The child's language of pa III

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THE CHILD'S LANGUAGE OF PAIN

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They know that I know
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THE CHILD'S LANGUAGE OF PAIN

Abstract

A series of experiments was conducted with children, aged between five and eleven years, which sought to determine the utility of using their verbal, and non-verbal, communications to measure the quality or intensity of the pain they are experiencing.

Experiments which investigated children's ability to use language to communicate pain suggested that children are aged seven years, and older, before they discriminate between pain and non-pain words, or can show that these words share a similar meaning with an adult comparison group.

When children aged between seven and ten years completed verbal pain questionnaires, the results showed that the seven year olds demonstrated only rudimentary discrimination between five acute painful situations. Discrimination improved with age, but the ten year olds were not as discriminating as an adult comparison group.

Children aged five to ten years were asked to recall, and describe, all of their past painful experiences. Results show significant developmental trends in the following; the number of painful experiences that children can recall, the figurative use of language to describe the recalled pain, and the number of pain descriptions that children generate.

An experiment investigated the reliability of non-verbal rating scales when completed by children aged between five and ten years. Results indicate that children below the age of seven failed to show satisfactory levels of reliability, and that the response strategies that they use may over-estimate the degree of reliability they do show. Older children do show reliable responses using these scales.

The final experiment looked for changes in children's behaviour when they received either a drug or placebo, whilst undergoing a painful medical procedure. Results are not conclusive, but do suggest that the frequency and intensity of facial expressions, and vocalisations, decrease when an analgesic was administered.

Overall, these studies show that children are, on average, seven years of age before we can use their own pain communications as reliable indicators of the quality and severity of the pain they experience.

CHAPTER ONE

INTRODUCTION

The aim of this thesis is to investigate children's pain communications. The verbal, or non-verbal, behaviour of a child in pain is the public expression of an essentially private, and virtually universal, human experience. Despite the common feeling that we know what pain means, attempts to study the phenomenon have encountered conceptual and methodological difficulties.

1. MULTI-DIMENSIONAL NATURE OF PAIN

Pain varies on at least two dimensions: quality and intensity. Knowledge of both of these dimensions is thought to be relevant for both diagnosis and management in adult patients.

Clinical investigators working with adults have long recognised the varieties of pain. Melzack and Wall (1982) state that the verbal descriptions of, for example, the burning qualities of causalgic pain, or the stabbing, cramping qualities of visceral pain frequently provide the key to diagnosis and may even suggest the course of therapy. These qualitative differences can only be captured, potentially, by the use of language.

Far more work, however, has been carried out on the measurement of the overall intensity of pain (e.g. Beecher 1959; Huskisson 1983). Language could possibly also capture this dimension, but it is thought that non-linguistic communications can more easily capture the intensity of pain.

2. COMMUNICATION OF PAIN

Three types of pain communications, and therefore three potential ways of measuring pain, are discussed throughout this thesis: verbal, non-verbal and behaviour. Verbal and non-verbal pain measures are completed by the individual thought to be experiencing the pain. Behaviour is rated by someone who observes the individual who it is thought may be in pain. Non-verbal and behaviour measures have the potential to communicate the intensity dimension of pain. It is only by verbal communications, however, that we can begin to appreciate, in full, an individual's pain experience. Only language has the potential to capture the qualitative and emotional dimension of an individual's pain, or these differences between pains, as well as communicating the intensity dimension of pain.

The main aim of this thesis is to investigate children's ability to use language to describe pain. Investigations of both non-verbal and behaviour communication ability will also be presented. Verbal, non-verbal and behaviour communications are defined as follows.

Verbal: The individual describes, in words, what his or her pain feels like. This can take two forms. The first is for the individual to generate, spontaneously, verbal pain descriptions in response to a question such as, "What does your pain feel like?". It is very difficult to assign numerical values to, or to determine qualitative differences between, data of this type.

The second approach is more structured. The individual selects words which describes his or her pain from a range of possible pain descriptors which are provided on a specially constructed pain questionnaire. The words chosen by individuals can be used to provide intensity values. They can also be used to consider qualitative differences between the individual's pain over time, or qualitative and quantitative differences between different pain conditions.

Non-verbal: The individual completes a single dimension rating scale which usually represents intensity. These can take various forms, such as a visual analogue scale or a numerical rating scale.

Visual analogue scales are lines which are usually 10 cm in length. Anchor words can be provided at either end of the scale: for example, 'no pain', to 'worst pain possible'. The individual places a mark on the line which represents the perceived intensity of the pain. The distance is measured from the 'no-pain' end of the scale to the individuals mark. This value represents the intensity of pain.

Numerical rating scales take the form of a series of numbers, often ranging from 0 through to 5. Zero represents no pain and five represents the worst pain possible. The number chosen by the individual provides the pain intensity value.

Behaviour: the researcher defines a set of behaviours which, he or she feels, would represent the expression of pain in an individual. These behaviours can be assessed for their occurrence only, or for their occurrence and severity. Severity is usually estimated using a numerical rating scale. The frequency and/or duration of behaviours, or the estimated severity of the behaviours form the pain value.

3. PAIN AND LANGUAGE

As stated, the major aim of this thesis is to investigate children's verbal pain describing ability. Careful consideration, therefore, will be given to work related to semantic acquisition.

In medicine, language is sometimes used as an aid to diagnosis and treatment for adult patients suffering pain. But even the media continually makes us aware of the splitting, pounding qualities of headaches; the gnawing, nagging pain of rheumatism and arthritis; the cramping, heavy qualities of menstrual pain; the smarting, itchy quality of piles. These descriptions occur very frequently and there seems to be a high degree of agreement that such words are useful descriptions. Until recently, however, there have been few studies of their use and meaning.

The words that we use to talk about pain might be viewed, on one level, as arbitrary labels attached to underlying personal states. But, although the labelling may be arbitrary, the underlying communication cannot be truly arbitrary, as most of us can communicate these inner states to another party by the use of language, and appear to be referring to the same experience. The question we wish to address, however, is how do children progress in their semantic-developmental use of pain words?

An important distinction to be raised at this point is the distinction between what Clark and Clark (1977) call 'sense' and 'reference'. The sense of a word, its intension, is the concept associated with the word. The reference of a word, its extension, is the set of things to which the word applies in any real or imaginary world. For example, the sense of 'dog' is one's concept of what it is to be a dog, while the possible referent of 'dog' is the set of all real or imaginary dogs that fit this concept. Knowledge of the 'sense' of a word does not automatically mean the individual knows the correct 'referent'. People can know what a word means without knowing what it refers to, and vice versa (Macnamara 1982).

In terms of pain description, when children are tested under experimental conditions they may be able to show that they have knowledge that certain words can be used to describe pain, without knowing which pains these words refer to. Alternatively, they may show no evidence of knowing that certain words could be used to describe pain, and then subsequently go on to describe pain, using words, very well.

Fabrega and Tyma (1976), have proposed a heuristic distinction between three classes of words that are employed to describe pain. They label these three classes as Primary, Secondary and Tertiary pain terms.

Primary pain terms: contemporary English has a limited set of words that have special and restricted use and which serve as a base for the description of the perceptual experience which we have defined as pain: 'sore', 'ache', 'hurt' and 'pain'. None of these terms is marked with respect to quality of pain.

Secondary pain terms: these are words which seem to be borrowed from the remaining, or unrestricted, lexicon in order to describe, more fully, an experience. They are used to denote physical change of state, or damage, and are employed as qualifying metaphors, or similes, to Primary pain terms; e.g. 'I have a crushing pain', 'My pain feels like it is crushing'. In some cases these Secondary terms can replace the Primary terms.

Tertiary pain terms: These terms do not bear a special connection to pain. Rather, these consist of terms of qualification that are used to register intensity, duration, quality and so on of any experience. Examples are, deep, intense, mild, steady, depressing, tingling: e.g. 'I have an intense pain in my leg'. Unlike Secondary pain terms, as these tertiary terms refer to general attributes of many types of phenomena, they cannot be used in place of Primary pain terms.

At present we do not know the developmental progression in the use of these three types of pain descriptors. However, the studies undertaken will allow comment on this. The following two sections consider the literature on literal and figurative language and the implications of these for pain description in children.

3.1 Pain and literal language

How do children come to know that a certain quality of pain is given a certain name? There appear to be no specific theoretical references in the literature addressed to this topic. However, if one considers the literature addressed to concrete items, it may hold some indication of the processes involved in the area in which we are interested, that is subjective pain experience.

3.1.1 Origins of pain description?

It is commonly assumed that in the early stages of language acquisition children learn to acquire and use word meanings as a function of their interactions with adults and peers. That is, the information they need comes directly from these sources. The child has to sort out from this information the relevant aspects for his needs. How is this achieved?

Brown (1958) has noted that when adults name objects for children, it is the level of usual utility that determines which name the adult will give to the child. As an example, the child is told that a pineapple is a pineapple, not fruit; a beagle is referred to as a dog, not a beagle or an animal. It appears that adults seldom use the most abstract category name; most often they use terms at the middle level of abstraction. They carry the most information, possess the highest category cue validity and are differentiated from each other more than either abstract superordinate categories or specific names (Rosch et al 1976).

For example, we can consider 'apple' as the basic, middle level of abstraction, while 'fruit' would be the superordinate category, with perhaps 'golden delicious' being the subordinate or most specific category name. Therefore, when an adult talks of apples, he tends to call them apples rather than fruit or golden delicious.

In terms of pain description, we do not know the criteria the adult uses when naming things for the child. Using the breakdown used by Fabrega and Tyma (1976) one might expect adults, initially, to use primary pain terms, to later qualify these with tertiary pain terms and then finally introduce the child to secondary, that is figurative, pain description.

Macnamara (1972) suggests that words are used as messages about meanings the adult speaker intends to convey. The child must figure out what these meanings are, but the whole process probably begins with the child knowing already the meaning the speaker wishes to convey and then determining how the language relates to the meaning. For example, the child knows such things as mother-dog-milk and actions such as kissing-barking-spilling. It becomes a problem then of establishing a relationship between the objects and events in the child's cognitive perceptual system and the language that may be used to talk about these objects and events.

But what of the cases with no external referent, such as we have with pain? It has been suggested that cognitive factors affect our pain perceptions (Melzack and Wall 1965), so we would expect these perceptions to vary between and within individual's. What we would predict is that the development of a sophisticated grasp of pain terms and categories would lag behind the development of words for concrete objects.

Looking for meaning in language, children might be expected to make mistakes in deciding the meaning-language relationships. Children do not always ascribe the same meanings to words and sentences adults do, even when they have external referents. It will be interesting to see the effect of lack of these external objects and events.

3.1.2 Theories of Semantic Acquisition

Several theories have been postulated to account for the child's acquisition of meaning in language; the semantic-feature hypothesis (Clark 1972, 1975), the functional-core hypothesis (Nelson 1974, 1977) the prototype hypothesis (Bowerman 1978), and the contrastive hypothesis (Barrett 1978) It may be useful to consider the arguments for each of these approaches and see how applicable they are to a consideration of the acquisition of pain terms.

These hypotheses have been extensively considered in Macnamara (1982) and Kuczaj (1982). However, these authors limit their deliberations almost entirely to the child's acquisition of object names or, as Macnamara puts it, 'things you could bump into'. Although, from our point of view, this is less than ideal, it does reveal some insights into the issues we have to consider in the more abstract world of pain communication.

3.1.2.1 Semantic-Feature Hypothesis

Clark (1973) formulated the 'Semantic Feature Hypothesis' to account for the acquisition of the semantic system by the young child. She assumes that the meanings of words are composed of features or meaning components and that children learn the meaning of words gradually by adding more and more features to their lexical entries until the entries for each word are complete by adult standards. For example, four-legged, barks etc., compose the meaning of the word dog. Clark argued that children appear to acquire the most general features first and the more specific features later: four-legged would be acquired before barks. Clark also suggested that the earliest semantic features to be acquired are derived from an encoding of the perceptual attributes of referents.

Two predictions were made based on this hypothesis (Clark 1973). Firstly, children should over-extend the use of a word. For example, the word dog would be used to name all four-legged animals. Secondly, the objects to which an over-extension is made will bear perceptual features in common with the original object.

Initially, diary data presented by Clark (1973) seemed to support the hypothesis. However, subsequent work has cast doubt on this hypothesis on both logical and empirical grounds.

3.1.2.1.1 Problems with the Semantic-Feature Hypothesis

Queries have been raised concerning feature theory. Feature theory involves the abstraction of features from a whole concept so that the concept may be known. But in order to abstract the features from a whole concept, one must already know the whole concept in order to know what to abstract from it. Nelson (1974) points out that abstraction theory pre-supposes what it is meant to explain, namely the principle by which common elements are abstracted as common and thereby the definition of the concept itself.

A list of features cannot define a concept (Greenberg and Kuczaj 1982). It is possible to list the features of a concept, but only if those features are properly organised do they form the concept as we ordinarily think of it. It may also be noted that so far as pain terms are concerned, there is a problem even in specifying what the list of features may be. For example one may be able to list the features of 'dog' - four legs, a tail, barks, hair, etc., but what are the features of 'stinging'?

A further criticism of feature theory comes from Palermo (1976, 1982), who points out that:

a) Feature theories tend to ignore the communicative function of language in their concern for the componential analysis of the lexicon.
b) Recognition of the communicative function leads to a concern with contextual factors.
c) Those who propose feature theories either explicitly or implicitly rule out the metaphoric use of words.

Criticism on empirical grounds comes from Reich (1976) and Barrett (1978). Reich points out that under-extension, as well as over-extension, occurs in early lexical development, which suggests that it need not be the most general features which are acquired first. Barrett has shown that over-extension is not such a common phenomenon as the semantic-feature hypothesis predicts.

3.1.2.2 The Functional-Core Hypothesis

Nelson (1974) suggested that objects are initially assigned to concepts by the child on the basis of their functional relationships. That is, on the basis of what the child can do with those objects, or on the basis of what those objects can do. It was also hypothesised that the child then analyses the objects that have been included within a particular concept on functional grounds, in order to obtain a hierarchy of attributes that facilitates the identification of new instances of the concept. At the top of this hierarchy is a functional core that defines the functional relationships into which an object must be able to enter in order to be included as an instance of that concept. The features that describe the perceptual attributes of concept instances are represented lower down in the hierarchy. This hypothesis states that a word is then attached to the concept that has been formed in this way.

The priority given to functional relationships in this theory is motivated by Nelson's (1973) finding that the vast majority of the earliest object names acquired by children typically refer to objects that move or which the child acts upon in some way.

3.1.2.2.1 Problems with the functional-core hypothesis. Barrett (1982) argues that this hypothesis does not provide an adequate explanation of over-extension. The hypothesis would predict that all objects labelled by a word will have certain functional relationships in common. For example, this hypothesis would predict that the child's concept of ball would be made up of such functions as bounces, rolls, is thrown up, is caught. However, Barrett (1979) and Bowerman (1978), have shown this prediction to be false. Some over-extensions are based upon a single perceptual feature, whilst functional differences are ignored. In the light of these findings, Nelson (1979) modified the hypothesis by suggesting that children may use language for many communicative functions, including statements of similarity as well as identity. This includes the possibility that children use language analogically. Apparent over-extensions can be considered to be figurative use of language. Unfortunately, this means that the hypothesis cannot be refuted through the observation of over-extension.

As Macnamara (1982) points out, in their later forms, the contrast between the semantic-feature and the functional-core hypotheses is mainly one of emphasis. Nelson allows that children do establish semantic markers that have been abstracted from the sensory array, and Clark does allow semantic features that are based on functions and characteristic activities.

3.1.2.3 The prototype hypothesis

Bowerman (1978) presented a theory, based in part on the work of Rosch (1977), which seems to provide a better explanation of extensional errors than the previous two theories. She points out that children hear particular words modelled most frequently in connection with only one referent or a small group of highly similar referents. She argues that children will later begin to produce these words only in connection with these prototypical referents. These words, therefore, will be under-extended. At a later stage, children begin to extend these words to novel referents that share one or more features with these prototypes.

In support of this hypothesis, Bowerman (1978) describes a variety of the over-extensions produced by her own children to show that the objects that are named by a word are linked by a family resemblance and not by criterial features. Barrett (1979) also presents data which support this prediction.

3.1.2.3.1 Problems with the prototype hypothesis

The major criticism of this hypothesis is is that it is an incomplete explanation of semantic acquisition rather than being incorrect. For example, Macnamara (1982) comments that it is unclear whether these examples given by Bowerman are over-extensions, or whether they are examples of the early use of figurative language. Also, Barrett (1978, 1982) argues that this hypothesis fails to account for developments in what he refers to as semantic fields, or domains which contain related words. These are discussed in the following section.

3.1.2.4 The Contrastive Hypothesis

Barrett (1978, 1982) and Clark (1983, 1987) developed the contrastive hypothesis to account for these unexplained developments within semantic fields. This hypothesis disputes the assumption that it is sufficient for the child to abstract features from the referents of a word in order to set limits on the extension of that word. Instead, it assumes that children expect that all new words that they learn contrast with the words that they already know. It is suggested that the child must abstract those contrasting features that distinguish the referents of that word from the referents of other words within the same semantic field in order for the child to be able to exclude referents from the extension of that word.

The hypothesis proposes that a word is first assigned by the child to a semantic field on the basis of the general invariant attributes shared by the referents of that word. The child then compares the referents of the word with the referents of the other words already assigned to the semantic field on similar grounds. The features, either perceptual or functional, that distinguish those referents from one another are abstracted and stored in the lexicon as the meaning of that word.

The hypothesis predicts that a word will not be over-extended to label an object for which the child has already acquired a more appropriate name. Over-extension should only occur when the more appropriate name has not yet been acquired. Barrett (1978) found this prediction confirmed.

3.1.2.4.1 Problems with the contrastive hypothesis

Queries have been raised about this hypothesis. Nelson (1979) has argued that the contrastive hypothesis predicts that the meaning of a word can only be acquired by reference to both positive and negative referential instances. However, Bowerman (1978) and K.E. Nelson and Bonvillian (1978) have shown that the child can learn the meaning of an object name from a single positive referent.

Gathercole (1987) carried out an extensive review of the contrastive hypothesis and the evidence cited to support it. Although she acknowledges that the issues raised by this hypothesis need to be answered by any theory of semantic acquisition, she concludes that there is little empirical support for the hypothesis that young children automatically assume that all words in their lexicon contrast. She further argues that there are theoretical problems with the position that children assign newly acquired words to semantic fields.

3.1.3 Summary of theories of semantic acquisition

Although each of these theories has elements which are unique to it, none of them has been accepted as a complete and full account of semantic acquisition in the child. Perhaps, for our purpose, we are less interested in proving, or disproving, a particular theory than in using the points raised by the theories to understand certain elements of the child's semantic acquisition process; in this case the acquisition of pain terms.

For instance, it seems accepted that words are often composed of perceptual features and/or functions. Words range from those which have meanings which are very similar to one another, through to those which are very dissimilar to one another, on these dimensions. Of course, whether this is the sole basis for word meaning is in considerable doubt.

It also seems to be accepted that words are organised in some way. This organisation appears to be in the form of semantic categories or semantic fields. For each category of words, or words closely related in the semantic category or field, there are 'best examples', or prototypes, of that particular semantic domain.

Fabrega and Tyma (1976) have argued that there are four words which are acquired to describe only pain; pain, ache, sore and hurt. One might expect that these words would be acquired relatively early in semantic development and would be closely associated within a semantic category, or semantic field.

Terms of qualification, which are not acquired uniquely to describe pain, are brought into use as and when required. Only then do they become part of the pain vocabulary.

The final comment is on those words which are used in a figurative way to describe an individual's pain. These are words which were perhaps initially acquired for a different purpose, but which become part of the pain vocabulary along side, or in place of, the primary pain words as and when the need arises. The figurative use of language provides the largest number of potential pain descriptors and therefore figurative language will be considered in some detail in the following section.

3.2 PAIN AND FIGURATIVE LANGUAGE

The aim in this selective review is to restrict deliberations to those studies which have addressed aspects of figurative use which appear to have relevance to pain description, which have been well conducted, and which have provided clear results. Ortony (1980), Lakoff and Johnson (1980) and Cooper (1986) have considered in detail the complex theoretical and philosophical issues in this area. Vosniadou (1987) has reviewed the empirical literature on children's metaphorical competence.

For clarity, throughout this section, 'figure of speech' is used as the generic term to cover all non-literal utterances. Metaphor refers solely to actual metaphors, similes to similes etc.

Amongst adults, the use of metaphor and simile in pain description is very common. The McGill Pain Questionnaire (Melzack 1975), a commonly-used adult verbal pain measurement questionnaire, relies almost entirely on people's ability to utilise metaphor.

Undoubtedly, even in everyday usage, many of the words and phrases we use to talk about the pains we experience are used as similes or metaphors. One talks easily about burning pains, cutting pains, etc., without meaning that we have been burned or cut; rather it is more that it feels 'as if' we have been burned or cut.

The primary function of figurative language is to provide a partial understanding of one kind of experience in terms of another kind of experience (Lakoff and Johnson 1980). This normally involves explaining something abstract in terms of something more concrete. This skill is very important in sharing our pain experiences with others. Through metaphor, or simile, we can, to some extent, externalise our sensations. We can allow others to share in the experience.

As we have noted, Fabrega and Tyma (1976), have proposed a distinction between three classes of terms that are employed to describe pain. They label these three classes Primary, Secondary and Tertiary pain terms. It is the secondary, or figurative pain terms with which we are concerned here. These are words which are used to denote physical change of state, or damage, and are employed as qualifying metaphors, or similes, to Primary pain terms; e.g. 'I have a crushing pain', 'My pain feels like it is crushing'. In some cases these Secondary terms can replace the Primary terms.

3.2.1 Children's figurative competence

In this context, competence involves the ability to detect similarity across two unlike domains and to use one domain to talk about, or understand something about, another domain. This involves two components. The first component requires experience in perceiving, so that resemblances can be detected despite dissimilarities. For example, resemblances underlying metaphors can exist across two objects, or two events, or the resemblance can consist of a similar experience evoked by two unlike objects or attributes. With practice at perceiving and experiencing, children come to notice invariants across unlike domains.

The second component of figurative competence is knowing that words can refer figuratively. No research exists directed at determining children's figurative pain-describing abilities. Research to date, which has addressed the general topic of children's figurative abilities, shows inconsistent findings.

For example, two well conducted studies can come up with what appear to be very conflicting findings, and yet still both be correct. Winner, Rosensteil and Gardner (1976) showed that mature levels of metaphoric comprehension did not take place before early adolescence. In contrast, Billow (1981), found that children as young as three years of age showed evidence of metaphoric understanding. One can argue that many of these inconsistencies can be explained by an understanding of the theoretical and/ or methodological difficulties encountered. To fully appreciate these difficulties requires a close scrutiny of the details of the studies undertaken in this area.

3.2.2 Empirical studies

Gardner, Kircher, Winner and Perkins (1975) investigated whether children could produce appropriate metaphoric figures when given the opportunity to do so, and if they were likely to prefer a metaphoric figure when given a multiple choice. Subjects were aged seven, eleven, fourteen and nineteen years. In addition, pre-school children aged three and four years participated in an abbreviated version of the study.

Short stories were devised which ended with an unfinished sentence and subjects were asked to generate their own endings. They then heard four alternative endings: a literal ending; a conventional ending; a metaphorically appropriate ending; and a metaphorically inappropriate ending and were asked to choose one which best fitted the story. The subject was then asked the reason for his choice.

The unexpected finding from the production part of the experiment was the relatively large number of appropriate metaphors produced by the three and four year olds. These younger children produced the highest percentage of metaphors. However, the overwhelming proportion of productions at each age level was classified as conventional.

Results from the forced choice condition indicate that there was a sharp decrease across ages in the number of literal endings preferred by subjects. There was also a decrease in the number of conventional endings, and a striking increase in the number of metaphorically appropriate endings. Inappropriate endings were almost never selected by any subject of any age.

This study indicates that children aged three and four years of age can produce appropriate novel metaphors. Primary school children produce few, and appear not to prefer, metaphors. However, there is a rapid increase in spontaneous metaphoric production, and an increase in the preferance for metaphors with increasing age.

Winner, Rosensteil and Gardner (1976) sought to assess children's capacity to interpret metaphoric statements. The subjects were aged six, seven, eight, ten, twelve and fourteen years. Half the subjects were given a verbally-presented multiple choice task in which each metaphoric sentence was followed by four possible interpretations: magical, metonymical, primitive-metaphoric and genuine-metaphoric. Primitive-metaphoric responses refer to the individual focussing on an incidental aspect of the dual function adjective which prevents comparison being made between the physical and psychological domains, or between sensory modalities. Genuine metaphoric responses, in contrast, acknowledge the dual function of the adjective and, therefore, cross modality comparisons are made. The remaining subjects were required to supply their own interpretation to verbally-presented metaphoric sentences. These spontaneous interpretations were coded using the same four categories above.

In both experimental conditions, primarily metonymical and primitive-metaphoric responses were offered by six, seven and eight year olds. No age-group favoured magical interpretations. By eight years of age, subjects chose genuine-metaphoric responses as often as primitive ones; and by ten years of age, subjects strongly favoured genuine-metaphoric interpretations. Although ten year olds demonstrated a basic understanding of metaphor, they were often either unable to explain their interpretations or they had to recourse to metonymical or primitive-metaphoric justifications. A higher level of metaphoric understanding emerged in early adolescence.

This study suggests that spontaneous production of metaphor occurs first, followed by comprehension and then by the ability to explain the rationale of metaphor.

Honeck, Sowry and Voegtle (1978) investigated children's understanding of proverbs by having subjects compare each proverb against two pictures; a non-literal correct interpretation of the proverb and an incorrect interpretation. Subjects in the study were three groups of children aged seven, eight and nine years.

Results of this study indicate that for each age group mean performance was significantly better than chance. However, no age difference was found. We see that children aged seven to nine years are able to comprehend proverbs, that is, figurative language. The authors conclude that the present task minimised irrelevant processing demands while providing an easily understood context, namely the pictures, which the children used to apprehend the meaning of the proverb.

Reynolds and Ortony (1980) hypothesised that if metaphorical language itself is the source of comprehension difficulty, then children should not find similes easier to understand than their corresponding metaphors, even though similes contain an explicit syntactic signal that a comparison is to be made.

This study tested five groups of children aged seven, eight, nine, ten and eleven years. Their task was to read a short story and then to select the most appropriate continuation sentence in a four-alternative, forced-choice test. Each story was accompanied by a colour drawing that illustrated its main idea. In one experimental condition, correct selection of the targets involved the comprehension of metaphor. In the other condition, correct selection involved the comprehension of semantically matched similes. All subjects also received items in which they were required to select literal targets.

Results showed a significant age effect which was due to increased correct responses by the older subjects, and a figurative-type effect which was due to more correct responses by subjects in the simile condition than in the metaphor condition. The same analysis was performed on literal responses and in this case there was no effect of age.

These results lend support to the notion that the comprehension of figurative language varies with the complexity of the task. For younger children, similes are easier to comprehend than their corresponding metaphors: the data from the specific simile condition shows a high level of figurative performance as early as age seven and a half years.

Billow (1981) reports a study which investigated whether spontaneous metaphors are a frequent part of children's language, and whether the child recognises the metaphoric relation created. The subjects in the study were children who ranged in age from two to six years.

Individual children were observed for one half-hour period during free play. All possibly figurative expressions of each child were recorded. After the observation period, the observer questioned the child as to whether he or she knew the correct name for the object, event, or feeling. Each figurative expression uttered by the child was considered a metaphor, unless excluded as examples of misnomer or over-generalisation.

The results show that observers recorded 83 metaphors in 134 half-hour observations. Metaphors appeared in a total of 48 out of 134 observations. The authors argue that the data shows a rather steady decline with age of metaphoric verbal expression. This did not, however, reach statistical significance.

Children were able to supply evidence of metaphoric awareness 43% of the time. Even the youngest children (ages 2.7 to 3.6) possessed some understanding of their metaphoric verbalisation.

In discussing these results, the authors state that they present clear evidence that children between the ages of 2.7 and 6.0, that is , pre-operational age-levels, do make use of metaphoric language. On some occasions the child is capable of articulating the rationale of the verbal substitution.

Vosniadou and Ortony (1983) investigated children's ability to distinguish among literal, metaphorical, and anomalous comparisons. Subjects in the study were children aged three, four, five and six years, and a group of adults.

In a comparison task, subjects were asked to complete statements by choosing one of two words. Each statement appeared in combination with three word pairs: a metaphorical/ literal word pair, a literal/ anomalous word pair, and a metaphorical/ anomalous word pair.

The recognition of a metaphorical statement as metaphorical usually requires the realisation that conventional category boundaries are being transgressed. For this reason, another group of children and adults received instructions to complete statements in which the word 'like' was substituted by 'the same kind of thing as'. In this categorisation task the literal choices become the correct ones, and the metaphorical ones become inappropriate. This checked that subjects doing the comparison task could be expected to have knowlege of conventional categories, whose violations are involved in the metaphorical comparisons.

Analysis showed a significant effect for age which was due to an overall increase in number of literal responses with age. There was also a significant effect for task, which was the result of a greater number of literal responses in the categorisation task than in the comparison task.

In both tasks the children, even the youngest, showed a clear preference for meaningful comparisons over anomalous ones. The older children did better at rejecting anomalous comparisons than the younger children. However, even the three year olds rejected anomalies, for the most part, significantly more often than predicted by chance.

The findings show that by four years of age children appear to be able to distinguish meaningful comparisons that are literal from those that are metaphorical. This suggests that they have their knowledge adequately organised to understand when the terms in a meaningful comparison belong to different conventional categories. Therefore, they have at least one important pre-requisite for metaphor production and comprehension.

Vosniadou and Ortony (1986) tested the metaphoric competence of young children. The children in the study were all six year olds.

Materials consisted of seven short stories, each of which concluded with a metaphorical sentence describing an action. For half the children, the target sentences were expressed as metaphors and for the remaining half the same sentence was transformed into their corresponding similes. Half the children were randomly assigned to a paraphrase task and half were asked to act out the stories using toys in a specially constructed 'toy-world' environment. In the paraphrase task, the children heard each story twice and were then asked to re-tell it. After re-telling each story, the target (metaphorical) sentence was read again and the children were asked to explain what the sentence meant.

Results of the experiment indicate that there were more correct enactment responses than paraphrase responses and no difference between simile and metaphor. There were more correct metaphorical responses than literal responses in the enactment, but not in the paraphrase, task. The children's spontaneous recall of the metaphorical sentences in the paraphrase condition showed a significant effect of sentence type. Similes were more frequently repeated without change than were metaphors.

Results also indicate that young children find it easier to interpret metaphorical sentences in an enactment task than in a paraphrase task. Acting out the metaphorical sentences does not impose additional metacognitive requirements on the comprehension task. Perhaps acting out the stories makes it more likely that the children will process the information contained in these stories. Finally, the toy-world environment provides a situational context which further restricts the range of possible interpretations of the metaphorical sentences.

Windmueller, Massey, Blank, Gardner and Winner (1986) argue that if all that is required to comprehend figurative language is that one be able to understand non-literal similarities, then there should be no difference between the ability to understand allegory and metaphor.

Four groups of children aged six, eight, ten and twelve years of age participated in a forced choice task. Allegory and their parallel metaphor items were constructed. For both metaphors and allegories, a picture was presented with each target situation and with each choice. After selecting the response most similar to the target, children were asked to explain their choice.

Analysis showed that comprehension improved steadily with age. Correct choices far out-numbered correct reasons. While six year olds selected the correct choices at chance levels, all three older age-groups selected the correct choice at a level significantly above chance. There was a greater difference between six and twelve year olds on the measure of reasons given than on correct choices. Six year olds produced almost no correct reasons.

There was no difference between allegory and metaphor and the number of correct choices made, but there was a difference in the number of correct reasons. Children at ages eight, ten and twelve generated more appropriate reasons for allegories than for metaphors. Six year olds produced the same number of reasons for allegories and metaphors.

3.2.3 Summary of figurative language studies.

Each of the studies in the previous section has been cited because they are well conducted experiments, even though they show a wide variation in the age at which they are prepared to attribute metaphoric competence to the child. Perhaps the biggest problem in determining the age that children develop metaphoric competence is the large variation in the criteria adopted by different researchers before accepting that children have this competence.

When children are observed in a natural setting, even very young children of two to three years of age can be shown to produce figurative utterances (Billow 1981). However, they are not able to fully explain the rationale behind these utterances. This complex metacognitive ability to explain does not occur until later in development.

When children are provided with an incomplete story and asked to provide their own endings, Gardner et al (1975) showed that three and four year olds could produce suitable figurative endings.

Research which provides children with a context in which to act out the figurative statement (Vosniadou et al 1980) has shown that children of six years of age are better able to enact metaphors than to explain them. Children also find it easier to explain enacted tasks than to explain verbally presented material. Perhaps this is because these impose less metacognitive demands.

Researchers have attempted to examine, non-verbally, children's figurative abilities. Honeck et al 1978 found that when children were asked to choose one from a pair of pictures to describe a proverb, by age seven children showed significant figurative ability.

A popular experimental paradigm is to present an incomplete story and ask children to complete the story by selecting from figurative and non-figurative endings (Gardner et al 1978; Reynolds et al 1980; Vosniadou et al 1983; Windmueller et al 1986; Winner et al 1976;). Gardner et al, found a sharp increase with age in the preference for metaphoric endings, and Winner et al, conclude that by age ten children are able to demonstrate a basic understanding of metaphor, although they cannot explain it fully. Reynolds et al found good levels of figurative competence by age seven and a half. Vosniadou et al conclude that children know literal vs figurative distinction by age four years. Windmeuller et al found that by age eight children were able to show knowledge of figurative language. They found it easier to give reasons for allegories than metaphors.

When children are presented with a figurative story and asked to explain what it means, research has shown that between six years (Vosniadou et al 1986) and eight years of age (Winner et al 1986) children can carry out this paraphrase task. However, Vosniadou et al found that the children's paraphrases were not as good as their ability to act out the stories.

The type of figurative language studied, metaphor, simile, allegory or proverb, seems to influence the complexity of the figurative task. Reynolds (1980) and Vosniadou et al (1986) found that children seem to find simile easier to deal with than metaphor. Similarly, Windmeuller et al (1986) found that children were better able to explain allegories than similes.

3.2.4 Implications for pain description

Children find it much easier to produce their own spontaneous figurative speech than to comprehend the figurative speech of others. A conservative estimate would indicate that by five years of age children have the necessary figurative ability to do this, although they may not be able to explain the full rationale behind their language usage. Therefore, one might expect children of this age to have the ability to go beyond basic pain description (sore, hurt, ache, pain) and produce pain descriptions which use language from the general lexicon, in a figurative manner.

However, pain questionnaires require the child to appreciate the figurative speech of others and therefore the ability to use these should develop later, perhaps by the age of eight or nine years. Based on the above research, one might also expect this figurative ability to reflect the complexity of the material with which they are presented. Similes or allegories should be easier for the child to use than metaphor.

4. EMPIRICAL STUDIES OF CHILDREN'S PAIN COMMUNICATIONS

The following three sections review empirical studies which have investigated verbal, non-verbal and behaviour pain communications in children. Some of the studies reviewed are reported in more than one section. Although this has led to some duplication, it is felt that this is justified by being able to consider the relevant aspects of these studies along with other studies which have researched the same aspect of pain communication.

4.1. VERBAL STUDIES

4.1.1. Clinical studies

Abu-Saad and Holzemer (1981) and Abu-Saad (1984) report data from a convenience sample of ten children aged nine to fifteen years of age who were undergoing surgical procedures. The words the children used to describe their pain are reported along with 10cm visual analogue scale values reported at the same time as the verbal descriptions were given (see table below).

Descriptor	**Pain scale response**
Discomfort	1, 3, 6
Aching	1, 2, 3, 4, 5, 6, 10
Pinching	1, 2
Pulling	1, 4, 10
Tight	1, 4, 5
Itching	2, 3, 4, 5, 6
Deep	2
Hurting	2, 3
Stretching	2, 6, 8
Dull	2, 8
Burning	4, 6
Sore	4, 5, 9
Stinging	5, 6, 7, 8
Stabbing	7
Throbbing	7
Hot	7
Hitting	7
Sharp	8, 9

Words used by the children to describe their pain, with the associated visual analogue scale responses

There are two major questions which remain unanswered by this study. The first of these arises because, from the data presented above, we can see that there appears to be no systematic relationship between the words chosen to describe pain and the intensity of pain reported on the visual analogue scale. That is, at different times, and for different children, individual pain descriptors were used by the children along with varying visual analogue scale intensities. For example, aching was used by children on several occasions to describe their pain. At different times aching was given as the pain descriptor when the children rated their pain as being 1, 2, 3, 4, 5, 6, or 10 on the ten point scale.

The second problem arises because the authors report that several children who seemed not to be describing pain by their verbal descriptions, still rated themselves as being in pain on the visual analogue scale: no pain, 1, (N=6); fine, 1, (N=1); no pain, 3, (N=1); no pain, 4, (N=1); fine, 5, (N=1); OK, 5, (N=1). One child described his pain as 'being hit with a sledge hammer' and concurrently rated this pain as 0 on the visual analogue scale.

It therefore remains unclear, from the data presented, whether one should accept the child's verbal pain descriptions or visual analogue scale estimates, or indeed either, as an indicator of the pain the children are experiencing.

Furthermore, the authors do not comment on the possible qualitative differences between the various pain conditions which, perhaps, could only be revealed by analysis of the verbal descriptions.

It is not at all clear why the authors asked the children to produce words to describe their pain as little attention has been paid to their analysis.

Beales, Keen and Lennox (1983) report an interview study of thirty-nine children who were all suffering from juvenile chronic arthritis. The children were aged from six to seventeen years. Much of the data are analysed in terms of two groups, the younger group being six to eleven years and the older group being twelve to seventeen years. Part of the data reported asked the children to describe the sensation that they were experiencing in their joints. The children were provided with the following list of eleven pain descriptors. These descriptors had been chosen on the basis of the authors' previous experience with children with juvenile chronic arthritis.

Does your (joint) feel like:

it has been cut?
it has been bumped or banged?
it is burning?
it has been grazed?
it is being pricked?
it is being pinched?
it has been smacked?
it is being given an electric shock?
it is being squeezed?
it is being pulled?
it is aching?

We are not presented with the data which shows either the number of children who selected each descriptor, or a breakdown of the descriptors chosen by each age group. The authors do tell us that some words were chosen fairly regularly. For instance, 100 per cent of the children chose 'aching' as describing the sensation in their joints. Fifty three per cent of the twelve to seventeen year olds and fifty per cent of the six to eleven year olds claimed some form of sharp sensation (cut, pricked, smacked and pinched). There was only one difference between the younger and the older age groups. Fifty three per cent of the twelve to seventeen year olds reported some burning sensation in their joints in comparison with 33 per cent of the six to eleven years old. Although the authors report that each of the eleven sensation items presented was acknowledged by some of the children, they do not provide any data on this.

Thompson, Varni and Hanson (1987), and Varni, Thompson and Hanson (1987) used the Varni/Thompson Pain Questionnaire to provide a comprehensive assessment of the child and parents' perception of the child's pain experience. The subjects in this study were twenty three families, eighteen with female children five with male children, a total of forty six subjects, twenty three mothers and twenty three children aged from five to fifteen years of age.

The Varni/Thompson Paediatric Pain Questionnaire, yields scores from visual analogue scales as well as providing demographic and illness-related data. It also has a section which provides children with a list of words from which they have to select those which describe the pain they are experiencing. It is interesting to note that in the Thompson et al (1987) paper the children's pain descriptions are neither reported nor discussed.

The Varni et al (1987) paper does report on the words that the children used to describe their pain.

Descriptor	**%**	**Category**
Sore	70	(S)
Aching	65	(S)
Uncomfortable	65	(E)
Miserable	52	(E)
Tiring	48	(A)
Horrible	48	(E)
Pins and Needles	48	(S)

Unfortunately, the authors present the data for the children as a group, rather than a breakdown by age.

However, it is interesting to note that of the seven most commonly selected words, three are from the sensory (S), three are from the evaluative (E) and one is from the affective (A) categories, as defined by Melzack and Torgerson (1971).

The authors argue that "the pain descriptor terms begin the process of differentiating the sensory, affective and evaluative qualities of paediatric pain experience". Unfortunately, the authors seem to have made no use of these pain descriptors at all, other than to catalogue the number of children who chose them.

4.1.2. Non-clinical studies

Savedra, Tesler, Ward, Wegner and Gibbons (1981) and Savedra, Gibbons, Tesler, Ward and Wegner (1982), investigated the pain-describing abilities of a convenience sample of one hundred children in hospital and one hundred and forty children in school, aged between nine and twelve years of age. Several questions were asked of the children. There were two questions asked which are of interest for this section.

The children were asked to "circle the words that describe pain". The authors presented a list of twenty four words (see table below) that the authors claim adults had been shown to recognise as pain descriptors. The number of words selected ranged from one through to twenty three. Most children selected between three and thirteen words.

When asked to 'remember the worst pain you ever had, what was it, tell how it felt?', the children produced a large variety of pain situations, and they also used a wide variety of words to describe the pain recalled. These words included throbbing, piercing, pinching, swollen and numb. The children could be very descriptive by the use of figurative responses i.e.

"like a war in my stomach".

Words	N/H	H
Like a sharp knife	53	49
Sore	60	64
Cold	22	13
Cruel	24	20
Tugging	19	20
Sickening	28	41
Tingling	15	18
Like an ache	74	67
Pounding	52	41
Sad	22	24
Like a pinch	40	50
Miserable	55	60
Cutting	41	31
Uncomfortable	64	75
Shooting	28	15
Pulling	26	23
Horrible	37	54
Tiring	19	37
Like a sting	55	55
Biting	37	19
Hot	38	29
Itching	32	28
Like a hurt	54	54
Unbearable	44	46

The list of words, from which the children were asked to select those that they recognised as pain descriptors, and the percentage number of hospitalised (H) and non-hospitalised (N/H) children who chose them.

It is difficult to interpret the children's responses to being asked to circle the words which describe pain, as there was no check on the reliability or validity of these responses. A request to repeat the task at a later stage would have allowed some comment on the reliability of the data. Taking the precaution of including in the list non-pain words would have shown whether the children were indeed selecting the words on the required basis.

The responses to their worst pain ever are, potentially, more interesting in that they suffer less from the same methodological difficulties. Unfortunately, many of the children, number unspecified by the authors, selected a pain they had described previously and/ or used words which they had been shown in question one. Some children did produce words to describe their 'worst pain ever' which they had not been shown previously, but details are not provided.

This paper has shown that children have some verbal ability to describe pain. However, its weaknesses mean that we are still unclear as to how reliable or valid measures of these these abilities are.

Ross and Ross (1984b) Report on an interview study using nine hundred and ninety four American children, who were aged between five and twelve years. Open ended questions were used to determine the extent of the children's knowledge and understanding of pain, their ability to describe pain and their specific pain experiences. Semi-structured interviews were administered individually to the children.

The authors report that almost seventy per cent of the sample were able to provide single pain descriptors, such as stabbing, burning, squeezing, jabbing, pressing, dull and agonising. A number of children were able to generate good figurative sentences, such as describing a stomach ache as 'like bees in your stomach'.

A specific pain condition was identified in a sub-group of the children, (N=44), who suffered from headaches. These children provided some interesting descriptions of their pain. For instance:

Girl aged 7.11, "it starts like cruel fingers creeping up the back of my neck".

Girl aged 8.4, "it felt awful, like someone whipping your head".

Boy aged 10.1, "it feels like a sledge hammer is inside your body trying to break out.

The authors note that any study which relies on children's recall of their pain experiences must confront the true-recall vs learned-response issue. That is, are children remembering what they experienced at the time, or are they recalling what they were told happened at the time? In the present study, perhaps the most powerful support for confidence in the data comes from an examination of the children's description of specific pain experiences. As the authors note, "a predominant feature of the descriptions was the use of child-like imagery, set within a child-appropriate frame of reference, and differing markedly from that used by adults". For example; a child describing a headache which an adult may describe as 'splitting':

"like there is this big monster in there, see, and he's growing like crazy and there's no room and he's pulling the two sides of my head apart he's getting so big".

Boy aged 7.9 years,

In conclusion, the authors suggest that there was evidence of the children's ability to communicate about their pain experiences. However, there were no clearly defined age trends and no sex differences. This lack of age trends is somewhat surprising given the age-range studied, and is not easily explained.

Schultz (1971) conducted a survey of the concept of pain in seventy four 10 and 11 year old boys and girls. The questions asked were;

1. Have you ever been in hospital?
2. Why were you in hospital?
3. List three things that have happened to you that made you feel pain?

4. Underline no more than two of the following. When I have pain I feel afraid, brave, nervous, feel like

crying but I don't, feel like crying and I do.

5. What does pain mean to you? Write down everything that comes to your mind about pain.

No statistical data analysis was performed. Results indicate that thirty nine of the seventy four children had been hospitalised at some time. The author notes that previous hospitalisation did not seem to have much effect on the children's answers to question four. There were only eight out of the seventy four children who said that when they felt pain they wanted to cry and did. The number of responses to question four was double the total number of children in each group since two responses were given by all but two. Often boys answered brave but also nervous or afraid: an interesting combination the author notes. The final question, Question five, sought to elicit what pain meant to 10 and 11 year old children. Some of the replies were, 'It hurts', 'It hurts inside', 'I feel like screaming', 'I am going to die'.

One must interpret the responses to question four with caution. With a supplied-response format such as this, one would have to check carefully that the children were making reliable, if not valid, responses.

Jerrett (1985) produced a paper which examines how a selected group of children view their pain experience. A combination of drawings and interviews were used to study the children's ideas of pain. The study used a convenience sample of forty, 5-9 year old children who were attending a Paediatric outpatient clinic. Each of the children was given a 9"x12" piece of paper and a set of five coloured markers and they were asked to draw a picture which showed pain. Afterwards the children were asked about the drawings.

Six additional questions were used to elicit information about the child's perception of pain.

These questions related to their past experiences with pain, words used to describe the pain, pain severity, and ways to manage pain. Although the data is not reported in sufficient detail to make reliable comment, the author concludes that there is evidence to suggest that children could share their feelings and ideas about pain, and although children may have limited verbal skills, they possess an 'appropriate' language to describe their pain.

The author notes that the children were certainly able to discuss their pain experience, and that the children's pain descriptions were often quite graphic. These included such statements as 'Pain is like a whole bunch of mosquitoes poking around in my ears'. They note that the children also used terms such as 'funny', 'nagging', 'scarey' and 'wierd' to describe the pain. They make no further comment on verbal description.

Gaffney and Dunne (1986) report a study of 680 Irish children, aged from 5 to 14 years of age. The data reported, consisted of the children's responses to the statement 'Pain is ....'. This was one of ten items in a generate-response and sentence completion questionnaire. The authors wished to examine if, and when, children's definition of pain changes with increasing age. They wished to relate this to Piagetian theories of cognitive development. It was hypothesised that the responses of the younger children, in the pre-operational stage of cognitive development, will tend to be perceptually dominated and very concrete. Progressing age level should show a shift from perceptual functioning, manifested in increasing abstraction and developing inner awareness of psychological, or emotional, components of pain. The children studied were in three age groups:

Group 1, ages 5, 6, 7, Piagetian pre-operational stage,
Group 2, ages 8, 9, 10, concrete-operational stage

Group 3, ages 11, 12, 13, and 14, formal-operational stage.

Broad categories were devised in order to encode the data:

Definition 1, consisted of concrete definitions. This corresponded with responses which sought to substantiate pain as a 'thing', or a 'something', or an 'it'.

Definition 2, responses were semi-abstract definitions which included the uses of terms 'feeling', or 'sensation'.

Definition 3, was a more abstract definition which included physiological, psychological, and psycho-physiological definitions of pain.

As hypothesised, a significant linear increase with age in the number of themes individuals used to define pain was found. There was also a gradual decrease with age in use of concrete definitions of pain, although these did remain important responses over all age-groups. Semi-abstract and abstract definitions did increase with age. The authors note that previous studies have involved a very restricted age range of children which may account for the lack of developmental trends noted in these previous studies.

An interesting methodological point raised in the present study was the use of a multi-mention scoring procedure. Developmental differences may be obscured by the fact that basic definitions of pain used by children such as 'pain is something that hurts' may always be true, and valid, and be retained at all age levels. The authors note their use of a multiple-mention coding system in the study, which allowed various themes in the subject's responses to be recorded separately. That is, one subject could contribute to definition one, two or three. This had the advantage of demonstrating that earlier definitions may be retained and co-exist with more sophisticated themes. The basic conclusion of the authors is that the appearance of new themes in the data which they report appears to reflect increasing understanding with age of the biological purposes of pain and its causal relationship with illness and trauma, and a developing awareness of more abstract psychological and psychosocial aspects of pain.

One query that one might raise is that their assertion that the evidence supports the view that the children questioned about pain and illness were giving their own views rather than repeating those of the parents. The authors note that if that was the case then the views would tend to be in random order. This need not be the case. It may be that parents describe and talk about such things as pain and illness in a different way with different children at different ages.

Gaffney and Dunne (1987) report data from a study of 680 Irish school children aged 5 to 14 years about the causality of pain. The results indicate an association between pain and transgression, consonant with the literature on children's beliefs about the causality of illness, but not reported in previous studies of children's ideas about pain. Developmental patterns were also noted in the data, and one significant sex difference was observed which is consistent with a previously reported trend.

In essence, this was a sentence completion task. The question being; "A person gets a pain because ....." and the children had to generate responses to this question. Following close scrutiny of the data yielded by this questionnaire, coding categories were derived to allow for data analysis to be performed. For purposes of the statistical analysis, the subjects were divided into three age groups, roughly corresponding to three Piagetian developmental stages.

