the pain intensity of the injection.

ABSTRACT

Title: Minimizing the Pain Intensity of Preoperational Children Receiving an Injection.

Children report injections to be the most painful experience they can think of, yet most children are required to receive injections as a routine part of health care. The purpose of this study was to evaluate the effectiveness of using a topical anesthetic prior to an injection in decreasing the pain experienced by preoperational children. Fifty-one children between the ages of 3 and 6 from a rural setting comprised the convience sample. All children received a Diptheria-Pertussis-Tetanus (DPT) intramuscular injection.

A randomized control-group post test only experimental design was used to test the hypothesis. Immediately prior to the DPT injection, an ice cube was held to the skin at the site of injection for thirty seconds for children in the intervention group; the control group received no intervention. Pain intensity was measured by the Oucher scale.

A one-tailed t-test was used to test the hypothesis. No significant difference was found between the control and intervention groups ($p = .3635$, $df = 49$, $t = -0.35$). Twenty-three children reported no pain with the injection. The clinic nurse who administered all of the DPT

injections used distraction as a routine part of her practice. Further research using distraction as a nursing intervention to minimize the pain experience is warranted.

Author: Linda M. Casebolt R.N., B.S.N.

Approved: [redacted]
Sheila M. Kodadek R.N., PhD.