Ages 5,6, and 7 were combined as group one, containing one hundred and ninety four children, which corresponds to the pre-operational stage of cognitive development.
Ages 8,9, and 10 formed group two, with one hundred and ninety five children corresponding to the stage of concrete operations.
Ages 11, 12, and 14 were combined as age-group three with two hundred and ninety one children corresponding to the period of early formal-operations.

Twelve coding categories were employed in an attempt to make sense of the data. The codes were multiple mention so that subjects could contribute to more than one category. Based on their understanding of the theories of Piaget and Kohlberg, the authors of the present study hypothesised that the responses of the younger children would reflect a belief that pain is the outcome of breaking, or failing to comply with, rules. Piagetian theory would also predict that the young child's understanding of the causality of pain would be influenced by other characteristics of pre-operational thinking.

In the discussion of the results, the authors find that there is a consistency with their stated hypothesis in that;

a) almost half the sample i.e 44% of subjects, cited as causes of pain, explanations involving one or more elements of transgression or self-causality.
b) Objective and abstract explanations of pain increased significantly with age.

The authors' concept of transgression is quite interesting. The authors use this to hypothesise that the response of younger children would reflect the belief that pain is the outcome of breaking or failing to comply with rules, i.e. their acts of transgression. In terms of the results of the study, trauma was cited as the most often cause of pain and this transgression category provided the most next most often cited case, i.e. transgression by eating. This concept of transgression persisted over all the age groups. Concurrently the older children did offer alternative explanations or more expanded abstract explanations.

There are several possible ways to explain this 'transgression' explanation. Piagetian theory may maintain that this way of thinking stems from the mentality of the child himself, that is, by his limited cognitive capacity. Other authors, for example, Bibace and Walsh, in their presentation of a number of papers on health, illness and bodily functions note, as others have noted, that children are not merely passive recipients of environmental information. The child actively constructs his own views about such things as birth, death, sexuality, the insides of their bodies, illness and medical procedures. The implication of this, is that 'transgression' becomes an important concept in that it influences the child's interpretations of their pain and illness. This presumably derives from the assumption that these ideas evoke guilt and notions of punishment, which as negative psychological variables would tend to augment the experience of pain.

An alternative explanation would suggest that the reason that 'children' invoke the concept of 'transgression', i.e that the pain they experience involves things such as eating, which may or may not be perceived as acts of transgression, is because their experience is that most of the pain they experience is actually caused by such things as eating. That is, a perfectly logical response which reflects the experience of the child, rather than reflecting a limitation of cognitive ability.

The authors raise a methodological issue which I think may bear some importance to the discussion here. They refer to previous studies by Abu-Saad, Ross and Ross, and Jerrett, who used formats such as, What has caused you pain?, list the things that have caused you pain? These ways of presenting question to children are likely to evoke specific mentions of illness and trauma. The present study, the authors argue, has succeeded in producing a very different type of response form the children. Which of these approaches is more accurate is open to discussion.

In the final conclusion the authors claim that the findings of the present study indicate an association between pain and transgression in the minds of children. The result is consistent with the literature of children's understanding of the causality of illness.

Gaffney (1988) presents a set of interesting data, collected from 680 Irish school children, who responded to the questions; 'Pain is . . .', 'A pain is sometimes . . .' and 'A pain can feel like . . .'

The range of pain descriptors used in response to the first two questions increased progressively with age. Pain descriptors used by five and six year olds were mainly sensory and evaluative words (hurting, sore, awful, terrible). Between eight and ten years the range of pain descriptors broadened to include affective descriptors (annoying and irritating), and qualitative words (stinging sharp pricky). The eleven to fourteen year olds used further qualitative words; piercing, jabbing, throbbing.

Analysis of responses to the third question indicated a highly significant difference over age in the use of analogy. The percentage of each age-group using analogy increased from 5.7 per cent for the five to seven year olds to 42 per cent for eight to ten year olds and to 70 per cent for eleven to fourteen year olds.

The study of children's use of these different ways of describing pain is clearly very important. The distinction between being able to describe ones pain experience in terms of the sensory versus affective/evaluative component of the pain experience may be of great clinical significance; as it can be for adults.

The use of figures of speech to allow us to externalise, and therefore share with others, our private experience of pain is an important development in the child's cognitive ability, and certainly warrants further study.

As the author notes, this study has focussed on children describing 'pain in general' and it will be useful to compare these responses with data collected from children describing their own experience.

4.1.3. Summary of verbal studies

The studies cited above are all well conducted experiments. Each of them has acknowledged the potential importance of verbal descriptions of children's pain. Unfortunately, although the authors have succeeded in collecting verbal responses from children, their analysis and interpretation of these responses in some cases has been rather unsatisfactory.

The comments of Ross and Ross (1984a) are perhaps relevant here. Their discussion revolves around two issues. As they point out, for straight information-gathering, or for ease of subsequent data analysis, what they describe as the 'supplied-format' can be the best methodology. This is the approach taken by Beales et al (1983), Thomson et al (1987), Varni et al (1987), Savedra et al (1981) and Savedra et al (1982). None of these authors has sought to capitalise on the strengths of this approach. They appear to have been content to catalogue the number of children who chose certain words to describe their pain, but little else. No attempt has been made to discuss the implications of the findings in either theoretical terms, or in terms of the future directions for empirical research.

The second issue raised by Ross and Ross (1984a) is that if the child's spontaneous responses are needed, then a 'generate-format' methodology is the best one. This is the methodology used by Abu-Saad et al (1981), Abu-Saad (1984), Savedra et al (1981), Savedra et al (1982), Ross and Ross (1984b), Schultz (1971), Gaffney and Dunne (1986 and 1987) and Gaffney (1988). These studies have shown that children can not only generate single pain descriptors, but that children can produce the most colourful of figurative descriptive sentences to describe their pain. Unfortunately, in some cases, the analysis of the data has left a lot to be desired.

Abu-Saad et al (1981) and Abu-Saad (1984) have failed to address the apparant lack of relationship between the children's spontaneous verbal pain descriptions and the diffuse responses reported concurrently on a visual analogue scale. Scultz (1971), Savedra et al (1981), and Savedra et al (1982) fail to provide any analysis of their findings of literal and figurative pain describing ability in their study sample.

Ross and Ross (1984b) provide the most puzzling findings. After conducting a huge study, they conclude that in the sample studied, of American children aged five to twelve years, there were no clearly defined age trends in children's pain describibg abilities. Over thirty per cent of the children studied were unable to produce even single pain descriptors. In discussing children's figurative ability in a previous section, we saw that this age-range showed perhaps the most dramatic changes in figurative ability. One might expect that this alone would influence their descriptions.

In contrast, Gaffney and Dunne (1986 and 1987) and Gaffney (1988) have shown that by using a carefully constructed research hypothesis which was firmly based in a theoretical framework, a sensitive methodology, and imaginative data analysis, it is possible to show not only that children of different ages do perceive and describe pain differently, but that there is an ordered progression in the ability of these different age-groups of children. One may also argue from these studies that the specific questions asked of the children are going to greatly influence the data yielded.

The studies reviewed in this section also point out a tension between two perspectives which neeeds to be made explicit. It is clear that some of the studies quoted, especially those in the clinical literature, are concerned with children describing their own experience whilst others, especially in the non-clinical literature, are concerned with children's, perhaps more abstract ability, to describe pain in general. These two approaches are likely to yield different, but complementary, data.

Indeed, it may be argued that it is impossible to exclude the impact of the individual's personal experience when asking the person to describe pain in general. Similarly, one can not exclude the individual's cognitive abilities when asking the person to describe their current pain. Perhaps we have to acknowledge that these approaches are different facets of the same overall problem; the child's pain communicating ability. Clearly, knowledge gained from both research traditions is important if we are to gain further understanding in this area.

It is hoped that when discussing the results of studies undertaken in this thesis we will be able to comment on this further.

In conclusion, it is worth reiterating that it is only by verbal descriptions that we can capture the full meaning of the pain experience. As we have seen above, the potential importance of verbal pain description has been acknowledged by some clinical researchers working with children. However, this research has tended to view verbal pain description as peripheral to the main research questions. This, it is supposed, has led to the situation whereby less emphasis, analysis and theoretical interpretation has been placed on these verbal descriptions.

Research on healthy children's pain describing ability, although empirically rigorous, has, in some cases, also lacked theoretical content which, it is hypothesised, has led to the non-detection of the developmental progression one might expect, based on the literal and figurative language development literature. The notable exceptions, outlined above, do encourage more rigorous research in this area.

4.2. NON-VERBAL STUDIES

4.2.1. Visual analogue scales

Scott, Ansell and Huskisson (1977) sought to measure the severity of pain in one hundred children with Juvenile Chronic Polyarthritis. A visual analogue scale without definitions or divisions was used at the same time as a four point simple descriptive scale. The children studied ranged from two years of age to seventeen years of age with only seven of the children being less than five years of age. The authors report that eleven per cent of the children failed to complete the scale and this was particularly common below the age of five.

Results show that there was a highly significant correlation of r=0.63 between pain severity measured on the visual analogue and simple descriptive scales. When compared with the scores of one hundred adults tested it was found that the children were reporting significantly less pain than the adults.

In discussing these results the authors conclude from their data that pain can be measured in most children and few of those over the age of five had any difficulty in understanding the concept of the visual scale.

The authors comment that it is difficult to explain the finding of low pain scores in children with arthritis. A simple explanation might be that the children were not actually in pain during the course of the study. This does not mean that they are not in pain at other times.

Abu-Saad and Holzemer (1981) and Abu-Saad (1984) report data which aims to explore children's self assessment of the pain experience. They used a 10cm visual analogue scale, with the ends marked 'I have no pain' and 'I have very severe pain'.

The children who took part in this study were a convenience sample of ten, nine to fifteen year olds who were admitted for surgical procedures in an American hospital. The children were interviewed four times a day on the first and second post-operative day. During each of eight visits the investigator first noted:

a) the child's behavioural indicators using a check list;
b) the child's physiological responses, including pulse, respiration and blood pressure;
c) the child's rating of the intensity of his pain on the 10cm visual analogue scale.

Analysis of the results from this study indicate that children who scored highly on the behavioural indicators checklist, consistently selected high ranks on the visual analogue scale. The same was true for children who were showing either a few, or no, behavioural indicators of pain, who consistently chose positions low on the pain scale.

The authors argue that the study shows that children aged nine to fifteen years can use the visual analogue scale to indicate their perceived pain and that it also indicates that the child's mark on the pain scale is a valid indicator of the severity of his pain experience at that moment.

This is only true, of course, if one has already accepted that these 'pain behaviours' are the true indicators of pain.

Thompson, Varni and Hanson (1987) and Varni, Thompson and Hanson (1987) looked at pain assessment in juvenile arthritis. Twenty three families constituted the final study sample: in total forty-six subjects, twenty-three mothers and twenty-three children aged between five and fifteen years. The Varni/Thompson Paediatric Pain Questionnaire (Varni and Thompson 1985) was used to provide an assessment of the child's and parent's perception of the child's pain experience. This questionnaire claims to measure the intensity of pain, the sensory, affective and evaluative qualities of pain, and the location of pain, in a manner comprehensible to children.

For the purposes of this section we are interested in the visual analogue scale, which was a 10 cm horizontal line with no numbers, marks or descriptive vocabulary words along the length of the line. This scale was anchored with pain descriptors and happy and sad faces. Through the course of this study, the child, mother and physician rated present pain, and the child and mother rated worst pain for the previous week. The physician rated the present pain intensity immediately after conducting a rheumatological examination.

Results indicate that the child's present pain intensity was significantly correlated with the mother's perception of present pain intensity and with the physician's perception of present pain intensity. The child's and mother's ratings of worst pain for the previous week were again significantly correlated. Correlations between mother and child pain intensity rating and the child's age show an increase in the correlation as the child's age increases, as do the correlations between physician and child. No significant difference in present pain intensity ratings were found between child and parent, or child and physician, or parent and physician.

The authors argue that the strong association between the child's, mother's and the physician's ratings of pain provides support for use of the visual analogue scale in paediatric pain assessment. They go on to say that the findings of the study suggest that some children as young as five years of age are able to communicate their pain intensity to a parent or health care professional using this visual analogue scale.

They also note that the present pain intensity scores were found to be low in this study. Thankfully they do go on to point out that this should not be interpreted as meaning that children with arthritis feel little pain as has been suggested by other authors, for example Scott and Huskisson (1977). The children in this study who rated the worst arthritic pain that they had experienced in the previous week recorded substantially higher pain scores than they did at the time of the clinic visit.

McGrath, de Veber and Hearn (1985) evaluated two cross modality matching procedures, visual analogue scales and brightness matching, as measures of children's pain.

In the first study reported, forty children aged from three to fifteen years, rated, on two separate occasions, the heaviness of five identical looking containers which in fact varied in weight from seventy five to two hundred and seventy five grams. The children were asked to 'make the light as bright as the container is heavy' and 'make the line as long as the container is heavy'.

All but seven of the children (mean age of 4.7 years) completed the study. Results show that both procedures produced almost identical responses from the children, with no effect of age. Although, between session reliability did improve with age.

The second study reported asked children to use the same two cross modality matching responses to rate the magnitude of negative or positive affect depicted in a series of nine cartoon faces.

The authors report that the children studied (one assumes the same children who took part in the previous, and following, study) were able to use the cross modality matching procedures consistently. There were no differences by age.

The final study asked twenty of the children who had cancer to use both the visual analogue scale and the facial scales to evaluate the pain produced by necessary medical procedures; e.g. finger pricks, lumbar punctures.

The authors report that the results from these self report measures showed that there were consistent differences in the pain associated with these different medical procedures.

The authors conclude from these studies that children above five years of age can use visual analogue scales and an affective interval face scale to describe their pain in a meaningful way.

The following two studies used, as their measurement device, pain thermometers. These are in essence a variant of visual analogue scales. They are usually presented as a vertical scale marked from zero to one hundred with a movable point which denotes the pain intensity.

Jay, Ozolins, Elliott and Caldwell (1983) investigated the relationship between children's distress whilst they were undergoing painful medical procedures, and a number of psycho-social, medical and demographic variables. The subjects for this study were forty-two paediatric cancer patients who were undergoing bone marrow aspirations. The sample included twenty-six males and sixteen females. For analysis, three age-groups were formed. In the first age-group children were aged two to six years, the second age-group were aged seven to twelve years, the third, thirteen to twenty years. Several questionnaire measures were administered to the children and the parents.

For the purposes of the current review the measure of interest is the pain thermometer. Children aged eight years and older were asked to rate their anticipated pain level on the pain thermometer. They were also asked to rate their level of experienced pain following the procedure.

Observers also recorded the occurrence of distress related behaviours during the medical procedures on the Observation Scale of Behavioural Distress. These distress scores were subsequently correlated with the children's pain thermometer ratings of their anticipated pain and of their experienced pain. The correlations were found to be significant. The authors argue that this lends substantial validity to the Observational Scale of Behavioural Distress, as the self report measures correlate significantly with it.

Szyfelbein, Osgood and Carr (1985) studied fifteen acutely burned children, thirteen males and two females who were successive admissions to a burns unit. The age of the children ranged from eight to seventeen years with a mean age of fourteen years. These children's pain was assessed during dressing changes with a large 0 to 10 thermometer-like scale. The children were asked to give a pain score just before the drawing of blood samples; in addition, throughout thirty-three dressing changes they were asked to give scores at one minute intervals and to volunteer any changes in pain level which occurred between the one minute queries. Each child had received an orally administered analgesic approximately forty-five minutes before the dressing changes.

The authors conclude that the results indicate that the children grasped the idea of quantifying their pain on a 0 to 10 scale and even in moments of extreme discomfort and distress were generally willing to continue to give their pain scores. The pain scores given by these children did seem to reflect the degree of pain they were experiencing. This is suggested by the progression from a relative lack of pain with the removal of outer layers of bandage, that is a mean pain score of 1.4, through the moderately uncomfortable application of salve to the injury, a mean pain score of 3.2, to the very painful detachment of the inner-most layers of gauze, the pain score of 8.6.

4.2.2. Five point scales

Le Baron and Zelter (1984) investigated a sample of fifty patients aged between six and eighteen years of age who were receiving bone marrow aspirations in an American hospital. This included twenty one females and twenty nine males. The sample was divided into two age groups, the twenty six younger children were aged between 6.2 and 9.11 years, and the twenty four older children were aged between 10.0 and 18.2 years. Observations were made of the children's behaviour throughout the course of the medical intervention on an instrument which they called a Procedure Behaviour Checklist.

The bone marrow aspiration was divided into three time periods. Observer and patient pain ratings during these three time periods were based on a five point scale; one equals no pain, five equals extreme pain. It is interesting to note that the authors said that for children less than ten years of age, and for any of the older children who had difficulty with the self rating procedure, the numbers were presented together with faces showing increasing degrees of distress. The observer asked the child to point to the face which showed how much hurting he or she had felt. The only comments that the authors make on the children's self-assessment of their pain is to attempt to correlate these assessments with the scores derived from two behavioural checklists.

There were significant correlations between the patient's self rating of pain and the behaviour checklist scores at times one and two and a non-significant relationship at time three. The authors note that the behaviours rated on the checklist are related more strongly to observer than to the patient ratings, either because patients are less reliable reporters or because the self ratings reflect the private experiences of suffering, whereas observable behaviour reflects a more inter-personal dimension of pain. Observer ratings and patient self reports provide supportive evidence that children and adolescents did not differ significantly in their experience of pain at any time during the medical procedure.

Richter, McGrath, Humphreys, Goodman, Firestone and Keen (1986) compared the efficacy of relaxation and cognitive coping, compared with a non-specific placebo control, in the treatment of migraine. The subjects were forty-two patients aged nine to eighteen years, with a mean age of 12.8 years. The patients in the study were taught to monitor headache activity four times daily using a headache diary. This yields quantitative measures of pain intensity rated from 0-5. Various other questionnaire measures were used. The research design involved four distinct phases of continual headache monitoring; four weeks of base-line, six weeks of treatment, four weeks of post-treatment, and four weeks of follow up from the twelfth to sixteenth week after treatment.

The results of the study indicate that both the relaxation and cognitive coping group had significantly fewer headaches and less overall headache activity after treatment than the placebo control group. These gains were maintained at follow up. However, there was no significant effect in terms of headache duration and peak intensity. The authors argue that it is possible these variables are indeed less responsive to treatment than such things as frequency of headache.

The authors do not discuss the possibility that the measurement tool that they used was either inappropriate or insensitive for the population studied, i.e., they assumed that the tool they used to measure pain intensity was actually measuring this.

4.2.3. Other

Hester (1979) conducted a study with forty-four children who were aged between four and seven years, in an attempt to ascertain their responses to a painful stimulus. She sought to observe correlations between their behavioural responses and their subjective non-verbal ratings of the experience. The children were observed for several behaviours whilst they received injections. The children then rated the extent of pain during the injection by responding to two instruments.

The first assessment tool employed was Eland's projective tool which comprises a series of black and white pictures of a dog cartoon character in five situations. Four of the animal sketches are an attempt to duplicate painful events familiar to children. In the fifth sketch the animal is shown in the child's condition. The child is asked to rank the four pictures in order, from the picture of the event that hurts least, to the picture of the event that hurts most. The fifth picture, which replicates the child's condition, is inserted by the child in the ranked series. Hester, in the course of the present study modified this so that a rabbit was used instead of a dog.

The second instrument was Hester's Poker Chip Tool. This tool was developed specifically for this study. The device was actually four white poker chips. These poker chips are equated as pieces of hurt; one chip is a little bit of hurt and four chips the most hurt. The child is asked if it hurt. If the child says no, zero is recorded. If the child responds yes, he is given the four poker chips. The number of chips selected reflects the degree or intensity of pain he is experiencing.

A statistically significant difference was found between the two instruments. That is, the mean for the poker chip tool was 0.95, whilst the mean for Eland's tool was 2.59. The results from the poker chip tool were tested for correlation with the results from Eland's tool and there were no significant correlation found. The vocal responses of the children during the injection correlated positively and significantly with both Eland's tool (r=0.36) and with the poker chip tool (r=0.62), whereas verbal responses were not significantly correlated with Eland's tool but were significantly correlated with Hester's poker chip tool (r=0.45).

The facial expression score was negatively and significantly correlated with both Eland's tool (r=-0.50) and with the poker chip tool (r=-0.45). There were no significant correlations between gross motor responses and Eland's tool. There were significant negative correlations between the child's motor responses and responses to the poker chip tool (r=-0.59).

These negative correlations are interesting and the author suggests two possible explanations. The behaviour measurement tool for facial expression and motor behaviour is not valid for this age group, or the motor behaviour and facial expressions may be gating mechanisms used by children to abate pain, as in Melzack and Wall's Gate-Control pain theory. Children who respond to painful stimuli with facial and motor behaviour may actually feel less pain.

Alternative explanations could be that the two self-rating tools used were not measuring the children's actual pain experience, or that the two measures reflect different aspects of pain.

Eland (1981) investigated the effects of nursing intervention on the amount of pain experienced by pre-school children who were undergoing a routine immunisation procedure. The sample consisted of twenty male and twenty female children aged between four years nine months and five years and nine months. The children were randomly assigned to a group which received either a skin coolant, or air puff, prior to receiving the injection.

The children were asked to complete an assessment scale which consisted of eight coloured squares which were placed across the bottom of a white board. The eight colours were presented in exactly the same order to each child. The children were asked to select a colour similar to the event most painful for them. From the remaining colours the child was asked to select another felt square that was like hurt, but not quite as much hurt as the event identified by the child as the most painful. The child was then asked to pick a colour like something that hurts just a little. Finally, the child was asked to choose a colour like no hurt at all. In essence this produces a four point scale. The first point being no pain, the next three points being pain of increasing severity.

After the child received the injection he was asked to select a colour like the hurt of the injection from the colour scale he had constructed. A few minutes later the child was asked to select a colour like the way they felt now. For data analysis, the colour scale was assigned numerical ratings. The most painful was rated as 3, moderate as 2, mild as 1, no pain at all as 0. There was a significant difference between the children, in that those children who received the coolant spray subjectively rated their pain as being less severe than the children that received air puffs.

The author argues that although the colour pain tool used during the study has limited reliability, the data is supportive of the validity of the colour tool to measure children's pain.

Beyer (1984) developed the Oucher, which is a poster like display consisting of a vertical numerical scale (0-100) on the left and a six picture photographic scale on the right. The scale is designed to measure the report of pain intensity in children aged three to twelve years. Validity data is contained in a series of four articles (Beyer and Aradine 1986, 1987a, b, Aradine et al 1987).

Content validity was assessed by having seventy eight children between the ages of three and seven years rank order the pictures in the Oucher. Forty one per cent sequenced all the photographs while seventy seven per cent were able to sequence five or six correctly. Of all the pictures, eighty five percent were placed in the correct sequence (Beyer and Aradine 1986). Scores on the Oucher correlate highly with visual analogue scores and Hester's (1979) Poker Chip Tool and correlated poorly with measures of fear, thus showing convergant and discriminant validity (Beyer and Aradine 1987a,b) Finally, scores on the Oucher were sensitive to analgesic induced reduction in pain (Aradine et al 1987). In some studies, the sub-samples were small but the authors argue that the Oucher appears to have good psychometric properties.

However, as McGrath and Unruh (1987) have noted, the recent proliferation of faces-type scales has not led to any agreed upon standard. There would be major advantages in using faces which have well researched psychometric properties.

Lollar, Smits and Patterson (1982) developed an instrument which they called the Paediatric Pain Inventory (PPI) to measure paediatric pain perception in children. This is projective instrument which employs twenty four pictures representing potentially pain evoking situations across several settings; medical (e.g. receiving stitches), psychosocial (e.g. being scolded by a policeman), recreation (e.g. falling off a skateboard) and activities of daily living (e.g. getting an electric shock.

The situations were depicted in a series of line drawings which used male figures without facial features. Six pictures were constructed for each of the four settings.

Nursing students administered the PPI to two hundred and forty children and adolescents aged from four to nineteen years. The analysis of interest is that each individual rated the pictures for intensity and duration of the perceived pain. The duration questions asked how long the hurt would last and included the following categories; seconds, day, week, longer. The intensity of pain was measured by a sorting of the twenty four pictures in terms of a three colour rating scale. The colours red, yellow and green were selected to represent much, some and little pain.

The results showed a very low correlation (r=0.08) between the total intensity and total duration, suggesting that apparently different dimensions were indeed being measured. Analysis was made of the difference in levels of pain and duration across the four types of pain situations. The means differed significantly both for intensity and duration. These results indicate that psychosocial pain is perceived as being significantly less intense than the other types of pain experience. On the duration dimension, the results suggest that the medical pain is perceived as lasting longer than the other kinds of pain.

A major problem with this study is that the children have been analysed as one age-group. Clearly, with the age range from four through to nineteen years this would be very difficult to support. We do not have any information on the distribution of children within this age-range. The authors do report significant differences by age in that children aged seven and older tend to perceive pain as lasting longer than younger children.

The authors note that the PPI is in the early stages of its development and does require more extensive research. This future research must include a careful analysis of the use of the PPI with different age-groups. The strength of the PPI lies in the use of an interesting methodology.

Scott (1978) examined several aspects of children's perception of pain, such as the colour of pain, texture, shape, pattern and continuous versus intermittent quality. A projective test was developed using cartoons to illustrate two situations in which children commonly experienced pain; a self administered hammer blow and a doctor administered needle.

Interviews were recorded with fifty eight children aged four to ten years in hospital out-patient departments and in school. There were thirty four males and twenty four females, with thirty three children in the four to six year old group and twenty five children in the seven to ten year old group.

Significantly more children perceived the pain of the needle as jagged rather than smooth, and the pain of the hammer blow as a continuous rather than an on and off pain. The authors main finding of interest is the consistently graded differentiation in synaesthetic perception in the younger age-group on four of the five variables. Synaesthetic perception may be more characteristic of children in Piaget's pre-operational stage (age four to six). More cognitive oriented perception may be exhibited by seven to nine year old children who approximate the stage of concrete operations.

The authors conclude that the number of significant results in this study is minimal and could easily have occurred by chance.

4.2.4. Summary of non-verbal studies

Non-verbal pain estimation concentrates on the single dimension of intensity. Although this is less satisfactory than verbal measures, it is thought at least to represent the child's perception of that dimension. If non-verbal estimation can be shown to be reliable, and valid, then we do have a very useful tool.

It is difficult to justify reliability and validity for a pain measurement tool when researchers conduct a one off measurement, do not introduce an experimental manipulation or do not concurrently cross validate with an already validated measurement tool.

Scott et al (1977), Thompson et al (1987) and Varni et al (1987) have concluded, on the basis of their studies, that children as young as five years of age can communicate their pain intensity using a visual analogue scale. Scott et al use as their criteria for this conclusion the fact that the children did put a mark on the visual analogue scale. In a more sophisticated attempt at validity Thompson et al and Varni et al asked parent and physician to rate, concurrently, on the same type of scale, the pain the child was thought to be experiencing. The significant correlations observed are taken as validating the instrument.

Abu-Saad et al (1981) and Abu-Saad (1984) claim validity for the visual analogue scale for children aged nine years and older. In their study, they validated the visual analogue scale ratings by correlating the values against an unvalidated behaviour check-list with undemonstrated reliability.

In a similar way, we see that Jay et al (1983) correlated the pain intensity estimation scores of children, aged eight years and over, derived from pain thermometer ratings, with structured ratings of the children's behaviour and conclude that the significant correlations validate the two instruments.

The study by Szyfelbein et al (1985) presents eight years old and older children's pain intensity ratings derived from a pain thermometer and relates these to different stages in what appears to be, intuitively, an increasingly painful medical procedure. The fact that the actual pain intensity scores increase, in accord with the expected increase, is taken as validating the pain thermometer.

Le Baron and Zelter (1984) asked children to use a five point rating scale to estimate their pain intensity. The authors then sought to validate these scores against a behaviour checklist. Unfortunately, there is some confusion about the actual scale which they used. All children under the age of ten years, and any of the older children who found difficulty with the five point scale, were presented with the scale supplemented with faces showing increasing degrees of distress. The one conclusion that we can draw from this, is that the scale has limited use for younger children if children aged over ten years found it too difficult to use.

Richter et al (1986) conclude that children aged nine years and older could use a five point scale to monitor their headaches. They validated the instrument by comparing the headache activity of two treatment groups with a placebo control group. Unfortunately, there were no significant differences in intensity between the three groups. It remains unclear whether this lack of difference is a function of no treatment effect, or inadequacy of the rating scale.

Hester (1979) used two assessment tools to enable children aged between four and seven years to estimate their perceived pain intensity. These estimations were correlated with each other and with an unvalidated behaviour checklist. The lack of any significant correlations between the scores derived from the two scales, and the inconsistent findings from the correlations with the behaviour checklist allows us to conclude that the usefulness of these scales remains unproven.

The study by Eland (1981) has shown that children aged between four and five years were able to construct a three point scale using coloured squares. Children who received a skin coolant reported significantly less pain using this scale than children in a placebo condition. Although the children's choice of colour to depict pains was variable, the author claims that the tool has been validated by these results. Lollar et al (1982) also used a three colour rating scale when they asked children to estimate pain intensity experienced in a range of cartoon situations. No attempt was made to estimate reliability or validity. Perhaps it would have been more helpful if the authors had compared and contrasted different age-groups of children, rather than concentrating on the large age-range of four to nineteen years.

In a series of articles, Beyer (1984), Beyer and Aradine (1986, 1987a,b,), Aradine et al (1987) have produced data on convergant and discriminant validity of the Oucher scale. The authors argue that the scale represents the pain experience of children aged between three and twelve years of age.

These findings, if supported by further research, will certainly contradict some of the studies reviewed here which have failed to demonstrate effective pain communication in children of this age.

McGrath et al (1985) present a series of three studies which looked at the reliability and validity of visual analogue, brightness matching and facial scales. They take the convergent information from these studies as indicating that children aged five years, and older, can use these scales in a reliable way.

It appears that the same children took part in each of the studies reported. This may go some way to explain how they have yielded data which so strongly supports this position. It may be the case that these children had more practise at the tasks that they performed than other researchers have encouraged children to have. The number of children who took part in the studies, (forty in two of the studies, twenty in the other) was also relatively small given that the age-range studied of three to fifteen years.

Scott (1978) tentatively suggests, on the basis of her study, that synaesthetic pain perception may be more characteristic of children aged four to six years and that more cognitively oriented perceptions may be more characteristic of eight to ten year old children. The utility of this approach is yet to be demonstrated.

As noted in an earlier section, on verbal communication of pain, we again see that some non-verbal studies have concentrated upon the child describing their own experience, whilst others have asked the child to describe, in a more abstract way, the experience of others. Both types of study are necessary to throw light on the problems in this area.

4.3. BEHAVIOUR STUDIES

4.3.1. Injections

Hester (1979) investigated forty-four children aged four to seven years. She sought to observe correlations between their behavioural responses to, and their subjective ratings of, the experience of immunisation. The children completed two assessment tools. These were, Eland's projective tool and Hester's poker-chip tool. During the injection the child was assessed on four behavioural categories described by McCaffery (1972) and Zborowski (1969) i.e. vocal, verbal, facial and motor responses.

Analysis of the data showed that vocal responses correlated positively and significantly with responses on both Eland's tool and the poker-chip tool. Verbal responses and the response to Eland's tool were not signficantly correlated. However, the children's verbal responses and the response to the poker-chip tool were positively and significantly correlated.

The facial expressions score was a sum of scores received on forehead, eye, and jaw behaviour. The facial expression scores were significantly negatively correlated with Eland's tool and the poker-chip tool. There were no correlations between the child's motor responses and his response to Eland's tool but there was a significant negative correlation with the child's motor responses and his response to the poker-chip tool.

The results of this study show that vocal and verbal behaviours were more strongly correlated with the poker-chip tool than Eland's tool. Facial expressions were negatively correlated with both tools. Motor behaviour was significantly negatively correlated with the poker-chip tool but not with Eland's tool. Hester suggests two possibilities for this finding, i.e. the behaviour tool for facial expression and motor behaviour is not valid for this age group or the motor behaviour and facial expression may be gating mechanisms used by children to abate pain. The children who respond to painful stimuli with facial or motor behaviour may actually feel less pain.

Johnson and Strada (1986) investigated the acute pain responses in infants from a multi-dimensional perspective. The subjects were fourteen babies who were either two months (N = 9) or four months (N = 5) of age. The procedure was as follows: the baby's arm was swabbed with alcohol and then injected subcutaneously with a needle. Recordings were made thirty seconds prior to, and forty-five to sixty seconds post, injection. Two video recordings were made, one of the face and the other of the body. Audio tape recordings were made of the voice. Four different approaches to measuring behavioural response to acute pain were utilised: facial expression, body movement, crying and heart-rate.

The authors note the extreme variability between the infants. However, the important finding was that facial expression showed less variability among the infants than did the other measures. There were only three infants who did not have what the authors describe as the perfect pain-face configuration, and they had two of the three components. This pain face configuration is derived from the independant rating of three facial segments; forehead and brow, eyes and nose-ridge, and mouth.

It is interesting to note that it took ten hours of training for the two raters to reach a high agreement. The raters were paediatric nurses, and the authors note that this may have been in their favour. Is this destined to be merely a research tool?

4.3.2. Bone marrow aspirations

Jay, Ozolins, Elliott and Caldwell (1983) investigated the relationship between children's distress and a number of psychosocial, medical and demographic variables. The subjects in this study were forty-two paediatric cancer patients undergoing bone marrow aspirations. The sample included twenty-six males and sixteen females who were distributed among three age-groups:

Age-group 1, were aged 2 to 6 years, and contained 12 males and 5 females.
Age-group 2, were aged 7 to 12 years, and contained 9 males and 8 females.
Age-group 3, were aged 13 to 20 years, and contained 5 males and 3 females.

Parental measures were obtained from thirty of the forty-two subjects. Several questionnaires were administered to the parents and children. The instrument of interest to us is the Observation Scale of Behavioural Distress (OSBD). This scale is a revised version of the Procedural Behaviour Rating Scale, which was developed by Katz, Kellerman and Siegel (1980). The scale consists of eleven operationally-defined behaviours indicative of anxiety and/or pain in children. Since anxiety and pain are difficult to distinguish in acute clinical situations, the term behavioural distress is used to encompass both constructs. The OSBD was used as follows:

1) Behaviours were recorded in continuous 15 second intervals within each of the four phases of the bone marrow aspiration.
2) Each behavioural category in the scale is weighted according to intensity because, the authors argue, most observers would agree that screaming and flailing are more intense indicators of distress than verbal expressions of anxiety and pain.

In addition to this behaviour rating scale, the other measurement of interest was that the older children used a pain thermometer to rate their anticipated pain before the procedure, and after the procedure they rated the pain they had experienced.

One observer recorded the occurrence of distress-related behaviours during fifteen second intervals throughout the four phases on the OSBD. After the procedure was completed, children aged eight years or older were asked to estimate, on the pain thermometer, the pain they had experienced.

Results show that there were statistically significant differences found between children of different ages on the following behaviour categories: cry, scream, restraint and verbal resistance. Children between the ages of two and seven years of age exhibited these behaviours more frequently than children in the two older age-groups.

The total distress scores (the summation of scores across all phases) indicated a significant effect of age. The difference lay between group one, and the other two groups. There were no differences between groups two and three.

The OSBD total distress scores were highly significantly correlated with children's pain thermometer ratings of their anticipated pain (r=0.76) and significantly correlated with their ratings of the experienced pain (r=0.62).

In conclusion, the authors argue that the OSBD was found to constitute a valid measure of children's distress. Observation scores from the OSBD correlated significantly with parent and child's self-report measures of anxiety and distress. Therefore, they conclude that the observation scale is a reliable and valid instrument that may be used to measure children's distress in other medical procedures. The distress levels, infered from their behaviour, of children under seven were at least five times that of older children. Analysis of age trends indicates that these distress levels dropped dramatically between the ages of six and seven.

The final comment by the authors is that although children over the age of seven exhibit lower levels of behavioural distress, the need for intervention with older children is revealed more convincingly through self-report measures. Of course, in this study, self-report measures were only used with children of eight years and older.

Le Baron and Zeltzer (1984) carried out an assessment of acute pain and anxiety in children and adolescents by the use of a behaviour check-list, self-reports and observer-reports. The subjects in this study were patients aged between six and eighteen years of age who were receiving bone marrow aspirations (BMA). There were twenty-one females and twenty-nine males. The mean ages of the children were, females 10.1 years and males 10.8 years.

This study measured five behaviours using the Procedure Behaviour Check List (PBCL). This was made up of the following behaviours which were operationally defined: muscle tension, screaming, crying, restraint used, pain verbalised, anxiety verbalised, verbal stalling, physical resistance. The intensity of each behaviour was rated by the observer on a 1-5 scale, with 1 being very mild and 5 being extremely intense. All eight behaviours were identical or similar to items on the Procedure Behaviour Rating Scale developed by Katz et al (1980). It can be noted that some of the behavioural definitions are partly overlapping.

The BMA was divided into three time periods and the behavioural check list was completed once during each of the three periods. During a typical BMA, time 1 encompassed four to six minutes, time 2 about two to three minutes and time 3 about two to four minutes.

In addition to completing the behavioural check-list immediately following the BMA procedure, the observer also rated patient anxiety and pain in relation to times 1, 2 and 3. She then asked the patient to rate both pain and anxiety separately for each of the three time periods. Both the observer and patient ratings were based on a five point scale, 1 = no pain or anxiety, to 5 = extreme pain or anxiety. For children less than ten years, and for any of the older children who had difficulty with the self-rating procedure, the numbers were presented together with faces showing increasing degrees of distress. The observer asked the child to point to the face that showed how scared or how much hurting he or she felt.

In discussing the results of the study the authors note that during times 1 and 3 relatively fewer behaviours were observed for both older and younger children than during time 2, and the scores for these two age groups differed significantly only during the actual BMA procedure. The correlation between age and total PBCL score was highly significant.

Younger patients were significantly more likely than adolescents to cry, scream, express verbal anxiety and to need restraint at some time during the procedure, thus the tendency for older adolescents to show physical self-control and fewer emotional outburts. This is similar to the finding of Katz et al (1980).

An interesting finding is that post hoc analysis showed that the adolescents were exhibiting an increase in such behaviours as flinching and groaning relative to the younger age groups. If these two additional behaviours were added to the PBCL, then the significant age difference found during time 2 does not exist.

The PBCL scores correlated significantly with independent observer ratings of pain and anxiety during times one, two and three. Patients self rating of pain and anxiety were significantly correlated with PBCL scores at times one and two only. The PBCL scores correlated more strongly with observer ratings of pain and anxiety than with patients ratings of pain and anxiety during all three phases. These correlations suggest that:

a) Behaviours on the PBCL express varying combinations of pain and anxiety depending on circumstances and the individual patient.
b) Behaviours on the PBCL are related more strongly to observer than to patient ratings, either because patients are less reliable reporters, or their self rating reflect their private experience of suffering, whereas observable behaviour reflects a more inter-personal dimension of pain and anxiety.

In conclusion, the authors note that the relationship between anxiety and sensory components of pain and the distinction between pain and suffering is very difficult to make, especially for children. However, they go on to say that few children had difficulty distinguishing between the concepts of being 'scared' and 'hurt'. Thus they believe that the largest difficulty in assessing these variables resides in their mutual inter-dependence more than in a cognitive inability or unwillingness of some patients to think carefully about the ratings.

4.3.3. Surgical procedures

Abu-Saad (1984) and Abu-Saad and Holzmer (1981), used a convenience sample of ten, nine to fifteen year olds who were undergoing surgical procedures. Eight sets of measurements were made on each child on the first and second post-operative day. Each child was seen on four occasions by the investigator.

Data was collected at each data point as follows. During each visit, the investigator noted the child's behaviour, in the following three areas:

a) vocalisations: grunting, screaming, groaning, crying, gasping, sobbing;
b) facial expressions: clenched teeth, tightly shut lips, widely opened eyes, wrinkled forehead, biting of lower lip;
c) body movement: immobile, purposeless, protective, rhythmic or rubbing.

The children also rated the severity of the pain they were experiencing on a 10cm visual analogue scale. Physiological parameters were also measured: pulse, respiration, blood pressure.

In discussing the results of the study, the authors note that all behavioural categories were used by at least one child. They do not present a separate analysis for each of the behavior categories, but they do show that the overall frequency of pain indicators was significantly correlated with the children's responses on the visual analogue scale.

The authors go on to claim that the analysis supports the validity of the visual analogue scale as an indicator of the pain level of school age children. One assumes that they had made the assumption before the study commenced that the behaviours they were recording were reliable and valid indicators of pain.

4.3.4. Summary of behaviour studies

Overall behaviour findings have been considered in the above studies. However, the following four sub-sections draw together the findings for vocalisations, verbalisations, body movement and facial expression, where these are reported separately, in the above studies.

Vocalisations: Johnson and Strada (1986) found that the cry data for two and four month old babies was highly variable. Therefore, it was not possible to determine if there was a specific "pain signature" to the cry.

Hester (1979) showed, in her study of four to seven year olds, that the frequency of the children's vocalisations during injections was positively and significantly correlated with the children's self-rated pain intensity estimates derived from two assessment tools.

In their study of six to eighteen year olds, Le Baron and Zeltzer (1984) found that younger patients produced more vocalisations, that is, crying and screaming, than older children. However, the finding of increased groaning in the adolescent group, which when included in the analysis removed a large part of the difference between the younger and older children, may illustrate that the the difference occurs because the older children control, or manage, their vocalisations.

Jay et al (1983) found that children between the ages of two and seven years exhibited more crying and screaming than older children. Distress levels were found to drop dramatically between the ages of six and seven.

Verbalisations: Hester (1979) in studying children aged four to seven years found that the frequency of verbal responses was not significantly correlated with the children's responses on Eland's projective tool. These verbal responses were positively and significantly correlated with Hester's 'poker chip tool'.

Verbal resistance was found to be more common in the two to seven year old age-group, than in older children, in the study by Jay et al (1983)

Body movement: In their study of young babies, Johnston and Strada (1986) found a high inter-rater agreement for observed body movements and from this finding argue that this dimension could be easily used clinically. However, they do go on to warn that there are no body movements which are specific to a pain reaction.

Hester (1979) found that children's motor responses were not significantly correlated with their self-assessment of pain intensity on Eland's projective tool. These motor responses were negatively correlated with the children's self assessment of pain intensity on Hester's 'poker chip tool'.

Jay et al (1983) and Le Baron and Zeltzer (1984) found that children aged between two and seven years more often required physical restraint whilst undergoing a painful procedure than older children.

Facial expression: Johnston and Strada (1986) report as their most important finding that facial expression showed less variability amongst infants receiving injections than any of the other measures taken. All of the infants in the study showed at least two of the three components of what the authors describe as a 'pain-face configuration'.

An unexpected finding reported by Hester (1979) was that facial expression scores were significantly negatively correlated with self-assessed pain intensity estimates on both Eland's projective tool and Hester's poker chip tool.

4.4. Comment on empirical work

Although it is only by verbal descriptions that we can capture the full meaning of the pain experience, these descriptions have not been rigorously researched in clinical work with children. The few studies presented earlier, although acknowledging the potential importance of children's verbal pain descriptions, were not able to use these descriptions to any effect. It still remains unclear as to whether verbal descriptions are a potentially meaningful way of children communicating their pain.

It is even more unfortunate that research on healthy children's pain describing ability has revealed so few insights. Research has shown that children do have some verbal ability to describe pain. However, there have been no attempts to relate children's ability to the literature on literal and figurative semantic development. It is, intuitively, somewhat surprising that research to date has not revealed any clearly identifiable developmental trends in this area.

In contrast, studies of children's general concept of pain, and causality of pain in general have shown developmental trends, within a Piagetian framework.

The first five experiments, outlined briefly below and detailed in chapters two, three and four, are an attempt to investigate further children's verbal abilities.

Non-verbal pain estimation concentrates on the single dimension of intensity, which, although less satisfactory than verbal, is thought at least to reflect the older child's perception of that dimension. The studies reported have shown that the use of the visual analogue scale holds the most promise for children communicating their pain.

One weakness of these studies has been that data for both older and younger children have been included in the same analysis. Therefore, it remains unclear by which age children are able to reliably use these scales. A second problem is that the question of reliability is further confounded by the problem of presenting children with the same noxious stimulus at different times against which to make their intensity estimates.

Experiment six, presented in chapter five, is a study which is designed to determine by what age children can reliably use visual analogue scales.

Behaviour as an indicator of the amount of pain a child is experiencing is perhaps the most difficult to discuss. Clearly many individuals find behaviour the most 'comfortable' indicator of the pain a child is experiencing. After all, it is there, it can be seen, if necessary it can be measured over time. Estimates of intra and interrater reliability can be calculated for individuals rating the occurrence of these behaviours. But the question remains as to whether observable 'pain behaviour' is only an illusion of their validity as indicators of pain. Although it is possible to measure behaviour reliably, this, of itself, does not necessarily mean that it is a valid indicator of pain.

Experiment seven is the final study, which looks at children's pain behaviours, and how these behaviours are influenced when the children were given an analgesic.

5. RATIONALE BEHIND THE STUDIES UNDERTAKEN

Historically, there have been two kinds of approach to the study of pain:

a) the use of laboratory techniques to produce and measure pain in people who are not normally in pain.

b) the use of tools to measure, or otherwise assess, pain in patients who are suffering acute or chronic pain.

With adults, laboratory induced pains are of importance in that they enable researchers to carry out the precise manipulation of variables in controlled studies. Clearly, children cannot be subjected to laboratory induced pains. This serves to highlight the first problem that was encountered. In the studies presented, it was wished to maintain control of the noxious stimuli, and then measure the children's varying responses to these fixed stimuli. But how could this be done, within ethical limits?

Another relevant point, as was observed earlier, is that until fairly recently, pain measurement has concentrated upon treating pain as a specific sensory quality varying only in intensity. But, researchers have now come to acknowledge what the rest of the world already knew; each pain has its unique qualities. The pain of a toothache is qualitatively different to that of a pinprick! Thus the second problem was that it was necessary to present a range of noxious stimuli, of varying qualities, as well as of varying intensities.

The third problem encountered was the problem of traditional experimental designs. This is perhaps best illustrated by a brief consideration of the study conducted by Dubuisson and Melzack (1976). The essence of the study was that individuals suffering from one of eight clinical conditions completed a verbal pain questionnaire. Subsequent analysis of these questionnaires showed that the individual's responses provided a correct classification for 77% of the cases. That is, on the basis of the words chosen to describe the quality and intensity of the pain experienced, for 77% of the cases one could say which of the clinical conditions the individual was suffering from.

The problem highlighted by this study is the use of between-subjects experimental design. There were different individuals suffering each of the clinical conditions. In terms of our wish to look at whether an individual responds differently across a range of painful situations, a within-subjects experimental design is needed. For children, does everything noxious merely 'hurt', or do children appreciate the different qualities of pain involved in different situations? This is yet another reason to have control of a range of stimuli.

Therefore, we are in the position of wanting to present a range of painful stimuli to a range of children of various ages, and then be in the position to measure the children's responses to these stimuli. The paradox is that, at the same time, we cannot inflict pain on the children. One solution was to present visual stimuli to the children that they knew would be painful if they were actually experiencing it. One could then measure their varied responses to these constant stimuli.

To this end a series of photographs of five situations was produced that the children recognised as being painful. For each situation, a set of three photographs depicted a child carrying out a sequence of actions which culminated in a discrete painful experience. A short explanatory sentence accompanied the photographs. Neisser (1976), indirectly points toward this solution as being a means of determining the extent and the degree of sophistication of an individual's cognitive structures that he calls schemata, anticipations, or preparedness for what they would experience if the event were to happen. Therefore, we are now in a position to investigate children's pain communicating abilities based on these constant stimuli. The following section gives a brief outline of the studies undertaken.

6. EXPERIMENTS UNDERTAKEN

As stated, the aim of this thesis is to provide empirical data on children's ability to undertake verbal and non-verbal pain description. Seven experiments were undertaken. Experiments one to six were carried out on non-clinical populations; experiment five on a clinical population. Full details of the studies will be given later, but broadly they addressed the following questions:

6.1. Experiments One to Three

An investigation of the 'sense' of pain descriptors.

a) Do children have available a lexicon of pain descriptors?
b) Do these descriptors share the same meaning for children and adults?

6.2. Experiment Four

An investigation of the 'referent' of pain descriptors

a) Can children use language to describe and discriminate between several pain situations?

6.3. Experiment Five

An investigation of children's pain schemata.

a) Can children recall and describe their own past painful experiences?
b) When do children begin to use figures of speech to describe these experiences?
c) Which words can children spontaneously generate as pain descriptors?

6.4. Experiment Six

An investigation of children's non-verbal estimation.

a) Can children use non-verbal rating scales to estimate pain intensity in a reliable way?

6.5. Experiment Seven

An investigation of children's pain behaviour.

a) When undergoing a painful procedure, does the child's behaviour change when given an analgesic?
b) Does the child's self report of pain reflect his change in behaviour?

CHAPTER TWO

An investigation of the 'sense' of pain descriptors

1. INTRODUCTION

This chapter presents three inter-related studies which are designed to determine whether children could use language, in a reliable way, to describe their pain. In order for us to conclude that children had the ability to do this we would have to show not only that they appreciated that certain words could be used as pain descriptors, but also that their use of these pain descriptors represented the same quality and intensity of experience as it does for other children and adults.

If we can show that children of a given age can at least recognise pain words, and we can also show that these words have a meaning which is shared by other children and adults, we have a basis for further study of language as a means of communicating, in a reliable way, their pain.

2. EXPERIMENT ONE

2.1 INTRODUCTION

This first experiment addresses the question of whether children of different ages have available a lexicon of pain descriptors. To begin to answer this question, we need a collection of words which describe pain.

On the basis of an introspective analysis of the qualities of tactual sensation, Titchener (1920) derived what he believed to be four distinctive, qualitatively different, categories of pure pain experience; prick, clear pain, quick pain, and ache. Dallenbach (1938) later brought together a list of forty four words describing pain qualities and classified some of the words into five groups, characterising:

a) the temporal course of the experience, e.g. palpitating, throbbing.
b) its spatial distribution, e.g. penetrating, radiating.
c) its fusion or integration with pressure, e.g. heavy, pressing.
d) its affective colouring, e.g. savage, ugly.
e) its purely qualitative attributes, e.g. achy, bright, dull, itchy, pricking.

Using these words and others gleaned from the clinical literature on pain, Melzack and Torgerson (1971) arrived at a final list of ninety-six words which they felt adults could use to describe pain.

This current study is, in essence, a word recognition task. In the introductory chapter, a criticism was levelled against studies of children's use of language to describe pain. When children are presented with pain descriptors from which to select those words which describe their pain we need, as far as possible, to ensure that they are not merely guessing when they choose a particular word. In the clinical situation, we may never know if the child, or adult's, choice of a word to describe their pain is valid, or even reliable. However, even in the non-clinical situation we can determine children's, and adults, ability to discriminate pain from non-pain descriptors.

Having decided to include adjectives that did not describe pain in this part of the study, we could ensure that the subjects were not appearing to do well at detecting pain descriptors by merely saying 'yes', to any word which was presented to them. To display discrimination between pain and non-pain adjectives, subjects would have to pick out from this 'mixed bag' of words, only the pain descriptors.

2.2 METHOD

2.2.1 Subjects

Five groups of children aged five (N=26, mean age=5.4, range=5.0-5.9), six (N=24, mean age=6.7, range=6.2-6.11), seven (N=35, mean age=7.7, range=7.1-7.11), nine (N=34, mean age=9.6, range=9.0-9.10), and eleven (N=33, mean age=11.5, range=11.1-11.11), and an adult comparison group (N=34, mean age=30.4, range=25.3-42.5) were tested.

The children attended either a council Mixed Infant School or council Mixed Junior School in the Durham area. The adult comparison group were parents of children who attended these two schools, and were recruited via a letter sent to parents asking for volunteers to take part in a study of children's language development. No attempt was made to stratify the children or parents by social class or intelligence.

2.2.2 Materials

The words used in this study were taken from a study conducted by Melzack and Torgerson (1971). These words were adjectives which they hypothesised adults might use to describe pain. These words were matched with non-pain adjectives which were taken from "The Teacher's Handbook of 30,000 words" (Thorndike and Lorge 1943), giving 192 words in all. The matching of the pain and non-pain words was made on the basis of similar frequency of occurrence, and the same overall characteristics as the pain-describing words; i.e. the same number of syllables, similar length and similar sound (Tables 2.1 and 2.2, on pages 85 and 86).

2.2.3 Procedure

Each of the 192 words was printed onto individual cards. These cards were shuffled and presented one at a time, in random order, to each subject.

To avoid reading difficulties the words were read out to each subject. The subject's task then was to respond 'yes' or 'no' to the question, "Could we say a pain felt ..." followed by one of the 192 words. This procedure was repeated until all 192 words had been presented. Subjects 'yes' or 'no' responses were recorded on an alphabetical listing of the words. Each person was seen for one session which lasted about twenty minutes.

Prior to the running of the experiment, it had been found necessary to prefix each word by this or a similar short sentence as the younger children soon appeared to forget the purpose of the task if shown merely a list of words. This can be a very tedious task for the child. If it became apparent that the child's attention was wandering it became customary to have a short break of a few seconds during which the experimenter diverted attention by asking the child general questions about school. This was enough to concentrate the child's attention on the task once more.

2.3 RESULTS

The results of this experiment are presented in Tables 2.1 and 2.2. These tables show the individual pain describing adjectives proposed by Melzack and Torgerson, along with their matched control adjectives, with the percentage number of children and adults who selected both types of adjective as being pain descriptors.

It is apparent from these results that the nine year olds, and older, children, and the adults, are choosing

Table 2.1

SENSORY CLASS AND NON PAIN MATCHED WITH PERCENTAGE NUMBER OF SUBJECTS WHO CHOSE THE WORDS AS PAIN DESCRIPTORS

(A = ADULT)

		Age							Age					
		5	6	7	9	11	A		5	6	7	9	11	A
Temporal	Flickering	24	13	17	6	15	9	Flaking	32	13	-	-	-	-
	Quivering	36	13	23	15	29	9	Quavering	12	9	-	-	-	-
	Pulsing	16	4	20	15	11	68	Pleasing	16	4	-	-	-	-
	Throbbing	32	-	26	57	71	91	Sobbing	16	4	-	-	-	-
	Thumping	44	17	49	68	65	50	Ticking	28	13	17	3	-	-
	Beating	32	13	31	37	35	15	Beaming	28	-	6	3	-	-
	Pounding	20	13	11	38	40	71	Pouncing	20	17	9	9	6	20
Spatial	Spreading	32	17	49	62	41	32	Leaden	24	4	9	-	-	-
	Jumping	32	13	34	17	18	15	Jutting	24	-	-	-	6	3
	Radiating	28	4	11	3	3	17	Ravishing	28	9	-	-	-	-
	Flashing	24	4	14	9	20	26	Flaunting	12	4	3	-	-	-
	Shooting	44	9	23	29	20	76	Shaking	28	9	40	-	24	-
Punctate Pressure	Pricking	28	26	71	56	62	56	Pickling	12	9	6	-	-	-
	Boring	40	35	54	22	29	3	Borrowing	24	4	-	-	-	-
	Drilling	24	17	31	15	26	11	Dribbling	16	13	6	-	-	-
	Penetrating	16	13	11	9	15	62	Denegrating	28	9	6	-	-	-
	Piercing	24	13	17	29	50	80	Fearsome	24	4	3	-	-	-
	Stabbing	28	17	63	62	68	100	Stacking	20	17	3	3	-	-
	Lancinating	12	-	-	-	-	-	Languishing	20	4	-	-	-	3
Incisive Pressure	Sharp	32	48	69	65	62	91	Large	28	13	-	-	-	-
	Cutting	20	17	51	41	35	50	Crashing	32	9	-	-	-	-
	Lacerating	20	9	-	-	-	41	Irritating	44	17	-	-	-	-
Constrictive Pressure	Pinching	36	26	49	35	53	41	Pining	28	9	6	-	-	-
	Nipping	44	26	63	62	65	29	Neighing	24	-	3	-	-	-
	Tight	40	17	46	15	35	50	Light	40	4	-	-	-	-
	Pressing	36	4	43	24	47	41	Presiding	20	4	3	-	-	-
	Gnawing	24	13	17	3	-	90	Napping	40	4	11	-	-	-
	Binding	28	-	3	-	-	6	Bounding	40	4	6	3	-	-
	Gripping	32	13	40	26	26	76	Grooming	32	13	-	-	-	-
	Biting	28	17	77	41	41	74	Bidding	20	-	3	-	-	-
	Squeezing	28	13	40	20	32	17	Squabbling	24	22	6	-	3	-
	Cramping	32	13	37	41	71	76	Cracking	20	22	3	-	3	-
	Crushing	28	9	37	35	35	53	Crumbling	28	13	9	-	-	-

		Age							Age					
		5	6	7	9	11	A		5	6	7	9	11	A
Traction Pressure	Tugging	20	17	34	29	32	17	Struggling	28	13	6	-	3	-
	Pulling	32	22	46	17	47	9	Puffing	24	22	14	15	-	-
	Wrenching	28	4	6	17	15	37	Writing	32	9	-	-	-	-
Thermal	Hot	36	48	54	43	65	32	Short	24	-	-	-	-	-
	Burning	28	22	60	71	59	91	Churning	12	4	9	-	3	24
	Scalding	24	22	51	65	59	91	Scanning	16	-	9	-	-	-
	Searing	12	4	3	-	-	88	Searching	20	20	9	-	-	9
Brightness	Tickling	32	66	46	56	68	6	Tidying	24	9	-	-	-	-
	Tingling	36	9	31	71	62	68	Tinkering	12	9	3	-	-	-
	Itchy	36	43	63	76	71	24	Stingey	28	4	-	-	-	-
	Smarting	28	-	3	-	6	71	Smelling	24	9	9	3	3	-
	Stinging	56	48	97	91	91	71	Stifling	20	17	14	-	-	15
Dullness	Dull	20	13	54	20	18	83	Dumb	36	13	-	-	-	-
	Sore	44	87	91	100	100	56	Gaudy	28	-	-	-	-	-
	Blurred	28	13	9	20	15	11	Slurred	20	4	6	-	-	-
	Drawing	20	17	14	-	9	9	Draping	24	13	-	-	-	-
	Numbing	20	4	6	41	50	68	Nudging	36	9	6	-	-	-
	Hurting	60	78	100	100	100	91	Hurrying	32	4	6	-	3	-
	Aching	56	61	94	100	100	91	Baking	28	9	-	-	-	-
	Heavy	48	17	34	17	32	21	Hearty	20	9	-	-	-	-
	Steady	32	17	17	15	12	24	Sturdy	16	13	6	-	-	-
Misc.	Tender	8	9	26	24	20	29	Amber	20	-	-	-	-	-
	Taut	24	-	-	-	3	15	Tart	24	4	-	-	-	-
	Rasping	20	4	3	-	-	26	Gasping	28	9	-	-	-	-
	Tearing	28	13	20	9	32	43	Teaching	28	13	-	-	-	-
	Splitting	28	22	43	29	50	57	Spluttering	24	9	23	-	3	-

Table 2.2

AFFECTIVE AND EVALUATIVE CLASS AND NON PAIN MATCHED WITH PERCENTAGE NUMBER OF SUBJECTS WHO CHOSE THE WORDS AS PAIN DESCRIPTORS

(A = ADULT)

		Age 5	6	7	9	11	A		Age 5	6	7	9	11	A
Tension	Nagging	12	13	14	12	26	80	Wagging	28	–	9	3	–	1
	Dragging	24	9	26	6	24	29	Sagging	28	9	6	–	–	–
	Tiring	32	22	51	53	53	29	Typing	20	–	–	–	–	–
	Fatiguing	24	–	3	–	3	50	Intriguing	8	4	–	–	–	–
	Exhausting	24	22	29	53	46	62	Exclaiming	24	9	–	–	–	–
Autonomic	Choking	44	22	43	37	53	43	Chatting	12	9	6	–	–	–
	Sickening	44	26	63	57	71	80	Silvery	28	13	–	–	–	–
	Suffocating	40	17	37	26	38	38	Saturating	24	9	–	–	–	–
	Nauseating	36	17	9	–	–	71	Navigating	20	9	3	–	–	–
Fear	Fearful	8	17	49	43	35	29	Cheerful	20	17	6	–	3	–
	Dreadful	40	48	80	94	71	83	Helpful	12	13	–	–	–	–
	Frightful	28	30	57	68	34	68	Delightful	16	9	–	–	–	–
	Terrifying	40	39	57	71	41	62	Electrifying	16	9	–	–	–	–
Punishment	Punishing	24	26	31	15	32	43	Prominent	16	17	3	–	–	9
	Gruelling	32	–	9	3	11	29	Groundless	32	–	6	–	–	–
	Racking	28	9	11	–	–	–	Barking	16	9	3	–	–	–
	Cruel	20	26	60	62	32	43	Crafty	36	17	–	–	–	–
	Vicious	20	22	34	43	43	68	Vigorous	20	4	6	3	–	–
	Torturing	32	17	51	37	56	68	Posturing	12	9	–	–	–	–
	Killing	48	35	89	68	50	62	Willing	32	4	–	–	–	–
Misc.	Grinding	32	22	23	15	29	37	Greying	12	–	–	–	–	6
	Wretched	36	22	17	29	17	62	Wrinkled	36	13	9	–	–	–
	Awful	56	70	89	92	89	89	Doleful	24	4	14	–	–	–
	Wicked	28	22	49	26	29	26	Winged	16	9	3	–	–	–
	Blinding	28	9	9	26	32	80	Blinking	36	13	6	–	6	3

		Age 5	6	7	9	11	A		Age 5	6	7	9	11	A
Evaluative	Distracting	28	13	29	41	32	6	Protracted	12	13	–	–		–
	Annoying	40	43	77	80	77	83	Trying	40	9	–	–	–	–
	Troublesome	28	26	46	29	38	68	Cumbersome	20	4	–	–	–	11
	Bearable	16	–	14	35	32	85	Wearable	28	–	–	–	3	3
	Miserable	36	30	71	41	43	37	Biddable	28	13	–	–	–	–
	Ugly	32	4	17	–	6	11	Ungainly	32	4	–	–	–	–
	Intense	32	22	11	41	29	80	Insulting	28	13	9	–	–	6
	Violent	28	13	14	24	24	57	Velvet	20	–	–	–	–	–
	Agonising	24	21	23	57	57	91	Agreeable	16	9	9	3	–	3
	Savage	24	13	26	6	29	50	Singing	28	9	6	–	–	–
	Unbearable	44	13	29	65	71	88	Unforgiveable	32	9	–	–	–	–
	Intolerable	24	9	14	11	15	80	International	12	9	–	–	–	–

few control words as pain descriptors. In contrast the six year olds are tending to choose more of the control words as pain descriptors. For the five year olds we can see that they are not discriminating between the pain and control words.

This difference between age-groups is clearly illustrated in Fig. 2.1. This shows the mean number of pain and control words chosen as pain descriptors by each group of subjects.

Fig. 2.2, shows the difference between the number of pain and control words selected by the children.

The number of words chosen as pain descriptors by the children and adults ranged from 0, through to 90 (Table 2.3).

2.4 DISCUSSION

As might be expected, some false positive responses were made but, as we see in Fig. 2.1, these did not form a significant proportion for the seven, nine and eleven year olds, or adults. For the five and six year olds, however, it is clear that younger children are likely to select non-pain adjectives as being potential pain descriptors.

If we only had the information on the number of pain adjectives chosen by the children, we would have to explain a very puzzling picture. The five year olds are saying that they recognise more pain describing adjectives than the six year olds! However, because we have data on the number of control non-pain words they incorrectly selected as pain descriptors, we can see clearly that the five year olds are not discriminating at all between pain and non pain adjectives.

As we noted in the introductory chapter, Fabrega and Tyma (1976) have argued that there are four primary

MEAN NUMBER OF PAIN AND CONTROL WORDS CHOSEN AS PAIN DESCRIPTORS BY THE CHILDREN AND ADULTS

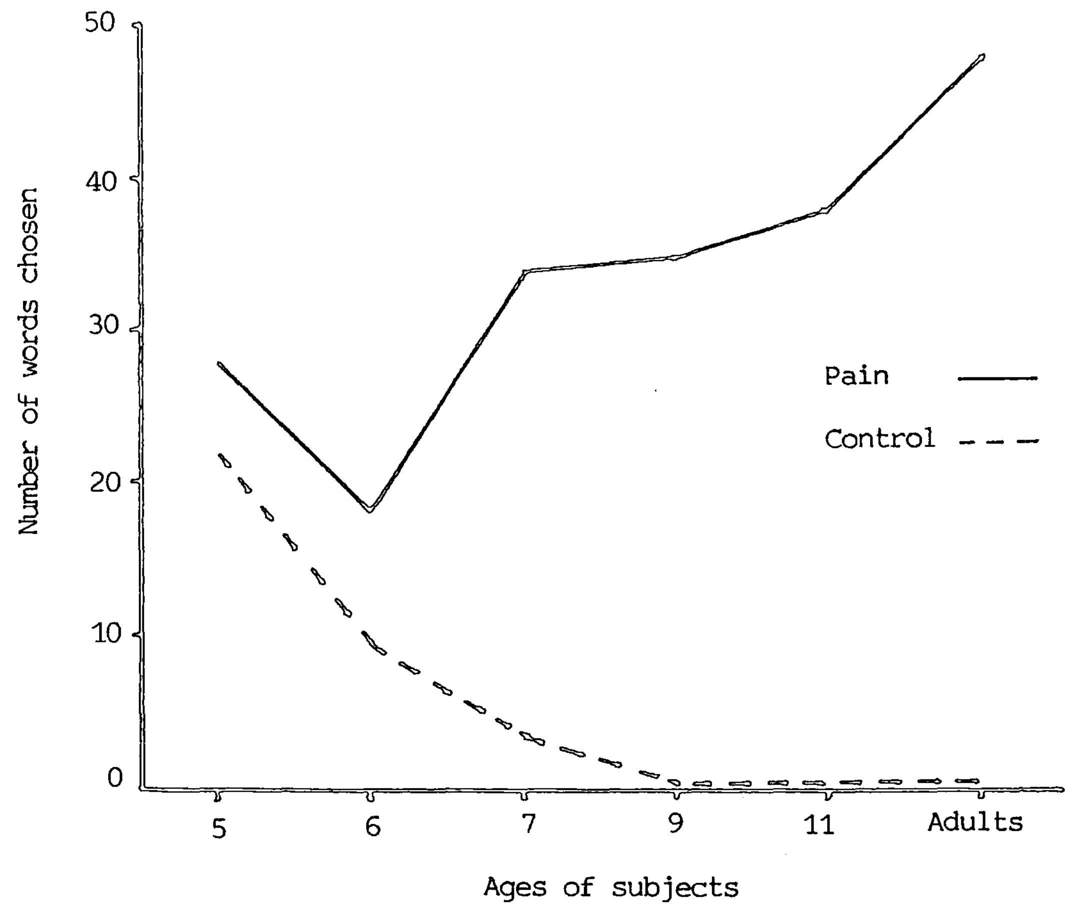
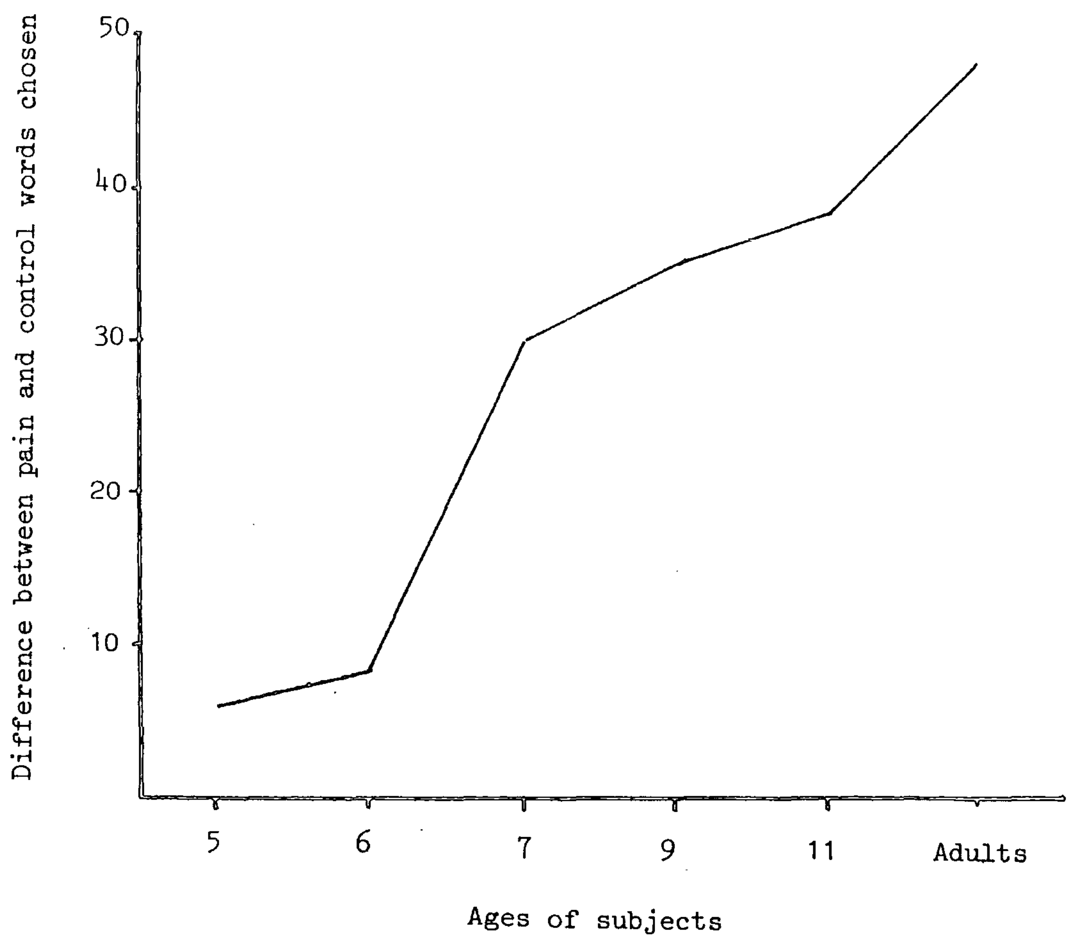


Fig. 2.1



Difference between the number of pain and control words selected by the children

Fig. 2.2

Table 2.3

NUMBER OF WORDS CHOSEN AS PAIN DESCRIPTORS

AGE	MINIMUM	MAXIMUM	MEAN	S. DEVIATION
5	0	90	28	26.2
6	0	42	18	14.1
7	4	69	34	17.8
9	14	62	35	12.5
11	7	72	38	16.0
ADULTS	5	80	48	17.3

pain descriptors in English: pain, sore, ache and hurt. Three of these were included in the words presented to the children: sore, ache and hurting. It was also speculated that children may acquire these pain descriptors first, as their initial entries in their pain describing lexicon.

We can see that the vast majority of the seven, nine and eleven year olds selected these words as potential pain descriptors. These descriptors were also the most popular with the five and six year olds, although they were chosen less often than by the older children. Hurting and aching were also selected by the majority of adults, whilst sore was selected by just over half of them. It may be the case that sore is looked upon by many adults as being a child-like pain descriptor, and is, therefore, dropped from the vocabulary as other pain descriptors are acquired. However, the data do seem to support the idea that these primary pain descriptors are the first pain descriptors acquired.

A further question we need to answer is, have the children and adults attached some reliable, more specific 'meaning' to these pain describing adjectives? To recognise that a word belongs to the superordinate category 'pain descriptor' is one thing; to use it effectively and meaningfully will require a finer grained knowledge of its similarity, or dissimilarity, to other pain descriptors. The second experiment reported was designed to test this knowledge.

3. EXPERIMENT TWO

3.1 INTRODUCTION

Experiment One showed that adults, and children aged seven and older, can discriminate between pain and non-pain descriptors. Five and six year olds show very little evidence of having this ability. We might expect that the most popular pain descriptors are the words that adults and children choose most often to talk about their pains. However, we cannot assume from this that the individual perceives these words as meaning the same thing as they do to another child or adult. But if we could show that these pain words were subsequently categorised in the same way for each of the children and adults, then we could make stronger assertions as to the similarity of subjective meaning than we could previously. Therefore, this categorising ability was the subject of this second experiment, which employed a word sorting task.

Melzack and Torgerson (1971) carried out a preliminary series of experiments aimed at classifying pain words into groups. On the basis of these data, the words were categorised into three major sub-classes and thirteen sub-classes. Each sub-class was given a descriptive label (Tables. 2.1 and 2.2 on pages 85 and 86).

Melzack and Torgerson do not describe what these initial experiments were, how they were carried out, or who the subjects were. This perhaps weakens the experiments they do describe, which aimed at validating these initial suppositions. This involved subjects indicating if they agreed or disagreed that each word belonged to its designated sub-class. Melzack and Torgerson adopted an arbitrary criterion of 65% agreement. Words not achieving this level were presented in a later experiment to subjects who had to make a forced choice test to put the words in a sub-class.

As we have noted earlier, we do not know how the initial sub-classes were arrived at and the fact that the subjects in the subsequent experiment were working within a predetermined framework may have unduly affected these designations of words to categories. Ideally, one would wish to start from the position of no classification and then allow subjects to provide their own individual categories. Only in this way could we claim to be getting at each person's perception of the similarities in meaning of sub-groups of words.

As Palermo (1976) has stated, it is possible that most of the concepts, both natural and acquired, of the adult and child are the same. It is only the complexity of the relationships into which they enter that may differ. However, whilst it may be the case that the concepts of pain may be the same for adults and children, we might predict that the words used to describe these different concepts, or different qualitative categories of pain, would differ between adults and children.

For the adults we might expect a much closer clustering of peripheral members of the same category and clear distinctions between categories. For the younger child we might expect a very obscure, almost arbitrary allocation of peripheral members to a particular category and unclear boundaries between categories. At some age, as yet unknown, children will be unable to show knowledge that certain words are members of a particular category of pain descriptor, or indeed will not be able to demonstrate the existence of such things as categories of pain descriptors, even if the underlying concepts are the same as adults and older children. As noted earlier, the verbal labels used to describe pain may be arbitrary, even if, as Palermo (1976) claims, the underlying concepts are not.

The purpose of this study is to compare adult-child categorisation of pain descriptors. It was felt that a triadic comparison procedure would not only be manageable for the children and adults, but would yield very useful data. In this instance none of the groups would know that it was their categorising ability that was being tested. It was felt that any naturally occurring categories would emerge with the minimum of external influence; as well as ensuring that both groups were forced to consider all possible combinations of word meanings under investigation.

3.1.1 Triadic comparison

In the present study, the categorisation of twelve pain descriptors was investigated. The choice of this number reflects, to some degree, the limiting aspect of the triadic comparison procedure. Even using this fairly small number of words, this formula generates 220 triads from the twelve words. For example, we take words one and two with every other remaining word: words one and three with every other remaining word, and so on. In this way every possible combination of three words is presented to the subject for consideration. The task of the subject is to decide, on each occasion, which two of the three presented pain descriptors 'feels' most alike. For subjects to settle on a choice of two words they must necessarily compare their previous subjective experience of the three 'types' of pain. They then either choose two words as feeling most similar, or reject one of the three as being less like the other two. Therefore, all possible combinations of word 'meanings' are considered.

Subsequent analysis will allow us not only to uncover any categorisation present, but also consider varying degrees of strength of membership of a category for individual words. This information may prove to be useful in the assessment of the impact of the linguistic strategies described earlier. Discrepancies arising between and within groups may point to one or the other strategy as best describing the mechanism underlying the observations.

Smith and Kemler (1977) have shown that children of five years of age, and older, can carry out both the diadic and triadic comparison procedure. In their study, children were presented with shapes varying in size and hue and asked to "put together the ones that go together". Children as young as five years of age showed evidence of significant categorising ability when carrying out these triadic comparisons. The children's ability to do this task varied with the complexity of the materials with which they were presented.

Therefore, it can be concluded that if the children in this study fail to show evidence of categorising ability in the tasks presented, it is because of the complexity of the task, rather than a function of their not understanding an overly complex methodology.

3.2 METHOD

3.2.1 Subjects

The children and adult comparison group for this experiment were selected from the children and adults who took part in Experiment One; five year olds N=10, (mean age=5.6, range=5.0-5.9); seven year olds N=12, (mean age=7.7, range=7.2-7.10); nine year olds N=10, (mean age=9.4, range=9.0-9.8); eleven year olds N=10, (mean age=11.7, range=11.2-11.10) ; adults N=12, (mean age=28.7, range=25.3-35.9). There were equal numbers of males and females in each group.

3.2.2 Materials

It was decided to concentrate on four categories, or qualities, of pain descriptors as defined by Melzack and Torgerson; three words were selected from each of these categories (Table 2.4).

The choice of words chosen was made in part on the basis of the results of Experiment One, in that popular categories of pain descriptors were selected, to maximise the children's performance. It was also decided to include the Primary pain terms (Fabrega and Tyma 1976), ache, sore and hurt, to determine if these

Table 2.4

	CATEGORY	DESCRIPTOR		
1	DULLNESS	HURTING	ACHING	SORE
2	CONSTRICTIVE PRESSURE	PINCHING	NIPPING	BITING
3	THERMAL	HOT	BURNING	SCALDING
4	FEAR	DREADFUL	FRIGHTFUL	TERRIFYING

Words used in Experiment 2 - with assigned category words formed a category for the children and adults. Each subject in the experimental groups had chosen all twelve of these words as pain descriptors in Experiment One.

As indicated in the introduction, this is a triadic comparison task. The number of triads derived from twelve words is 220. This method has usually meant writing each of the twelve words on a card and then constructing the 220 triads using these cards. However, this is very time consuming and laborious. Bearing in mind the ages of the children and, therefore, their limited attention span it was felt that the use of a computer generated visual display which could at one and the same time generate triads, record the responses of the subjects and produce hard copy for subsequent analysis would be useful. This left the experimenter free to concentrate on the children.

A computer programme was written, which generated the triads and then presented them on the television screen of a Commodore PET 3032 series micro-computer, which made for ease of presentation and randomisation. Even using this method of presentation it would have taken over one hour to present the full 220 triads. Therefore, it was decided to split the session into four equal blocks each containing 55 triads. In practise this proved to work very well; each session lasted about 15 minutes.

Within the four blocks of 55 triads the frequency of occurrence of the twelve words was balanced as far as possible (not more than 18, not less than 10). The randomisation within blocks was to be the same each time the programme was run. This meant that each subject could be seen on four separate occasions, but ensured that all 220 triads were presented. The presentation of the four blocks of triads was randomised between and within subjects. The randomisation of the order of presentation within each block was such that the same word does not appear on two consecutive triads.

The same definition for each word was given to each subject, i.e. this is a word you have chosen as a pain descriptor. For the subjects to discriminate further between the words, they would have to attach their own subjective meanings to them. It was stressed at all times that it was the meaning of the pain word which was to form the basis for their responses, not how the word looked or sounded.

3.2.3 Procedure

Formal presentation was as follows. The block to be presented was selected and the first triad appeared on the screen. The words were read out aloud to ensure all the words were considered. The subjects response was to press two keys corresponding to the two words chosen as most similar. Safeguards were taken to ensure as far as possible no key press errors. After the subject had pressed the keys, the next triad appeared on the screen and so on until the 55 trials had been presented. A hard copy of the results was then produced by way of a printer attachment.

3.3 RESULTS

3.3.1 DATA ANALYSIS

Two useful techniques can be employed to enable us to look for evidence of categorisation in the data yielded by the triadic comparison procedure; Cluster Analysis and Multi Dimensional Scaling. Each of these techniques produces a pictorial representation of the data, which makes for ease of preliminary analysis.

3.3.1.1 Cluster Analysis

Clustering techniques seek to form 'clusters' or 'groups' of individuals such that individuals within a cluster are more 'similar' in some sense than individuals from different clusters; in this case these 'individuals' are the twelve pain descriptors used in this experiment. Hierarchical clustering techniques produce a solution in which some clusters are nested within other clusters. In our case the twelve pain descriptors can ultimately be thought of as occupying a semantic space. Within this space we hope to find clusters of words, which the subjects have indicated by their responses to the triadic comparison procedure, are more closely associated with one another than with the other words.

The method used proceeds by successively combining, in this case pain descriptors, into groups. This technique operates on a matrix of inter-individual similarities constructed from the number of times words were paired as being most similar by the subjects, and the results are presented in the form of dendograms which are a two-dimensional diagram illustrating the fusions which have been made at each stage of the procedure. It can be said that the dendograms are indeed summaries of the information yielded by triadic comparison.

However, implicit in any summary is the fact that we lose some information. For example, many of the original inter-individual differences may be lost. It therefore becomes of some importance to verify that the clusters yielded by this analysis are in fact real. In these cases it can be useful to obtain some further visual representation of the original similarity matrix in order that the structure implied by the dendogram may be examined further.

3.3.1.2 Multi-Dimensional Scaling

The Multi-Dimensional Scaling to be performed on the data provides for internal analysis of the matrix of 'similarities' between the pain descriptors. The resulting output shows the relationship between the pain descriptors used, in the sense that the more often associated words are linked closer together in space.

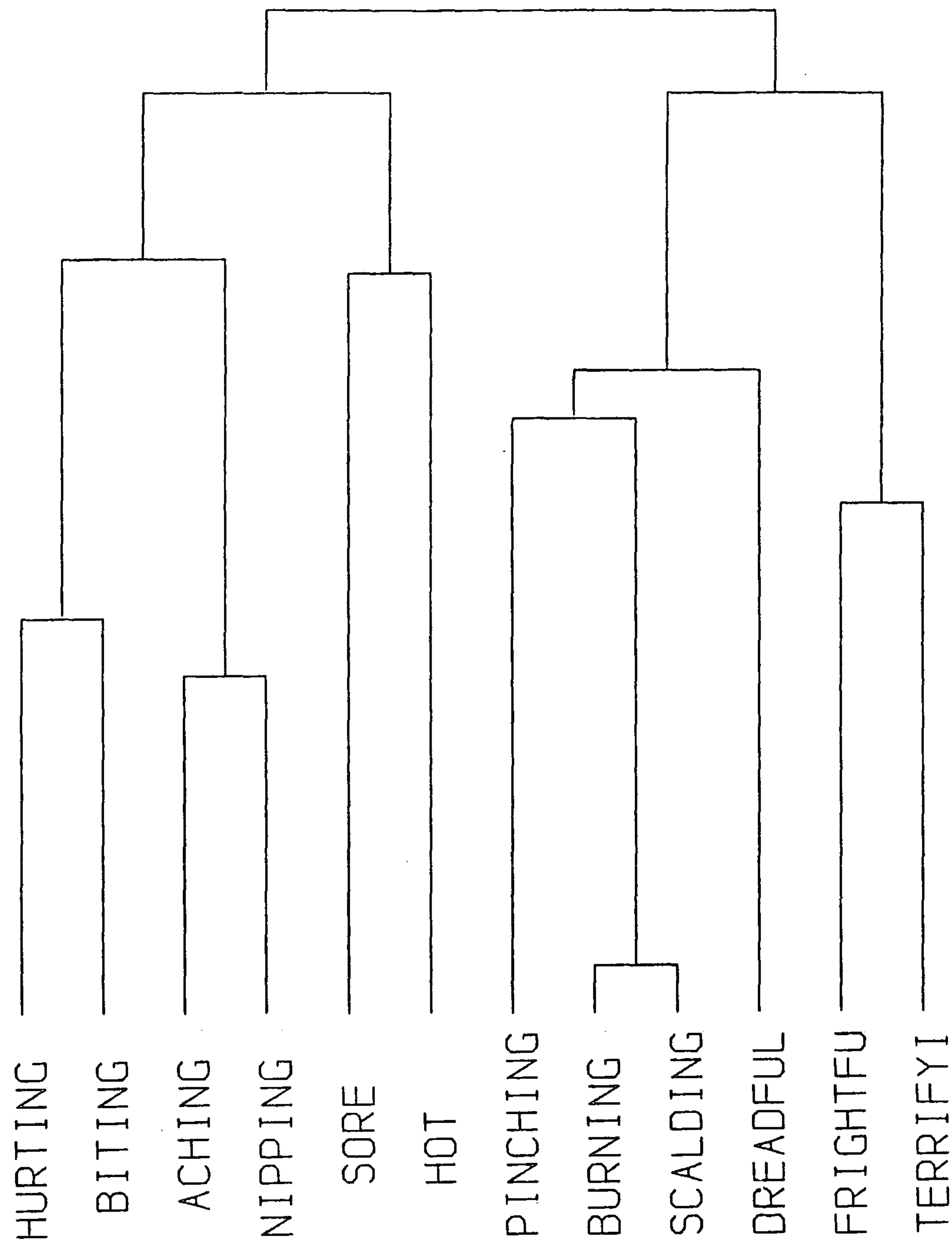
The aim of this experiment is to verify the ability of children, and adults, to categorise pain descriptors in an unconstrained way. However, we can also superimpose onto the resulting two dimensional Multi-Dimensional Scaling solution the categories predicted by Melzack and Torgerson (1971), and obtain a fairly clear idea of the relationship between their findings and the findings of this study.

3.3.2 Cluster Analysis

Hierarchical Cluster Analysis was performed on the data yielded by triadic comparison, using a CLUSTAN 1C computer package. The results of this are presented as Figs. 2.3 to 2.7.

These Figures show, for each age-group of subjects, the degree to which the twelve pain descriptors were looked upon as depicting similar qualities of pain. Reading from the bottom of the dendograms, the more strongly two words are associated, the earlier they are linked in the analysis. These two words are then linked with the next most strongly associated word, or words, and so on until all twelve words are linked together.

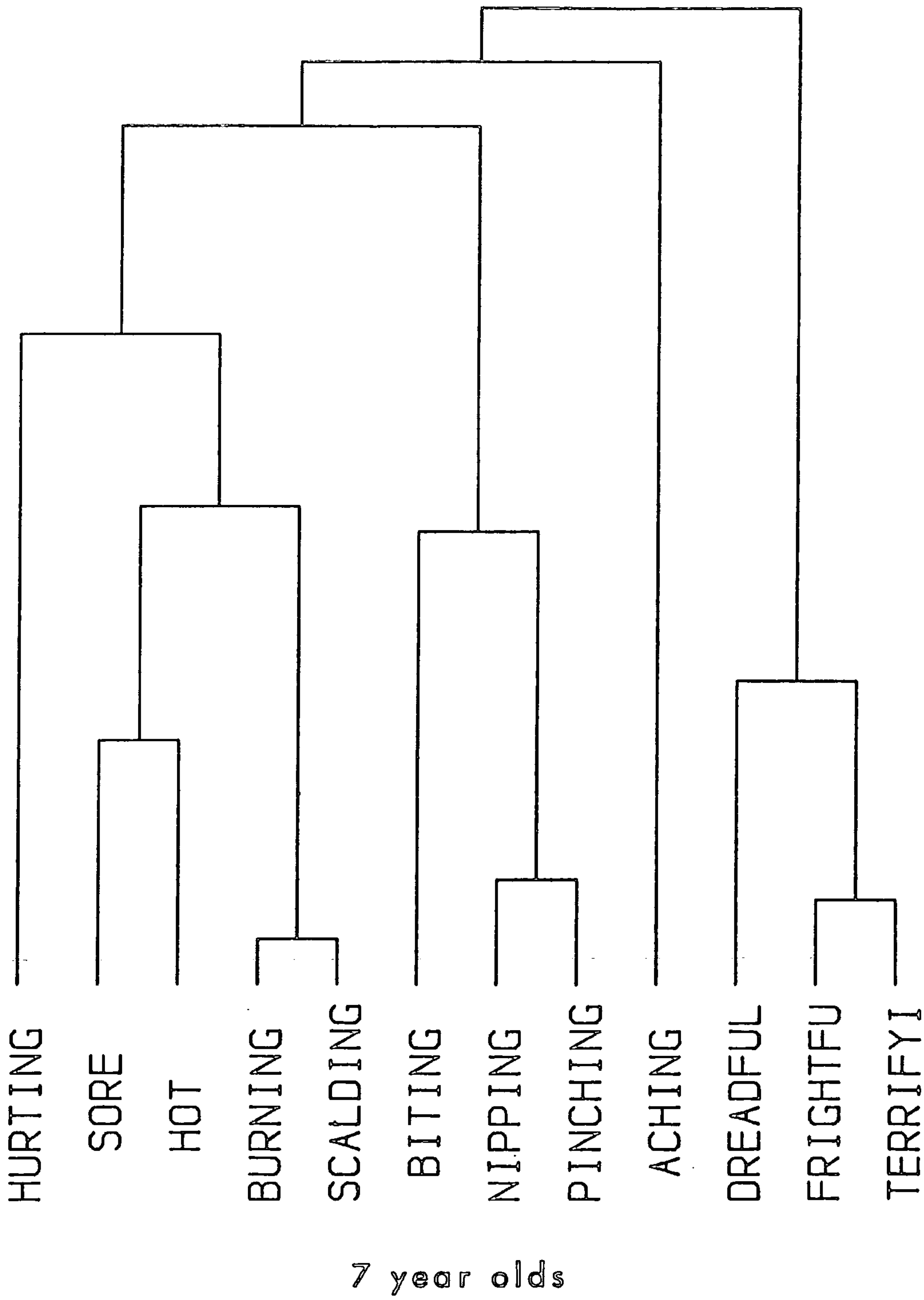
For example, Fig. 2.7 shows the cluster analysis of the adults data. This seems to indicate four discrete clusters of pain descriptors. The most strongly associated words are nipping and pinching, which are closely followed by biting; thus forming the constrictive pressure category. The remaining nine words seem to be distributed into three categories, in line with Melzack and Torgerson's findings. Figs. 2.5 and 2.6, show the cluster analysis results for the nine and eleven year olds. These also suggest four discrete categories of pain descriptors. Figs 2.3 and 2.4, show the results for the five and seven year olds. The



5 year olds

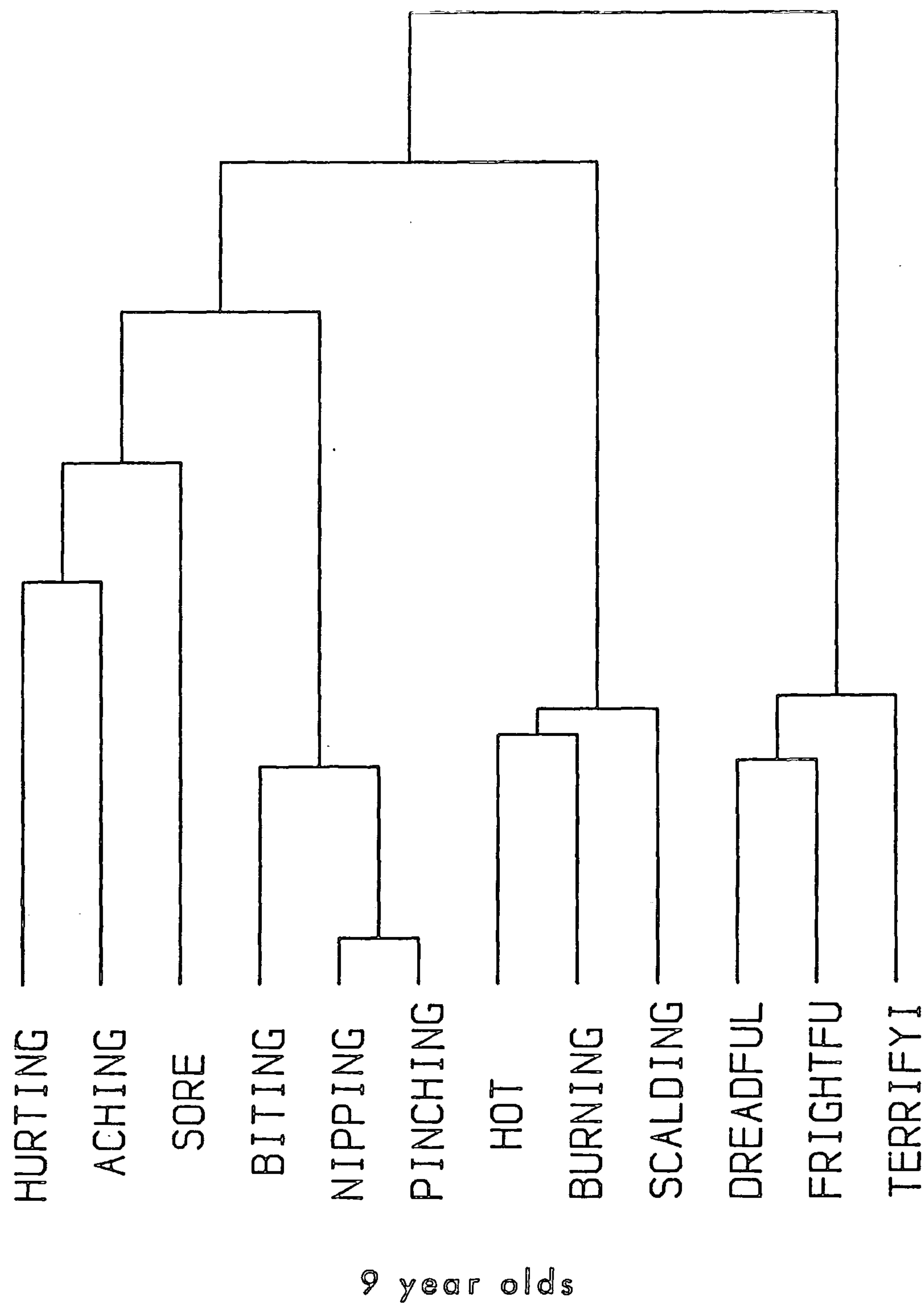
Cluster Analysis of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.3



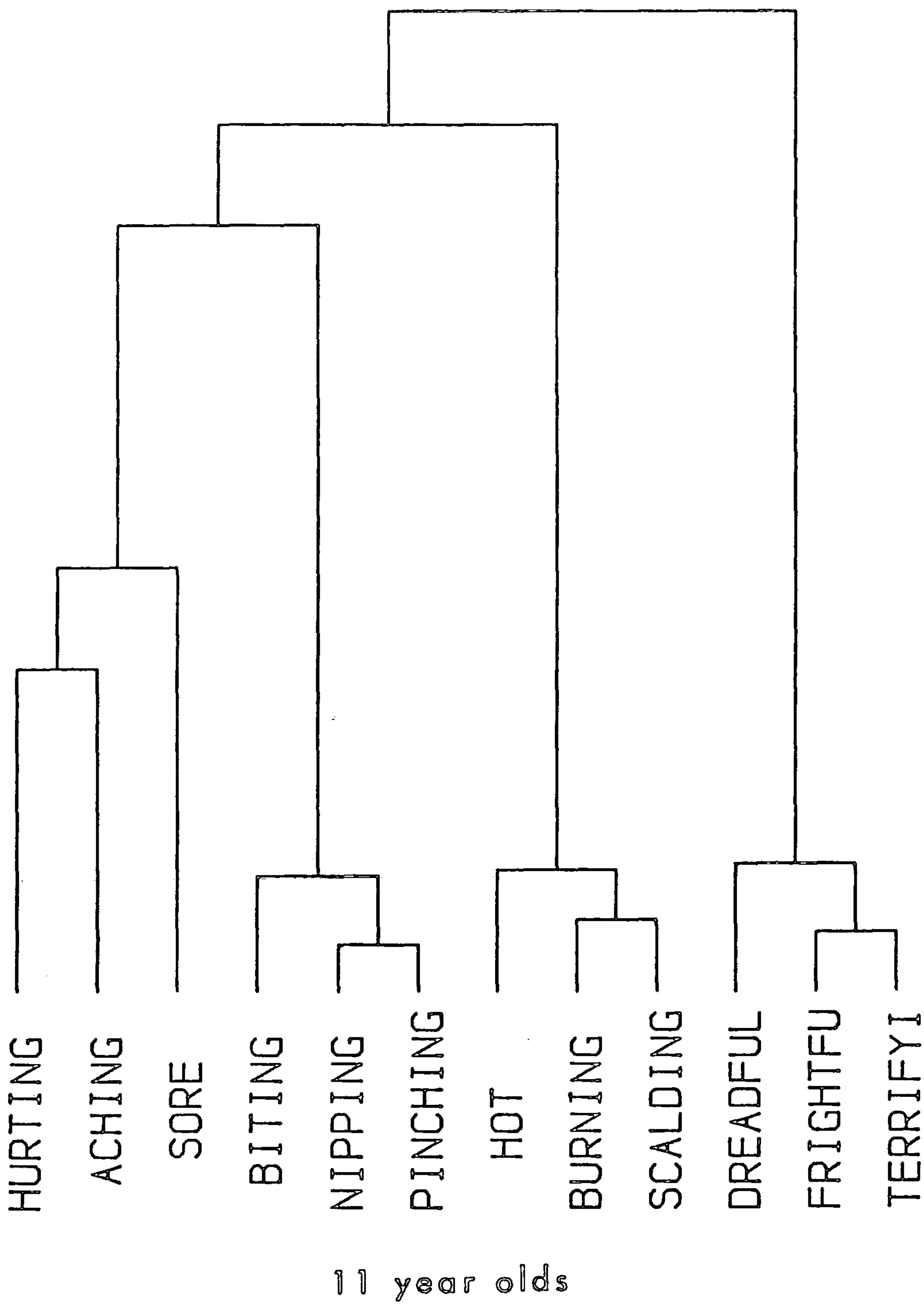
Cluster Analysis of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.4



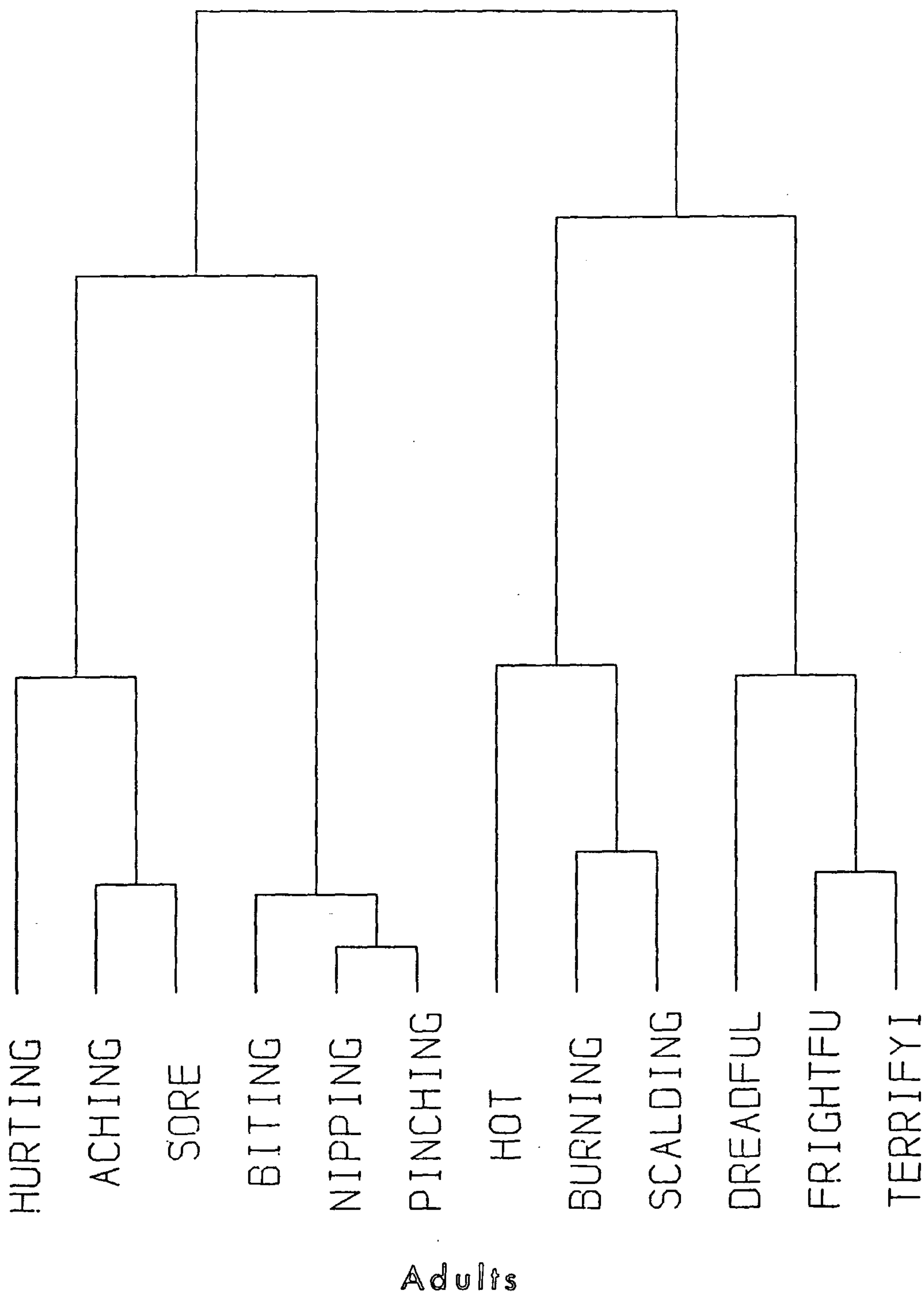
Cluster Analysis of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.5



Cluster Analysis of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.6



Cluster Analysis of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.7

analysis indicates the existence of two discrete categories for the seven year olds, but the remaining analysis for the seven year olds, and indeed the complete analysis for the five year olds, seems to indicate a very diffuse grouping, which does not conform to the Melzack and Torgerson findings.

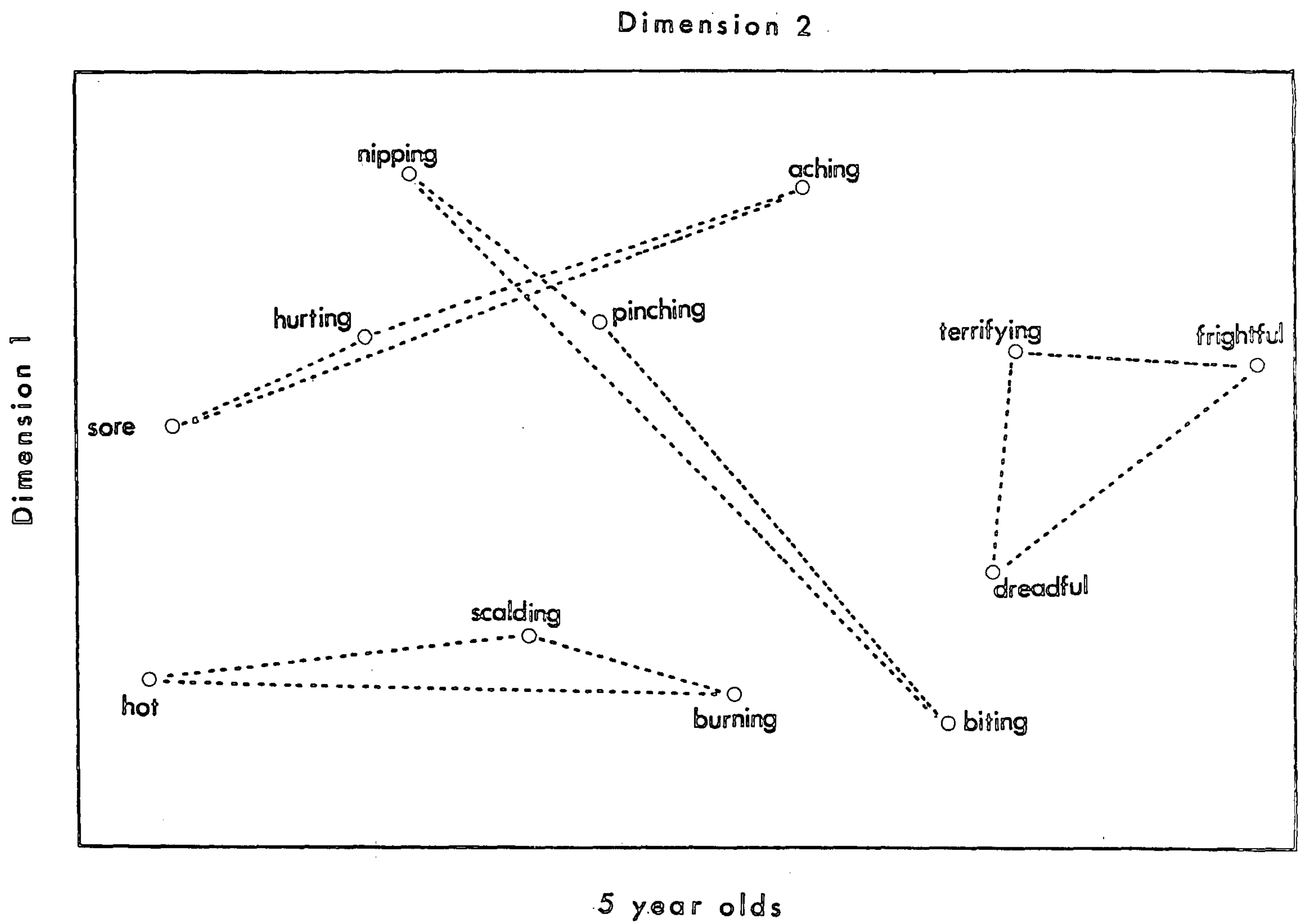
In this analysis, distances between the successive linkings are merely relative, a recognised limitation of the procedure. In a following section, statistical significance analysis of the data will be presented.

3.3.3 Multi-Dimensional Scaling

Multi Dimensional Scaling was applied to the correlation matrix of the triadic comparison data, and presented as Figs. 2.8 to 2.12.

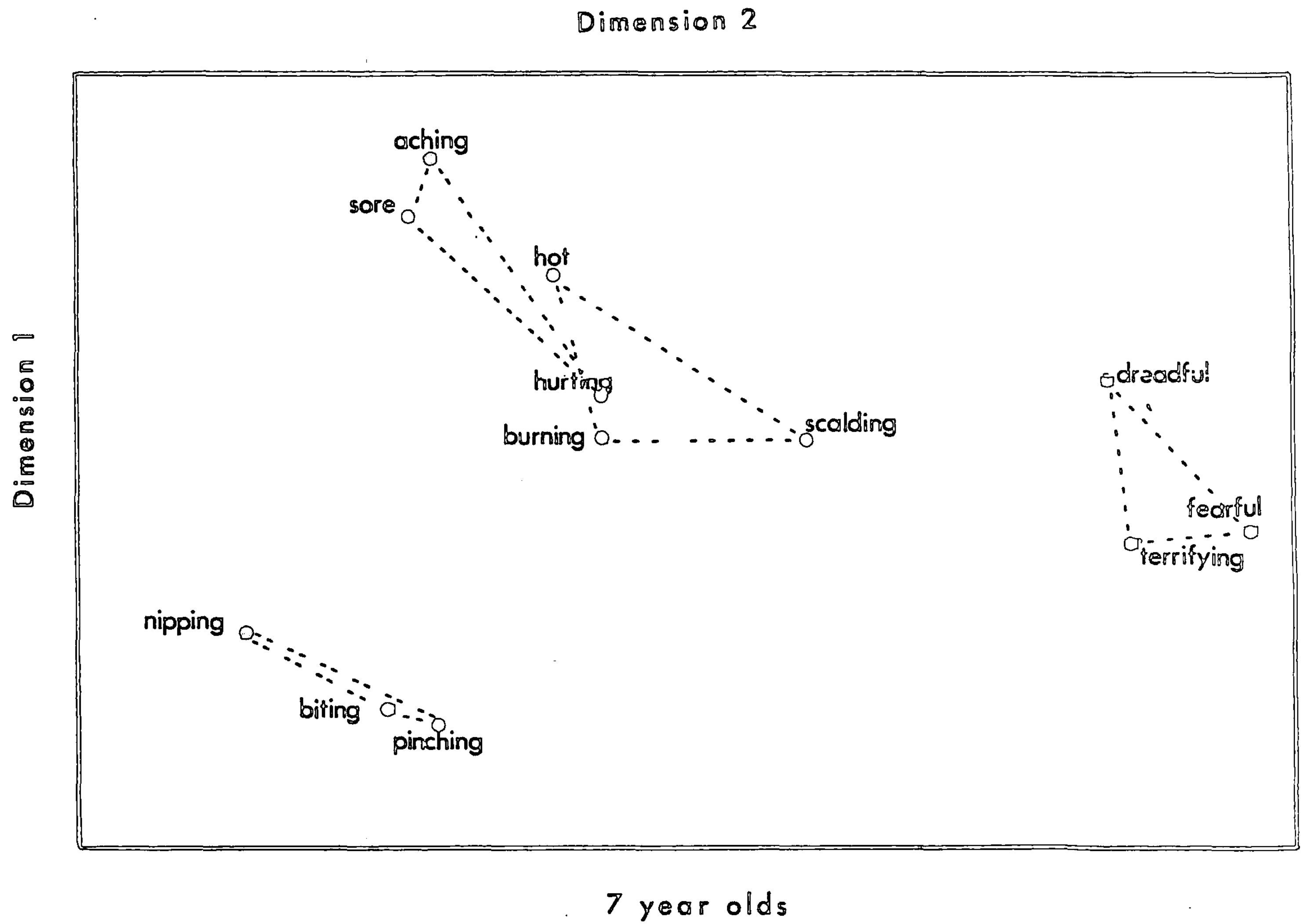
In this analysis, the more often that words are chosen as being alike, the closer they lie in space. As an aid to comparison, for each age-group, the three words from each of the four categories of pain descriptors, as proposed by Melzack and Torgerson, have been connected by dotted lines on each figure. For example, Fig. 2.12, shows the analysis of the adults data. This clearly indicates the existence of the four, qualitative different categories of pain descriptors in line with Melzack and Torgerson's findings. Figs. 2.10 and 2.11, indicate clear evidence of the same categorisation for the nine and eleven year olds. However, as we saw with the cluster analysis results, the seven year olds show evidence of only two clear clusters (Fig. 2.9), and the five year olds show a very diffuse set of responses (Fig. 2.8), with no clear categorisation apparent.

In a similar way to cluster analysis, multi-dimensional scaling produces a solution in which the distances between the pain descriptors is relative, rather than absolute. The following section presents statistical



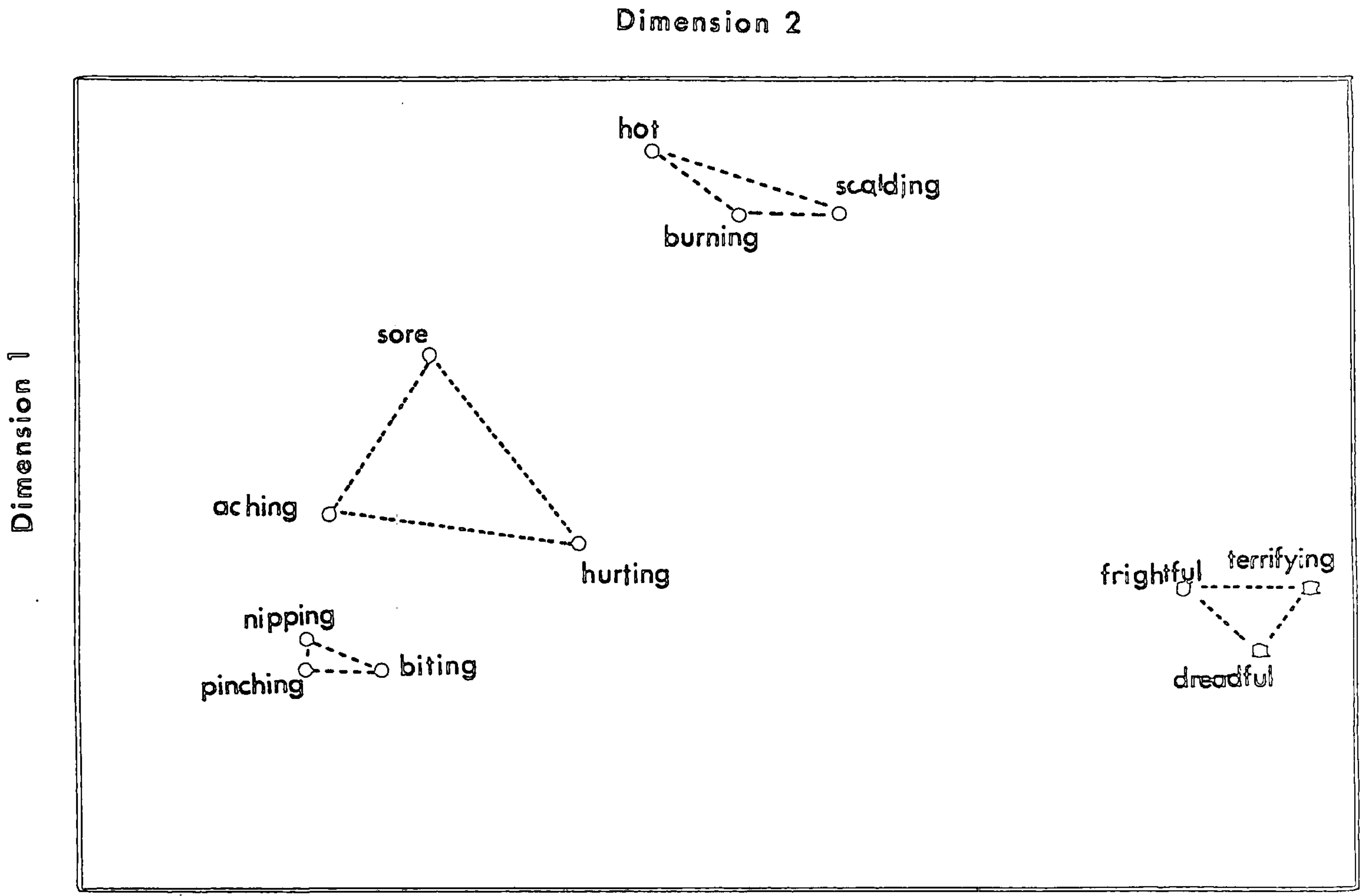
Multi-Dimensional Scaling of the number of times words were paired
as being most similar in the triadic comparison procedure

Fig. 2.8



Multi-Dimensional Scaling of the number of times words were paired as being most similar in the triadic comparison procedure

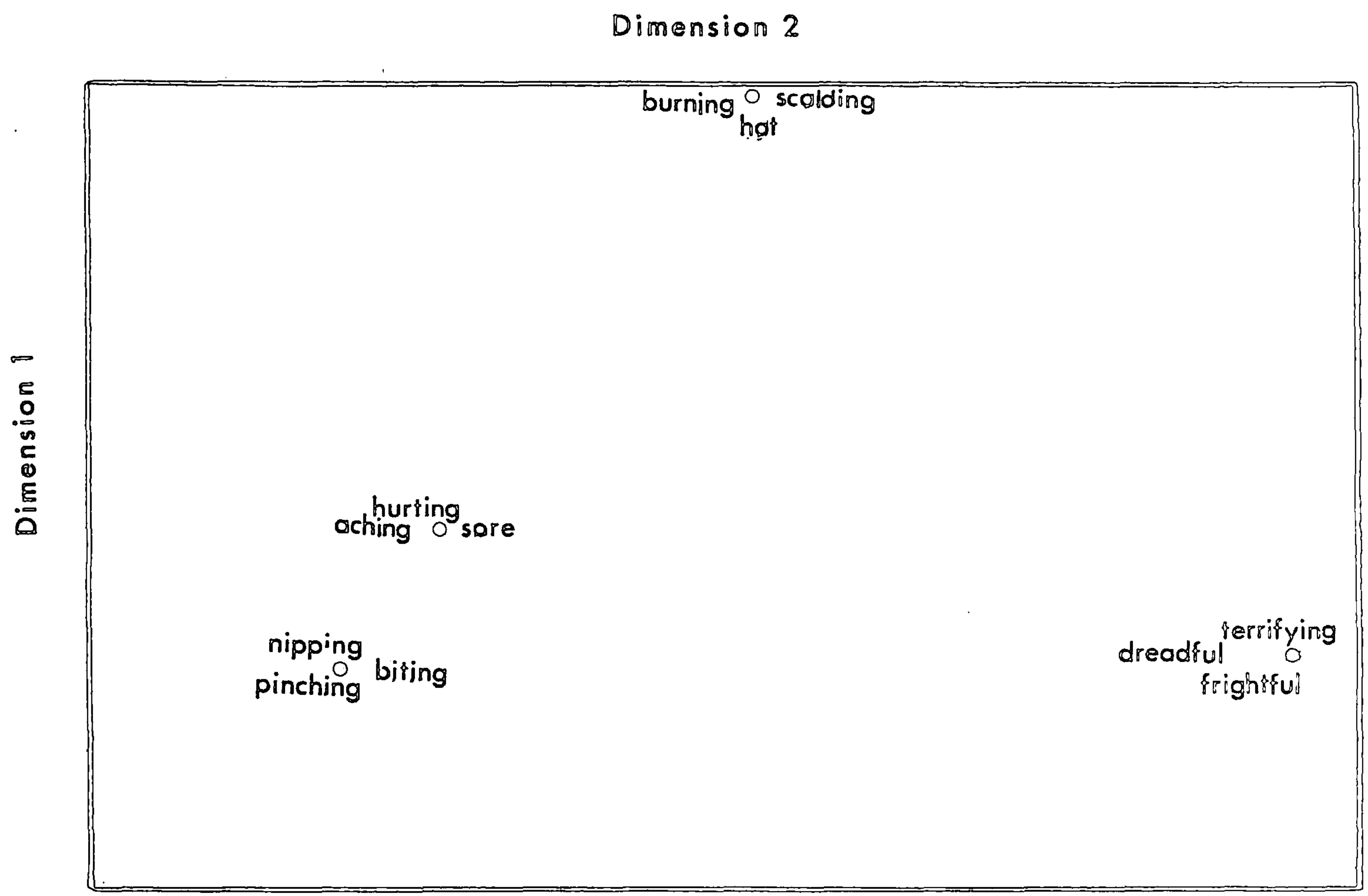
Fig. 2.9



9 year olds

Multi-Dimensional Scaling of the number of times words were paired as being most similar in the triadic comparison procedure

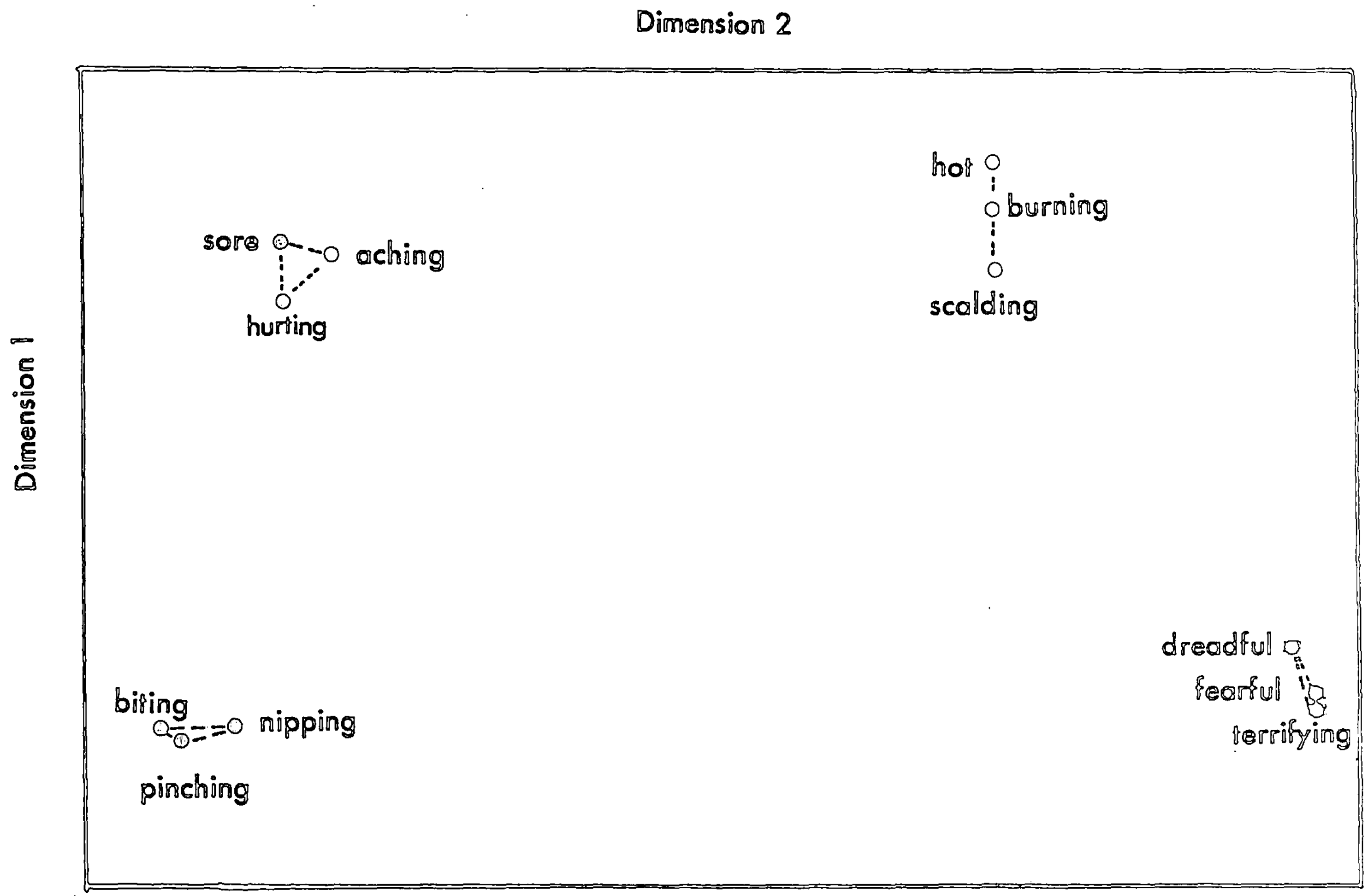
Fig. 2.10



11 year olds

Multi-Dimensional Scaling of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.11



Adults

Multi-Dimensional Scaling of the number of times words were paired as being most similar in the triadic comparison procedure

Fig. 2.12

analysis which considers whether, or not, these solutions occur significantly above chance levels.

3.3.4 Significance testing

The result of breaking down the 220 triads presented to each subject, using the a priori categories of Melzack and Torgerson, is presented in Table 2.5.

Therefore, we can see that each subject will yield a score, ranging from zero to twenty seven, for each of the four categories of pain descriptors, which represents the number of times they select the two words from the same Melzack and Torgerson category as being most closely associated. An analysis of the mean number of times the five groups of subjects selected the two words from the same category as feeling most similar, will provide an indication of their concept of categorisation. Fig. 2.13 shows the result of doing this.

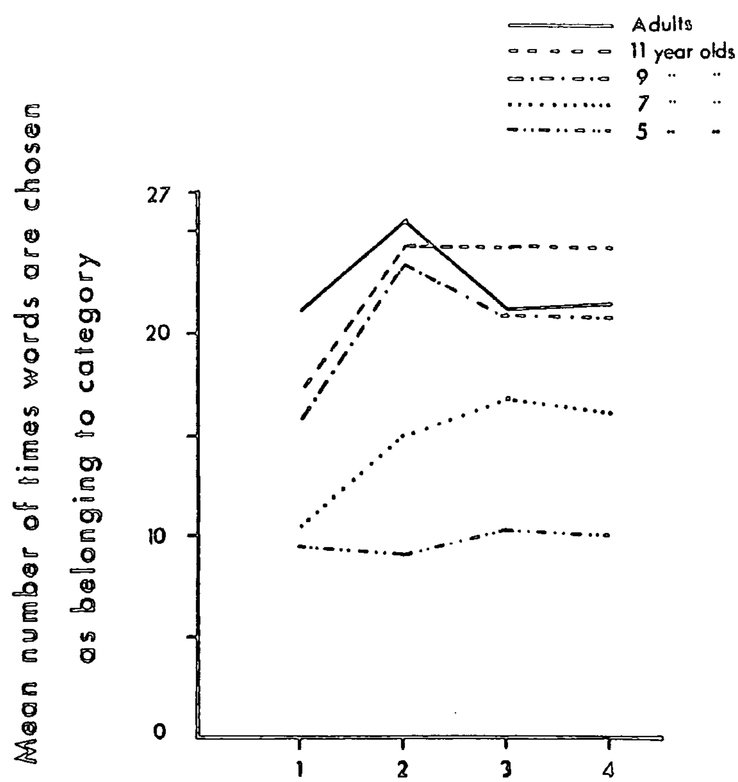
The results of one sample T tests, which tested whether the mean scores of the data shown in Fig. 2.13, differed from chance levels, are shown in Table 2.6. These tests indicate that all mean scores are significantly above chance levels for the nine and eleven year olds and adults, and for three out of the four categories for the seven year olds. None of the mean scores is significantly above chance level for the five year olds.

Analysis of Variance of the data showed a significant overall effect of age, F = 32.70, D.F. = 4 and 49 $p<0.001$. To tease out whether this was indeed a general effect, or whether only certain groups were contributing to this, post hoc analysis was performed using the Scheffe multiple comparisons test. The results of this are presented in Table 2.7.

Table 2.5

TRIADIC COMPARISON PROCEDURE

	27	occasions when 2 out of 3 words are from DULLNESS category
	27	occasions when 2 out of 3 words are from CONSTRICTIVE category
	27	occasions when 2 out of 3 words are from THERMAL category
	27	occasions when 2 out of 3 words are from FEAR category
	4	occasions when all 3 words are from the same category
	108	occasions when all 3 words are from different categories
Total	220	



Pain category (see Table 2.4)

Mean number of times pairs of words from Melzack and Torgerson categories are chosen as belonging to those categories.

Fig. 2.13

Table 2.6

Mean number of times pairs of words from Melzack and Torgerson categories were chosen as belonging to those categories (maximum possible = 27), with result of one sample t-tests.

Age Group \ Pain Category	Dullness	Constrictive	Thermal	Fear
ADULTS	21.5 $t = 9.32$ $p < 0.001$	25.5 $t = 27.5$ $p < 0.001$	21.3 $t = 6.27$ $p < 0.001$	21.5 $t = 7.49$ $p < 0.001$
11	17.6 $t = 6.00$ $p < 0.001$	24.3 $t = 15.8$ $p < 0.001$	24.4 $t = 10.7$ $p < 0.001$	24.3 $t = 17.3$ $p < 0.001$
9	15.8 $t = 2.89$ $p < 0.05$	23.5 $t = 12.63$ $p < 0.001$	20.9 $t = 7.56$ $p < 0.001$	20.9 $t = 6.66$ $p < 0.001$
7	10.6 $t = 0.86$ N.S.	15.0 $t = 2.53$ $p < 0.05$	17.0 $t = 4.52$ $p < 0.001$	16.2 $t = 2.49$ $p < 0.05$
5	9.4 $t = 0.58$ N.S.	9.1 $t = 0.07$ N.S.	10.2 $t = 0.66$ N.S.	10.0 $t = 1.13$ N.S.

Table 2.7

SCHEFFE POST HOC ANALYSIS - SUMMARY TABLE

Comparison of the differences between means of the four age groups of children and adults, for each of the four pain categories, on the triadic comparison procedure.

for $p \leqslant 0.05$ $F=10.44$: for $p \leqslant 0.01$ $F=15.32$

Category One

Age \ Age	7	9	11	Adults
5	0.36	4.69	18.35	56.77
7		3.04	8.34	23.01
9			0.43	4.95
11				4.09

Category Two

Age \ Age	7	9	11	Adults
5	4.15	61.51	77.50	127.87
7		8.84	11.02	18.10
9			0.28	2.86
11				1.37

Category Three

Age \ Age	7	9	11	Adults
5	7.15	19.95	38.04	17.16
7		2.61	10.01	2.73
9			2.70	0.03
11				1.51

Category Four

Age \ Age	7	9	11	Adults
5	3.67	29.96	131.36	33.01
7		1.71	6.09	2.50
9			2.91	0.06
11				1.96

These results show that there are no significant differences between the nine, eleven and adult groups in all four categories. The seven year olds do not differ significantly from the five year olds in any category, and only differ significantly from the adults in category one and the eleven year olds and adults in category two. The five year olds differ highly significantly from the nine, eleven and adult age-groups in all cases, except from the nine year olds in category one.

3.4 DISCUSSION

Preliminary data analysis seemed to confirm the existence of categories of pain descriptors which conform to those indicated by Melzack and Torgerson for the nine and eleven year olds and adults; for the seven year olds we have two clearly differentiated categories and some 'blurring' between the remaining words. For the five year olds we see much more diffuse groupings of words into categories. Indeed, for this latter age-group, it appears unclear as to where the category boundaries are.

Having 'viewed' the results of the triadic comparison procedure, further analysis of the data was undertaken to test to see if these relationships between pain descriptors are significant in the statistical sense, rather than being merely relatively associated.

This further analysis revealed that categorisation scores did not differ from chance levels in all four categories for the five year olds, or in the Dullness category for the seven year olds. All other scores are significantly above chance levels.

Post-hoc multiple comparison tests showed an interesting division amongst the five groups. There were no significant differences between the nine, eleven and adult groups in all four categories. The seven year olds did not differ significantly from the five year olds in any category, and only differed significantly from the adults in category one and the eleven year olds and adults in category two. The five year olds differed highly significantly from the nine, eleven and adult age-groups in all cases, except from the nine year olds in category one.

Clearly something is happening between five and nine years of age. Although they all had chosen these words as pain descriptors, the five year olds are performing at chance level on this task. The seven year olds are performing significantly above chance level on three out of the four categories, but by nine years of age, there is an improvement on this which brings the children up to adult competence.

It is interesting to note the lack of significant categorisation of the Primary pain terms; ache, sore and hurt, for the five and seven year olds. An explanation of this would be that these terms are not marked for intensity as argued by Fabrega and Tyma, but also, initially at least, they are not marked for quality either.

So the data has allowed us to quantify the qualitative impression that we gained from Hierarchical Cluster Analysis and Multi-Dimensional Scaling and indeed confirm, in the instances outlined above, the existence of significant categorisation in the groups of words.

We can now consider children's use of pain descriptors to measure intensity of pain.

4. EXPERIMENT 3

4.1 INTRODUCTION

Melzack and Torgerson (1971) sought to measure the intensity of pain descriptors by asking subjects to rate, on a five point scale, the intensity which they associated with a given pain descriptor. This implies the idea of an absolute value of pain intensity associated with each descriptor which it may be difficult to justify. An alternative, and perhaps more meaningful approach, is to ask subjects to estimate the intensity of individual pain descriptors relative to other pain descriptors.

This experiment used the latter, relative approach, and was designed to determine whether children rank order pain descriptors, by intensity, in the same way as other children and adults do. Two different procedures were used, to get some estimate of reliability of the subject's responses.

4.1.1 Diadic Comparison

The first procedure is a diadic comparison task, which presents to the subject all possible combinations of two words from twelve; 66 pairs in all. The task is for the subject to decide, on successive presentations of the 66 pairs, which of the two words describes the most intense pain.

A we noted in Experiment Two, Smith and Kemler (1972) have shown that children as young as five years of age can successfully undertake diadic comparisons.

A computer programme was written, which generated the diads and presented them on the television screen of a Commodore PET 3032 series micro-computer, which made for ease of presentation and randomisation. The randomisation of the order of presentation was such that the same word does not appear on two consecutive diads.

This procedure allows the rank ordering of the twelve pain words by intensity. The word chosen most often as depicting the most intense pain describes the most intense pain overall, through to the word chosen least often which describes the least intense pain overall.

4.1.2 Card Sorting

In the second procedure, the twelve words, were written onto cards and placed on a table. Each subject was asked to choose, and hand to the experimenter, the word which represented the most intense pain. This was repeated with the remaining words until no words remained. This gives a second ranking, by intensity, for each individual.

4.2 METHOD

4.2.1 Subjects

The same subjects as Experiment Two took part in this study.

4.2.2 Materials

The same words were used as in Experiment Two.

4.2.3 Procedure

Presentation was similar to the second experiment. Formal presentation was as follows. The first diad appeared on the screen. The two words were read out aloud to the subjects to ensure that both words were considered. The subject's response was to press a key corresponding to the word chosen as depicting the most intense pain. Safeguards were taken to ensure that as far as possible no key press errors occurred. After the subject had pressed the key, the next diad appeared on the screen and so on until all 66 trials had been presented. A hard copy of the results was the produced by way of a printer attachment.

4.3 RESULTS

The rank orderings for each age-group, derived from these two procedures, and the correlation coefficients between these rank orderings are presented in Table 2.8.

Table 2.8 shows that there is significant agreement between the rank orderings of the pain descriptors, derived from the two procedures, for the seven, nine and eleven year olds and the adults. There is a non-significant relationship for the five year olds.

Rank order correlation coefficients were calculated which test for relationships between the age-groups, on the diadic comparison and card sorting procedures. These are presented in Table 2.9.

There are a series of non-significant relationships between the rank-orderings of the five year olds and each of the other age-groups on both the diadic comparison and card sorting procedures. All other correlations are significant, except the relationship between the nine and eleven year olds, and nine year olds and adults on the diadic comparison procedure.

4.4 DISCUSSION

Clearly we have confirmation here that for the seven year olds and older there is a very good relationship between intensity rankings derived from the two procedures. The five year olds seem to be operating in a random fashion.

The intensity rankings by the five year olds do not correlate with the rankings of any of the other age-groups on either of the ranking procedures. In the diadic comparison procedure, the correlations between the intensity rankings for the nine year olds are not significantly correlated with the rankings for the eleven year olds or adults. All other correlations between age-groups are significant for both procedures.

Table 2.8

Rank ordering, by intensity, of pain descriptors with correlations between two procedures

For each age group, left column is dyadic comparison, right column card sorting

(N = 12 DF = 10 R @ .01 = .7079)

5 year olds		R = 0.0136	
Sore	70	Biting	80
Terrifying	66	Burning	77
Burning	63	Hurting	77
Biting	59	Aching	73
Frightful	58	Nipping	69
Hurting	56	Dreadful	63
Nipping	55	Pinching	61
Hot	50	Scalding	58
Dreadful	47	Sore	58
Pinching	46	Terrifying	56
Aching	45	Hot	52
Scalding	45	Frightful	46

7 year olds		R = 0.8113	
Scalding	99	Scalding	125
Burning	79	Terrifying	95
Terrifying	78	Dreadful	93
Dreadful	70	Aching	84
Hurting	66	Burning	82
Hot	66	Nipping	73
Aching	63	Biting	71
Frightful	59	Pinching	67
Biting	57	Hurting	65
Sore	55	Frightful	65
Nipping	50	Hot	56
Pinching	49	Sore	52

9 year olds		R = 0.7638	
Burning	78	Burning	92
Scalding	77	Scalding	89
Dreadful	67	Dreadful	81
Hurting	62	Terrifying	81
Sore	56	Frightful	70
Terrifying	55	Aching	68
Aching	54	Hot	57
Pinching	47	Hurting	54
Hot	47	Pinching	50
Frightful	43	Nipping	46
Biting	40	Biting	46
Nipping	39	Sore	46

11 year olds		R = 0.9168	
Scalding	104	Scalding	90
Terrifying	84	Terrifying	79
Burning	74	Frightful	65
Frightful	67	Biting	63
Dreadful	65	Burning	62
Biting	64	Dreadful	58
Nipping	57	Hurting	54
Aching	56	Aching	45
Pinching	55	Nipping	37
Hurting	53	Sore	37
Sore	53	Hot	35
Hot	45	Pinching	34

Adults		R = 0.9632	
Scalding	111	Scalding	117
Terrifying	100	Terrifying	117
Burning	92	Burning	98
Frightful	77	Biting	83
Biting	71	Frightful	81
Dreadful	69	Dreadful	81
Pinching	63	Pinching	63
Hot	57	Hurting	62
Hurting	49	Hot	49
Nipping	44	Nipping	45
Aching	36	Aching	45
Sore	29	Sore	12

CORRELATION MATRIX: INTENSITY RANKING OF PAIN DESCRIPTORS

DYADIC COMPARISON PROCEDURE

N = 12 DF = 10 R @ .05 = .5760 R @ .01 = .7079

	5 year olds	7 year olds	9 year olds	11 year olds
7 year olds	-.1233			
9 year olds	-.0669	.8034		
11 year olds	-.0124	.8207	.5615	
Adults	-.0163	.7584	.4643	.8696

CORRELATION MATRIX: INTENSITY RANKING OF PAIN DESCRIPTORS

CARD SORTING PROCEDURE

N = 12 DF = 10 R @ .05 = .5760 R @ .01 = .7079

	5 year olds	7 year olds	9 year olds	11 year olds
7 year olds	.0229			
9 year olds	-.1369	.7525		
11 year olds	-.0679	.7773	.7190	
Adults	-.0346	.7481	.7471	.8876

Table 2.9

5. OVERALL SUMMARY

This chapter presented three experiments which were designed to seek answers to the following questions:

a) Do children of different ages have available a lexicon of pain descriptors?
b) Do children categorise these descriptors in the same way as adults tested under the same conditions?
c) Do children rank order pain descriptors by intensity in the same way that adults do?

In each case, it was shown that children are, on average, seven years of age, or older, before they show these abilities. Children aged five years did not discriminate between pain and non-pain adjectives; they did not categorise by quality, or rank order by intensity, pain descriptors in the way that older children and adults did.

By contrast, children aged seven years and older, and adults, could discriminate between pain and non-pain adjectives, could categorise by quality, and rank order by intensity, pain descriptors, significantly above chance levels.

Primary pain terms (sore, ache and hurt) were seen to be more often selected as pain descriptors by all age-groups of subjects, although they were not perceived as belonging to a single qualitative category by the five or seven year olds.

CHAPTER THREE

An investigation of the 'referents' of pain descriptors

1. INTRODUCTION

This chapter presents Experiment Four which was designed to investigate, and quantify, children's ability to discriminate between several acute pain situations by the language they use to describe pain.

Amongst adults, the use of words to describe pain occurs frequently and, as we have seen, there seems to be agreement that many of these words share a similar meaning for adults (Melzack and Torgerson 1971), and that the words individuals choose to describe their pain can discriminate between several painful conditions (Dubuisson and Melzack 1976). How efficient are children at describing pain by language and what factors are associated with this ability?

1.1 Pain discrimination

Can children use words to describe and discriminate between varying types of pain? The traditional approach with adults has been to use varying clinical populations and to look for differences between them. This is unsatisfactory, for the present purpose, as there are clearly different individuals in each population. These individuals may have different characteristics which could account for differences found between the groups. It is more useful, in the present context, to look at each individual's ability to discriminate between several conditions.

Perhaps, the ideal situation would have been to investigate different age-groups of children who were all experiencing the same range of naturally occurring painful situations. Alternatively, a laboratory based study in which different age-groups of children all experienced the same series of, qualitatively and quantitatively, different painful stimuli could have been conducted. The first was impractical, and the second unethical.

A way round this was to present photographs of various pain situations to each of the children. Using these photographs as the independent variable ensures at least that we are keeping the stimuli constant between subjects. Using the subject's responses as the dependent variable, we can then test for discrimination between the pain situations. These responses are the words that the subjects select, on a modified McGill Pain Questionnaire, to describe the pain they anticipate in the depicted situations.

It is felt that presenting children with pictures of situations and at the same time asking them to choose words which describe 'anticipated pain' in these situations, would provide clues as to how the children were prepared to respond verbally to these situations. Does everything merely 'hurt' or feel 'sore', or does the child appreciate the different qualities and intensities of pain and then have the ability to describe these by the use of language?

As this is a novel procedure, an adult comparison group was included in the pain discrimination part of the experiment to ensure that the procedure could yield data which discriminated between the pain situations.

1.2 Factors which may affect pain describing ability

As well as considering pain discriminating ability in this study, for the children only, measurements were also made of the following, in an attempt to determine those factors associated with this ability.

General vocabulary; as this is primarily a verbal task, it was felt that it would be useful to have a measure of general vocabulary against which to compare children's pain discriminating abilities.

Individual differences; Melzack and Wall (1988) argue that pain is not simply a function of the amount of bodily damage done. They discuss research which has shown that "pain perception ... is a highly personal experience, depending on cultural learning, the meaning of the situation and other factors that are unique to each individual". The research reported was invariably carried out on adults or animals.

In this study, it is expected that all of the children and adults share a rather similar culture, as they all live on one large private housing estate. The children attend one of the three schools on that estate. Therefore, it was decided to look at these 'individual factors that are unique to each individual' in two ways. The first was in terms of personality differences, and the second in terms of gender differences.

Personality questionnaires were administered to the children in the study. This would enable us to look at the relationship between personality and the child's choice of pain-describing adjectives.

Although not a general theme of the thesis, in this study the opportunity was taken to investigate whether, or not, boys and girls differed on any of the dimensions studied.

Intelligence; it was thought that the ability to discriminate, verbally, between pain situations may be related to intelligence levels. The personality questionnaires used in this study also yield an abstract intelligence scale.

Pain vocabulary; it was thought that the number of pain-describing adjectives each child knew might influence their discrimination ability.

The actual tests used will be described in a later section.

2. METHOD

2.1 Subjects

Four groups of children aged seven (N=24, mean age=7.8, range=7.2-7.11), eight (N 29, mean age=8.6, range=8.0-8.10), nine (N=27, mean age=9.4, range=9.0-9.9) and ten (N=27, mean age=10.7, range=10.2-10.11) were tested on various measures. An adult comparison group (N=27, mean age=30.3, range=20.9-38.5) was included in part of the study.

The children attended one of two Council Mixed Junior Schools in the Durham area. The adults were recruited via a letter sent to a random selection of parents of children in the schools in which this experiment took place, asking for volunteers to take part in an experiment on children's language ability.

2.2 Materials

2.2.1 Pain descriptors

The children were tested to find out which words they knew as pain descriptors. The ninety-six potentially pain describing adjectives as used in Experiment One were shown to each child (Table 3.1). The child had to select from these the adjectives which they felt could be used to describe pain.

2.2.2 General vocabulary

The Mill Hill Vocabulary Scale (Raven et al 1982) was administered to each child. This scale is made up of a

Table 3.1

Percentage number of children, in each age group, who selected each word as a pain descriptor

SENSORY CLASS

		7	8	9	10
Temporal	Flickering	6	2	5	3
	Quivering	8	5	10	3
	Pulsing	7	5	4	23
	Throbbing	9	20	24	32
	Thumping	17	23	22	17
	Beating	11	16	12	5
	Pounding	4	13	14	24
Spatial	Spreading	17	21	14	11
	Jumping	12	6	6	5
	Radiating	4	1	1	6
	Flashing	5	3	7	9
	Shooting	8	10	7	26
Punctate Pressure	Pricking	25	19	21	19
	Boring	19	8	10	1
	Drilling	11	5	9	4
	Penetrating	4	3	5	21
	Piercing	6	10	17	28
	Stabbing	22	21	24	34
	Lancinating	–	–	–	2
Incisive Pressure	Sharp	24	22	21	32
	Cutting	18	14	12	17
	Lacerating	–	–	–	14
Constrictive Pressure	Pinching	17	12	18	14
	Nipping	22	21	22	10
	Tight	16	5	12	17
	Pressing	15	8	16	14
	Gnawing	6	1	–	30
	Binding	1	–	–	2
	Gripping	14	9	9	26
	Biting	27	14	14	25
	Squeezing	14	7	11	6
	Cramping	13	14	24	26
	Crushing	13	12	12	18

SENSORY CLASS (contd.)

		7	8	9	10
Traction Pressure	Tugging	12	10	11	6
	Pulling	16	6	16	3
	Wrenching	2	6	5	16
Thermal	Hot	19	15	22	11
	Burning	21	24	20	32
	Scalding	18	22	20	22
	Searing	1	–	–	30
Brightness	Tickling	16	19	23	2
	Tingling	11	25	21	23
	Itchy	22	26	25	8
	Smarting	1	2	–	24
	Stinging	34	32	32	24
Dullness	Dull	19	7	6	29
	Sore	32	34	33	19
	Blurred	3	7	5	4
	Drawing	5	–	3	3
	Numbing	2	14	17	23
	Hurting	35	34	33	21
	Aching	33	34	33	32
	Heavy	12	6	11	7
	Steady	6	5	4	8
Misc.	Tender	9	8	7	10
	Taut	–	–	1	5
	Rasping	1	–	–	9
	Tearing	7	3	11	15
	Splitting	15	10	17	20

AFFECTIVE CLASS

		7	8	9	10
Tension	Nagging	5	4	9	28
	Dragging	9	2	8	10
	Tiring	18	18	18	10
	Fatiguing	1	–	1	17
	Exhausting	10	18	16	21
Autonomic	Choking	15	16	18	15
	Sickening	22	20	24	28
	Suffocating	13	9	13	13
	Nauseating	3	–	–	24
Fear	Fearful	17	15	12	10
	Dreadful	28	32	25	29
	Frightful	20	23	12	23
	Terrifying	20	24	14	21
Punishment	Punishing	11	5	11	15
	Gruelling	3	1	4	10
	Racking	4	–	–	20
	Cruel	21	21	11	17
	Vicious	12	15	15	23
	Torturing	18	16	19	23
	Killing	31	23	17	21
Misc.	Grinding	8	5	10	16
	Wretched	6	10	6	21
	Awful	31	32	31	31
	Wicked	17	9	10	9
	Blinding	3	9	11	28
EVALUATIVE CLASS	Distracting	10	14	11	2
	Annoying	23	28	27	29
	Troublesome	16	10	13	23
	Bearable	5	12	11	29
	Miserable	25	14	15	16
	Ugly	6	–	2	4
	Intense	4	14	10	28
	Violent	5	8	8	20
	Agonising	8	20	20	32
	Savage	9	2	10	17
	Unbearable	10	22	25	30
	Intolerable	5	4	5	28

combination of two forms of assessment. The first is a recognition test of word meanings. The subject selects, out of a group of words, one word which most nearly corresponds to the meaning of the word at the head of the group. The second form of the test requires the subject to generate definitions for words.

The combined scores from these two tests provide a standardised measure of verbal ability.

2.2.3 Personality

The Children's Personality Questionnaire (CPQ) or the Early School Personality Questionnaire (ESPQ) was administered to the children in the study.

The CPQ is a standardised test which is designed for use with children aged from eight to twelve years. It consists of fourteen scales, or dimensions, of personality each of whose functionally independent nature has been established by factor-analytic research (Porter and Cattell 1968). Each of the fourteen dimensions measured by the CPQ has a technical name, a common name and an alphabetical symbol (full details in Appendix 1). Each dimension is defined by two poles or extremes. For example:

FACTOR A

Reserved	**vs**	**Warmhearted**
Detached, Critical		Participating, Outgoing
Cool		Easygoing

The ESPQ is a similar test designed for use with children aged six to eight. The major difference is that the ESPQ measures thirteen of the fourteen factors measured by the CPQ, as Factor Q3, the casual-controlled dimension, is found to be poorly differentiated with younger children.

Two parallel forms of the tests were administered to each of the children on two separate occasions. This double administration leads to a more reliable interpretation of the factors measured.

2.2.4 Intelligence

The CPQ and the ESPQ both include a brief estimate of intelligence which is standardised by age. The child who scores high on Factor B on these scales tends to be bright and abstract-thinking, whilst the child who scores low on this factor is more concrete-thinking. Whilst not as valid as more comprehensive intelligence tests, for example the Weschler Intelligence Scale for Children (Revised) (1976), this scale will prove useful in comparing the performances of the children who took part in the experiment.

2.2.5 Painful situation photographs

This experiment used five painful situations (Table 3.2). Each of these was depicted in a series of three photographs. The same child was used in each series. The child's face was not shown in the final 'painful' photograph to avoid the possibility of providing extra contextual clues to the children rating the pain.

Table 3.2

Pain Situations

1. A child pulling a pan of boiling water over himself
2. A child washing and getting soap in his eye
3. A child being given an injection in his arm
4. A child hitting his finger with a hammer
5. A child undergoing a dental filling

2.2.6 Modified McGill Pain Questionnaire

The questionnaire used in this experiment, was the McGill Pain Questionnaire (Melzack 1975). The only modification was to remove those words which were never, or seldom, selected by the children as pain descriptors. This left a somewhat briefer version of the questionnaire, whilst still retaining the seventeen, qualitatively different, categories of the original (Table 3.3).

2.3 Procedure

The children were tested, individually, for each of the measures made, except for the nine and ten year olds personality questionnaires which were group administered. This involved seeing each child on five separate occasions. All children were administered the measures in the following order: general vocabulary scale, personality questionnaire 1, pain vocabulary, personality questionnaire 2 and, finally, the pain discrimination experiment. The adult comparison group took part only in the discrimination experiment.

It will be apparant that by the time the children actually took part in the pain discrimination task they were very familiar both with the experimenter and his asking them to fill in questionnaires and answer questions. It is felt that in this respect the children were as well prepared as they could be to demonstrate, to their best of their ability, their pain describing capacity.

For the experiment, adults and children were shown the series of photographs, in a randomised sequence, along with a brief commentary describing the action sequence. In response to each pain situation, the children and adults filled in a modified McGill Pain Questionnaire (Table 3.3) to answer the following questions. Firstly, they had to rate, on a five point scale ranging from mild to unbearable, the overall intensity of the pain

Table 3.3

The following words represent pain of increasing painfulness.
Tick the word which best describes the pain the child is in.

1	2	3	4	5
Mild	Uncomfortable	Distressing	Horrible	Unbearable

Some of the words below may describe the pain the child is in. Tick the words which you think best describe it. Leave out any group of words that is not suitable. Use only one word in each group you choose; the word that applies best.

(1)	(2)	(3)	(4)
Pulsing	Spreading	Pricking	Sharp
Throbbing	Jumping	Drilling	Cutting
Thumping	Flashing	Piercing	
Beating	Shooting	Stabbing	
Pounding			

(5)	(6)	(7)	(8)
Nipping	Tugging	Hot	Tickling
Pressing	Pulling	Burning	Tingling
Gripping	Wrenching	Scalding	Itchy
Squeezing			Stinging
Crushing			

(9)	(10)	(11)	(12)
Dull	Tender	Tiring	Choking
Sore	Tearing	Exhausting	Sickening
Numbing	Splitting		Suffocating
Hurting			
Aching			

(13)	(14)	(15)	(16)
Fearful	Punishing	Wretched	Annoying
Frightful	Cruel	Awful	Troublesome
Terrifying	Vicious	Blinding	Dreadful
	Torturing		Intense
	Killing		Agonising
			Unbearable

(17)
Cool
Cold
Freezing

experienced. After this they chose adjectives from the questionnaire to describe what the pain would feel like.

This yielded five separate questionnaires, one for each pain situation, for each subject, to be used for data analysis.

3. RESULTS

3.1 Missing Data

Due to the number of measures taken in this experiment, data collection took place over a period of several weeks. Occasionally, children were missing from school, or were otherwise unavailable to me, on days that I visited. As far as possible these children were tested on later visits. However, during this section, small differences in the number of subjects which are included in different sets of analyses reflects those children who could not be followed up and, therefore, yielded incomplete data.

3.2 Descriptive statistics for the variables which may affect pain describing ability

3.2.1 Pain vocabulary

Table 3.1 shows the words that the children selected as pain descriptors.

As expected, words such as 'hurting' and 'sore' are very popular pain descriptors, whereas words such as 'lacerating' and 'lancinating' are not. The number of words that children recognised as pain descriptors, of course, varied (Table 3.4).

Table 3.4

Number of words children recognised as pain descriptors

Age	Minimum	Maximum	Mean	S.D.
7	17	68	42	14.0
8	39	83	58	13.3
9	27	87	53	15.0
10	6	73	45	16.0

Two sample T tests showed that there was no difference between the boys and girls in the number of pain descriptors chosen t = 0.362 DF = 105 N.S.

Table 3.5 shows a correlation matrix which illustrates the relationship between the four age-groups of children in the percentage number of times the words were chosen as pain descriptors.

3.2.2 Personality

Table 3.6 shows the mean scores and ranges for the four age-groups of children, for each of the personality dimensions derived from the ESPQ and the CPQ.

3.2.3 Intelligence

Dimension 'B' on the personality questionnaires (ESPQ and the CPQ) yields a standardised measure of intelligence (Table 3.6). Two sample T tests showed that there was no difference between the boys and girls in levels of intelligence t = 1.065 DF = 105 N.S.

3.2.4 General vocabulary

Table 3.7 shows the mean scores and ranges, for the four groups of children, on the Mill Hill Vocabulary Scale. Two sample T tests were carried out on this data

Table 3.5

Rank-order correlation between the percentage number of times questionnaire words were chosen as being pain descriptors for the four age groups of children

N = 60 RHO @ .05 = .2552 RHO @ .01 = .3353

8 year olds	.7425		
9 year olds	.7329	.7925	
10 year olds	.5368	.6881	.8354
	7 year olds	8 year olds	9 year olds

Table 3.6

EARLY SCHOOL PERSONALITY QUESTIONNAIRE (ESPQ)
AND CHILD PERSONALITY QUESTIONNAIRE (CPQ) SCORES

Values refer to standard ten scores, which have a range from 1 to 10, a mean of 5.5, and a standard deviation of 2.

	Ages							
	7		8		9		10	
	N=24		N=29		N=27		N=27	
	(ESPQ)		(CPQ)		(CPQ)		(CPQ)	
Factor	Mean	Range	Mean	Range	Mean	Range	Mean	Range
A	4.60	1-8	5.82	1-10	5.00	1-8	5.29	1-9
B	6.00	3-8	4.67	1-7	6.45	4-10	5.03	2-9
C	4.92	1-8	6.85	3-10	5.61	1-10	5.94	2-10
D	6.40	4-10	3.42	1-8	5.19	1-10	5.61	1-10
E	5.68	1-10	4.06	1-8	4.13	1-8	4.81	2-10
F	4.92	3-8	5.27	1-10	5.13	1-10	5.68	3-10
G	4.20	1-9	6.24	2-9	5.19	1-9	5.81	1-9
H	4.72	1-8	6.03	1-10	5.23	1-9	5.55	1-9
I	4.40	1-9	6.64	1-10	6.32	1-10	4.61	1-10
J	5.40	1-9	5.03	1-10	4.84	1-10	4.03	1-9
N	7.04	2-10	4.52	1-9	5.45	1-10	5.29	3-9
O	5.44	1-9	4.30	1-8	4.19	1-9	4.32	2-9
Q3			6.09	3-9	4.81	2-8	4.97	1-8
Q4	6.56	3-10	4.06	1-8	5.68	1-9	5.84	2-8

Table 3.7

MILL-HILL VOCABULARY SCALE SCORES

Values refer to percentile points derived from scores for Sets One and Two combined. For the range, 1 refers to the 95th percentile through to 7 which refers to the 5th percentile. Therefore, lower numbers refer to greater vocabulary skills.

Age	N	Mean	Range
7	24	2.88	1-7
8	29	2.73	1-7
9	27	2.66	1-7
10	27	2.90	1-7

and showed that there was no difference between the boys and girls in their vocabulary ability t = 0.388 DF = 105 N.S.

3.3 Pain intensity

3.3.1 Pain intensity differences across the five pain situations

Table 3.8 shows the analysis of anticipated pain intensity levels for the five pain situations for the children and adults. We see that for each of the groups of children, and adults, there is a significant difference over the five pain situations.

3.3.2 Pain intensity and sex

A comparison of the intensity levels of the anticipated pain for boys and girls showed that the girls anticipated higher intensity levels than boys t = 2.589 DF = 99 $p<0.02$.

3.3.3 Pain intensity and personality factors

Anticipated pain intensity levels are correlated with several personality factors (Table 3.9).

These occured on the following dimensions:

High scores on factors;

D, Undemonstrative-Excitable;
E, Submissive-Dominance,
F, Sober-Enthusiastic;
N, Naivete-Shrewdness,

are associated with 'lower' pain intensity levels.

Table 3.8

FRIEDMAN'S ANALYSIS OF PAIN INTENSITY DATA

FOR THE FIVE PAIN SITUATIONS

Values refer to the mean pain intensity values chosen for each of the five pain situations by each of the groups of subjects

		Pain						
Age	N	1	2	3	4	5	X^2	Prob.
7	24	3.96	1.88	3.19	3.21	2.77	22.23	.001
8	29	3.98	2.46	3.43	2.45	2.68	20.66	.001
9	27	4.06	1.81	3.22	3.20	2.70	29.13	.001
10	27	4.27	2.62	3.35	2.13	2.63	28.72	.001
Adults	27	4.43	1.61	2.11	3.59	3.26	55.84	.001

Table 3.9

CORRELATION MATRIX

Significant relationships between children's personality dimensions and estimated pain intensity over the five pain situations.

N = 101 D.F. = 99 R @ .05 = .1956 R @ .01 = .2552

Personality Dimension		Estimated Pain Intensity
D	Phlegmatic - Excitable	-.2545
E	Obedient - Assertive	-.2522
F	Sober - Happy go lucky	-.2005
G	Expedient - Concientious	.3212
I	Tough minded - Tender minded	.2184
N	Forthright - Shrewd	-.2037

High scores on factors;

G, Low Superego Strength-High Superego Strength;
I, Tough Minded-Tender Minded,

are associated with 'higher' pain intensity levels.

3.4 Pain discrimination
We can consider two forms of pain discrimination; group and individual. Group discrimination is based upon the results of applying statistical analysis to the pain descriptors that the different age-groups of children and adults chose to describe the pain situations. Individual discrimination is based upon a child's use of different words to describe the different pain situations. Firstly we will look at group discrimination.

3.4.1 Group discrimination
It was necessary to test whether the different age-groups of children, and adults, were discriminating between the five pain situations. Although children were free to select from as many categories of pain descriptors as they wished to describe a particular pain, only one word could be chosen from any particular category. The non-parametric Cochran Q test was then used to look for differences, within age-groups, between pain categories chosen to describe anticipated pain, over the five different pain situations. The results of these analyses are presented in Tables 3.10 to 3.14.

These tables show the number of children who chose each of the seventeen categories of pain descriptors to describe the five pain situations, the resulting Q value and its associated probability.

Table 3.15 summarises these results for the adults and children.

Table 3.10

SEVEN YEAR OLDS (N=24) - COCHRAN'S Q ANALYSIS

OF QUESTIONNAIRE DATA

Values refer to the number of children who chose words from a particular category to describe a particular pain situation.

Category	Pain 1	2	3	4	5	Q	Probability
Sensory Class							
1 Temporal	4	2	5	3	2	2.72	.606
2 Spatial	3	3	1	2	2	1.65	.800
3 Punctate	8	3	5	15	8	16.56	.002
4 Incisive	4	2	10	6	2	12.11	.017
5 Constrictive	7	1	6	1	2	11.07	.026
6 Traction	1	1	0	2	2	2.55	.637
7 Thermal	16	2	3	1	2	38.73	.001
8 Brightness	12	19	16	11	12	9.02	.061
9 Dullness	12	18	15	14	13	5.05	.282
17 Coldness	2	0	1	0	6	14.59	.006
10 Misc.	3	0	2	1	2	3.47	.483
Affective Class							
11 Tension	0	1	0	1	2	3.50	.478
12 Autonomic	7	1	1	2	2	12.60	.013
13 Fear	0	0	1	4	2	8.62	.072
14 Punishment	5	5	0	3	2	8.18	.085
15 Misc.	4	12	6	7	5	13.86	.008
Evaluative Class							
16 Evaluative	8	11	9	11	6	3.60	.463

Table 3.11

EIGHT YEAR OLDS (N=29) - COCHRAN'S Q ANALYSIS

OF QUESTIONNAIRE DATA

Values refer to the number of children who chose words from a particular category to describe a particular pain situation

Category	Pain 1	2	3	4	5	Q	Probability
Sensory Class							
1 Temporal	13	5	11	6	6	10.16	.038
2 Spatial	9	5	5	8	6	3.88	.422
3 Punctate	12	11	17	20	17	11.44	.022
4 Incisive	11	6	11	18	9	12.58	.014
5 Constrictive	12	9	11	13	7	5.04	.283
6 Traction	10	4	1	3	6	12.00	.017
7 Thermal	25	8	3	1	1	70.90	.001
8 Brightness	12	24	18	18	12	16.26	.003
9 Dullness	11	15	12	11	9	4.27	.371
17 Coldness	3	4	3	5	4	1.17	.884
10 Misc.	7	4	9	8	7	2.69	.611
Affective Class							
11 Tension	2	1	1	1	5	7.50	.112
12 Autonomic	5	5	2	2	5	3.72	.445
13 Fear	9	5	6	5	8	3.57	.468
14 Punishment	16	9	11	7	12	8.07	.089
15 Misc.	4	13	4	3	4	19.77	.001
Evaluative Class							
16 Evaluative	15	16	12	12	9	7.00	.136

Table 3.12

NINE YEAR OLDS (N=27) - COCHRAN'S Q ANALYSIS

OF QUESTIONNAIRE DATA

Values refer to the number of children who chose words from a particular category to describe a particular pain situation

Category	Pain 1	2	3	4	5	Q	Probability
Sensory Class							
1 Temporal	9	3	18	9	10	20.87	.001
2 Spatial	9	4	5	3	1	10.35	.035
3 Punctate	7	0	10	22	16	45.08	.001
4 Incisive	7	2	9	14	4	18.87	.001
5 Constrictive	2	3	11	4	6	12.70	.013
6 Traction	1	0	2	1	2	2.80	.592
7 Thermal	23	2	5	2	0	66.15	.001
8 Brightness	13	23	14	17	13	11.61	.021
9 Dullness	11	17	17	13	16	4.97	.291
17 Coldness	1	2	0	0	2	5.71	.222
10 Misc.	2	1	3	3	3	2.00	.736
Affective Class							
11 Tension	2	1	0	0	1	4.00	.406
12 Autonomic	3	0	0	0	3	9.00	.061
13 Fear	5	2	2	1	3	4.00	.406
14 Punishment	7	2	3	3	4	6.17	.187
15 Misc.	2	17	4	0	10	36.77	.001
Evaluative Class							
16 Evaluative	15	12	13	11	12	1.77	.778

Table 3.13

TEN YEAR OLDS (N=27) - COCHRAN'S Q ANALYSIS

OF QUESTIONNAIRE DATA

Values refer to the number of children who chose words from a particular category to describe a particular pain situation

Category	Pain 1	2	3	4	5	Q	Probability
Sensory Class							
1 Temporal	14	4	25	9	15	41.11	.001
2 Spatial	7	7	7	6	10	2.49	.647
3 Punctate	13	18	12	19	21	11.55	.021
4 Incisive	9	7	8	15	7	8.62	.072
5 Constrictive	11	8	11	11	5	6.55	.162
6 Traction	8	2	3	2	6	10.29	.036
7 Thermal	26	9	5	0	1	73.25	.001
8 Brightness	20	24	19	17	18	5.31	.257
9 Dullness	16	19	21	14	17	6.49	.166
17 Coldness	1	1	0	0	5	13.23	.010
10 Misc.	4	8	7	5	4	3.77	.438
Affective Class							
11 Tension	1	1	1	3	3	4.00	.406
12 Autonomic	3	0	1	2	3	5.67	.226
13 Fear	5	1	3	2	6	8.60	.072
14 Punishment	9	4	7	10	8	5.05	.282
15 Misc.	9	15	4	2	6	20.56	.001
Evaluative Class							
16 Evaluative	18	12	14	8	14	8.38	.079

Table 3.14

ADULTS (N=27) - COCHRAN'S Q ANALYSIS

OF QUESTIONNAIRE DATA

Values refer to the number of children who chose words from a particular category to describe a particular pain situation

Category	Pain 1	2	3	4	5	Q	Probability
Sensory Class							
1 Temporal	7	0	7	27	13	60.71	.001
2 Spatial	14	1	9	10	11	17.09	.002
3 Punctate	19	19	2	24	8	45.72	.001
4 Incisive	8	6	18	6	10	17.40	.002
5 Constrictive	0	1	7	8	1	17.88	.001
6 Traction	0	0	0	1	3	8.50	.075
7 Thermal	26	1	0	1	2	91.27	.001
8 Brightness	12	27	7	3	4	55.83	.001
9 Dullness	11	16	19	24	18	14.62	.006
17 Coldness	0	0	0	0	3	12.00	.017
10 Misc.	3	3	5	9	2	10.06	.040
Affective Class							
11 Tension	1	0	0	0	2	5.33	.254
12 Autonomic	1	0	0	0	4	12.00	.017
13 Fear	8	1	7	4	12	17.74	.001
14 Punishment	3	2	0	2	4	5.17	.270
15 Misc.	8	3	3	4	7	5.64	.227
Evaluative Class							
16 Evaluative	21	20	11	19	14	16.82	.002

Table 3.15

SUMMARY OF THE COCHRAN'S Q TEST RESULTS FOR THE CHILDREN AND ADULTS

Upper values refer to the Q values.
Lower numbers refer to the probability associated with the value

Category	Age 7	8	9	10	Adults
Sensory Class					
1 Temporal	2.72	10.16	20.87	41.11	60.71
	.606	.038	.001	.001	.001
2 Spatial	1.65	3.88	10.35	2.49	17.09
	.800	.422	.035	.647	.002
3 Punctate	16.56	11.44	45.08	11.55	45.72
	.002	.022	.001	.021	.001
4 Incisive	12.11	12.58	18.87	8.62	17.40
	.016	.014	.001	.071	.002
5 Constrictive	11.07	5.04	12.70	6.55	17.88
	.258	.283	.013	.162	.001
6 Traction	2.55	12.00	2.80	10.29	8.50
	.636	.017	.592	.036	.075
7 Thermal	38.73	70.89	66.15	73.26	91.27
	.001	.001	.001	.001	.001
8 Brightness	9.02	16.26	11.61	5.31	55.83
	.060	.003	.021	.257	.001
9 Dullness	5.05	4.27	4.97	6.49	14.62
	.282	.371	.291	.166	.006
10 Misc.	3.47	2.69	2.00	3.77	10.06
	.483	.610	.736	.438	.040
17 Coldness	14.59	1.17	5.71	13.23	12.00
	.001	.883	.221	.010	.017
Affective Class					
11 Tension	3.50	7.50	4.00	4.00	5.33
	.478	.112	.406	.406	.254
12 Autonomic	12.60	3.72	9.00	5.67	12.00
	.013	.444	.061	.226	.017
13 Fear	8.61	3.57	4.00	8.60	17.74
	.071	.467	.406	.071	.001
14 Punishment	8.18	8.07	6.17	5.05	5.17
	.085	.089	.187	.280	.270
15 Misc.	13.86	19.77	36.77	20.56	5.64
	.008	.001	.001	.001	.227
Evaluative Class					
16 Evaluative	3.60	7.00	1.77	8.38	16.82
	.463	.135	.778	.079	.002
	(N=24)	(N=29)	(N=27)	(N=27)	(N=27)

It is interesting to note that the adults show significant discrimination over the five conditions on fourteen out of the seventeen categories of pain descriptors. The children do show evidence of discrimination on some of the variables. However, these results will be discussed later, as they do require some caution in their interpretation.

It had been intended to carry out a further analysis of the rank order intensities of the pain descriptors chosen to describe the five pain situations. However, because of the small numbers who chose some of the classes, interpretation of the results would have been problematic, therefore, this analysis was not performed.

3.4.2 Individual discrimination

In this analysis, the total number of words chosen, (TNWC), refers to the total number of words individual children chose to describe the pain experienced in the five pain situations. The number of different words chosen (NDWC), refers to the different words chosen to describe the five pain situations. For example, if a child chose stinging as a word to describe every pain situation, then in the first instance of TNWC, this would contribute a score of 5, in the second instance, NDWC, this would count as 1.

The ratio of these two variables yields a score which reflects the use of different words to describe different pain situations. For example, if a child's TNWC was 15, and NDWC was 15, yielding a ratio score, of 1, then clearly different words are being used to describe different pain situations; there are no repetitions. A child with TNWC = 15, and NDWC = 5, with a ratio score of 3 is clearly using individual words to describe more than one situation. Thus a low ratio score reflects a greater degree of discrimination than does a higher ratio score.

3.4.2.1 Individual discrimination; intelligence, age, vocabulary, and pain words recognised

Table 3.16 shows a correlation matrix which illustrates the relationship between the ratio of TNWC/NDWC and these variables.

We see that there is no relationship with intelligence: the older children tend to have a better, i.e. lower, ratio score. There is no relationship with vocabulary, but there is a relationship with the number of pain descriptors known, i.e. the more words known as pain descriptors the better, or lower, the ratio score.

3.5 Words used to describe the pain situations

3.5.1 Words used to describe individual pain situations

Tables 3.17 to 3.21 contain the data for the four groups of children, and show the most popular words chosen for each situation. There is clearly a degree of repetition, e.g. 'stinging', 'sore' and 'awful' occur quite often.

3.5.2 Relationship between the pain words used to describe the pain situations, and intelligence, general vocabulary, pain words known and age

Table 3.22 shows a correlation matrix of these variables.

Looking first at the total number of words chosen to describe the pain situations (TNWC), we see that this is highly significantly negatively correlated with intelligence. The more intelligent children, across age-groups, are choosing fewer words than the less intelligent children to describe the five pain situations. Although one expects that as children got older they do get smarter, this result suggests that

Table 3.16

CORRELATION MATRIX

Relationship between the ratio of the total number of words chosen and the number of different words chosen (individual discrimination)

N = 104 D.F. = 102 R @ .05 = .1927 R @ .01 = .2515

	Ratio of the total number of words chosen/the number of different words chosen (TNWC/NWC)
Intelligence	-.0354
Age	-.2358
General vocabulary	.0774
Number of pain descriptors selected previously	-.2596

Table 3.17

7 YEAR OLDS: Percentage number of times words were chosen to describe pain situations

1		2		3		4		5	
Scalding	54	Stinging	67	Stinging	67	Pricking	54	Stinging	29
Stinging	46	Sore	50	Sore	33	Stinging	45	Awful	21
Hurting	29	Awful	42	Cutting	33	Awful	29	Drilling	21
Stabbing	29	Unbearable	29	Awful	25	Hurting	21	Unbearable	17
Unbearable	21	Hurting	21	Aching	21	Sore	21	Hurting	17
Awful	17	Itchy	13	Crushing	21	Sharp	21	Cold	13
Killing	17	Dreadful	8	Dreadful	17	Unbearable	17	Aching	13
Sickening	17	Blinding	8	Stabbing	17	Terrifying	17	Sore	13
Crushing	17	Killing	8	Unbearable	13	Aching	17	Tickling	13
Cutting	17	Cutting	8	Splitting	8	Dreadful	13	Cool	8
Suffocating	13	Intense	4	Hurting	8	Troublesome	8	Dreadful	8
Aching	13	Annoying	4	Scalding	8	Stabbing	8	Terrifying	8
Freezing	8	Torturing	4	Sharp	8	Shooting	8	Sickening	8
Dreadful	8	Vicious	4	Beating	8	Throbbing	8	Tender	8
Splitting	8	Cruel	4	Throbbing	8	Thumping	4	Dull	8
Sore	8	Suffocating	4	Freezing	4	Cutting	4	Tingling	8
Burning	8	Exhausting	4	Intense	4	Nipping	4	Cutting	8
Squeezing	8	Aching	4	Pounding	4	Pulling	4	Pricking	8
Shooting	8	Scalding	4	Flashing	4	Wrenching	4	Pulsing	4
Pulsing	8	Burning	4	Pricking	4	Hot	4	Throbbing	4
Intense	4	Wrenching	4	Squeezing	4	Tearing	4	Spreading	4
Vicious	4	Crushing	4	Burning	4	Tiring	4	Shooting	4
Tender	4	Stabbing	4	Suffocating	4	Sickening	4	Stabbing	4
Itchy	4	Piercing	4	Terrifying	4	Suffocating	4	Nipping	4
Hot	4	Pricking	4	Troublesome	4	Cruel	4	Gripping	4
Wrenching	4	Shooting	4			Vicious	4	Tugging	4
Pressing	4	Flashing	4			Killing	4	Pulling	4
Piercing	4	Spreading	4			Intense	4	Burning	4
Spreading	4	Beating	4			Agonising	4	Scalding	4
Pounding	4	Pulsing	4					Numbing	4
Throbbing	4							Tiring	4
								Exhausting	4
								Vicious	4
								Torturing	4
								Freezing	4

Table 3.18

8 YEAR OLDS: Percentage number of times words were chosen to describe pain situations

1		2		3		4		5	
Scalding	66	Stinging	76	Stinging	62	Stinging	45	Drilling	38
Unbearable	35	Sore	28	Splitting	31	Sharp	41	Killing	24
Terrifying	31	Blinding	24	Stabbing	28	Splitting	28	Cutting	21
Torturing	28	Scalding	24	Crushing	24	Unbearable	21	Exhausting	17
Stinging	28	Awful	21	Cutting	24	Nipping	21	Stinging	17
Crushing	28	Agonising	18	Throbbing	24	Cutting	21	Tickling	17
Shooting	28	Killing	14	Killing	21	Stabbing	21	Awful	14
Killing	24	Splitting	14	Pricking	21	Pricking	21	Terrifying	14
Stabbing	24	Stabbing	14	Terrifying	17	Killing	17	Beating	10
Wrenching	21	Pricking	14	Hurting	17	Drilling	17	Pricking	10
Cutting	21	Unbearable	10	Unbearable	14	Hurting	14	Stabbing	10
Splitting	17	Dreadful	10	Awful	14	Itchy	14	Sharp	10
Hurting	17	Annoying	10	Sharp	14	Squeezing	14	Crushing	10
Sharp	17	Vicious	10	Beating	10	Shooting	14	Hurting	10
Suffocating	14	Terrifying	10	Aching	10	Thumping	10	Tender	10
Drilling	14	Suffocating	10	Vicious	10	Piercing	10	Splitting	10
Beating	14	Aching	10	Dreadful	10	Crushing	10	Suffocating	10
Freezing	10	Hurting	10	Agonising	10	Sore	10	Vicious	10
Agonising	10	Nipping	10	Jumping	7	Aching	10	Agonising	10
Burning	10	Cutting	10	Shooting	7	Agonising	10	Unbearable	10
Cool	10	Sharp	10	Piercing	7	Spreading	7	Cool	10
Thumping	10	Shooting	10	Pressing	7	Tugging	7	Pounding	7
Throbbing	10	Throbbing	7	Numbing	7	Fearful	7	Spreading	7
Pounding	7	Flashing	7	Suffocating	7	Terrifying	7	Flashing	7
Squeezing	7	Drilling	7	Torturing	7	Vicious	7	Shooting	7
Tugging	7	Gripping	7	Freezing	7	Awful	7	Squeezing	7
Pulling	7	Crushing	7	Pounding	3	Cold	7	Tugging	7
Itchy	7	Pulling	7	Flashing	3	Freezing	7	Pulling	7
Sore	7	Wrenching	7	Drilling	3	Pulsing	3	Wrenching	7
Aching	7	Choking	7	Nipping	3	Throbbing	3	Sore	7
Tearing	7	Torturing	7	Squeezing	3	Pounding	3	Numbing	7
Exhausting	7	Troublesome	7	Wrenching	3	Jumping	3	Sickening	7
Awful	7	Cold	7	Hot	3	Flashing	3	Fearful	7
Blinding	7	Freezing	7	Burning	3	Wrenching	3	Frightful	7
Pulsing	3	Pulsing	3	Scalding	3	Scalding	3	Throbbing	3
Spreading	3	Beating	3	Dull	3	Tingling	3	Nipping	3
Piercing	3	Pounding	3	Sore	3	Numbing	3	Gripping	3
Nipping	3	Piercing	3	Exhausting	3	Exhausting	3	Scalding	3
Gripping	3	Pressing	3	Frightful	3	Sickening	3	Tingling	3
Tickling	3	Squeezing	3	Annoying	3	Suffocating	3	Itchy	3
Tingling	3	Burning	3	Intense	3	Frightful	3	Dull	3
Dull	3	Tingling	3	Cold	3	Blinding	3	Aching	3
Numbing	3	Itchy	3			Annoying	3	Tearing	3
Choking	3	Dull	3			Troublesome	3	Cruel	3
Vicious	3	Exhausting	3			Dreadful	3	Torturing	3
Troublesome	3	Fearful	3			Cool	3	Troublesome	3
Intense	3	Frightful	3					Dreadful	3
								Intense	3
								Freezing	3

Table 3.19

9 YEAR OLDS: Percentage number of times words were chosen to describe pain situations

1		2		3		4		5	
Scalding	78	Stinging	70	Throbbing	37	Stinging	44	Drilling	41
Unbearable	44	Blinding	41	Stinging	33	Sharp	41	Awful	30
Stinging	44	Sore	37	Sore	22	Pricking	41	Numbing	22
Throbbing	22	Annoying	33	Unbearable	19	Stabbing	26	Annoying	19
Hurting	19	Awful	22	Aching	19	Throbbing	22	Stinging	19
Spreading	19	Aching	15	Tingling	19	Sore	19	Agonising	15
Killing	15	Hurting	11	Crushing	19	Dreadful	15	Aching	15
Terrifying	15	Nipping	11	Cutting	19	Hurting	15	Tingling	15
Cutting	15	Pulsing	7	Spreading	19	Piercing	11	Nipping	15
Stabbing	15	Spreading	7	Sharp	15	Cutting	11	Fearful	11
Sore	11	Sharp	7	Stabbing	15	Nipping	11	Sore	11
Sharp	11	Tingling	7	Beating	11	Tingling	11	Pricking	11
Flashing	11	Cool	7	Pounding	11	Aching	11	Pounding	11
Torturing	7	Beating	4	Piercing	11	Vicious	11	Throbbing	11
Pounding	7	Flashing	4	Hot	11	Spreading	7	Pulsing	7
Piercing	7	Shooting	4	Numbing	11	Itchy	7	Beating	7
Crushing	7	Hot	4	Hurting	11	Annoying	7	Stabbing	7
Numbing	7	Burning	4	Splitting	11	Intense	7	Sharp	7
Splitting	7	Tickling	4	Awful	11	Agonising	7	Cutting	7
Exhausting	7	Itchy	4	Annoying	11	Thumping	4	Tickling	7
Choking	7	Tender	4	Agonising	11	Beating	4	Itchy	7
Torturing	7	Exhausting	4	Thumping	7	Pounding	4	Hurting	7
Beating	4	Fearful	4	Drilling	7	Shooting	4	Sickening	7
Shooting	4	Terrifying	4	Gripping	7	Drilling	4	Killing	7
Pricking	4	Vicious	4	Squeezing	7	Gripping	4	Unbearable	7
Pulling	4	Torturing	4	Scalding	7	Wrenching	4	Flashing	7
Hot	4	Dreadful	4	Dreadful	7	Hot	4	Squeezing	4
Burning	4	Agonising	4	Pricking	4	Scalding	4	Crushing	4
Tingling	4	Unbearable	4	Nipping	4	Numbing	4	Tugging	4
Aching	4			Pressing	4	Tender	4	Pulling	4
Suffocating	4			Pulling	4	Tearing	4	Dull	4
Frightful	4			Wrenching	4	Splitting	4	Tender	4
Vicious	4			Frightful	4	Fearful	4	Tearing	4
Awful	4			Terrifying	4	Unbearable	4	Splitting	4
Blinding	4			Cruel	4			Exhausting	4
Annoying	4			Vicious	4			Choking	4
Dreadful	4			Killing	4			Cruel	4
Intense	4			Wretched	4			Torturing	4
Freezing	4							Wretched	4
								Blinding	4
								Intense	4
								Cold	4
								Freezing	4

Table 3.20

10 YEAR OLDS: Percentage number of times words were chosen to describe pain situations

1		2		3		4		5	
Scalding	86	Stinging	64	Stinging	57	Sharp	43	Drilling	57
Stinging	68	Blinding	43	Throbbing	57	Pricking	36	Tingling	32
Throbbing	43	Sore	43	Sore	29	Stinging	25	Numbing	29
Sharp	32	Piercing	25	Agonising	21	Nipping	25	Throbbing	29
Awful	29	Itchy	21	Hurting	18	Itchy	21	Agonising	25
Sore	29	Sharp	21	Numbing	18	Sore	18	Aching	21
Crushing	29	Stabbing	21	Sharp	18	Piercing	18	Terrifying	18
Wrenching	25	Agonising	18	Stabbing	18	Throbbing	18	Stinging	18
Unbearable	21	Hurting	14	Piercing	18	Killing	14	Sharp	18
Agonising	21	Scalding	14	Awful	14	Shooting	14	Cold	14
Intense	18	Hot	14	Hot	14	Stabbing	11	Killing	14
Aching	18	Crushing	14	Crushing	14	Cutting	11	Thumping	11
Piercing	18	Pricking	14	Nipping	14	Dull	11	Jumping	11
Stabbing	14	Spreading	14	Pulsing	14	Numbing	11	Shooting	11
Jumping	14	Tearing	11	Thumping	11	Hurting	11	Wrenching	11
Drilling	11	Splitting	11	Spreading	11	Splitting	11	Awful	11
Tender	11	Annoying	11	Cutting	11	Cruel	11	Dreadful	11
Terrifying	11	Throbbing	7	Aching	11	Intense	11	Pulsing	7
Torturing	11	Nipping	7	Splitting	11	Beating	7	Beating	7
Killing	11	Squeezing	7	Beating	7	Squeezing	7	Spreading	7
Thumping	7	Wrenching	7	Jumping	7	Tickling	7	Flashing	7
Flashing	7	Aching	7	Shooting	7	Tingling	7	Piercing	7
Burning	7	Tender	7	Pressing	7	Tender	7	Stabbing	7
Hurting	7	Vicious	7	Wrenching	7	Tiring	7	Cutting	7
Fearful	7	Awful	7	Tender	7	Dreadful	7	Nipping	7
Vicious	7	Dreadful	7	Tearing	7	Agonising	7	Crushing	7
Beating	4	Pulsing	4	Fearful	7	Pulsing	4	Pulling	7
Pounding	4	Pounding	4	Cruel	7	Pounding	4	Tickling	7
Shooting	4	Jumping	4	Torturing	7	Jumping	4	Itchy	7
Pricking	4	Flashing	4	Killing	7	Flashing	4	Sore	7
Nipping	4	Shooting	4	Annoying	7	Drilling	4	Splitting	7
Pressing	4	Drilling	4	Dreadful	7	Pressing	4	Tiring	7
Gripping	4	Cutting	4	Intense	7	Gripping	4	Sickening	7
Pulling	4	Burning	4	Unbearable	7	Tugging	4	Cruel	7
Tingling	4	Numbing	4	Pricking	4	Pulling	4	Vicious	7
Numbing	4	Tiring	4	Drilling	4	Exhausting	4	Blinding	7
Tearing	4	Fearful	4	Squeezing	4	Choking	4	Troublesome	7
Exhausting	4	Cruel	4	Pulling	4	Sickening	4	Pricking	4
Choking	4	Torturing	4	Burning	4	Fearful	4	Pressing	4
Sickening	4	Wretched	4	Tickling	4	Terrifying	4	Tugging	4
Suffocating	4	Intense	4	Tingling	4	Punishing	4	Scalding	4
Cruel	4	Unbearable	4	Itchy	4	Vicious	4	Hurting	4
Wretched	4	Cool	4	Exhausting	4	Torturing	4	Tender	4
Troublesome	4			Sickening	4	Wretched	4	Tearing	4
Freezing	4			Frightful	4	Awful	4	Exhausting	4
				Vicious	4	Annoying	4	Suffocating	4
								Frightful	4
								Wretched	4
								Annoying	4
								Intense	4
								Freezing	4

Table 3.21

ADULTS: Percentage number of times words were chosen to describe pain situations

1		2		3		4		5	
Scalding	85	Stinging	89	Sharp	67	Throbbing	74	Drilling	48
Stinging	44	Troublesome	48	Pricking	52	Aching	48	Shooting	37
Agonising	30	Sore	41	Piercing	30	Crushing	30	Numbing	30
Sharp	30	Pricking	26	Sore	26	Intense	26	Sharp	26
Intense	26	Annoying	15	Nipping	26	Tender	26	Throbbing	26
Unbearable	19	Tender	11	Shooting	26	Dreadful	19	Intense	22
Terrifying	19	Hurting	11	Hurting	22	Numbing	19	Aching	22
Hurting	19	Itchy	11	Troublesome	19	Hurting	15	Dreadful	15
Piercing	19	Blinding	7	Fearful	19	Cutting	15	Awful	15
Flashing	19	Dull	7	Tender	19	Spreading	15	Terrifying	15
Spreading	19	Agonising	4	Dreadful	15	Troublesome	11	Frightful	15
Awful	15	Intense	4	Throbbing	15	Annoying	11	Fearful	15
Shooting	15	Dreadful	4	Awful	11	Shooting	11	Pulsing	15
Sore	11	Wretched	4	Aching	11	Pounding	11	Wretched	11
Burning	11	Cruel	4	Tingling	11	Pulsing	11	Sickening	11
Throbbing	11	Punishing	4	Stabbing	11	Awful	7	Tingling	11
Blinding	7	Fearful	4	Terrifying	8	Punishing	7	Cutting	11
Wretched	7	Hot	4	Dull	7	Frightful	7	Agonising	7
Frightful	7	Nipping	4	Stinging	7	Fearful	7	Troublesome	7
Aching	7	Piercing	4	Flashing	7	Sore	7	Vicious	7
Pulsing	7	Spreading	4	Intense	4	Stinging	7	Tiring	7
Dreadful	4			Annoying	4	Sharp	7	Tender	7
Torturing	4			Numbing	4	Stabbing	7	Hurting	7
Vicious	4			Itchy	4	Flashing	7	Tugging	7
Punishing	4			Tickling	4	Agonising	4	Stabbing	7
Fearful	4					Blinding	4	Piercing	7
Sickening	4					Wretched	4	Pricking	7
Tiring	4					Splitting	4	Freezing	4
Splitting	4					Tearing	4	Cold	4
Tearing	4					Tingling	4	Cool	4
Tender	4					Hot	4	Cruel	4
Numbing	4					Wrenching	4	Punishing	4
Stabbing	4					Piercing	4	Choking	4
Drilling	4					Jumping	4	Sore	4
Pricking	4					Thumping	4	Dull	4
Pounding	4							Stinging	4
Thumping	4							Burning	4
								Hot	4
								Wrenching	4
								Crushing	4
								Spreading	4
								Pounding	4
								Thumping	4

Table 3.22

CORRELATION MATRIX

Relationship between the total number of words chosen, the number of different words chosen and the number of different categories chosen to describe the five pain situations and intelligence, age, general vocabulary and the number of pain descriptors selected previously.

N = 104 D.F. = 102 R @ .05 = .1927 R @ .01 = .2515

	Total number of words chosen	Number of different words chosen	Number of different categories chosen
Intelligence	-.3051	-.3046	-.3382
Age	.1956	.3746	.2637
General vocabulary	.1807	.1555	.1784
Number of pain descriptors chosen previously	-.0812	.0663	.0653

abstract intelligence, independent of age, may be an important variable.

There is no relationship with vocabulary or number of pain descriptors known. There is a modest correlation with age; the older children are choosing slightly more words. The pattern repeats itself for the number of words chosen (NDWC) and the number of different categories chosen (NDCC).

3.5.3 The relationship between sex and personality, and TNWC, NDWC and NDCC

T tests showed that there were no significant differences between boys and girls on TNWC t = -0.847; NDWC t = -0.130; NDCC t =0.414. It is of interest to note also that none of these four new variables relate to personality factors. The only variable to relate, significantly, to personality factors, as we noted earlier, seems to be estimated pain intensity.

3.5.4 Words chosen as potential pain descriptors and words used to describe the pain situations

As we saw earlier (Table 3.1) certain words were more often chosen by children as potential pain descriptors than others. We may expect that in completing the five pain questionnaires some words would be used more often than others. As we see in Table 3.23, words such as 'stinging' and 'sore' are more often chosen to describe the pain situations, whilst others are seldom used. What is the relationship between these two findings?

Table 3.24 shows a correlation matrix between the percentage number of times words were selected as being potential pain descriptors, and the percentage number of times words were used as pain descriptors in describing the five pain situations, for the four age-groups of children. Each of these correlations is significant, which would indicate that each of the

Table 3.23

Percentage number of times that words were used to describe the pain situations

SENSORY CLASS		7	8	9	10
Temporal	Pulsing	2.8	1.7	3.1	4.8
	Throbbing	4.2	9.2	18.5	31.0
	Thumping	1.4	4.0	3.1	5.4
	Beating	2.1	8.6	4.9	7.1
	Pounding	2.1	6.3	6.8	3.0
Spatial	Spreading	2.8	4.0	9.3	10.1
	Jumping	0	2.9	1.2	6.0
	Flashing	2.1	4.6	4.3	3.6
	Shooting	4.2	11.5	3.7	7.1
Punctate Pressure	Pricking	14.6	10.9	10.5	10.1
	Drilling	3.5	14.4	10.5	13.1
	Piercing	1.4	4.6	5.6	18.5
	Stabbing	11.1	19.5	11.7	14.9
Incisive Pressure	Sharp	6.3	16.1	15.4	23.8
	Cutting	14.6	19.0	12.3	9.5
Constrictive Pressure	Nipping	1.4	7.5	6.8	10.7
	Pressing	0.7	2.3	0.6	4.2
	Gripping	0.7	3.4	2.5	2.4
	Squeezing	2.1	5.7	2.5	3.6
	Crushing	7.6	17.2	6.8	13.1

SENSORY CLASS (contd.)		7	8	9	10
Traction Pressure	Tugging	2.1	4.0	0.6	1.8
	Pulling	1.4	4.0	1.9	3.6
	Wrenching	2.1	8.0	1.2	10.7
Thermal	Hot	1.4	2.9	3.7	5.4
	Burning	3.5	3.4	1.2	2.4
	Scalding	12.5	17.2	15.4	17.9
Brightness	Tickling	2.1	4.0	1.9	3.0
	Tingling	1.4	2.3	9.3	8.3
	Itchy	4.2	6.9	3.1	9.5
	Stinging	51.4	43.1	40.7	45.8
Dullness	Dull	1.4	2.3	0.6	2.4
	Sore	28.5	10.3	20.4	23.8
	Numbing	0.7	4.6	8.0	11.3
	Hurting	19.4	13.2	11.7	13.1
	Aching	12.5	12.1	14.8	12.5
Misc.	Tender	2.8	2.3	1.9	7.1
	Tearing	0.7	1.7	1.2	4.2
	Splitting	2.8	9.0	6.8	8.9

AFFECTIVE CLASS		7	8	9	10
Tension	Tiring	1.4	1.1	0	3.0
	Exhausting	1.4	5.7	2.5	2.4
Autonomic	Choking	0.7	1.7	1.9	1.8
	Sickening	5.6	1.7	1.2	4.2
	Suffocating	4.9	9.2	0.6	1.2
Fear	Fearful	0	3.4	3.1	4.8
	Frightful	0	2.9	1.9	1.8
	Terrifying	6.9	16.7	3.7	6.0
Punishment	Punishing	0.7	0	0.6	1.2
	Cruel	2.1	0.6	1.2	7.7
	Vicious	3.5	6.9	4.3	5.4
	Torturing	2.8	9.2	3.7	6.0
	Killing	4.9	21.3	5.6	8.3
Misc.	Wretched	0	0	1.9	3.0
	Awful	26.4	12.1	14.8	15.5
	Blinding	2.1	6.9	8.0	8.3

EVALUATIVE CLASS	Annoying	1.4	3.4	14.2	4.8
	Troublesome	2.1	3.4	0	1.8
	Dreadful	9.7	6.9	5.6	8.3
	Intense	3.5	1.7	3.1	7.7
	Agonising	0.7	10.9	9.3	17.9
	Unbearable	18.8	19.5	13.6	6.5

Table 3.24

Rank-order correlation between the percentage number of times questionnaire words were said to be suitable as pain descriptors (table 3.1) and the number of times the words were used to describe the pain situations (table 3.21), for the four age groups of children

N = 60 RHO @ .05 = .2552 RHO @ .01 = .3353

7 year olds	.3727			
8 year olds		.2569		
9 year olds			.4182	
10 year olds				.4303
	7 year olds	8 year olds	9 year olds	10 year olds

age-groups of children are more often using those words for which they have shown a preference beforehand.

We can also look at the relationship between the four groups of children in the percentage number of times that they used individual words to describe the pain situations. A rank order correlation matrix of the values shown in Table 3.23 is shown in Table 3.25.

The significant correlations between the groups would indicate that the same words tended to be popular, or unpopular, amongst the different age-groups of children.

3.5.5 Do the children only choose words to describe the pain situations that they had selected previously as potential pain descriptors?

We can now look at two variables which allows us to answer this question. In the following analysis, NWCK, refers to the number of words chosen to describe the pain situations that the children had chosen as potential pain descriptors previously, and NWCNK refers to the words chosen to describe the pain situations that they had not selected previously.

3.5.5.1 The relationship between NWCK and NWCNK, and age, intelligence, general vocabulary and number of pain words selected previously

Table 3.26, shows correlations between age, intelligence, vocabulary, number of pain descriptors known and NWCK and NWCNK.

There is a significant relationship between age and NWCK; the older children are choosing more pain descriptors that they 'knew'. But there is an even more significant correlation between age and the number of pain descriptors chosen that the children did not know. That is, the older children are using more words that they had not selected as potential pain descriptors.

Table 3.25

Rank-order correlation between the percentage number of times questionnaire words were used as pain descriptors to describe the pain situations, for the four age-groups of children.

N = 60 RHO @ .05 = .2552 RHO @ .01 =.3353

8 year olds	.6880		
9 year olds	.5543	.7081	
10 year olds	.4969	.5830	.7364
	7 year olds	8 year olds	9 year olds

Table 3.26

CORRELATION MATRIX

Relationship between the number of words used to describe the pain situations which the children had chosen previously as pain descriptors, the number of words used to describe the pain situations which the children had not chosen previously as pain descriptors and age, intelligence, general vocabulary and the total number of pain descriptors selected previously.

N = 104 D.F. = 102 R @ .05 = .1927 R @ .01 = .2515

	Number of words used which were chosen previously as pain descriptors (NWCK)	Number of words used which were not chosen previously as pain descriptors (NWCNK)
Age	.2513	.3251
Intelligence	-.0548	-.2332
General vocabulary	-.1604	.2950
Number of pain descriptors selected previously	.6060	-.5313

There is no relationship between intelligence and NWCK, bu there is a relationship between age and the number of words used which were not selected previously as pain descriptors. That is, across age-groups, the more intelligent children are selecting fewer words that they had not chosen previously.

There is no relationship between levels of general vocabulary ability and the number of words that the children had selected as potential pain descriptors. But there is a highly significant correlation between general vocabulary skills and the number of words chosen to describe the pain situations that the children had not previously selected as potential pain descriptors. Remembering that the lower the vocabulary score, the 'better' the vocabulary ability, we see that this relationship means that it is the more able children who are choosing those words that they had previously chosen as pain descriptors. The less able children are using words not previously selected.

As might be expected, the number of words chosen to describe the pain situations that the children had pre-selected as pain descriptors, (NWCK), is highly significantly correlated. The more words they had chosen previously, the more of these words they use. But, the number of words selected to describe the pain situations that the children had not previously chosen as potential pain descriptors, is significantly negatively correlated with the number of pain descriptors known. The fewer the pain descriptors chosen originally, the more the unselected words are chosen to describe the pain.

3.6 Categories chosen to describe the pain situations

For any one pain situation, only one word can be chosen from a category. Therefore, we might expect, over a range of different situations, that certain categories of pain descriptors, as well as certain words, will be more often used than others. Tables 3.27 - 3.31, show the rank ordering of the seventeen categories of descriptors, with the percentage number of times each category was chosen to describe each of the five pain situations.

Table 3.32 shows the rank ordering of the seventeen categories of descriptors collapsed over the five pain situations.

Table 3.33 shows a rank order correlation matrix between the four age-groups, for the data contained in Table 3.32.

This shows quite remarkably significant relationships between the groups. Clearly the children are displaying a high degree of uniformity in their choice of categories.

4. DISCUSSION

We saw in the previous chapter, Experiments One, Two and Three, that by seven years of age and older children are beginning to discriminate words that can be used to describe pain from those that cannot. They can appreciate that words can be organised into qualitatively different categories, and to appreciate that words vary in intensity, in a similar way to adults. The current chapter has addressed the question of whether children can then go on to use these words to describe painful conditions.

4.1 Words recognised and used as pain descriptors

In this study, children aged seven to ten years chose those words that they recognised as pain descriptors, from the same list of pain words, without the non-pain words being included, as was used in Experiment One. The number of words chosen as pain descriptors was unrelated to age, general vocabulary as measured by

Table 3.27

RANK ORDER	PAIN SITUATION 1			PAIN SITUATION 2			PAIN SITUATION 3			PAIN SITUATION 4			PAIN SITUATION 5		
	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	7	Thermal	67	8	Brightness	79	8	Brightness	67	3	Punctate	63	9	Dullness	54
2	8	Brightness	50	9	Dullness	75	9	Dullness	64	9	Dullness	58	8	Brightness	50
3	9	Dullness	50	15	Affec. Misc.	50	4	Incisive	42	8	Brightness	46	3	Punctate	33
4	3	Punctate	33	16	Evaluative	46	16	Evaluative	38	16	Evaluative	46	16	Evaluative	25
5	16	Evaluative	33	2	Spatial	13	15	Affec. Misc.	25	15	Affec. Misc.	29	17	Coldness	25
6	5	Constrictive	29	3	Punctate	13	5	Constrictive	25	4	Incisive	25	15	Affec. Misc.	21
7	12	Autonomic	29	14	Punishment	11	1	Temporal	21	13	Fear	17	1	Temporal	8
8	14	Punishment	21	1	Temporal	8	3	Punctate	21	1	Temporal	13	2	Spaital	8
9	1	Temporal	17	4	Incisive	8	7	Thermal	12	14	Punishment	13	4	Incisive	8
10	4	Incisive	17	7	Thermal	8	10	Sensory Misc.	8	2	Spatial	8	5	Constrictive	8
11	15	Affec. Misc.	17	5	Constrictive	4	2	Spatial	4	6	Traction	8	6	Traction	8
12	2	Spatial	13	6	Traction	4	12	Autonomic	4	12	Autonomic	8	7	Thermal	8
13	10	Sensory Misc.	13	11	Tension	4	13	Fear	4	5	Constrictive	4	10	Sensory Misc.	8
14	17	Coldness	8	12	Autonomic	4	17	Coldness	4	7	Thermal	4	11	Tension	8
15	6	Traction	4	10	Sensory Misc.	0	6	Traction	0	10	Sensory Misc.	4	12	Autonomic	8
16	11	Tension	0	13	Fear	0	11	Tension	0	11	Tension	4	13	Fear	8
17	13	Fear	0	17	Coldness	0	14	Punishment	0	17	Coldness	0	14	Punishment	8

7 YEAR OLDS: The percentage number of times each pain category was chosen to describe each of the five pain situations

Table 3.28

	PAIN SITUATION 1			PAIN SITUATION 2			PAIN SITUATION 3			PAIN SITUATION 4			PAIN SITUATION 5		
RANK ORDER	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	7	Thermal	86	8	Brightness	83	8	Brightness	62	3	Punctate	69	3	Punctate	59
2	14	Punishment	55	16	Evaluative	55	3	Punctate	59	4	Incisive	62	8	Brightness	41
3	16	Evaluative	52	9	Dullness	52	9	Dullness	41	8	Brightness	62	14	Punishment	41
4	1	Temporal	45	15	Affec. Misc.	45	16	Evaluative	41	5	Constrictive	45	4	Incisive	31
5	3	Punctate	41	3	Punctate	38	1	Temporal	38	16	Evaluative	41	9	Dullness	31
6	5	Constrictive	41	5	Constrictive	31	4	Incisive	38	9	Dullness	38	16	Evaluative	31
7	8	Brightness	41	14	Punishment	31	5	Constrictive	38	2	Spatial	28	13	Fear	28
8	4	Incisive	38	7	Thermal	28	14	Punishment	38	10	Sensory Misc.	28	5	Constrictive	24
9	9	Dullness	38	4	Incisive	21	10	Sensory Misc.	31	1	Temporal	21	10	Sensory Misc.	24
10	6	Traction	35	1	Temporal	17	13	Fear	21	13	Fear	17	2	Spatial	21
11	2	Spatial	31	2	Spatial	17	2	Spatial	17	17	Coldness	17	1	Temporal	21
12	13	Fear	31	12	Autonomic	17	15	Affec. Misc.	14	14	Punishment	14	6	Traction	21
13	10	Sensory Misc.	24	13	Fear	17	7	Thermal	10	6	Traction	10	11	Tension	17
14	12	Autonomic	17	6	Traction	14	17	Coldness	10	15	Affec. Misc.	10	12	Autonomic	17
15	15	Affec. Misc.	14	10	Sensory Misc.	14	12	Autonomic	7	12	Autonomic	7	15	Affec. Misc.	14
16	17	Coldness	10	17	Coldness	14	6	Traction	3	7	Thermal	3	17	Coldness	14
17	11	Tension	7	11	Tension	3	11	Tension	3	11	Tension	3	7	Thermal	3

8 YEAR OLDS: The percentage number of times each pain category was chosen to describe each of the five pain situations

Table 3.29

RANK ORDER	PAIN SITUATION 1			PAIN SITUATION 2			PAIN SITUATION 3			PAIN SITUATION 4			PAIN SITUATION 5		
	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	7	Thermal	85	8	Brightness	85	1	Temporal	67	3	Punctate	72	3	Punctate	59
2	16	Evaluative	56	9	Dullness	63	9	Dullness	63	8	Brightness	63	9	Dullness	59
3	8	Brightness	48	15	Affec. Misc.	63	8	Brightness	52	4	Incisive	52	8	Brightness	48
4	9	Dullness	41	16	Evaluative	44	16	Evaluative	48	9	Dullness	48	16	Evaluative	44
5	1	Temporal	33	2	Spatial	15	5	Constrictive	41	16	Evaluative	41	1	Temporal	37
6	2	Spatial	33	1	Temporal	11	3	Punctate	37	1	Temporal	33	15	Affec. Misc.	37
7	3	Punctate	26	5	Constrictive	11	4	Incisive	33	5	Constrictive	15	5	Constrictive	22
8	4	Incisive	26	4	Incisive	7	2	Spatial	19	2	Spatial	11	4	Incisive	15
9	16	Evaluative	26	7	Thermal	7	7	Thermal	19	10	Sensory Misc.	11	14	Punishment	5
10	15	Affec. Misc.	18	13	Fear	7	15	Affec. Misc.	15	14	Punishment	11	10	Sensory Misc.	11
11	12	Autonomic	11	14	Punishment	7	14	Punishment	11	7	Thermal	7	12	Autonomic	11
12	5	Constrictive	7	17	Coldness	7	10	Sensory Misc.	11	6	Traction	4	13	Fear	11
13	10	Sensory Misc.	7	10	Sensory Misc.	4	6	Traction	7	13	Fear	4	6	Traction	7
14	11	Tension	7	11	Tension	4	13	Fear	7	11	Tension	0	17	Coldness	7
15	15	Affec. Misc.	7	3	Punctate	0	11	Tension	0	12	Autonomic	0	2	Spatial	4
16	6	Traction	4	6	Traction	0	12	Autonomic	0	15	Affec. Misc.	0	11	Tension	4
17	17	Coldness	0	12	Autonomic	0	17	Coldness	0	17	Coldness	0	7	Thermal	0

9 YEAR OLDS: The percentage number of times each pain category was chosen to describe each of the five pain situations

Table 3.30

	PAIN SITUATION 1			PAIN SITUATION 2			PAIN SITUATION 3			PAIN SITUATION 4			PAIN SITUATION 5		
RANK ORDER	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	7	Thermal	93	8	Brightness	86	1	Temporal	89	3	Punctate	68	3	Punctate	75
2	8	Brightness	71	9	Dullness	68	9	Dullness	75	8	Brightness	61	8	Brightness	64
3	16	Evaluative	64	3	Punctate	64	16	Evaluative	50	4	Incisive	54	9	Dullness	61
4	1	Temporal	57	15	Affec. Misc.	54	8	Brightness	68	9	Dullness	50	1	Temporal	54
5	9	Dullness	57	16	Evaluative	43	3	Punctate	43	5	Constrictive	39	16	Evaluative	50
6	3	Punctate	46	7	Thermal	32	5	Constrictive	39	14	Punishment	36	2	Spatial	36
7	5	Constrictive	39	5	Constrictive	29	4	Incisive	29	1	Temporal	32	14	Punishment	29
8	4	Incisive	32	10	Sensory Misc.	29	2	Spatial	25	16	Evaluative	29	4	Incisive	25
9	14	Punishment	32	2	Spatial	25	10	Sensory Misc.	25	2	Spatial	21	6	Traction	21
10	15	Affec. Misc.	32	4	Incisive	25	14	Punishment	25	10	Sensory Misc.	18	13	Fear	21
11	6	Traction	29	1	Temporal	14	7	Thermal	18	11	Tension	11	15	Affec. Misc.	21
12	2	Spatial	25	14	Punishment	14	15	Affec. Misc.	14	6	Traction	7	5	Constrictive	18
13	13	Fear	18	6	Traction	7	6	Traction	11	12	Autonomic	7	17	Coldness	18
14	10	Sensory Misc.	14	11	Tension	4	13	Fear	11	13	Fear	7	10	Sensory Misc.	14
15	12	Autonomic	11	13	Fear	4	11	Tension	4	15	Affec. Misc.	7	11	Tension	11
16	11	Tension	4	17	Coldness	4	12	Autonomic	4	7	Thermal	0	12	Autonomic	11
17	17	Coldness	4	12	Autonomic	0	17	Coldness	0	17	Coldness	0	7	Thermal	4

10 YEAR OLDS: The percentage number of times each pain category was chosen to describe each of the five pain situations

Table 3.31

	PAIN SITUATION 1			PAIN SITUATION 2			PAIN SITUATION 3			PAIN SITUATION 4			PAIN SITUATION 5		
RANK ORDER	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	7	Thermal	96	16	Evaluative	74	3	Punctate	93	1	Temporal	100	3	Punctate	70
2	16	Evaluative	78	9	Dullness	59	4	Incisive	67	9	Dullness	89	9	Dullness	67
3	2	Spatial	52	3	Punctate	30	9	Dullness	70	16	Evaluative	70	13	Fear	54
4	8	Brightness	44	4	Incisive	22	16	Evaluative	41	2	Spatial	37	16	Evaluative	52
5	9	Dullness	41	15	Affec. Misc.	11	2	Spatial	32	10	Sensory Misc.	33	1	Temporal	48
6	3	Punctate	30	8	Brightness	11	1	Temporal	26	5	Constrictive	20	2	Spatial	41
7	4	Incisive	30	10	Sensory Misc.	11	5	Constrictive	26	4	Incisive	22	4	Incisive	37
8	13	Fear	30	14	Punishment	7	8	Brightness	26	13	Fear	15	15	Affec. Misc.	26
9	15	Affec. Misc.	30	13	Fear	4	13	Fear	26	15	Affec. Misc.	15	8	Brightness	15
10	1	Temporal	26	2	Spatial	4	10	Sensory Misc.	19	3	Punctate	11	12	Autonomic	15
11	10	Sensory Misc.	11	5	Constrictive	4	15	Affec. Misc.	11	8	Brightness	11	14	Punishment	15
12	14	Punishment	11	7	Thermal	4	6	Traction	0	14	Punishment	7	6	Traction	11
13	11	Tension	4	1	Temporal	0	7	Thermal	0	6	Traction	4	17	Coldness	11
14	12	Autonomic	4	6	Traction	0	11	Tension	0	7	Thermal	4	7	Thermal	7
15	5	Constrictive	0	11	Tension	0	12	Autonomic	0	11	Tension	0	10	Sensory Misc.	7
16	6	Traction	0	12	Autonomic	0	14	Punishment	0	12	Autonomic	0	11	Tension	7
17	17	Coldness	0	17	Coldness	0	17	Coldness	0	17	Coldness	0	5	Constrictive	4

ADULTS: The percentage number of times each pain category was chosen to describe each of the five pain situations

Table 3.32

RANK ORDER	SEVEN YEAR OLDS			EIGHT YEAR OLDS			NINE YEAR OLDS			TEN YEAR OLDS		
	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN	CATEGORY NUMBER	CATEGORY LABEL	% NO. OF TIMES CHOSEN
1	9	Dullness	60	8	Brightness	58	8	Brightness	59	3	Punctate	59
2	8	Brightness	58	3	Punctate	53	9	Dullness	55	8	Brightness	58
3	16	Evaluative	37	16	Evaluative	44	16	Evaluative	47	1	Temporal	49
4	3	Punctate	32	9	Dullness	40	3	Punctate	41	9	Dullness	47
5	15	Affec. Misc.	28	4	Incisive	38	1	Temporal	36	16	Evaluative	47
6	4	Incisive	20	14	Punishment	38	4	Incisive	27	4	Incisive	33
7	7	Thermal	20	5	Constrictive	36	7	Thermal	24	5	Constrictive	33
8	5	Constrictive	14	1	Temporal	28	15	Affec. Misc.	24	7	Thermal	29
9	1	Temporal	13	7	Thermal	26	5	Constrictive	19	14	Punishment	27
10	14	Punishment	12	10	Sensory Misc.	24	2	Spatial	16	2	Spatial	26
11	12	Autonomic	11	2	Spatial	23	14	Punishment	14	15	Affec. Misc.	26
12	2	Spatial	9	13	Fear	23	13	Fear	10	10	Sensory Misc.	20
13	17	Coldness	8	15	Affec. Misc.	19	10	Sensory Misc.	9	6	Traction	15
14	10	Sensory Misc.	7	6	Traction	17	6	Traction	4	13	Fear	12
15	13	Fear	6	12	Autonomic	13	12	Autonomic	4	11	Tension	6
16	6	Traction	5	17	Coldness	13	17	Coldness	4	12	Autonomic	6
17	11	Tension	3	11	Tension	7	11	Tension	3	17	Coldness	5

Rank ordering of the seventeen categories of pain descriptors, collapsed over the five pain situations, for each age-group of children

Table 3.33

Rank-order correlations between the percentage number of times questionnaire categories were chosen to describe pain situations

8 year olds	.7880		
9 year olds	.9220	.8659	
10 year olds	.8307	.9195	.9429
	7 year olds	8 year olds	9 year olds

standard tests, or to their level of abstract intelligence.

4.2 Success of the pain discrimination procedure

As noted in the introduction to this chapter, a novel procedure was used to test for pain discrimination. For this reason an adult comparison group was included to test that the procedure could yield data which showed discrimination between several painful conditions. It is argued that the data from the adult comparison group does show that the procedure does indeed have the potential to show this discrimination in terms of both the intensity of the anticipated pains (Table 3.8) and the words chosen to describe the varying qualities of pain anticipated (Table 3.14). Where relevant, the adult data will be discussed along with the children's data in this discussion.

4.3 Pain intensity

Each subject was asked to provide a pain intensity rating for each of the five pain conditions. Analysis shows clearly that there are highly significant differences in the pain intensity responses over the five pain conditions for each of the four age-groups of children and the adults (Table 3.8). That is, all groups of subjects discriminated across the five pain conditions on the intensity of anticipated pain.

Girls were shown to anticipate more pain in these situations than boys. There was no significant relationship between intelligence or vocabulary level on anticipated pain intensity.

Pain intensity was shown to be related to several personality dimensions. That is, the more Undemonstrative, Submissive, Sober, Naive, Tender-minded, more Highly-Moral children, view pain in increased intensity terms (Table 3.9).

4.4 Qualitative group discrimination between the pain situations

Statistical analysis of the qualitative dimensions of the questionnaire data was undertaken (Tables 3.10 to 3.14). However, the interpretation of the results requires a degree of caution. Analysis has shown that for the various age-groups, certain qualities of pain show statistically significant discrimination over the five pain situations. This discrimination is evident because the number of children selecting a particular quality to describe a particular pain varied over the five conditions. However, these analyses can be misleading.

For the pain intensity estimates discussed above, all individuals were called upon to make an estimate on that dimension for each pain condition. However, in terms of describing the qualitative dimensions of pain, individuals were free to select, or not to select, words from each of the seventeen qualitatively different categories to describe the pain experienced in each pain condition. Therefore, there are varying numbers of individuals in the analyses of the varying qualitative dimensions across the five situations.

For example, Table 3.10 shows the Cochran's Q analysis of the questionnaire data for the seven year olds. Category 17, Coldness, shows a highly significant difference over the five conditions in the number of children who selected words from that category. It is clear, however, that very few of the children actually chose words from that category; 2, 0, 1, 0, 6, for pains one to five respectively.

Therefore, in order to gain a true representation of the information contained in the data we have to interpret the statistical analysis results in conjunction with the more qualitative 'feel' that we get from the other information we have available. As an aid to clarity, it was decided, arbitrarily, to restrict this discussion to those instances which satisfied the following two criteria. At least half of the children in each age-group had to have selected a particular qualitative class to describe at least one of the pain situations, and also the particular class had to show a significant degree of discrimination between the five pain conditions.

Using these criteria, the seven year old children show evidence of only a very small degree of discrimination (Table 3.10). Over half of the children chose the Punctate Class to describe pain situation four, the Thermal Class to describe pain situation one, and the Affective Miscellaneous Class to describe pain situation two. Although the Brightness and Dullness Classes were the most popular descriptors for all five pains, these did not discriminate between the pains.

The eight year olds showed the following combination of selections (Table 3.11). Over fifty per cent chose the Thermal, Class to describe pain one; the Brightness Class to describe pain two; the Punctate and Brightness Classes to describe pain three; the Punctate, Incisive and Brightness Classes to describe pain four and the Punctate Class to describe pain five.

There is clearly a degree of repetition evident, with the Punctate and Brightness Classes being selected to describe three out of the five pains. However, the combinations of words chosen does provide a small degree of discrimination, although clearly in a more complex fashion than that of the seven year old children.

Over fifty per cent of the nine year old children chose the Thermal Class to describe pain one; the Brightness and Affective Miscellaneous Classes to describe pain two; the Temporal and Brightness Classes to describe pain three; the Punctate, Incisive and Brightness Classes to describe pain four; the Punctate class to describe pain five (Table 3.12).

Again we see that there is a degree of repetition in that the Brightness category is selected to describe three of the five pains. However, it is clear that in viewing the combinations of categories chosen by over fifty per cent of the children, for pains one to four there are what appear to be unique combinations of categories which discriminate between those pains.

Over fifty per cent of the ten year olds chose the Temporal and Thermal Classes to describe pain one; the Punctate and Affective Miscellaneous Classes to describe pain two; the Temporal Class to describe pain three; the Punctate Class to describe pain four; the Temporal and Punctate Classes to describe pain five (Table 3.13).

Again we see a degree of repetition, with the Temporal and Punctate Classes being selected to describe three of the five pains. However, all but one of the children chose the Thermal Class to describe pain one, and all but two chose the Temporal Class to describe pain three. Thus we see a higher degree of agreement amongst the ten year olds than was found in the younger children.

Applying the same criteria to the adult data shows that over fifty per cent chose words from the Temporal, Spatial, Punctate, Thermal and Evaluative Classes to describe pain one; the Punctate, Brightness, Dullness and Evaluative Classes for pain two; the Incisive and Dullness Classes for pain three; the Temporal, Punctate, Dullness and Evaluative Classes for pain four; the Dullness and Evaluative Classes for pain five (Table 3.14).

The adults show by far the highest degree of agreement and the best discrimination in that for pain one all but one of the adults selected the Thermal Category, for pain two they all selected the Brightness Category and for pain four they all selected the Temporal Category.

4.5 Individual qualitative discrimination

The ratio between the number of words chosen and the number of different words chosen to describe the five pain conditions was used as a measure of an individual's pain discrimination ability. We see that it is the number of words which children had previously selected as pain descriptors, and increasing age, which are associated with this increased pain discrimination (Table 3.16).

4.6 Words used to describe the pain situations

When considering the number of words, the number of different words and the number of different categories that children chose to describe the five pain situations, we see a trend in each case, for the more intelligent children across age-groups to choose fewer of these than the less intelligent children. There is also a tendency with increasing age for children to choose more of each of these variables (Table 3.22).

There is a clear tendency for the groups of children to choose words to describe the pain situations that they had recognised earlier as pain descriptors (Table 3.26). Even more striking is the relationship between the different age-groups of children in the words that they chose to describe the pain situations (Table 3.25). This clearly indicates that the same words tend to be popular, or unpopular, across the groups. The same is true in the choice of categories to describe the pain situations, as there are highly significant relationships between the different age-groups in the rank ordering of the choice of categories (Table 3.33).

When describing the pain situations, the children do not restrict themselves to those words that they selected earlier as pain descriptors. It is tempting, therefore, to conclude that they are guessing when they use these different words.

Further analysis shows that there is a tendency with increasing age to choose words that were selected previously (Table 3.26). However, there is an even greater tendency with increasing age to use words not selected previously (Table 3.26). This, coupled with the fact that there is a relationship between the number of words used to describe the pain situations that had not been selected previously and higher general vocabulary skills (Table 3.26), does suggest an alternative explanation. That is, with the addition of a 'pain context', the depicted pain situations, in which to use the pain descriptors, the older, and more verbally skilled children, are better able to utilise their knowledge and skills to construct figurative descriptions of the painful situations.

4.7 Summary

Statistical analysis of the questionnaire data has shown us that the youngest children show indications of only rudimentary verbal pain discrimination in this task. The best predictors of success at pain discrimination are the number of pain descriptors children know and increasing age (Table 3.16). When describing pain, those children with greater verbal abilities are more inclined to use pain descriptors that they had not recognised previously; this is also true, independent of age, for the more intelligent children (Table 3.26).

The relationship between personality factors and discrimination ability and anticipated pain intensity is of interest. This seems to indicate that personality is not related to the ability to describe, verbally, qualitative differences between different pains, but rather it is related to reported elevated or depressed intensities within these various qualities (Table 3.9).

To conclude, we have seen that success at verbal pain discrimination seems to rest on a general increase in age and intellectual development which operates independently of personality. Anticipated pain intensity levels were seen to be unrelated to general intellectual development, but were weakly related to several personality dimensions.

CHAPTER FOUR

An investigation of children's pain schemata

1. INTRODUCTION

This chapter presents Experiment Five which took the form of a structured interview. This was designed to determine whether children could recall, and describe, their past painful experiences. Little systematic work has been carried out to assess, specifically, the child's ability to recall and describe their own past painful experiences.

This study aims to answer several questions;

1.1 Can children recall their past painful experiences?
Implicit in an individual's verbal, or non verbal, assessment of pain, is the assumption that the individual has access to past experience upon which to base present descriptions or estimates. Verbal descriptions of the current pain require the assessment of current state and then attachment of a linguistic label to it. This label has been acquired as a pain descriptor in the past, or is thought to be appropriate, in the current context, as an extension of previous usage, or as an appropriate figurative use of language. Therefore, the first question allows us to ask by what age children recall a reasonable number of painful experiences to allow us to say that they have access to a knowledge base upon which to base their subjective labelling, or indeed their non-verbal estimates.

In an attempt to determine children's ability to recall painful experiences, Savedra et al (1981 and 1982) conducted an interview study of hospitalised and non-hospitalised children aged nine to twelve years

(N=214). The children were asked to "list three things that had caused you to have pain". The following table lists the seven categories which had the highest frequency of response.

Category	Cause 1	Cause 2	Cause 3
Falls	14	13	8
Being hit	12	10	11
Surgery	9	5	5
Aches/ pains	8	13	10
Shots	7	5	2
Cuts	6	4	6
Broken bones	4	7	4
Don't know	3	7	16

Top seven responses to the question "What three things have caused you to have pain", with the percentage number of children who generated that response.

It is unfortunate that the data presented is collapsed over age-groups. However, we do see that three per cent of children failed to give one cause, seven per cent failed to give a second cause and sixteen per cent failed to give a third cause for pain. It still remains unclear, from the data presented, by what age children are unable to recall their past pain experiences, and whether there is a trend towards older children having greater recall than younger children.

A further criticism of this study is that asking the children to list three things which had caused them pain might have precluded the finding of a developmental trend. We might expect that children of different ages may be expected to recall a different number of pain experiences; this question may well mask this difference.

In a study of 994 children aged 5 to 12 years of age, Ross and Ross (1984b), asked open-ended questions to determine the extent of the children's knowledge and understanding of pain. The authors report an absence of clearly defined age trends in their data.

It is unclear exactly what questions were asked of the children in this study. It is also difficult to determine exactly what the children's responses were, although the authors present the following information.

Cause of pain	**Percentage number of children**
Accidents	36
Heat and noise	11
Illness	9
Surgery	7
Aggressive action of others	7

Specific pain experiences, and the percentage number of children who generated them.

As in the Savedra et al study, this paper has collapsed the reported data over age-groups and, therefore, it is not possible to determine the ability of children of different ages to recall past painful experiences.

The lack of age trend in this study is very surprising, given the age-range studied. But, again, this may be a function of the study questions asked. The present study will clarify this issue.

1.2 To what do the children attribute the cause of these painful experiences?

Do children attribute the cause of their painful experiences to realistic real world events? Do they see a relationship between actions that they carry out, or the things which happen to them and the pain that they experience, rather than making arbitrary attributions?

Gaffney and Dunne (1983) asked six hundred and eighty children, aged five to fifteen years, to complete the sentence "A person gets a pain because...". The results of this study show that forty-four per cent of the children cited as causes of pain explanations involving one or more elements of transgression, or self causality. Objective and abstract explanations of pain increased significantly with age.

Category	Age 5-7	Age 8-10	Age 11-14
Trauma	15.9	27.1	44.3
Transgression/ eating	26.8	26.6	17.8
Illness/sickness	24.7	15.9	16.2
Transgression/ general	7.2	20.0	17.5
Psychological	2.5	4.6	18.5
Transgression/ other	5.7	8.7	12.0

Children's Attributions of the Causes of Pain

The authors argue, citing the work of Piaget (1977) and Kohlberg (1941), that transgression is a "misconception" on the part of the child, which is brought about by the cognitive constraints under which the child has to labour. That is, because the younger child, below the age of seven, tends towards egocentrism, and tends to identify wrong acts with punished acts and vice versa, they will view pain as the outcome of breaking or failing to comply with rules.

However, this is a theoretical stance, rather than being the only possible explanation. That is, the child who attributes his stomach ache to being caused by his "having eaten too much", or "having run too fast" (two examples given by the authors of transgression), may be making a perfectly logical link, rather than an erroneous link, as the authors would have us believe.

The work of Savedra et al (1981 and 1982) and Ross and Ross (1984b) has already been referred to. In the context of this question, Ross and Ross found that for the nine hundred and ninety four children studied, "specific pain experiences were attributed in a logical and matter-of-fact way to clearly related and immediate causes". They rarely found evidence of a perceived 'misbehaviour-pain as punishment' link. We must remember that these specific responses were limited to the worst pain ever.

Savedra et al (1981 and 1982) report that when children were asked to list three things which had caused them pain, the "younger children especially gave answers related to physical aspects of pain". They also report that the older children included a psychological connotation in their responses.

Therefore, both in the reported findings and in the interpretation of their data, we find Savedra et al, and Ross and Ross, in opposition to Gaffney and Dunne. The current study will allow comment on this.

1.3 How do children describe these events?

We clearly need to know how children spontaneously describe a painful experience. But, ideally we need to know how each individual child describes a range of different experiences. The description of all the painful events that each child can recall having experienced may provide an answer to this problem. Can they recall what the pain felt like? Does everything 'hurt' or feel 'sore', as we know that most children over the age of five recognise these words as pain descriptors? Or do the children use different words to describe different situations?

Savedra et al (1981 and 1982) asked children to describe their worst pain ever. The children studied were aged between nine and twelve years of age. Unfortunately, the data are not presented in a manner which allows for proper evaluation. The responses are discussed as a single group, rather than for the different age-groups of children. The pain descriptions reported are a list of single pain descriptors which the children used. Unfortunately, the authors have omitted the report the number, or ages, of children who used them, or the situations which the words were used to describe. Also this study does not allow for comment on the way that individuals describe different painful experiences.

Ross and Ross (1984b) provide examples of both single word pain descriptors and children's use of sentences to describe their recalled pain. However, none of the data reported gives examples of individual children describing more than one painful situation.

In contrast with the studies considered above, the present experiment asks questions of the children studied which will allow a clear answer to be reached.

1.4 Do children spontaneously use figures of speech to aid their pain description?

This next question is an extension of the previous question. Many of the words, phrases and sentences used to describe pain have a figurative element. This clearly is a useful tool, as it enables the use of external events or cross modality experiences to be utilised in externalising this subjective experience.

A review of the literature on children's figurative ability indicated that children as young as five years of age may be expected to have the ability to produce novel figurative descriptions. Several sources have provided data which would indicate that children of different ages can indeed produce figurative pain descriptions.

Abu-Saad and Holzemer (1981) and Abu-Saad (1984) found that children aged nine to fifteen years spontaneously generated figurative descriptions of their surgical pain. For example, they produced the following one word metaphors; pinching, stretching, burning, stabbing and hitting.

Beales et al (1983) asked juvenile arthritic children, aged six to seventeen years, to select from a list of eleven statements those which described their joint sensations. All but one of these statements is a figure of speech. For example, "Does your joint feel like it has been cut?". This is a clear example of the use of simile to aid pain description. Unfortunately, the results are presented for the children as a group. This clearly prevents us from knowing by what age children were able to use these pain descriptions.

Thompson et al (1987) and Varni et al (1987) asked twenty five children, aged five to fifteen years, who were suffering from juvenile arthritis, to select words to describe their pain from the Varni/ Thompson Paediatric Pain Questionnaire (Varni and Thompson 1985). The data presented is not broken down by age-groups, but does indicate that some of the children are willing to select figurative pain descriptors from the questionnaire.

Unfortunately, we do not know by what age the children were selecting figurative descriptions and there was no attempt to determine whether the children were merely guessing as to which words could describe their pain.

Savedra et al (1981 and 1982) asked children between nine and twelve years of age to select from a list of words those they thought could describe pain. The same problems as outlined for the Thompson et al (1987) and Varni et al (1987) papers apply here also.

Ross and Ross (1984b) report on an interview study they conducted with American children aged between five and twelve years. Results show that some of the children were able to generate good figurative pain descriptions. Although the authors note that thirty per cent of the children interviewed were unable to provide even single word pain descriptions, whether figurative or non-figurative, they also provide examples of even the younger children producing good figurative descriptions of their pain. For example, a child aged six describing his stomach ache as 'like bees in your stomach'. However, the authors report no significant age trends in the data.

Gaffney (1988) investigated the responses of six hundred and eighty Irish school children, aged between five and fourteen years, to the question 'A pain can feel like . . .'. She found that 5.7% of five to seven year olds, forty two percent of eight to ten year olds and seventy percent of eleven to fourteen year olds produced examples of analogy.

It is interesting that the question was phrased in such a way as to almost demand that the children use figures of speech to complete it, in that it contains the linguistic marker 'like'. It remains to be shown whether children spontaneously produce figures when invited merely to describe their recalled experience.

The present study will provide data not only on children's figurative pain descriptions, but will produce data which can be analysed by age and figurative content; simile or metaphor.

1.5 Do children describe their painful experiences in terms of the sensory dimension of pain, or the affective/ evaluative dimension?

When it comes to describing pain, there are two broad dimensions to be considered. This is true for both adults and children. Do children describe their painful experiences in terms of the sensory dimension of pain, that is what the pain felt like? Or do they describe the affective/ evaluative dimension of pain, that is, what did it feel like to have the pain? Although a single pain could be described along both of these dimensions, the ability to appreciate these two dimensions, because they appear to be quite different, may appear at different times, or ages.

In a study of ten children aged nine to fifteen years, who were undergoing surgical procedures, Abu-Saad and Holzemer (1981) and Abu-Saad (1984) report the words that these children used to describe their pain. Eighteen pain descriptors were used by the children on forty-six occasions. Seventeen of the eighteen words are sensory descriptors. The remaining word, 'discomfort', is an affective descriptor.

Beales et al (1983) interviewed thirty-nine juvenile arthritic children aged from six to seventeen years. The children were presented with a list of eleven words from which they had to select the words which described their pain. All eleven words were sensory descriptors, therefore, we do not know if these children would have elected to use affective or evaluative descriptors if they had been included.

Thompson et al (1987) and Varni et al (1987) provided children, aged from five to fifteen years, with a list of words to describe their pain. The data is not presented by different age-groups, but of the seven most popular words chosen by the children as a group, three were sensory (sore, aching, pins and needles), three were evaluative (uncomfortable, miserable, horrible) and one was an affective pain descriptor (tiring).

Savedra et al (1981 and 1982) asked children between the ages of nine and twelve years to choose from a list of twenty-four words those words that the children felt could be used to describe pain; these included sensory, affective and evaluative descriptors. Unfortunately, because of previously discussed methodological problems, it still remains unclear from this study whether children of different ages do describe their pain in these different ways.

The present study will allow children to spontaneously describe their pain experiences, and will provide data which can be analysed by age in terms of sensory and affective/evaluative pain descriptions.

1.6 How do children describe the intensity of these recalled events?

Perhaps the most salient factor for all of us is the intensity of the pain which we experience. How do children describe this? Does a child recall all pain as being of one intensity, which may argue against their ability to use pain measurement devices which presume their ability to appreciate different intensities of pain, or do they use different terminology to describe the intensity of different pains.

Research reported above has not addressed this question directly. Although, as we have seen, children have been asked to describe pain, the question of how painful it felt has been omitted. Children have been asked to describe, in words, their worst pain experience. The descriptions given, however, are a composite of the qualitative different sensory, affective and evaluative dimensions, as well as a quantitative estimate of pain intensity.

This question clearly asks children to describe, in words, the intensity of pain experienced.

1.7 Which words can children spontaneously generate as pain descriptors?

What is the extent of the pain descriptor lexicon for individual children? In Experiment One, we have seen that children of seven years of age, and older, can recognise a variety of pain descriptors. We also need to know if children can spontaneously recall a set of words which they have available as potential pain descriptors.

In the studies we have considered in sections a to f above, we have seen evidence of children generating pain descriptors (Abu-Saad and Holzemer 1981, Abu-Saad 1984, Savedra et al 1981 and 1982, Ross and Ross 1984b). Also, in seeking answers to questions a to f, in this study, we may anticipate that we will see children using words to describe their recalled pain; the current question will seek to elicit any other words which the children think that they could have used, but did not.

2. METHOD

2.1 Subjects

Six groups of children aged 5 (N=30, mean=5.7, range=5.3- 5.11), 6 (N=30, mean=6.5, range=6.0-6.10), 7 (N=30, mean=7.6, range=7.2-7.9), 8 (N=30, mean=8.5, range=8.0-8.9), 9 (N=30, mean=9.7, range=9.0-9.11), and 10 years of age (N=28, mean=10.5, range=10.0-10.8) were interviewed.

2.2 Procedure

To ensure that the children who took part in this experiment performed to the best of their ability, the experimenter visited school and met with the children on two occasions before actually carrying out the formal study. These visits involved initially being introduced to the children as a visitor who would like to spend some time in the classroom in order to talk with the children and see some of the work they were doing. The visits were spent chatting to individual's, listening to them read, or being involved in their art and craft activities. In this way it is hoped that the children did indeed produce their best performance in as relaxed an atmosphere as possible.

The children were asked to recall all of their past painful experiences, using a structured interview format. They were given the following instructions;

"From time to time we all have pains. Some pains are worse than others, and they can all feel quite different. Tell me in a few words the pains that you have had? Describe what you think caused the pain? What did the pain feel like? How painful was it?

The children were encouraged to ask questions to ensure that they understood what was wanted of them. Responses were recorded on a prepared sheet.

Although this experiment was conducted in a conversational style, which was aimed at putting the children at ease, it can be noted that many of the children still asked if they had "got it right" when it was apparant that the formal questioning was finished.

3. RESULTS

The children's responses are presented in Appendix 2. The following analyses are based upon this data.

Throughout the remainder of this chapter, when a specific example is given, the following convention will be used. The age and position, as shown in Appendix 2, will be cited along with the quotation. For example, the twentieth child in the five year olds age-group will be shown as (5.20).

3.1 Can children of different ages recall their past painful experiences, and if so, what are they?

Fig. 4.1 shows, by age-group, the mean number of painful situations recalled by the children.

A total of thirty-eight pains were recalled by the five year olds (N=30), thirty seven by the six (N=30), fifty five by the seven (N=30), sixty eight by the eight (N=30), one hundred and forty eight by the nine year olds (N=30) and one hundred and sixty seven by the ten year olds (N=28).

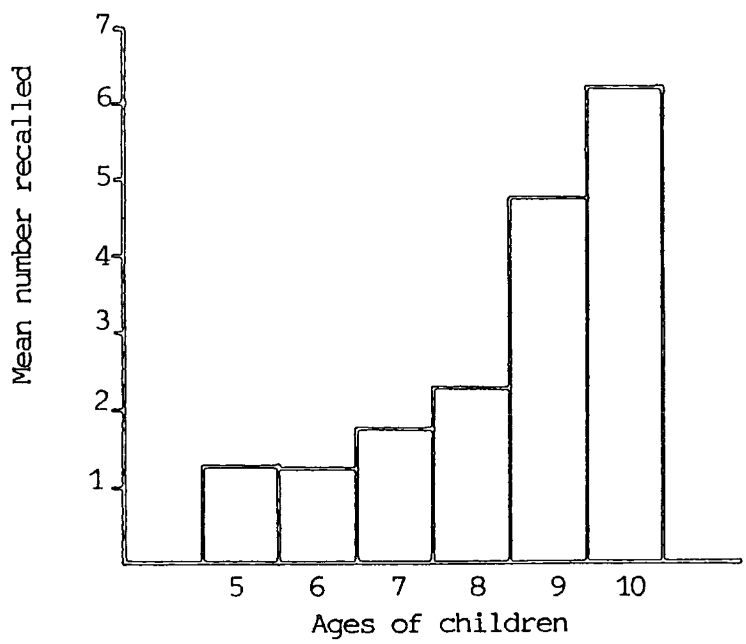
All children aged eight years and older could recall at least one example of a pain that they had experienced. Three of the five year olds, six of the six year olds and one of the seven year olds, could not recall any painful experiences.

Five year olds were shown to be able to recall, on average, one situation which had caused them pain. The number of painful experiences recalled increased steadily with age. Ten year olds were able to recall, on average, six painful experiences.

One-Way Analysis of Variance of the children's responses shows that there is a highly significant difference between the six age-groups on the number of pain situations recalled ($F = 47.77$ D.F. $= 5,172$ $p<0.001$).

Tables 4.1 to 4.6 show the painful experiences that the children recalled. These experiences are arranged in rank order from most to least common.

For the five year olds (Table 4.1), by far the most often recalled painful experiences are tummy pains (47%). These are followed by pains in leg, knee or head (23%, 10% and 10%).



Mean number of painful experiences recalled by the children

Fig. 4.1

Table 4.1

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

FIVE YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Tummy pains	14 (47%)	3 food; 1 fall; 10 N/K	Swelled up; horrible (3); sick; nasty; stings; awful; like spots; not nice; like a bug; lumpy
Pain in knee	7 (23%)	6 falls; 1 N/K	Horrible; sore (2); hurting (2); bad
Pain in leg	3 (10%)	3 falls	Bad; hurt; sore
Pain in head	3 (10%)	2 hit; 1 food	Hurt; awful
Chickenpox	2 (7%)	2 N/K	Nasty; like a pin
Headache	2 (7%)	1 noise; 1 N/K	-
Throat	2 (7%)	1 stuck pill; 1 N/K	Bad; hurting
Ankle	1 (3%)	1 fall	Little pain
Cut eyebrow	1 (3%)	1 fall	-
Earache	1 (3%)	1 N/K	-
Elbow	1 (3%)	1 fall	Sore
Toothache	1 (3%)	1 N/K	Dreadful/awful

Table 4.2

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

SIX YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Tummy pain	10 (33%)	4 eating; 1 growing; 2 diarrhoea; 1 car travel; 2 N/K	Hurting (2); horrible (2); tight; nasty; sick (2); sore
Headache	6 (20%)	2 noise; 4 N/K	Sore; horrible (3); nasty/hurting
Pain in knee	4 (13%)	4 falls	Hurt
Head pain	3 (10%)	1 fall; 2 N/K	Bumped; stinged; like hair sticking up
Pain in foot	2 (7%)	1 cramp; 1 N/K	Cramp
Pain in leg	2 (7%)	2 falls	Hurt; painful
Ankle pain	1 (3%)	Fall	Sore
Black eye	1 (3%)	Collision	Awful
Blisters	1 (3%)	Sun	Itchy
Chest pain	1 (3%)	Running	Horrible
Chickenpox	1 (3%)	N/K	Horrible
Hand pain	1 (3%)	Fall	Pinching
Skin pain	1 (3%)	Eczema	Itchy
Sunburn	1 (3%)	Sun	Nasty
Sore throat	1 (3%)	Cough	Croaky
Thumb pain	1 (3%)	Jammed in door	Tickly

Table 4.3

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

SEVEN YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Tummy pain	23 (77%)	1 riding bike; 2 jogging; 1 hungry; 2 feeling sick; 1 fighting; 1 need toilet; 1 fall; 3 eating; 1 a bug; 10 N/K	Hurting; sick; stitch
Headache	6 (20%)	1 nutting things; 1 coughing; 4 noise	
Pain in hand	4 (13%)	1 caught it; 1 fall; 2 N/K	Stings; horrible; hurts; sharp
Pain in knee	4 (13%)	4 falls	Sore (3)
Pain in leg	4 (13%)	1 lying on it; 3 N/K	Horrible; going round in circles (1); aches
Pain in elbow	2 (7%)	Fall; bumped it	Sore; tingles
Back pain	1 (3%)	N/K	Strike-strike
Blister	1 (3%)	Skidding on floor	Stinging
Pain in cheek	1 (3%)	N/K	Sharp
Cough	1 (3%)	A cold	Horrible
Cut	1 (3%)	Fall	-
Earache	1 (3%)	N/K	Hurting
Pain in eye	1 (3%)	Ice in eye	Hurting
Sore lips	1 (3%)	They dry up	Hurts
Pain in mouth	1 (3%)	Frostbite	Hurts/sharp
Stitches	1 (3%)	Bitten by dog	Sore
Pain in thigh	1 (3%)	Running	-
Pain in throat	1 (3%)	Cough	Sore

Table 4.4

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

EIGHT YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Tummy pain	15 (50%)	1 punch; 1 being in car; 3 food; 1 tiredness; 1 excitement; 2 a bug; 6 N/K	Can't breathe; like a needle; painful; bad; horrible (4); quite; sharp; awful; sickly; like a pin (2); like sick; a lot
Headache	5 (17%)	1 hit head; 2 noise; 2 N/K	Drowsy/dizzy/cold; fuzzy; awful; not nice; not much
Pain in leg	5 (17%)	1 fall; 1 kick; 1 bump; 1 twisted it; 1 N/K	Hurting; hard; painful/hurt; like a needle;
Stitch	5 (17%)	3 jogging/running; 1 football; 1 eating;	Painful (2); hurt; awful
Sore throat	4 (13%)	1 infection; 1 tonsillitis; 2 N/K	Hurt; awful; horrid
Pain in head	3 (10%)	1 split head; 2 N/K	Hurt
Sore foot	3 (10%)	1 stamped on; 1 spelk; 1 walking	Hot; like a needle; sore
Cut	2 (7%)	1 scratch; 1 fall	Awful
Growing pains	2 (7%)	1 growing; 1 N/K	Pins and needles; sore
Measles	2 (7%)	2 N/K	Pressing/hurting; horrid
Pain in arm	2 (7%)	1 fall; 1 hit it	Like being shot
Pain in chest	2 (7%)	1 heat; 1 N/K	Achey; big pain
Broken arm	1 (3%)	1 fall	Loose
Being sick	1 (3%)	1 N/K	-
Cough	1 (3%)	Going out in T-shirt	Painful
Earache	1 (3%)	N/K	Like a prick

Table 4.4 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

EIGHT YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Flu	1 (3%)	N/K	Horrid
Illness	1 (3%)	Bugs	Hurt
Injection	1 (3%)	A needle	Awful
Nose bleed	1 (3%)	Got thumped	-
Scratch	1 (3%)	Cat	Hurt
Stitches	1 (3%)	Glass	Like finger fell off
Toothache	1 (3%)	Wobbly tooth	Very painful
Pain in ankle	1 (3%)	Falling over	Sharp
Pain in finger	1 (3%)	Jammed in door	Stings
Pain in knee	1 (3%)	Fall	Sore
Pain in lip	1 (3%)	Operation	Hurt
Pain in mouth	1 (3%)	Toothache	Rotten
Pain in neck	1 (3%)	Pillow too high	Quite bad
Pins and needles	1 (3%)	N/K	Like you were pricked

Table 4.5

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

NINE YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Tummy pain	22 (73%)	8 eating; 1 hit; 1 sweets; 1 bug; 1 too much medicine; 1 bad fruit; 1 cold; 8 N/K	Funny; flat; terrible (2); hot; aching (3); hurt (4); stung; very painful (2); sickly; sore; unpleasant; awful (2); not too bad; horrible
Stinging pain	9 (30%)	4 nettles; 4 bee; 1 cut	Red; soft; stung (3); terrible; hurt (2); hot; painful; all spots
Pain in head	9 (30%)	1 blunt end of a [illegible]e; 1 a cold; 1 noise; 1 shock; 1 the cold; 2 fell; 2 N/K	Hurt; like a headache; horrible
Headache	8 (27%)	3 noise; 2 shouting; 3 N/K	Terrible (2); aching; stinging; horrible; very painful; dizzy; throbbing; not very nice
Pain in throat	7 (23%)	2 tonsillitis; 1 infection; 4 N/K	Not nice (2); itch; nipped; tickled; sore; felt poorly
Pain in leg	7 (23%)	1 pulled muscle; 1 running; 1 bruise; 1 fell; 1 the cold; 2 N/K	Awful (3); sore; not very nice; stung
Earache	6 (20%)	1 noise; 1 coldness; 1 sore throat; 3 N/K	Cold; aching; loud; awful (2); painful
Pain in knee	6 (20%)	4 fell down; 1 tripped up; 1 N/K	Stings (2)
Chickenpox	5 (17%)	1 itching; 4 N/K	Sore (2); itchy; like a pin; painful/harsh
Fell down	5 (17%)	1 tripped; 1 slipped; 3 N/K	Hot; bad; painful (2)
Toothache	4 (13%)	1 sweets; 1 ulcer; 1 not brushing; 1 N/K	Horrible; lumpy; spread
Cough	3 (10%)	1 eating; 1 playing outside; 1 tummy bug	Don't like it; tickly; not nice

Table 4.5 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

NINE YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Pain in eye	3 (10%)	1 too much to drink; 1 rubbing; 1 anaesthetic	Sick; like lightning
Pain in nose	3 (10%)	2 bumps; 1 coming in from cold	Stung; awful
Pins and needles	3 (10%)	1 sitting down; 1 being still; 1 N/K	Tickly (2); funny
Sprained ankle	3 (10%)	1 jumped on it; 1 fell on it; 1 N/K	Swollen/bruised; very bad; sore
Stitches	3 (10%)	1 split head; 1 jammed leg; 1 fell	Tingling; biting; bad
Blocked nose	2 (7%)	2 N/K	Not nice
Broken arm	2 (7%)	2 fall	Real pain
Chest pain	2 (7%)	1 bronchitis; 1 sharp sting	Sharp; shocking
Flu	2 (7%)	1 getting wet; 1 cold	Unpleasant; hurts/stings
Pain in arm	2 (7%)	1 dislocated shoulder; 1 fall	Wobbly/shakey; hurt
Pain in finger	2 (7%)	1 cut; 1 jammed	Numb; swollen
Pain in gum	2 (7%)	1 toothbrush; 1 N/K	Sore
Pain in neck	2 (7%)	1 lying in bed; 1 N/K	Achey
Sharp pain	2 (7%)	1 burn; 1 bloodtest	Sore; like I fell over
Stitch	2 (7%)	2 running	Awful; bumping up and down
Black eye	1 (3%)	Elbowed	Stinging/watery
Bleeding hand	1 (3%)	Bumped it	Stinging
Broken toe	1 (3%)	Bump	Stinging/swelling

Table 4.5 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

NINE YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Burn	1 (3%)	Lamp	Hot
Cold	1 (3%)	Staying outside	Quite painful
Cut arm	1 (3%)	Fell	Horrible
Hard pains	1 (3%)	Fell	Horrible
Hay fever	1 (3%)	Cut grass	Not very nice
Little pain	1 (3%)	My sister	Hurt
Pain in chin	1 (3%)	Tripped	Shocked
Pain in elbow	1 (3%)	Knocked it	Hard
Pain in feet	1 (3%)	Walking	All crying
Pain in lip	1 (3%)	Cut	Painful
Pain in tongue	1 (3%)	N/K	Swollen/numb
Pin through toe	1 (3%)	Pin	Numb
Pneumonia	1 (3%)	N/K	-
Sick	1 (3%)	N/K	Not very nice
Split eyebrow	1 (3%)	Being silly	-
Split head	1 (3%)	N/K	Itchy
Terrible pains	1 (3%)	Snowball	Stinging
Tired	1 (3%)	N/K	-
Whooping cough	1 (3%)	Coldness	Horrible

Table 4.6

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

TEN YEAR OLDS

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Headache	18 (60%)	3 bang on head; 1 running; 1 fell; 1 blocked nose; 2 noise; 1 flu; 1 noise and tension; 2 migraine; 1 sinusitis; 1 my brother; 4 N/K	Banging in head; like a needle; very painful; aching; throbbing; on and off; hurt; like a drum; horrible; getting your head flattened; thumping; bumped head; like a big nail in head; like a thunder-storm; like being hit; head felt like dropping off; dull; like a hammer hitting my head; felt head was made of lead
Tummy pain	14 (47%)	3 eating; 1 flu; 1 clothes; 1 food; 1 being in car; 2 bug; 1 sweets; 4 N/K	Aching; felt blue; sucking in; big pain; sickly (2); like a punch (2); horrible; disturbing; like an earthquake; like ice; cutting me; sharp prick; a stone rumbling in my tummy
Pain in knee	12 (40%)	1 knocked bone out of place; 9 falls; 1 gravel in scratch; 1 cut on thorns	Like I had no bones; numb; horrible; sore; like needles (2); like a prick; not very nice; tingly; quite bad; a tingle; not much pain
Pain in ankle	11 (37%)	4 falls; 2 running; 1 bent it; 1 kicked; 1 stood on ball; 1 caught foot in hole; 1 football boot	Heavy (2); stinging (2); sore/throbbing/ached; funny; like a pair of tongs gripping hard; like people were standing on it
Pain in finger	10 (33%)	3 cuts; 2 breaks; 1 jammed it; 1 knocked it; 1 skin came off; 1 loose piece of skin; 1 top of thumb chopped off	Stinging (2); numb/sore; bad; on and on; painful; disturbing; like I had fingers chopped off
Pain in head	10 (33%)	2 banged it; 1 bamboo cane; 5 falls; 1 dart in back of head; 1 my mum was getting me	Bruised; like a sword gashing it; sore; nasty; made me see less; someone hitting me; stinging; like a bus on a mouse; like my head was full of lead and everything was soft

Table 4.6 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

TEN YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Pain in leg	10 (33%)	5 falls; 1 football; 2 being kicked; 1 sitting on my leg too long; 1 N/K	Sore (3); like a twisted ankle; stung; like a rock dropped on my leg; throbbed; a brick on my leg; like I had cramp; when I hit it it felt as if I didn't hit it in the first place
Pain in arm	6 (20%)	1 run over; 1 my dog; 1 jammed it; 2 broke it; 1 cut it	Like being kicked; stinging; stung; droopy
Pain in hand	5 (17%)	1 broke it; 2 cut it; 1 someone fell on it; 1 N/K	Like a mouse nibbling; painful; a tingle; numb/helpless; like in cold weather when you have no gloves
Earache	4 (13%)	1 cold in ears; 1 wax; 1 the cold; 1 N/K	Aching; sore; someone hitting my ear; felt it had something in that was growing bigger;
Pain in eyes	4 (13%)	1 hot air; 1 injection; 1 chlorine; 1 N/K	Sore; as though I couldn't open my eye; as if I could close my eyes any minute
Pain in throat	4 (13%)	1 coughing; 2 cold; 1 N/K	Like a flea scratching; like I lost my voice; like a golfball in my throat
Toothache	4 (13%)	1 tooth erupting; 1 chewing; 1 bad pulp; 1 the cold	Like tooth falling out; ached; horrible; like someone trying to pull it out
Pain in chest	3 (10%)	1 fall; 1 eating too much; 1 hit by music stand	Like car in crusher; numb; stiff
Pain in elbow	3 (10%)	2 hitting funny bone; 1 fall	Aching; horrible
Pain in foot	3 (10%)	1 different shoes; 1 stood on nail; 1 N/K	Like I couldn't walk; horrible; sting
Pain in neck	3 (10%)	1 ripped muscle; 1 jerked it; 1 sleeping and twisted head	Stiff; couldn't move head; like someone pulling my neck
Sick	3 (10%)	1 being in car; 1 too much to eat; 1 bug	Felt bloated; sickly; horrible

Table 4.6 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

TEN YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Split lip	3 (10%)	1 cut it; 1 football boot; 1 somebody's head	Horrible; stinging; as if my lip was ten times as big as it was
Stings	3 (10%)	1 nettles; 1 bee; 1 wasp	Stinging; burning
Banged into door	2 (7%)	1 wasn't looking; 1 bruised me	Numb
Bite	2 (7%)	2 a dog	Sore; stinging
Fell off swing	2 (7%)	1 hand slipped; 1 tried to jump off	Like I was in a different place; like I was thrown off a cliff
Pain in mouth	2 (7%)	1 banged lip; 1 pulling it	Like it wasn't there; horrible
Pins and needles	2 (7%)	1 kneeling; 1 N/K	Pins and needles (2)
Pain in wrist	2 (7%)	1 fell over; 1 N/K	Not too bad
A cold	1 (3%)	The cold	Not very painful
Anaesthetic	1 (3%)	Injection of something	Like brain was bursting
Back pain	1 (3%)	Fell	Stung
Banged into wall	1 (3%)	Couldn't stop bike	-
Being hit	1 (3%)	Someone thumped me	Hurt and ached
Being ill	1 (3%)	Being in the sea	-
Bronchitis	1 (3%)	N/K	Horrible
Bruise	1 (3%)	Hitting sharp edge	Dull/hurt
Burnt hand	1 (3%)	Getting dinner out of oven	Sharp sting
Catarrh	1 (3%)	N/K	Could hardly breathe
Chickenpox	1 (3%)	Spots	-
Circumcised	1 (3%)	N/K	-

Table 4.6 (contd.)

PAINS RECALLED WITH THE PERCENTAGE NUMBER OF CHILDREN WHO RECALLED HAVING A PAIN OF THAT TYPE, WITH THE ASSOCIATED CAUSES AND WORDS USED TO DESCRIBE THE PAIN

TEN YEAR OLDS (CONTD.)

PAIN	NUMBER OF CHILDREN	CAUSES	WORDS USED TO DESCRIBE PAIN
Constipation	1 (3%)	Being in bed too much	Dull
Cramp	1 (3%)	Crouching down	Like your bones breaking
Infected blister	1 (3%)	Germs getting into it	Numb
Nosebleed	1 (3%)	Fell	Couldn't feel it
Pain in face	1 (3%)	The door	Not very nice
Pain in shoulder	1 (3%)	Knocked it	Stung
Pain in thigh	1 (3%)	Running	Disturbing
Run over	1 (3%)	By bike	Heavy
Scarletina	1 (3%)	A rash	Very bad
Whooping cough	1 (3%)	N/K	Thumping

Table 4.2 shows that tummy pains are the most often recalled by the six year olds (33%). Headache and head pains combined were recalled by thirty per cent of the children (20% and 10%). These are followed by pains in knee (13%), foot (7%) and leg (7%).

Seventy seven per cent of seven year olds recalled having had tummy pains (Table 4.3). These are followed by headache (20%), pain in hand (13%), knee (13%), leg 13%) and elbow (7%).

Table 4.4 shows that fifty per cent of the eight year olds recall having had tummy pains. Twenty-seven per cent recall having had a headache or a pain in the head (17% and 10%); seventeen per cent a pain in the leg, or a 'stitch'; thirteen per cent recall a sore throat; ten per cent a sore foot.

The nine year olds (Table 4.5) most often recall having experienced tummy pains (73%). Pain in head and headache are recalled by fifty seven per cent of the children (30% and 27%); stinging pains by thirty per cent; pain in throat or leg by twenty three per cent; earache or pain in knee by twenty per cent.

Table 4.6 shows that ninety-three per cent of the children recall having a headache or pain in head (60% and 33%). The next most often recalled are tummy pains (47%), pains in knee (40%), ankle (37%), finger (33%), leg (33%), arm (20%), and hand (17%).

3.2 To what do the children attribute the cause of these painful experiences?

Tables 4.1 to 4.6 show the causes which the children gave for the pains that they recalled having experienced.

Table 4.7 shows, for each age-group of children, the number of pains recalled and the percentage number of pains for which causes were not known.

We can see that although thirty-eight pains were recalled by the five year olds, they were not able to identify the cause of forty-five per cent of these pains. The number of pains recalled increases between the ages of six and ten years. However, the percentage number of pains for which the cause is not known remains between twenty six and thirty three per cent for the six to nine year olds. The percentage number of pains for which the cause is not known falls to twelve per cent for the ten year olds.

Based upon a careful scrutiny of the children's responses contained in Tables 4.1 to 4.6, categories were derived which described, in a manageable form, those responses. Therefore, the categories emerged from the data rather being imposed on it.

The following list shows the categories employed and some examples of the responses coded as belonging to those categories.

Category	**Example of responses**
Accident	Fell/ fall; Jammed in door; cut
Illness	Eczema; diarrhoea; bronchitis
Food/eating	Sweets; Too much to eat; Eating
Physical effort	Running; Football
Cold weather	Frostbite; The cold;
Animals	Bitten by dog; Cat
Heat/noise	Noise; Hot air
Aggressive action of others	Got thumped; Punch; Being kicked
Inactivity	Being still; Sitting on leg
Motion sickness	Being in car; Car travel
Tired/excited	Tiredness; Excitement
Injections	Injection of something; a needle

The objects or events to which the children attributed their painful experiences are presented in Table 4.8. Two independent raters reached almost 100% agreement in

Table 4.7

The number of pains recalled by the six age-groups of children, and the percentage number of pains, in each age-group, for which the children could not identify the cause.

	Ages					
	5	6	7	8	9	10
Number of pains recalled	38	37	55	68	148	167
Percentage number with cause unknown	45	26	33	31	28	12

Table 4.8

The children's perceptions of the causes of their past painful experiences, and the number of children in the various age-groups who attributed their pain to those causes. Percentages are shown in brackets.

	Ages					
	5	6	7	8	9	10
Accidents	15(71)	11(41)	12(32)	15(32)	41(39)	91(62)
Illness		4(15)	4(11)	6(13)	13(12)	18(12)
Food/eating	4(19)	4(15)	4(11)	4 (9)	14(13)	8 (5)
Physical effort		1 (4)	5(14)	5(11)	5 (5)	5 (3)
Cold weather			2 (5)		7 (7)	4 (3)
Animals			1 (3)	1 (2)	4 (4)	4 (3)
Heat/noise	1 (5)	2 (7)	4(11)	3 (6)	7 (7)	3 (2)
Aggressive action of others				3 (6)	2 (2)	3 (2)
Inactivity					3 (3)	2 (1)
Motion sickness		1 (4)		1 (2)		2 (1)
Tired/excited				2 (4)		
Injections				1 (2)	1 (1)	2 (1)
Other	1 (5)	4(15)	5(14)	6(13)	9 (8)	5 (3)
Total number of causes known	21	27	37	47	106	147

categorising these responses. The very small number of disagreements were resolved after discussion.

This shows that, for all age-groups studied, accidents are the most often identified cause of the children's painful experiences (5 year olds = 71%, 6 year olds = 41%, 7 year olds = 32%, 8 year olds = 32%, 9 year olds = 39%, 10 year olds = 62%). None of the five year olds identified illness as a cause of their pain. However, for the six to ten year olds, illness is perceived as being the second most frequent cause of pain (6=15%, 7=11%, 8=13%, 9=12%, 10=12%). Food, or eating, is the second most often recalled cause of pain for the five year olds (19%), and forms the next most often cited cause of pain for the six (15%), seven (11%), eight (9%), nine (13%) and ten year olds (12%).

The most often cited cause of pain for the five to nine year olds, and the second most often cited for the ten year olds, are tummy pains. Table 4.9 shows how the children studied described the cause of these tummy pains.

Table 4.9 also indicates that for all age-groups of children studied, a proportion of tummy pains have no identifiable cause. Indeed, only four (29%) of the fourteen tummy pains recalled by the five year olds had a known cause. This contrasts with the older age-groups, in that for these children over half of the tummy pains had a known cause: six year olds, 80%; seven year olds, 57%; eight year olds, 60%; nine year olds, 64%; ten year olds, 71%.

Of the fourteen tummy pains recalled by the five year olds, three were thought to be caused by food and one by a fall. For the older children we see that food remains an often cited cause of the pains. For the six year olds, food is supplemented by illness (diarrhoea), motion sickness and growing; for the seven year olds,

Table 4.9

Causes to which the children attributed their tummy pains

Ages

5	6	7	8	9	10
3 food	4 eating	3 eating	3 food	8 eating	3 eating
1 fall	2 diarrhoea	1 riding bike	1 punch	1 hit	1 food
10 n/k	1 growing	2 jogging	1 being in car	1 sweets	1 flu
	1 car travel	1 hungry	1 tiredness	1 bug	1 clothes
	2 n/k	2 feeling sick	1 excitement	1 medicine	1 being in car
		1 fighting	2 a bug	1 bad fruit	2 bug
		1 need toilet	6 n/k	1 cold	1 sweets
		1 fall		8 n/k	4 n/k
		1 a bug			
		10 n/k			

physical activity (riding bike, jogging, fighting) and the notion of disease (a bug) as the cause of their tummy pains; for the eight year olds, the awareness of a physical state (tiredness and excitement) and disease (a bug); for the nine year olds injury (being hit), disease (a bug) and the notion of contaminated food (bad fruit); for the ten year olds, disease (flu, bugs), physical constriction around the tummy (clothes) and car travel.

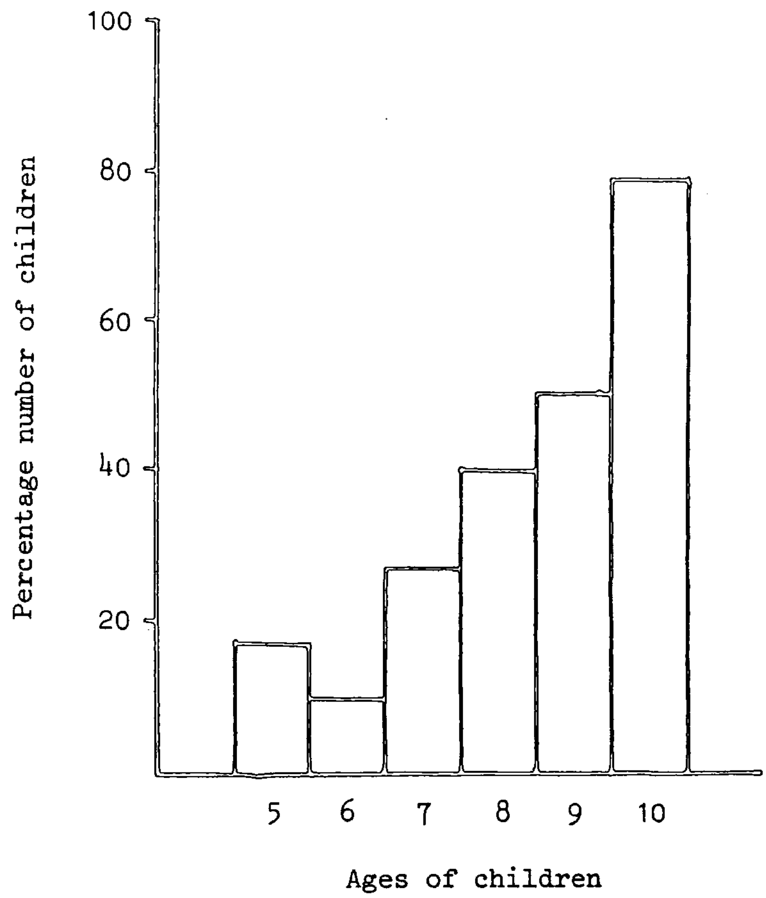
3.3 How do children describe these painful experiences?
The following three sub-sections consider analyses of: the figurative use of language, sensory versus affective/ evaluative pain descriptions, and children's descriptions of the intensity dimension of the pain experienced.

3.3.1 Do children spontaneously use figures of speech to aid their pain description?
The figurative pain descriptions made by the six age-groups of children are contained in Appendix 3.

In all age-groups of children we see evidence of figurative pain descriptions. However, there are clear differences between the groups in that few of the younger children are producing figures of speech, whilst most of the older children are.

Figure 4.2 shows the percentage number of children in each age-group who used at least one example of figurative language to describe their pain.

We see that seventeen per cent of five year olds, ten per cent of six year olds, twenty-seven per cent of seven year olds, forty per cent of eight year olds, fifty per cent of nine year olds and seventy-nine per cent of ten year olds spontaneously produced figurative pain descriptions.



Percentage number of children who used at least one example of figurative language to describe their recalled pain

Fig. 4.2

Statistical analysis shows that there is a highly significant difference over the six age-groups in the number of children who used figurative pain description (x^2 = 48.03, D.F = 5, $p<0.001$).

3.3.2 Do children describe their painful experiences in terms of the sensory dimension of pain, or the affective/ evaluative dimensions?

Appendix 4 lists the pain descriptors that the children used to describe their recalled pains.

Figure 4.3 shows the percentage number of pains, in each age-group, which were described using affective-evaluative words. The remainder of the descriptions used words which described the sensory dimension.

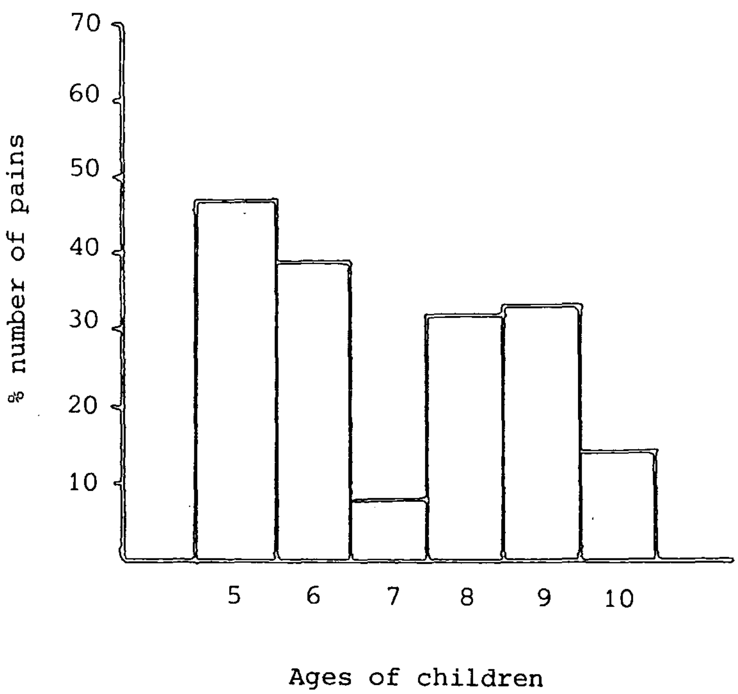
Forty-seven per cent of five year olds, thirty-nine per cent of six year olds, eight per cent of seven year olds, thirty-two per cent of eight year olds, thirty-three per cent of nine year olds and fourteen per cent of ten year olds described their pains in words which describe the affective/ evaluative dimension of pain. In discussing these results, an attempt will have to be made at explaining the anomalous seven year olds.

3.3.3 How do children describe the intensity dimension of these recalled events?

Table 4.10 shows the words that the children used to describe the intensity of the pains that they had recalled.

We can see that most children are able to verbalise the intensity dimension of the pains that they had experienced. However, the five year olds were unable to describe the intensity of thirty per cent, and the six year olds sixteen per cent, of the pains that they had recalled. The seven to ten year olds could describe the

intensity of over ninety per cent of the pains



Percentage number of pains which were described in terms of the affective/evaluative dimension for each of the age-groups of children

Fig. 4.3

Table 4.10

Words used by the children to answer the question of 'how painful' was the pain that they had recalled, and the percentage number of pain intensities described in those words.

	Ages					
	5	6	7	8	9	10
Very	15	26	29	40	34	36
Very very	6		2		7	5
Not very	6	16	5	11	10	9
Not very very		3				
A lot	15	10	10	8	2	1
Quite			5	12	12	24
Very bad	3		2			
Not too bad						1
Not that bad	3					1
Not bad					1	
Bad	3		2		1	2
Very baddish			2			
Wasn't bad						1
Painful					4	2
Not that painful		3		3	2	
More painful					1	
Sore					2	1
Very sore		3			1	
Not that sore		3				1
Hurt				2		
Hurting					1	
Really hurting		3				
Hurts a lot			2		1	
Hurts a bit						1
A bit	3					
Little bit	6		7	3	1	
Very much	3			2		
Not very nice					1	
Not too bad						1
Bit better	3					
I could scream					1	
Just a little	3					
Stung					1	
Too					2	1
Not all that					1	1
Not very much		3				
Alright					2	
Not much		3	7	9		
Was not					1	
Like a nightmare					1	
Hot				2		

(Continued)

	Ages					
	5	6	7	8	9	10
Like a bone		3				
Not so				2		
Like dots banging in my head		3				
Hardly any						1
Just a bit			2			
Awful					4	1
A little bit			5			
Quite a lot				2	1	
Worse			5			
Mild				2		
Medium			2			
Quite a bit				2		
Down the bottom			2			
Pretty						1
Moderate						1
Really						1
Wasn't too						1
Aching						1
Achey						1
Not as						1
All itch						1
Tingley						1
Horrible					2	
Quite horrible					1	
Not that much						1
Half		3				
20%					1	
29%					1	
32%					1	
56%					1	
Percentage number of for which intensity was not recalled	30	16	7	3	4	5

recalled.

Across all of the age-groups of children, seventy-one different phrases were used to describe the intensity of pain experienced. Many of these phrases are highly idiosyncratic. However, over fifty per cent of the responses for each age-group were contained in the phrases, 'very', 'very very', 'not very', 'a lot' and 'quite'.

3.4 Which words can children spontaneously generate as pain descriptors?

Table 4.11 contains the pain descriptors that the children either spontaneously used to describe their pain, or which they thought could have been used to describe pain.

Figure 4.4 shows the median number of pain descriptors generated by each age-group.

The five and six year olds generated, on average, one pain descriptor, the seven year olds almost two, the eight year olds between two and three, and the nine and ten year olds year olds generated, on average, four to five pain descriptors.

Kruskal-Wallis One-Way Analysis of Variance of the children's responses shows that there is a highly significant difference between the six age-groups on the number of pain descriptors generated ($X^2 = 87.24$ $p<0.001$).

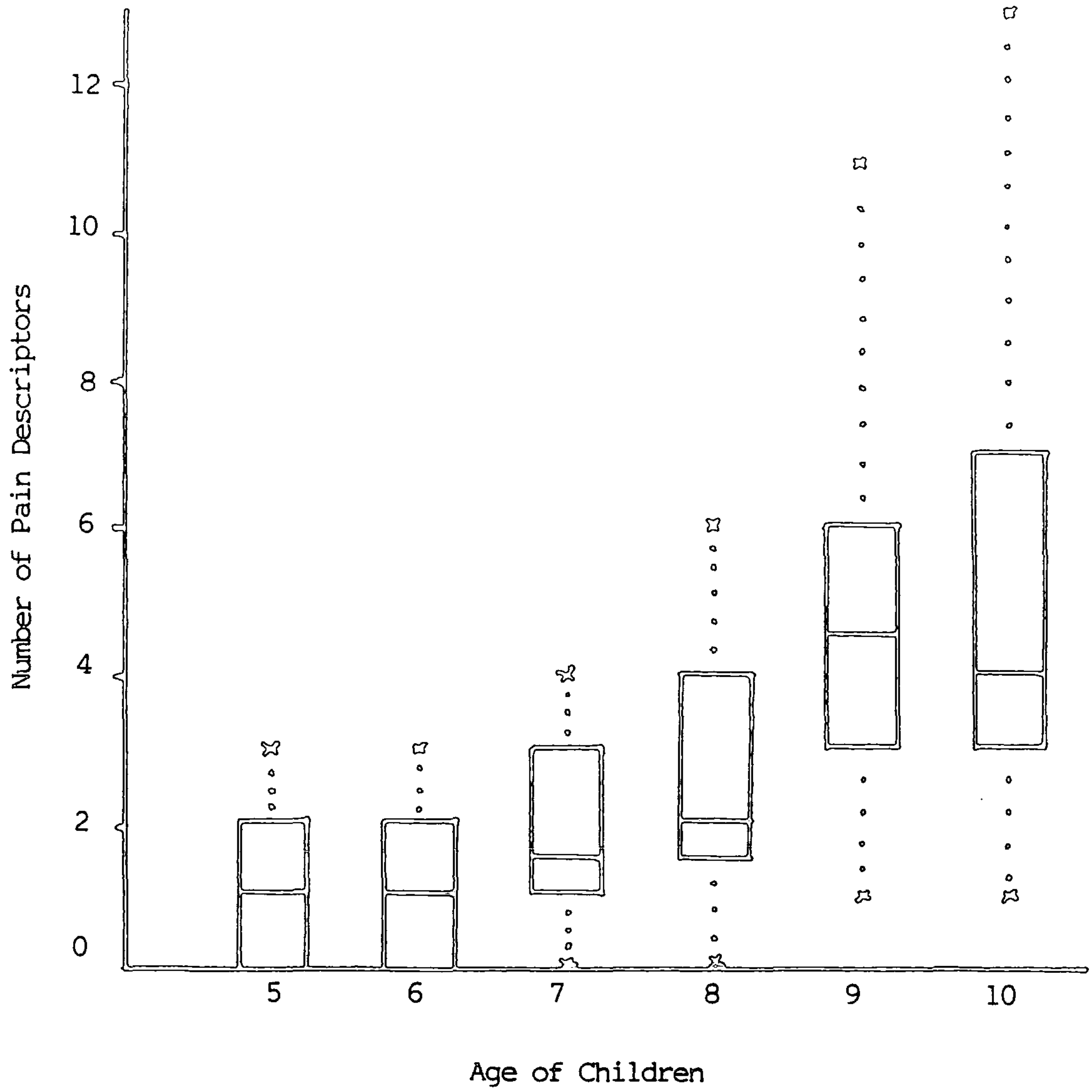
Table 4.12 contains a summary table of Mann-Whitney U tests which were employed to test for differences between the different age-groups of children. As several comparisons were conducted, a more stringent significance criterion of $p<0.01$ was adopted.

We can see that there are no differences in the number

5 year olds		6 year olds		7 year olds		8 year olds		9 year olds		10 year olds	
Horrible	20	Hurts	37	Hurting	30	Hurt	33	Stinging	50	Stinging	43
Hurts	20	Nasty	23	Stings	23	Painful	23	Sore	40	Sore	39
Sore	13	Horrible	17	Painful	17	Sore	23	Painful	37	Horrible	32
Stings	10	Sore	13	Sore	17	Horrible	20	Hurts	33	Painful	29
Awful	7	Sting	7	Aching	10	Awful	17	Horrible	30	Aching	21
Bad	7	Aching	3	Horrible	10	Bad	10	Ache	27	Sharp	21
Nasty	7	Awful	3	Sick	10	Not nice	10	Awful	27	Throbbing	21
Dreadful	3	Bad	3	Bad	7	Sharp	10	Terrible	20	Bad	18
Itchy	3	Itchy	3	Hard	7	Ache	7	Bad	17	Hurt	18
Like a pin	3	Pinching	3	Stitch	7	Burning	7	Hot	17	Not nice	14
Lumpy	3	Sickly	3	Awful	3	Cold	7	Harsh	13	Numb	14
Sick	3	Tickly	3	Bloody	3	Horrid	7	Itchy	13	Bruised	11
Ticklish	3	Tight	3	Funny	3	Hot	7	Kills	13	Disturbing	11
				Like a pin	3	Nasty	7	Tickly	13	Cramp	7
				Not very well	3	Needles	7	Funny	10	Dead	7
				Sharp	3	Sick	7	Sharp	10	Funny	7
				Squeezing	3	Stings	7	Sickly	10	Hard	7
				Tingle	3	Funny	3	Boiling	7	Heavy	7
						Fuzzy	3	Burning	7	Pins & needles	7
						Hard	3	Cold	7	Pricks	7
						Like a pin	3	Hard	7	Sickly	7
						Pins & needles	3	Numb	7	Tingly	7
						Pressing	3	Shocking	7	Banging	3
						Prick	3	Uncomfortable	7	Burning	3
						Punched	3	Unpleasant	7	Clamped	3
						Revolting	3	Angry	3	Disrupting	3
						Rotten	3	Bruised	3	Drooping	3
						Stabbed	3	Chronic	3	Dull	3
						Terrible	3	Flat	3	Earthquake	3
						Thumped	3	Horrid	3	Fire	3
						Watery	3	Like a pin	3	Glares	3
						Wonky	3	Lumpy	3	Helpless	3
								Nasty	3	Hitting	3
								Nipped	3	Hot	3
								Noisy	3	Irritating	3
								Spotty	3	Itchy	3
								Spreading	3	Its a killer	3
								Sticky	3	Killing	3
								Sweating	3	Like a sword	3
								Swollen	3	Needles	3
								Throbbing	3	Nibbling	3
								Tingling	3	Niggly	3
								Watery	3	Off & on	3
										Quick	3
										Scratching	3
										Shivery	3
										Sleepy	3
										Sprained	3
										Stiff	3
										Tender	3
										Terrible	3
										Thumping	3
										Tired	3
										Twisted	3
										Ugly	3
										Unhappy	3
										Weary	3
										Yuk	3

PAIN DESCRIPTORS GENERATED BY THE CHILDREN AND THE PERCENTAGE NUMBER OF CHILDREN WHO GENERATED THEM

Table 4.11



Box and Dot Plot showing the Median Number, Quartile and Range of Pain Descriptors generated by the six age groups of children

Summary Table of z Scores, and Associated Significance Levels, Derived From Mann-Whitney U Tests Comparing the Number of Pain Descriptors Generated by Each of the Age-Groups

(Minimum significance level set at $p<0.01$ because of multiple comparisons.)

Age						
	6	-0.88 (ns)				
	7	-2.09 (ns)	-1.21 (ns)			
Age	8	-3.96 (p<0.001)	-3.17 (p<0.001)	-2.23 (ns)		
	9	-5.85 (p<0.001)	-5.59 (p<0.001)	-5.17 (p<0.001)	-3.54 (p<0.001)	
	10	-6.17 (p<0.001)	-6.01 (p<0.001)	-5.63 (p<0.001)	-3.84 (p<0.001)	-0.01 (ns)
		5	6	7	8	9
				Age		

of pain descriptors that have generated between the following age-groups; the five, six and seven year olds; the seven and eight year olds; and the nine and ten year olds. All other differences are significant.

4. DISCUSSION

The findings of this study will be discussed under the relevant question headings that were proposed in the introduction to this chapter.

4.1 Can children recall their past painful experiences?

It was argued in the introductory section that verbal, and especially non-verbal, pain assessment requires the individual to have access to previous painful experiences. This study asked children, aged five to ten years, to recall as many of their past painful experiences as they could. Five to eight year olds could recall, on average, only one or two painful experiences. By nine and ten years of age, children could recall an average of five or six experiences (Figure 4.1). The developmental trend towards increased recall of painful situations, with increasing age, was highly significant.

This finding of a clear developmental trend contrasts with the earlier findings of Savedra et al (1981 and 1982) and Ross and Ross (1984b). It is suspected that this has occurred principally because of the very simple, but direct, question asked in the current study. Presenting the data separately for each age-group of children, rather than collapsing the data over age-groups, has also provided important information on children's self report of their previous painful experiences, at these different ages.

4.2 To what do the children attribute the cause of

these painful experiences?
In all age-groups we see that there are individual's who do not know the cause of the pain that they have recalled (Table 4.7). Almost half of the pains recalled by the five year olds, between a quarter and a third recalled by the six to nine year olds, but only twelve per cent of the ten year olds were of unknown origin. This increase with age in the number of pains whose causes were known is especially impressive given the increased number of pains recalled with increasing age (Table 4.7).

The causes to which children attributed their pains were varied, but all correspond to realistic actions and events (Table 4.8). This is in line with the findings of Savedra et al (1981 and 1982) who questioned nine to twelve year olds and Ross and Ross (1984b) who questioned five to twelve year olds. It may be useful to compare the similarities and differences between these studies and the data reported here.

In accord with this study, both Savedra et al and Ross and Ross (section 1.1 of this chapter) report 'accidents' as the most common cause of pain in the children that they studied. However, whereas we find that in this study 'illness' was the second most commonly reported cause of pain, Savedra et al do not report it as being in the top seven most often reported causes but, Ross and Ross report it as the third most often cited cause of pain in the children that they studied. A potentially important difference between these studies and the study reported here is that in both cases the data has been collapsed over age-groups. In the data reported here (Table 4.8) we can see that their are similarities between groups, but there are also important differences.

A detailed comparison with Gaffney and Dunne (1987) categories (section 1.1 of this chapter) is more difficult, in that they have used 'transgression' as a category, but we can see both in their data and the data reported here that over fifty per cent of causes cited were accidents, illness or eating.

In this study, we find no support for Gaffney and Dunne's (1987) 'transgression' argument which claims that children below the age of seven will view pain as the outcome of breaking rules. Over all age-groups, individuals who do not know what caused their pain appear content to say they do not know the cause rather than providing unrealistic explanations.

The probable explanation of the differences in the findings of studies conducted in this area is the variation in the questions put to the children. The data reported here, and by Savedra et al (1981 and 1982) and Ross and Ross (1984b), asked children to attribute cause to their own experience. Gaffney and Dunne (1987) asked the much more abstract question "a person gets a pain because . . . ".

Therefore, whilst we acknowledge that neither approach is ultimately the correct one, we must be aware that careful phrasing of questions is required when discussing pain experience with children.

In this study, as might be expected, accidents were the most often cited cause of the pain recalled across all age-groups (Table 4.8). It is interesting to note that none of the five year olds reported illness as being a cause of their pain, whereas, for the six to ten year olds, illness was the second most frequent cause of the recalled pain.

A distinction can be made between what might be called pains of internal and external origin. An example of an internal pain is 'tummy pains'. Tummy pains were often reported by children of all ages: they are the most frequently reported by the five to nine year olds and second most frequent for the ten year olds. Therefore, tummy pains were subjected to closer scrutiny (Table 4.9). We see that a large proportion of these reported pains, at each age, have an unknown origin. The causes to which the tummy pains were attributed appear to become more diverse as the children get older, but with no clearly observed trends. Food or eating remain the most often cited cause of these pains across all age-groups, but the older children tend to more often cite illness or physical and emotional states.

These hidden, internal pains, contrast quite strongly with those pains which are related to external, observable injury. The vast majority of all age-groups were able to give the causes for such things as cuts, breaks and bruises (Tables 4.1 to 4.6).

4.3 How do children describe their recalled pain?
This section will discuss, in general terms, the way in which children describe their pain. The subsequent three sections will deal, specifically, with the following; children's use of figurative language, followed by sensory, affective and evaluative pain description, and, finally, descriptions of pain intensity.

When it comes to describing, verbally, their pains, the different age-groups of children studied show many similarities, but several important differences. Across all age-groups of children we find examples of the use of what Fabrega and Tyma 1976 have called primary pain descriptors; pain, ache, hurt and sore. These appear to be enduring descriptors which are acquired and used by children of all ages studied. We also see examples, at all ages, of the use of Tertiary pain descriptors, for example 'nasty' or 'horrible' used to describe how the pain felt and 'very' or 'a lot' used to describe pain intensity.

Savedra et al (1981 and 1982) showed that children, aged nine to twelve years, could generate, spontaneously, single word pain descriptions. Ross and Ross (1984b) showed that many of the children that they interviewed, aged between five and fifteen years, were able to describe the worst pain that they could recall experiencing. The question remained as to whether children would use different descriptions if they were describing more than one pain. In the current study we find evidence of remarkably few instances of a child using the same description when describing more than one pain. A scrutiny of Appendix 2, which contains the children's complete responses, shows that even the majority of five year to seven year olds, who recalled and described more than one pain, used different descriptions. Perhaps of equal significance is the observation that the older children, who were recalling on average between five and six different pains, tended to describe these different pains in different ways.

4.4 Do children spontaneously use figures of speech to aid their pain description?

Based upon studies of the development of figurative ability in children which was reviewed in the introductory chapter, it was thought that an important distinction between the groups might be found in their use of figurative language, or Secondary pain descriptors (Fabrega and Tyma (1976).

Studies which have asked children to spontaneously generate pain descriptions (Savedra et al 1981 and 1982; Ross and Ross 1984b) have been unable to show developmental trends in children's figurative use of pain description. Those studies which have asked children to select those words which describe their pain from a supplied list of pain descriptors (Beales 1983; Thompson et al 1987; Varni et al 1987) have also failed to report any significant age trends in their data. Gaffney (1988) has shown that when encouraged to do so, children aged from five to fourteen years show a strong developmental trend in the production of analogies to describe what a pain could feel like.

In the current study, the younger children interviewed showed very little spontaneous use of figures of speech to describe the pains that they could recall experiencing. This contrasts with the majority of ten year olds interviewed who made extensive use of figurative language, almost exclusively simile, in their pain descriptions (Figure 4.2, and Appendix 3). The developmental progression in the usage of figurative language to describe pain, over the six age-groups of children, is highly significant.

The complexity of these figurative descriptions also varied across age-groups amongst those children who used it. For example a child aged five described the pain of chicken-pox as being;

"like a pin". (5.11)

A further example is a child of seven described a tummy pain, attributed to being caused by a bug, as feeling;

"Hurts like someone punched you" (7.21)

These, somewhat primitive, similes, which appear to be driven by direct perceptual similarities, contrast with the older children's more complex figures, not driven by direct experience. For example, the nine year old who described his stitches as feeling;

"Like a monster biting you" (9.23)

or the ten year old child who provided this description of a tummy pain;

"Felt like there was an earthquake in my stomach."
(10.11)

4.5 Do children describe their painful experiences in terms of the sensory dimension of pain, or the affective/ evaluative dimension?

A distinction was introduced earlier between the sensory dimension of pain and the affective/ evaluative dimensions. The first refers to sensory description of what the pain feels like, and the second refers to the emotional reaction to having the pain. Abu-Saad and Holtzmer (1981) and Abu-Saad (1982) showed that seventeen of eighteen words that children aged between nine and fifteen years of age generated to describe their pain were sensory descriptors. The remaining word was an affective descriptor. None of the other studies reviewed (Beales 1983; Thompson et al 1987; Varni et al 1987; Savedra et al 1981 and 1982) have provided data which throws light on this area.

In this study, it has been shown that the age-groups of children do vary in their use of verbal descriptions to describe these two dimensions (Figure 4.3, and Appendix 4). However, the reason for the variation is not immediately clear. The interpretation put forward to explain this variation requires the synthesis of the knowledge that there is an increase in both the number of painful experiences recalled (Figure 4.1) and an increase in figurative pain description, with increasing age (Figure 4.2).

We can see that between forty and fifty per cent of the pains recalled by the five and six year olds were described in terms of the child's emotional reaction to the pain (Figure 4.3). At the same time, we see that these children recalled few pains (Figure 4.1) and displayed little figurative ability (Figure 4.2).

Therefore, these children had available mainly Primary and Tertiary pain descriptors. This meant that they could only describe their pains in those terms; that is, as being 'sore', 'hurting', and 'aching', or, for example, 'awful' and 'horrible'; these were the only words that they had available.

In contrast, the seven year olds are using few of the emotional words and are concentrating on the use of the few sensory descriptors that they have available (Figure 4.3).

The increase in affective/ evaluative usage by the eight and nine year olds, almost to the levels of the five and six year olds, is seen not as a backward step in development, but has to be seen in the context of an increase in the number of pain situations recalled and increased figurative ability of these children. The eight year olds are recalling slightly more, and the nine year olds considerably more, painful experiences. Between eight and nine years of age there is a significant improvement in figurative ability. This suggests that these children have a greater choice in the way that they describe their recalled painful experiences. They have available Primary, Tertiary and to some extent Secondary pain describing ability.

The ten tear olds have best recall of pain experiences, largest pain vocabulary and best figurative ability. This improvement in figurative ability appears to show itself in the construction of novel figures of speech, which focus on the sensory dimension of pain. Therefore, they produce relatively fewer affective/ evaluative descriptions.

4.6 How do children describe the intensity of these

recalled events?
The majority of children in all age-groups studied showed ability to describe the intensity of the pain recalled (Appendix 4). By seven years of age, and older, almost all of the children could describe the intensity of the pain experienced. Unfortunately, many of the pain intensity descriptions used were highly idiosyncratic; across age-groups seventy one different phrases were used (Table 4.10). However, over half of the responses in each age-group were made of the phrases 'very', 'very-very', 'not very' 'a lot' and 'quite'.

A special place is reserved for the child who described his pain intensity in terms of percentages;

A bee sting	20%	
Stitches	56%	
Fell out of tree	32%	
Fell off bike	29%	(9.23)

As we have seen, more conventional responses took the form of qualifications to the term painful. There appear to be no notable trends across age-groups. This appears to be an early developed ability, which once established undergoes little change with age. This, of course, is in terms of the words used. There may be improvements in discrimination ability and the reliability and/ or validity of these descriptions.

4.7 Which words can children spontaneously generate as pain descriptors?

The children show a significant effect of age in the number of descriptors that they could produce. There are no significant differences between the five, six and seven year olds in the number of pain descriptors that they can spontaneously produce. On average they recall between one and two words. The eight year olds improve on this by recalling between two and three, pain descriptors. There is then a marked improvement with the nine and ten year olds recalling, on average, five words (Figure 4.4).

These are still a fairly small amount of words to have available to describe pain. But, coupled with the increased figurative ability of the older children, and the implied ability to produce novel figures of speech this brings, as we have seen in this study, verbal pain communication by these older children by the use of language looks quite hopeful.

4.8 Summary

This study has shown that there are highly significant developmental trends between five and ten years of age which show an increase with age in the following; the number of painful experiences children can recall having experienced (Figure 4.1), the figurative use of language to describe this pain (Figure 4.2), and the number of pain descriptors known (Figure 4.4).

An argument has been put forward which proposes that when younger children describe pain in terms of their emotional reaction to it, it may be partly due to their not have the necessary verbal abilities to describe the sensory dimension. Older children may use fewer affective/ evaluative descriptions because they can utilise their superior verbal skills to describe the sensory dimension.

CHAPTER FIVE

Investigations of children's use of non-verbal pain estimations, and children's 'pain behaviour'

1. INTRODUCTION

Chapters Two, Three and Four, have addressed the issue of children's use of language to communicate pain. We have seen that the young child has a limited ability to use language to describe pain. But, are young children merely restricted in their pain communications by their reduced vocabulary? Do they have an underlying knowledge of painful experiences which, perhaps, could be communicated without words?

This chapter contains two experiments. The first, Experiment Six, investigates children's use of non-verbal rating scales to communicate pain intensity, and the second, Experiment Seven, looks at children's behaviour as a possible indicator of the degree of pain that they may be experiencing.

2. EXPERIMENT SIX

2.1 Introduction

The aim of this experiment is to consider the advantages, and disadvantages, of using non-verbal visual analogue scales (VAS) to enable children to communicate their perceived pain intensities.

The visual analogue scale does not require verbal ability on the part of the child to complete it. However, it does require the child to display symbolic ability, knowledge of the existence of different possible levels of pain intensities and the ability to relate this pain intensity dimension to the visual dimension.

2.1.1 The concept of the visual analogue scale

A visual analogue scale (VAS) is a line, usually 10cm in length, the extremes of which are taken to represent the limits of the pain experience. One end is therefore defined as 'no pain' and the other as 'worst pain possible'. The individual is asked to mark the line at a point corresponding to the severity of there pain. The distance of the mark from the 'no pain' end of the scale is then taken to represent the individual's pain severity. Huskisson (1983), has referred to the VAS as; "a simple, robust, sensitive and reproducible instrument that enables a patient to express the severity of his pain in such a way that it can be given a numerical value". However, problems to be considered, especially when children are asked to complete the scale, include:

1) Failure by the individual to understand exactly what they have to do.
2) Questions of reliability - does it tend to measure the same thing, in the same way, at different times?
3) Questions of validity - does the resulting measurement relate to some aspect of the pain experience?

2.1.2 Uses of the visual analogue scale

Visual analogue scales have been used widely in studies of pain severity in different groups of adult patients, and particularly in clinical trials. They have been used to compare pain severity in the same patient at different times, or groups of patients receiving different treatments (see review by Huskisson 1983).

We also noted in the Introductory chapter that visual analogue scales have also been used with children who were thought to be in pain (Scott et al 1977; Abu Saad and Holzemer 1981; Jay et al 1983; Abu Saad 1984; Szyfelbein et al 1985; Thompson et al 1987; Varni et al 1987).

2.1.3 What constitutes a failure to understand the task requirements?

It has been argued by Huskisson (1983) that most patients with pain understand the task requirements, and Scott et al, (1977) that even children aged five and over can usually manage to complete the task.

However, the criterion adopted in these studies for failure to understand the task requirements is rather minimal; failure to understand these requirements was taken to occur only when subjects said they did not understand what they had to do. If someone says that they do not understand what they have to do with the scale, we certainly have a failure to understand, but we cannot then go on to assume that those who did place marks on the scale fully understood what they had to do.

Common knowledge, as well as a glance at any child's school books, tells us that when asked a question by adults, children have a tendency to attempt an answer, even if they do so incorrectly. But often they are wrong, and because we have some objective criteria to measure their response against, we know they are wrong. But what of pain, noteworthy because of its lack of an absolute standard against which to assess responses?

It is proposed that a legitimate claim that people have failed to fully understand the task occurs, not only when individuals say they do not understand, but also when they make significant errors between successive estimations of the same intensity of pain. This follows because to fully understand the task is to understand that any given intensity of pain occupies only one point on the scale. This is impossible to resolve clinically, as we can never know whether someone is experiencing the same intensity of pain on two separate occasions. This problem is intimately tied to the next point to be considered, that is the question of reliability.

2.1.4 Questions of reliability

The question to be tested is whether subjects mark the same point on the scale given the same intensity of pain on two separate occasions.

As we have noted, there is no absolute standard against which to gauge the efficiency of pain measurement tools. But, theoretically, VAS do seem to have two advantages over other scales, such as verbal descriptor scales. Verbal descriptor scales usually attempt to measure three to five levels of pain intensity between no pain and worst pain possible, whereas VAS have, potentially, a greater capacity and sensitivity to change in response to small stimulus changes, and they are not reliant on language.

There are not enough verbal descriptors that could be reliably placed in ascending order of severity of pain (Melzack and Torgerson 1971) to enable such fine discriminations as we potentially have on the VAS. We have also seen that young children not only have a smaller pain vocabulary than adults, but also their understanding of the qualitative and quantitative relationships between these descriptors differs from that of adults.

One may also argue that the apparent sensitivity of the VAS is spurious. A 10cm line certainly has an infinite number of points along its length, and, therefore, has the capacity for great sensitivity to change; but we must also consider the potential increase in error this allows. The lack of anchor points, such as verbal descriptors, may lead to a greater variation in subjects responses independent of stimulus change. If one attempted to test the reliability of a VAS, results may be confounded by the fact that changes in successive position marked on rating scales by a patient may reflect either changes in the amount of pain experienced, or merely a shift in the patient's response which is independent of the amount of pain experienced.

We would expect some small variation between successive responses due to error inherent in any measurement device; but, especially with young children, do we have the systematic, reliable response we need before we can conclude that VAS are reliable? In the absence of an absolute standard against which to compare the children's responses, we are left with the problem of whether it is the pain or the response which has changed.

Research carried out to date on children would seem to be based on an implicit, a priori, assumption that there exists a direct relationship between pain cognitions and pain behaviours (Abu Saad and Holzemer 1981; Jay et al 1983; Abu Saad 1984; Szyfelbein et al 1985; Thompson et al 1987; Varni et al 1987). If we could define these behaviours carefully enough, and/or if we could enable subjects to quantify their pain cognitions with sufficient accuracy, then we would be able to reveal this relationship. In this sense, a study which did not succeeded in finding a relationship between an individual's pain estimates on a VAS and that individual's behaviours, would be a failure. A study which found a relationship would be a success. Now that we have made explicit this implicit a priori assumption, it is possible to question it.

Occasionally we may find correlations between VAS pain estimates and behaviours (eg. Abu-Saad 1984, Abu-Saad and Holtzmer 1981) but we cannot elevate these correlations to causal relationships. They may, or may not, be manifestations of the same underlying phenomenon i.e. pain. Perehaps a better way to estimate the reliability of a pain measurement instrument would be to use another instrument that has been devised to measure the same aspect of the phenomenon as that device.

In this experiment, the second measurement involves the children in rating pain intensities by the use of a paired comparison procedure. This procedure addresses directly the same aspect of the pain phenomena as the children are addressing in their use of the rating scales, i.e. their perception of relative pain intensities of several pain situations, measured at different times.

Woodworth and Schlosberg (1954), describe the method of paired comparisons as the most adequate way of securing value judgements. The subject's task at any one moment is simplified to the utmost because only two specimens are compared. These are compared in certain respects; in this case comparison of pain intensities, and then another pair are considered, and so on until all specimens have been judged. Therefore, this data will allow us to estimate the relative size of the intensity steps between the pain situations. We can test for relationships between these and the rating scale estimates.

To enable tests of reliability to be conducted, ideally, the following criteria should be met;

a) The children must see the stimuli as painful.
b) The stimuli must be reproducible to enable us to compare responses between individuals.
c) The stimuli must be reproducible to enable us to compare responses from the same individual at different times.

d) We must be able to utilise at least one other procedure against which to assess the reliability of the scale responses.

To satisfy these criteria, within ethical constraints, the following experiment was performed. Children were shown photographs of painful situations and asked to rate the anticipated pain intensity on three different versions of the visual analogue scale.

2.2 METHOD

2.2.1 Subjects

Six groups of children aged 5 (mean = 5.8, range = 5.5-5.11), 6, (mean = 6.4, range = 6.0-6.8) 7, (mean = 7.7, range = 7.3-7.10) 8, (mean = 8.8, range = 8.4-8.11) 9 (mean = 9.5, range = 9.0-9.9) and 10 (mean = 10.4, range = 10.6-10.8) years of age, (N = 10 in each group) were randomly selected from one Junior and two Infant schools in the Durham area.

2.2.2 Materials

2.2.2.1 Photographs of painful and non-painful situations

To ensure that the stimuli were held constant between and within individuals, the photographs of five pain situations as used in Experiment Four were also used for this experiment. These had been shown to be clearly discriminable by the adult control group in terms of quality and intensity of pain, and to a lesser, but still significant degree, by the children in that study. Five control photographs, showing the same child in non-painful situations, were also used in this study (Table 5.1).

2.2.2.2 Rating scales

Three rating scales were used upon which the children made their estimations of pain intensity;

Table 5.1

PAINFUL AND NON-PAINFUL SITUATIONS
WHICH WERE RATED BY THE CHILDREN

Painful situations

1. A child pulling a pan of boiling water over himself.
2. A child washing and getting soap in his eye.
3. A child being given an injection in his arm.
4. A child hitting his finger with a hammer.
5. A child undergoing a dental filling.

Non-pain control situations

1. A child having a bath.
2. A child washing his hands.
3. A child drawing on his arm with felt pen.
4. A child sawing some wood.
5. A child cleaning his teeth.

a) Visual Analogue Scale 1 (VAS1) (Fig 5.1a)
This is the simplest looking scale, consisting of a 10cm line, labelled 'no pain' to 'worst possible'.

b) Graphic Rating Scale (GRS) (Fig 5.1b)
This is the same as VAS1, with the addition of three verbal intensity descriptors spaced along its length: 'not very', 'quite' and 'very'.

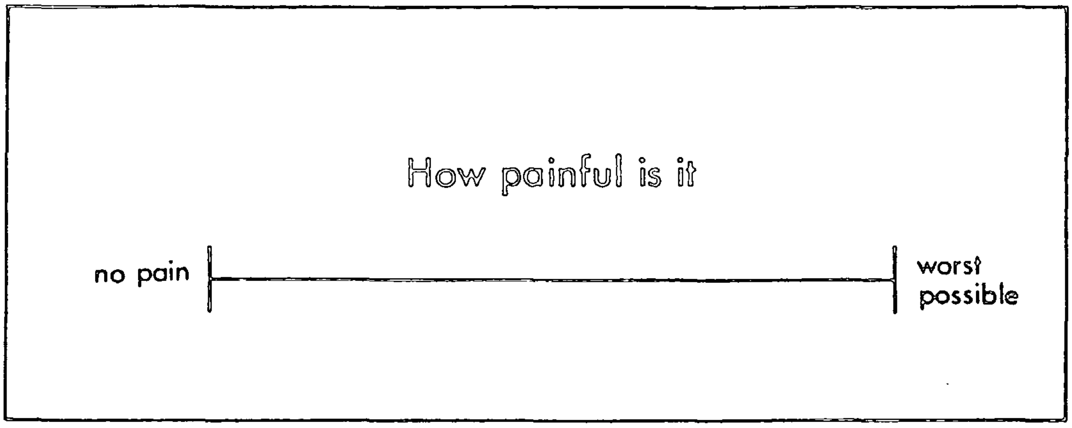
c) Visual Analogue Scale 2 (VAS2) (Fig 5.1c)
Similar to VAS1, with the addition of marks on the line, spaced every centimetre.

2.2.3 Procedure
In advance of conducting the formal experimental procedure, the experimenter was introduced one week in advance to all of the children who were to take part in the study. By the time this particular study was being carried out the experimenter had already spent several months in the schools conducting other studies and was certainly known, informally, to most of the pupils.

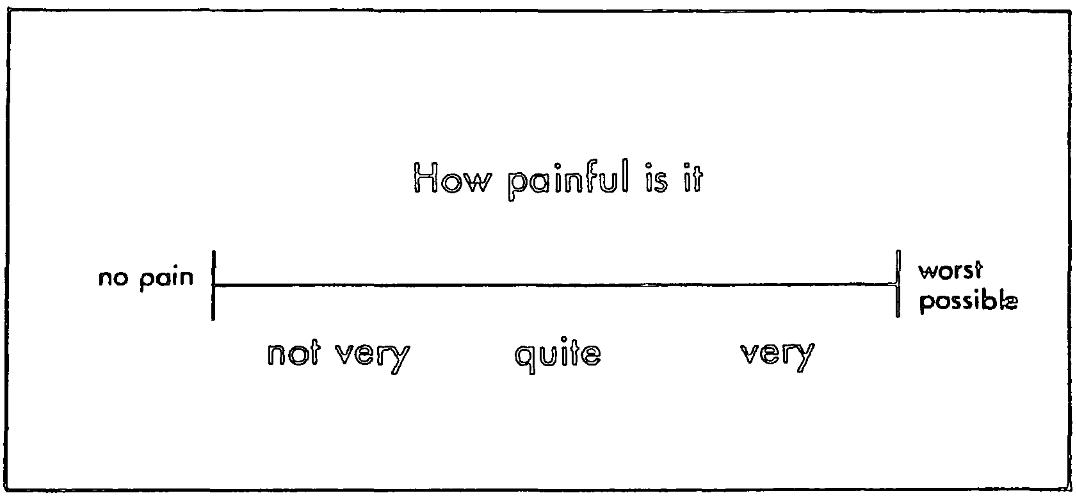
For the formal experiment, each child was seen individually on four separate occasions, with a minimum of three days between the meetings. On the first meeting, the children were presented with the ten sets of photographs, in random order, depicting the five pain and five non-pain situations. Their first task was to decide which of the situations were painful.

After this, the use of rating scales was explained to the children. The experimenter put a pencil on one end of the scale and told the child that that end of the line was no pain. The pencil was moved slowly along the line and the child was told that the further one went along the line the more pain there was, until the other end of the line was reached and that was the worst pain possible. Each child was then asked either to point to

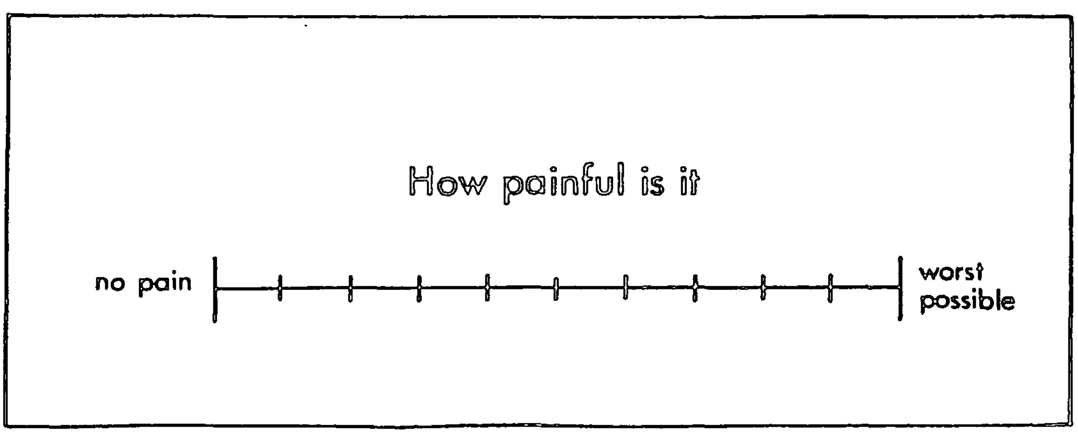
THE THREE RATING SCALES USED IN TESTS OF RELIABILITY



a) VISUAL ANALOGUE SCALE 1



b) GRAPHIC RATING SCALE



c) VISUAL ANALOGUE SCALE 2

Fig. 5.1

the 'no pain' end of the line and then the 'worst pain possible' end, or vice versa, to ensure at least that degree of understanding. If necessary, the instructions were repeated to ensure that the children understood the task.

As with the previous studies reported, these elaborate precautions were taken in order to maximise the performances of the children.

The children were then presented, at random, with copies of one of the three rating scales upon which to make their pain intensity estimates. Each pain intensity estimation was made on a separate copy of the rating scale. To obtain a measure of reliability in the child's use of the rating scale each pain situation was shown twice. The presentations of the pain situations were randomised, with the constraint that the same pain situation must not appear within three trials of its first presentation.

On the second meeting, the use of rating scales was again explained to the child who then completed another set of rating scales, selected at random from the two remaining scales. The presentation of the pain situations followed the same procedure as the first meeting.

The third meeting took the same form as the second meeting, except that the third, and final rating scale was used.

The purpose of the fourth meeting was to obtain a different measure of the child's estimate of pain intensity for the five pain situations, to act as a further means of evaluating the reliability of their rating scale estimates. This took the form of a Paired Comparison task, whereby all possible combinations of pairs of the five pain situations (ten pairs in all), were presented to the children. Their task was to decide which of the two situations was the most painful in each case. The situation chosen most often is the most painful overall, through to the situation chosen least often which is the least painful overall.

2.3 RESULTS

As an aid to analysis, each of the three rating scales was subdivided into twenty equally spaced intervals. These intervals were numbered from 1 to 20, from 'no pain', to 'worst pain possible'. Individual responses were regarded as having the value of the interval into which they fell. If a response fell on a line, it was asigned the lower value.

2.3.1 Discrimination between pain and non-pain situations

Across all age-groups of children, none of the non-painful situations was selected as being painful. The majority of children selected all five pain situations as being painful (Table 5.2).

2.3.2 Failure to understand the task requirements

None of the children said that they failed to understand how to use the scales.

2.3.3 Reliability

Reliability, as represented by correlation between the pain intensity estimates made, for the five pain situations, on successive presentations of the same scale, are illustrated in Table 5.3. All correlations are significant at $p<0.01$. There is an apparent trend towards an increasing relationship with increasing age.

Reliabilty, as represented by the mean of the two sets of pain intensity estimates made on each of the three rating scales, correlated with these values on each of the other scales, is shown in Table 5.4. This shows that each of these correlations is significant.

Table 5.2

NUMBER OF CHILDREN IN EACH AGE-GROUP WHO CHOSE PAIN AND NON-PAIN SITUATIONS AS BEING PAINFUL

(N=10 in each age-group)

		Age					
		5	6	7	8	9	10
Pain situation	1	10	10	10	10	10	10
	2	10	9	10	10	9	8
	3	9	9	10	10	8	6
	4	10	9	10	10	10	10
	5	6	8	8	10	8	9
Control situation	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0
	5	0	0	0	0	0	0

Table 5.3

Correlation Matrices - relationship between children's pain estimates on first and second presentation of three rating scales. (N = 50 DF = 48 r @ 0.01 = 0.36)

10 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.95		
GRS A		0.85	
VAS 2A			0.98

9 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.91		
GRS A		0.89	
VAS 2A			0.90

8 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.85		
GRS A		0.86	
VAS 2A			0.91

7 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.71		
GRS A		0.80	
VAS 2A			0.88

6 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.77		
GRS A		0.71	
VAS 2A			0.58

5 year olds

	VAS 1B	GRS B	VAS 2B
VAS 1A	0.64		
GRS A		0.59	
VAS 2A			0.68

Table 5.4

Correlation Matrices - relationship between mean values of two presentations of Visual Analogue Scale (VAS 1), Graphic Rating Scale (GRS) and Visual Analogue Scale 2 (VAS 2). (N = 50 DF = 48 r @ 0.01 = 0.3610)

10 year olds

	VAS 1	GRS
GRS	0.90	
VAS 2	0.96	0.92

9 year olds

	VAS 1	GRS
GRS	0.90	
VAS 2	0.94	0.86

8 year olds

	VAS 1	GRS
GRS	0.88	
VAS 2	0.90	0.92

7 year olds

	VAS 1	GRS
GRS	0.74	
VAS 2	0.78	0.76

6 year olds

	VAS 1	GRS
GRS	0.77	
VAS 2	0.72	0.64

5 year olds

	VAS 1	GRS
GRS	0.77	
VAS 2	0.76	0.76

Reliability, as measured by correlation between the pain intensity ranking on the Paired Comparison procedure and the mean pain intensity estimates made for the five pain situations, on the three rating scales, is shown in Fig 5.5. All correlations are significant.

2.3.4 Differences between presentations of the scales

Non-parametric statistical tests were applied throughout this section.

2.3.4.1 Analysis of the ratings made on successive presentations of the same scale

Analysis of the similarity of the ratings made for the five pain situations on successive presentations of the same scale is shown in Table 5.6. There is a high degree of agreement between presentations; there are however two significant differences between presentations for the six year olds.

2.3.4.2 Analysis of the similarity of the pain ratings between scores on VAS1, GRS and VAS2

Table 5.7 shows that there are no significant differences on the pain intensity estimations, for the five pain situations, between VAS1 and VAS2. There are differences for the five year olds between both the VAS1 and the VAS2 and the GRS. There are also differences for the eight and nine year olds between VAS2 and the GRS.

2.3.5 Analysis of the absolute errors between successive presentations of the same scale

The mean of the absolute values of errors (ignoring the sign) between the two presentations of each of the three rating scales is shown in Fig 5.2.

Table 5.5

Correlation Matrices - relationship between children's responses on Dyadic Comparison procedure and mean values of two presentations of Visual Analogue Scale 1 (VAS 1), Graphic Rating Scale (GRS) and Visual Analogue Scale 2 (VAS 2). (r @ 0.05 = 0.2787 r @ 0.01 = 0.3610)

10 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.66	0.67	0.66

9 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.73	0.72	0.75

8 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.78	0.78	0.76

7 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.74	0.68	0.68

6 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.34	0.55	0.34

5 year olds

	VAS 1	GRS	VAS 2
Dyadic Comparison	0.67	0.57	0.63

Table 5.6

Wilcoxon matched pairs signed-ranks tests of difference between first and second presentation of the three rating scales (N = 50 in each analysis)

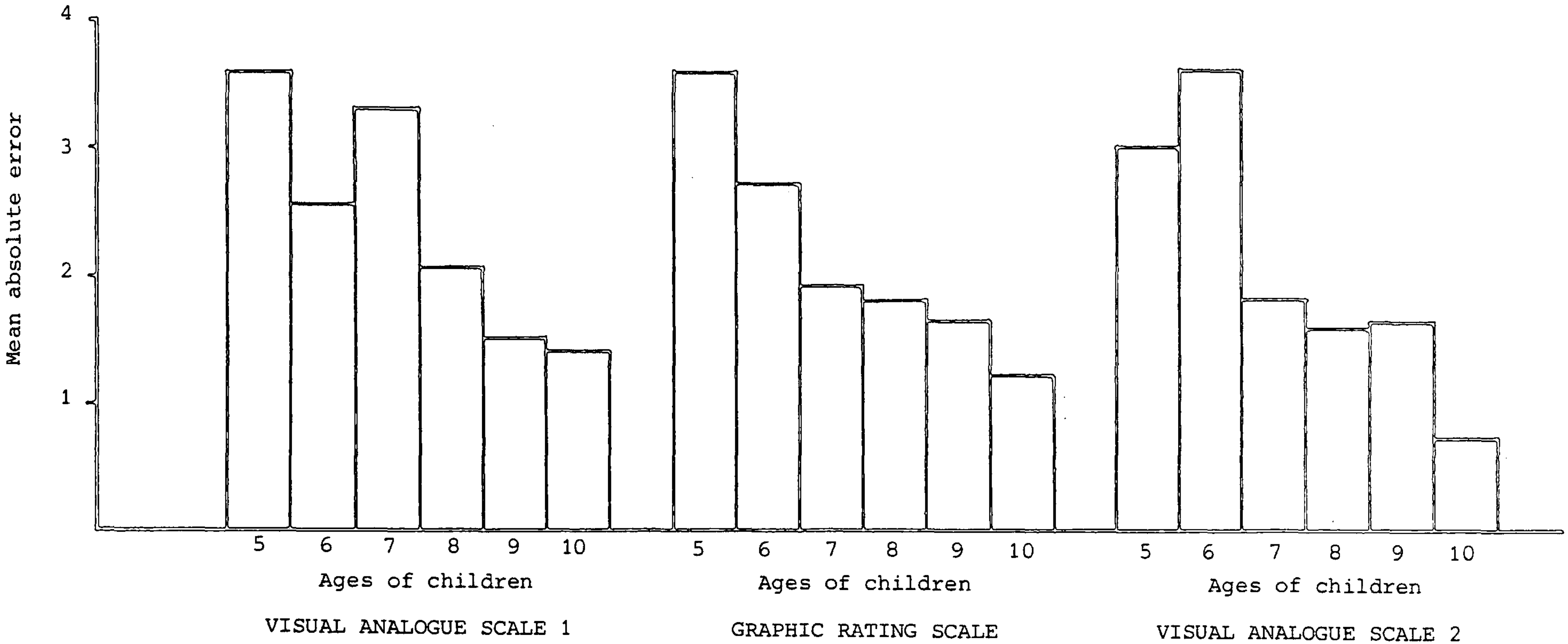
	VISUAL ANALOGUE SCALE 1		GRAPHIC RATING SCALE		VISUAL ANALOGUE SCALE 2	
	Z score	Significance	Z score	Significance	Z score	Significance
Age						
5	-0.39	NS	-0.17	NS	-1.24	NS
6	2.34	<0.02	-2.21	<0.03	-1.10	NS
7	-0.64	NS	-1.92	NS	-0.99	NS
8	-0.34	NS	-0.72	NS	-0.36	NS
9	-0.69	NS	-0.82	NS	-1.11	NS
10	-1.33	NS	-0.44	NS	-0.76	NS

Table 5.7

Wilcoxon matched pairs signed-ranks tests of difference between mean of first and second presentation of the three rating scales (N = 50 in each analysis)

	VISUAL ANALOGUE SCALE 1 v GRAPHIC RATING SCALE		VISUAL ANALOGUE SCALE 1 v VISUAL ANALOGUE SCALE 2		GRAPHIC RATING SCALE v VISUAL ANALOGUE SCALE 2	
	Z score	Significance	Z score	Significance	Z score	Significance
Age						
5	-1.98	0.05	-0.55	NS	-2.91	<0.004
6	-0.58	NS	-0.96	NS	-0.21	NS
7	-0.15	NS	-0.51	NS	-0.69	NS
8	-1.44	NS	-0.55	NS	-2.30	<0.02
9	-1.77	NS	-1.87	NS	-2.98	<0.003
10	-1.48	NS	-1.11	NS	0.57	NS

Fig. 5.2



MEAN ABSOLUTE ERRORS BETWEEN SUCCESSIVE PRESENTATIONS OF THE SAME RATING SCALE FOR EACH OF THE AGE-GROUPS OF CHILDREN

Friedman's analysis shows that there is a significant difference over the six age-groups on VAS1 and VAS2 but not on GRS: VAS1, X^2 =16.0 $p<0.01$; GRS, X^2 = 8.8 $p>0.05$; VAS2, X^2 =12.1 $p<0.05$ (Table 5.8).

2.3.6 The analysis of different response strategies used by the different age-groups of children

Close inspection of the children's data showed that children of different ages were adopting different response strategies on this task. This may have led to an over-estimation of reliability for the younger children.

To illustrate the problem, eleven different patterns of responding, when rating five situations, are shown in Fig. 5.3.

Subjects may choose to always place their responses on one part of the scale as in Fig. 5.3a, through to very spaced responses as in Fig. 5.3k. If strategy 5.3a is adopted throughout, then there is clearly very little chance of detecting errors between successive presentations of the same scale; although this shows virtually no evidence of discrimination in terms of appreciation of different intensities of pain. With increased spacing between the 5 responses, Fig. 5.3a through to Fig. 5.3k, the children are showing greater discrimination in terms of pain intensity, but they are also creating a situation which allows for a higher probability of error.

It was expected that the older children were making fewer errors whichever strategy they chose, i.e. they were making meaningful, reliable discriminations; whereas the younger children's errors were being underestimated because of their use of restricted strategies. Errors which did occur may be being made when broader strategies were being used, or because different strategies were being employed on successive

Table 5.8

FRIEDMAN'S ANALYSIS OF THE ERRORS MADE BETWEEN SUCCESSIVE PRESENTATIONS OF THE SAME RATING SCALE

Values refer to the mean rank order value, over the six age-groups of children, of absolute errors made between successive presentations of the same rating scale. (Degrees of freedom = 5, N=10 in each age-group).

	Age 5	6	7	8	9	10	X	Prob.
Visual Analogue Scale 1	4.5	4.0	4.9	2.9	2.5	2.4	16.0	.01
Graphic Rating Scale	4.1	4.4	4.2	3.0	2.8	2.7	8.8	.10
Visual Analogue Scale 2	3.5	5.0	3.5	3.5	3.4	2.1	12.1	.05

THE ELEVEN POSSIBLE RESPONSE STRATEGIES WHICH CAN BE EMPLOYED WHEN RATING FIVE PAINFUL EXPERIENCES, WITH THE ASSOCIATED S' VALUE FOR EACH STRATEGY

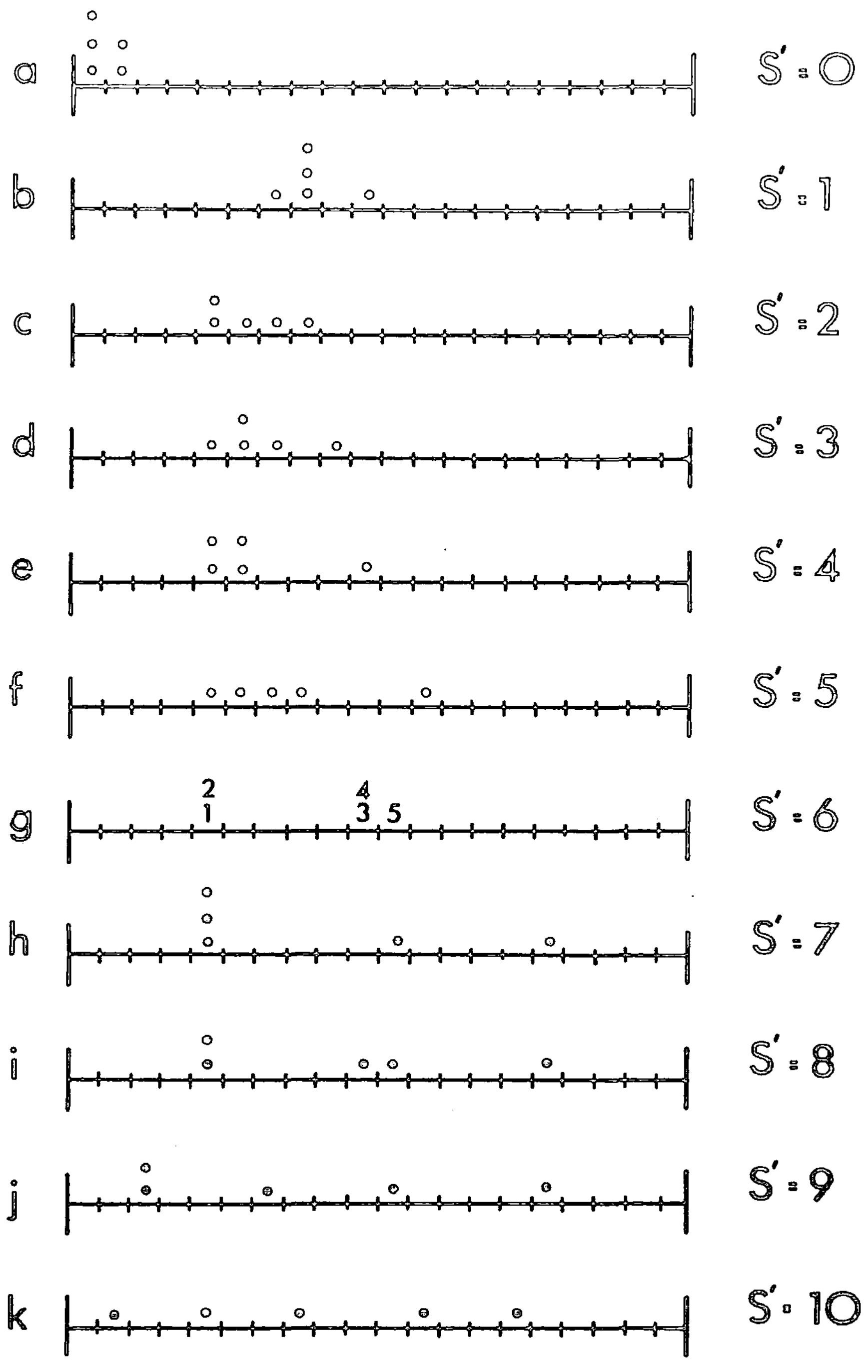


Fig. 5.3

presentation of the same scale. The greater attempt at using a variety of pain intensities, the larger the errors; the less attempt at using a variety of pain intensities, the lower the errors. The following null hypothesis was proposed;

a) There is no effect of response strategy on magnitude of error for any of the age-groups of children.

To solve the problem of describing, in an analysable way, the strategy of responding used, the following non-parametric statistic is proposed, denoted by the symbol S'.

Consider the response pattern of Fig. 5.3g. The numbers correspond to the positions marked on the VAS for each of the five pain situations. We take each number (or point) in turn and count the number of other points which are more than two positions away from it. Each pair of numbers is only considered once.

Therefore, we have;

Point 1: 1 - 2 < 2 intervals away
1 - 3 > 2 intervals away
1 - 4 > 2 intervals away
1 - 5 > 2 intervals away
Point 2: 2 - 3 > 2 intervals away
2 = 4 > 2 intervals away
2 = 5 > 2 intervals away
Point 3: 3 = 4 < 2 intervals away
3 = 5 < 2 intervals away
Point 4: 4 - 5 < 2 intervals away
Total number > 2 intervals away = 6

Therefore an S' of 6 describes a response pattern made up of two groups, or clusters, of responses with two responses in one cluster and three responses in the other.

The possible response patterns and the S' which describe these patterns are shown in Fig. 5.3. As can be seen an increase in dispersion of responses leads to an increase in the magnitude of the statistic. This statistic is used to test the null hypothesis outlined earlier.

S' is computed for each child's set of responses for each rating scale and correlated with the mean absolute error made by the children between successive presentations of the same scale. Clearly, for a particular child we derive two values of S', for each of the three scales; one for each of the two presentations of the rating scale, and only one error estimate, which reflects the difference between the successive presentations of the same scale. Therefore two forms of S' were calculated; S'(difference) was calculated as the difference between the two S' over the two presentations of a scale, and S' (mean) was the mean of the S' over the two presentations. The larger S'(difference), the greater the difference in strategies over the two presentations. The large S'(mean), the greater the tendency to use dispersed strategies.

Table 5.9, shows the correlations revealed between S'(difference) and S'(mean) and the children's absolute errors, on each of the three scales.

Significant correlations are only found in the five and six year old groups; therefore we can reject the null hypothesis outlined earlier, and conclude that there is a relationship between response strategy and the errors made, on the rating scales, by the five and six year olds, but not for the older children.

Table 5.9

Correlations between mean errors made between two presentations of the rating scales, and S' (Mean) and S' (Difference)
(In each analysis, N = 10 DF = 8 r @ 0.05 = .6319 r @ 0.01 = .7646)

		VISUAL ANALOGUE SCALE 1		GRAPHIC RATING SCALE		VISUAL ANALOGUE SCALE 2	
		S' (Mean)	S' (Difference)	S' (Mean)	S' (Difference)	S' (Mean)	S' (Difference)
5 year olds	Mean Error	-.0238	.7124	.6421	-.0515	.0394	.9222
6 year olds	Mean Error	.7007	.2986	.7474	.0760	.1573	.4774
7 year olds	Mean Error	-.2200	.1856	-.4254	.4522	.0244	.5199
8 year olds	Mean Error	-.3689	.1564	-.1471	.3176	.5541	.2661
9 year olds	Mean Error	.1112	0.0000	.0090	.3114	.6140	.1553
10 year olds	Mean Error	.4631	-.1115	.3607	.0032	.2263	.1625

2.4. DISCUSSION

2.4.1 Failure to understand the task requirements.

None of the children in the study said that they failed to understand what they had to do. Therefore, following tradition, we might assume that they all knew what to do. But this may be misleading.

2.4.2 Are responses reliable?

Measures of correlation between first and second presentations of the scales is a satisfactory measure of reliability. Each of the six age-groups of children have shown a significant degree of reliability. There is a trend to an increase in reliability with increasing age. Measures of correlation between the three rating scales are equally impressive. All correlations are significant.

However, in this experiment it is believed that we should expect a very good relationship between the responses on these two tasks i.e. a large part of the variance should be explainable by knowledge of one set of scores. Sternbach (1978), commenting on test-retest reliability in this area, has suggested that coefficients of 0.6 are acceptable, 0.8 are good and 0.9 are excellent.

In terms of reliability as estimated by correlations between successive presentations of the same scale, the five and six year olds reach the 'acceptable' criteria on two out of the three rating scales, but they each fall slightly below this criteria, into the unacceptable range, on one rating scale. The seven year olds responses vary between 'acceptable' and 'good', and the eight, nine and ten year olds reach the 'good' to 'excellent' criteria (Table 5.3).

For all six age groups of children, we find statistically significant correlations between the responses on the three rating scales and responses using the paired comparisons procedure. Therefore, we have further evidence of the reliability of the childrens responses. However, using the above criteria, we see that the six year olds certainly fail to meet even the 'acceptable' criteria. The slight improvement in this for the five year olds may again be a function of their strategies rather than a meaningfully better performance on this task. The seven to ten year olds all satisfy the 'acceptable' criteria but none progress into the 'good' area (Table 5.5).

But it is in the interpretation of errors made between the successive presentations of each of the rating scales which perhaps yields the most interesting results and insights. The degree of reliability attained by the children is remarkable; and for the younger children it is suspected, quite misleading. An analysis of the errors made between successive presentations of the three scales shows the expected trend, i.e. the younger children are making larger errors than the older children (Fig. 5.2 and Table 5.8). However, this is a quantitative differences where it was expected we might find a qualitative shift.

Close inspection of the raw data seemed to provide a clue to why the younger children may have been doing as well as they were. The children's data seemed to indicate that individual children were adopting very different strategies when responding in this task.

A new, non-parametric statistic, S', was devised in order to test the null hypothesis that response strategy was not related to the errors made by the children of different ages. Analysis revealed that response strategy was indeed related to the the errors made by the five and six year olds, but not for the older children. The three scales tend to produce slightly different responses (Table 5.9).

For VAS1, we see that for the five year olds, errors are correlated with shifts in strategy between successive presentations of the scale; the larger the shift, the larger the error. But for the six year olds it is not shifts in strategy, but the use of more dispersed strategies (higher values of S'(mean)), which is related to mean absolute error.

For the GRS, with both five and six year olds it is the use of more dispersed strategies which are related to higher mean absolute errors.

With VAS2, we find that for the five year olds, shifts in strategy are related to mean absolute errors. There are no significant relationships for six year olds.

There are no significant relationships on any of the three scales between S'(difference) or S'(mean) and mean absolute errors, for the seven to ten year olds.

This indicates that if the five and six year olds, attempt to make wider discriminations their errors increase, if they retain a narrow range stereotyped response pattern they make fewer errors. For the seven year olds and older their smaller absolute errors are occurring independently of whichever strategy they use.

3. EXPERIMENT SEVEN

3.1 INTRODUCTION

Experiment Seven investigates changes in the behaviour of children in pain. As noted earlier, we could not justify inflicting pain on children in the previous studies. However, the opportunity arose to observe children who had to undergo a routine medical procedure which caused them pain; physiotherapy for children suffering from juvenile arthritis.

At the outset, it was hoped that this would be a pilot study leading to a series of experiments which would investigate children's subjective experience of pain and/or their changes in behaviour when they were undergoing painful procedures. For various reasons, not least of which was the closure of the hospital where the experiment was undertaken, these hopes were not realised.

Although presented as the final experimental chapter, this work was actually carried out immediately after the experiments presented in Chapter Two. Therefore, the findings which were discussed in the previous chapters could not be incorporated into the experimental design. However, this chapter is presented in its own right as an example of a carefully conducted experiment, although it is somewhat difficult to incorporate it into the main theme of this thesis.

3.1.1 Physiotherapy in arthritis

Ansell (1983) has argued that the mainstay of management of arthritis in children is the maintenance of joint position and function by appropriate splinting and physiotherapy. Physiotherapy aims initially at preventing muscle wasting and then at the development of muscle function. Without adequate musculature, muscle shortening, which leads to deformity, is inevitable. Therefore, an exercise programme tailored to the child's individual needs is essential.

However, physiotherapy can cause the child severe pain because of the need to exercise the joints involved to pain tolerance, or to the maximum range of movement. The children involved in this study all spontaneously described physiotherapy sessions as the most painful aspect of their disease, although they also acknowledged that they were a necessary part of treatment. They all found that after physiotherapy they felt less stiff, and had a greater and more free range of movement.

3.1.2 Pain assessment in arthritis

Several methods have been used to assess pain levels, or analgesic effects of drugs, of adults and children with arthritis, for instance: Visual Analogue Scales (Brooks et al, 1982; Huskisson et al, 1981; Scott et al, 1977) and physician's pain ratings (Martio et al, 1981; Laaksonen et al, 1961; Matts et al, 1983). In this study, which was designed to examine the effect of an analgesic, Mefenamic Acid (Ponstan), on pain during physiotherapy, pain was assessed both by observing pain behaviour, and by questioning the children.

3.1.3 Study questions

Three questions were posed in this study;

a) When children are in pain, does the frequency and intensity of their pain, as communicated by their facial expressions and vocalisations, alter when they are given an analgesic?

b) When rating facial expressions of children thought to to be in pain, are raters influenced in this task by the child's vocalisations; when rating vocalisations are they influenced by facial expression?

c) Do children detect differences in intensity of pain when they are given an analgesic?

3.2 METHOD

3.2.1 Subjects

The experimental group was made up of twelve children who at the time of the study were inpatients at the Royal Canadian Memorial Hospital, Taplow. The children were aged from 8.0 to 16.2 years (details in Appendix 5a). Parents gave written concent for their children to take part in the study.

3.2.2 Procedure

A crossover design was used over four days. Half the children were randomly assigned to a group given Mefenamic Acid (Ponstan) as an adjunct analgesic for the first two days, and a placebo, Ascorbic Acid (Vitamin C), on the third and fourth days. The remaining six children received Ascorbic Acid on the first two days and Mefenamic Acid on the next two. Both were administered in liquid form, about one hour before the morning physiotherapy session.

Video tape recordings were made of the children during the session on each of the four days of the study, and used for subsequent analysis. Although each child had an individually specified set of exercises, they were the same on the four days of the study (details in Appendix 5b).

This study therefore yielded four video tapes for each child. Neither the experimenter, who made the video tapes, nor the physiotherapist knew which substance had been given to the child, except by inference from changes in behaviour.

The tapes were analysed by two independent raters, who each recorded two responses:

1) Pain faces, i.e. facial expressions which the observer regards as indicating pain.

2) Pain vocalisations, i.e. vocalisations which the observer regards as indicating pain.

The raters used a modified frequency method. The physiotherapy sessions were divided into ten second intervals. If either response occurred, it was scored on the first occurrence within each ten second interval. To take into account varying session lengths, the number of pain faces and vocalisations recorded was divided by the number of ten second intervals in the session. This gives us a probability of occurrence of pain faces and pain vocalisations for each session for each child (Appendix 5c). Statistical analysis for the two days of drug and two days of placebo were based on the mean ratings of the two observers (Appendix 5d).

In a second analysis, two other independent raters viewed the video tapes and rated pain faces and vocalisations on an intensity scale. Again a ten second, modified frequency schedule was used. At the end of each ten second period a tone sounded and the observers rated pain faces and pain vocalisations during the previous ten seconds on intensity, using a scale of 1-7, with 1 corresponding to a 'mild' pain through to 7, a 'severe' pain. The mean rating of the two observers was used for analysis.

This procedure provides four sequences of pain intensity ratings for each of the twelve children in the study (Appendix 5e). Mean intensity scores for pain faces and pain vocalisations were calculated for each session for each child (Appendix 5f). Statistical analysis was based on these means.

A third analysis was performed in which two different independent raters rated the pain faces without sound and the pain vocalisations without vision (Appendix 5g and 5h). In all other respects this analysis followed the same procedure as the second analysis.

On the third day of the study, the children were asked to compare their pain on that day with their pain on the previous day. They had been told the previous day to expect this. This was the crossover period of the study, when children were switched from drug to placebo, and vice versa.

3.3 RESULTS

The non-parametric Willcoxon test was used for analysis throughout as scores were not normally distributed. One-tailed probabilities are reported as the direction of the differences was predicted.

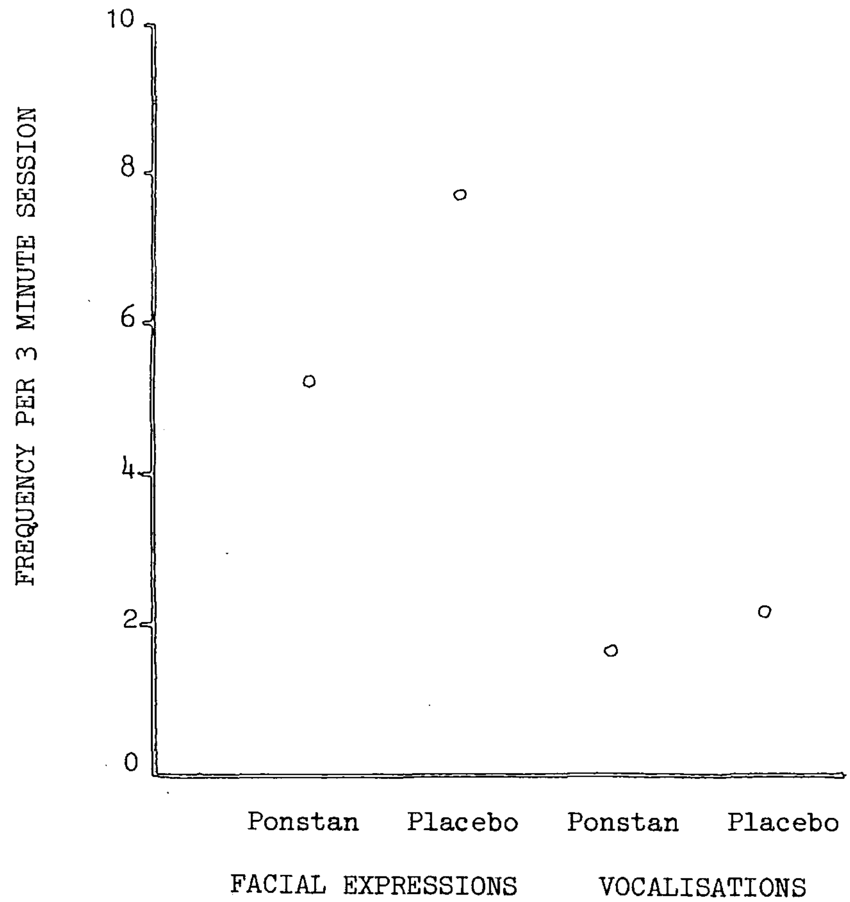
3.3.1 The probability of occurrence of pain face and vocalisation

The median probability of a pain face occurring per ten seconds decreased from 0.43 to 0.29 when Ponstan was given. The median probability of pain vocalisations decreased from 0.12 to 0.09. both decreases were significant ($z = -1.922$, $N = 12$ $p<0.027$, and $z = -1.82$, $N = 8$ as there were four ties, $p<0.034$, respectively). Inter-rater reliability was 82% for facial expression and 72% for vocalisations. Since probabilities over short time periods are not simple to interpret, the data is presented in an alternative form in Figure 5.4, which shows the estimated number of pain faces standardised for a three minute physiotherapy session, with and without the analgesic.

3.3.2 Intensity of pain faces and pain vocalisations

When raters were able to use sound and vision together, the median intensity of pain faces decreased from 4.2 to 3.3 when Ponstan was given; this decrease was significant ($z = -2.353$, $N = 12$, $p<0.01$). The median intensity of pain vocalisations was decreased from 1.0 to 0.75 ($z = -2.073$ $N = 9$ as there were three ties, $p<0.02$). Inter-rater reliability was 78% for facial expression and 85% for vocalisations.

When ratings were made using sound only and vision only, the median intensity of pain faces increased slightly from 2.84 to 3.11 when Ponstan was given; this was not a significant difference ($z = -0.078$, $N = 12$, $p>0.05$). The median intensity of pain vocalisations was unchanged at 1.0 ($z = -0.169$ $N = 7$ as there were five



Estimated number of pain faces and pain vocalisations standardised for a three minute physiotherapy session with, and without, the analgesic

Fig. 5.4

ties p>0.05). Inter-rater reliability was 67% for facial expression and 61% for vocalisations.

3.3.3 Children's pain estimation

When comparing their pain over two days, two of the children detected no difference; of the five others who switched to Ponstan, three said they had more and two said they had less pain; of the five switched from Ponstan, again three said they had more and two said they had less pain. There is clearly no difference here.

3.4 DISCUSSION

This study has shown that when ratings of painful facial expressions and vocalisations were made concurrently, children undergoing physiotherapy, after receiving an analgesic, showed a substantial reduction in the frequency and intensity of pain, relative to that shown when they received a placebo. The number of pain faces was nearly halved, and their rated intensity reduced. Painful vocalisation were also less common.

However, when facial expressions and vocalisations were rated independently, no difference was found on either behaviour between the analgesic and the placebo conditions.

The finding that ratings of facial expression are influenced by concurrent vocalisations, and vice versa, does not necessarily weaken the findings of the earlier analyses which showed significant reduction in frequency and intensity of pain in these children. Rather, it may argue against a simple additive model and suggests that pain behaviour cannot be reduced to its component parts and still retain its status as a meaningful communication.

When the children were asked which of the second and third days of the trial was more painful, they showed no discrimination in favour of the placebo day. This is difficult to interpret. It may indicate that the children simply did not find a difference between the days, or that they could not remember. A preferred measure would have been one in which the children made either verbal, non-verbal, or indeed both types, of pain intensity measurements during each physiotherapy session.

4. Overall Summary

In Experiment six, we saw that children did not admit failure to understand what they had to do in the task presented; although for the five and six year old children we have queried whether their responses are as reliable as they first appear. Failure, in this area, shows only under carefully controlled conditions, where stimuli are held constant and, therefore, response changes can be analysed. The worry is not that children cannot do the task, rather that they pretend they can and we may believe them.

Children aged seven years and older were shown to make reliable use of the visual analogue scales; errors made are independent of response strategy used, and do decrease as children get older.

Experiment six also suggests that the younger child's lack of ability to describe and discriminate pain may not be merely a function of a restricted verbal ability.

Experiment seven is more difficult to interpret. There is a strong, but not conclusive, suggestion that the children's behaviour did change between the drug and placebo conditions. It remains an unresolved issue as to whether this change in behaviour reflects a reduction in the pain experienced by the children because of the weakness of the procedure used to elicit the children's subjective pain estimates.

CHAPTER SIX

DISCUSSION

1. Introduction

This discussion chapter will adopt the following format: the major study questions, as outlined in the introductory chapter, will be restated; the findings from the studies undertaken will be presented, and we will consider how well these studies answer the study questions; a brief restatement of the theories of semantic acquisition, and empirical findings on figurative development, will be given; study findings will be integrated with these language issues; clinical implications of the study findings will be outlined; overall conclusions will be drawn; finally, speculations for future research will be given.

2. Study questions

Several questions were posed in the introductory chapter, which formed the basis for the studies undertaken.

1) Do children have available a lexicon of pain descriptors; if so, do these descriptors share the same meaning for children and adults?
2) Can children use language to describe, and discriminate, between several painful situations?
3) Can children recall, and describe, their own past painful experiences?
4) Can children use non-verbal rating scales, to estimate pain intensity, in a reliable way?
5) When undergoing a painful procedure, does children's behaviour change when given an analgesic?

3. **Summary of findings from the studies undertaken**

The first three studies looked at children's understanding of the sense of pain descriptors. Experiment One addressed the question of whether, or not, children have a lexicon of pain words available with which they could undertake verbal pain descriptions. That is, by what age can children differentiate between words which could describe pain and those which do not? Results indicated clearly that five year olds do not show evidence of discrimination between pain and non-pain words. Six year olds showed a small degree of discrimination, but they still tended to select non-pain words as pain descriptors, although less often than the five year olds. The number of pain descriptors recognised by the children then increases with increasing age; by seven years of age children rarely select non-pain words as pain descriptors.

The Primary pain descriptors, 'hurt', 'sore' and 'ache', were the most popular words chosen by all age-groups of children. Hurting and aching were also selected by the majority of adults, whilst sore was selected by just over half of them. This may indicate that 'sore' is considered to be a child-like pain descriptor and is dropped from the adults vocabulary as other pain descriptors are acquired.

Although this study provides our first evidence of the existence of children's pain describing lexicon, in that children aged seven and older are able to discriminate pain from non-pain words, the question remained as to whether the children had acquired more specific meanings to these words. To recognise a word as a pain descriptor was one thing, but had the children attached more specific meanings to these words. Experiments Two and Three addressed this question.

Experiment Two used a triadic comparison procedure to investigate whether children aged five, seven, nine and eleven years grouped twelve pain descriptors into four of the qualitatively different categories of pain, as proposed by Melzack and Torgerson (1971).

Results showed that five year olds were operating in a random fashion on this task, and, therefore, we were able to conclude that this age-group do not have the ability to categorise pain descriptors by pain quality. Children of seven years of age showed significant evidence of having this categorising ability in three of the four categories investigated. However, they failed to group into one category the Primary pain descriptors, ache, hurt and sore. Children of nine and eleven years of age showed clear evidence of perceiving the pain descriptors as belonging to the proposed four, qualitatively distinct, categories. Indeed, these children were as competent at adults on this task.

This study clearly shows that children are aged, on average, seven to nine years before they show evidence of appreciating the qualitative similarities, and differences, in the meanings attached to pain descriptors.

Experiment Three looked at children's understanding of the intensity represented by pain descriptors. The study used two procedures which each considered the relative intensity of pain implied in each of the words in a set of twelve pain descriptors. Results indicate that children of five years of age were performing at chance levels on this task. Children aged seven, nine and eleven, and adults, showed significant agreement between the two procedures in the relative intensity rankings of the twelve pain descriptors.

The five year olds intensity rankings did not significantly correlate with any other age-group on either of the intensity ranking procedures. There were significant relationships between the seven, nine and eleven year olds, and adults on each of the ranking procedures, except for the nine year olds rankings derived from the diadic comparison procedure, which did not correlate with those of the eleven year olds or adults.

We conclude from this study that the five year olds have not attached pain intensities to these words, in a reliable way. Children aged seven and older, and adults, have shown that they share an understanding that certain words represent a certain level of pain, relative to other pain descriptors.

Therefore, these first three experiments suggest that children are, on average, seven to nine years of age before they have a pain describing vocabulary in which pain terms share the same meaning as they do for children of the same age, or older children and adults.

The following study, Experiment Four, investigated children's referents of pain descriptors, and sought to determine whether children, aged between seven and ten years of age, and adults, could use a verbal pain questionnaire to discriminate, on the dimensions of intensity and quality, between five painful situations.

Results showed that each age-group of children studied, and the adult comparison group, produced highly significant differences in their pain intensity estimates over the five pain situations. Girls were shown to anticipate more severe pain than the boys. Pain intensity estimates were shown to be related to several personality dimensions, but were unrelated to age, intelligence or verbal ability.

The seven year olds showed only rudimentary discrimination in terms of the different qualities of pain they chose to describe the five pain situations. The children studied displayed an increasing degree of discrimination between the five pain situations, in terms of the quality of pain anticipated, with increasing age.

Highly significant relationships were found between the age-groups studied, in the words, and categories, that they chose to describe the five pain situations. This would indicate that the same words tended to be popular, or unpopular, across age-groups.

The factors which were shown to be related to the children's increased qualitative discrimination ability between the pain situations were, the number of pain describing words that the children knew, and increasing age. Older, and more verbal, children appeared able to use the context of the five pain situations to display increased competence in verbal pain discrimination by using words, figuratively, which they had not recognised earlier as pain descriptors.

From this study we can make the following conclusions about children's referents of pain descriptors. From the age of seven, and older, children show evidence of not only appreciating that different pains have different intensities, but that these children can communicate these differences, using a verbal, five point scale. The ability to communicate an appreciation of the qualitative differences between these painful situations appears to emerge, in a reliable way, on average, between the ages of nine and ten years.

Experiment five, which took the form of a structured interview, looked for evidence of children having access to past experience upon which to base their current pain descriptions and estimates. Results show that children of five years of age can recall, on average, only one past painful experience. However, there was a clear developmental trend towards increased recall of painful experiences with increasing age. By ten years of age, children can recall, on average, six painful experiences.

The children were unable to give the cause for many of the pains that they recalled having experienced. Almost half of the pains recalled by the five year olds, between a quarter and a third recalled by the six to nine year olds, and twelve per cent recalled by the ten year olds, were of unknown origin. The causes to which children attributed their pains all correspond to realistic actions and events, which argues against 'transgression' arguments by which younger children are thought to attribute their pain as the breaking of rules. Accidents were the most often cited cause of pain recalled across all age-groups. Internal pains, for example tummy pains, often were of unknown origin. This contrasts with external pains, for example cuts and bruises, for which the majority of all age-groups of children could give the cause.

In this study, children seldom used the same description for more than one pain that they recalled having experienced. When describing these experiences, five to seven year old children tended to describe them using Primary ('hurt', 'sore' and 'ache') and Tertiary (eg. 'nasty' and 'horrible') pain descriptors. Eight to ten year olds certainly retain this ability, but they are much more likely, than the younger children, to use Secondary, that is, figurative pain descriptions. These figurative descriptions, which were almost exclusively simile, showed a highly significant increase in the number of children who used them with increasing age. There was also a trend to an increase in the complexity of these figurative descriptions with increasing age.

It has been argued that there are at least two dimensions when describing pain; sensory and affective/

evaluative. In this study, it was shown that the different age-groups of children do vary in their use of verbal descriptions to describe these two dimensions. However, the manner in which they vary is not easily explained. The five, six, eight and nine year olds describe between thirty and fifty per cent of the pains that they recall in terms of the affective/ evaluative dimension. The seven year olds describe less than ten per cent and the ten year olds just over ten per cent of the pains recalled in this way.

The explanation proposed centred around the observation that the younger children studied were recalling fewer pains, had a restricted pain vocabulary and produced few figurative pain descriptions. With increasing age there is a shift from the use of Primary and Tertiary descriptions to the use of figurative descriptions, which rely upon figurative ability for constructions. The anomalous findings for the seven year olds reflects their position as being between these two stages.

The majority of children, in all age-groups studied, showed ability to describe the intensity of the pain that they had recalled. Unfortunately, across all age-groups, seventy-one different phrases were used to describe pain intensity. However, over half of the responses in each age-group were made up of the phrases 'very', 'not very', 'quite', 'a lot', 'very', 'very-very', as qualifiers to painful. There were no observable trends across age-groups.

The number of words and phrases that children produced to describe pain did increase with age, but five year olds only produced, on average, one pain descriptor. Even by ten years of age children were only producing, on average, six pain descriptions. However, it is clear that these older children's increased figurative ability allows them to construct novel figures of speech, to aid their pain descriptions, as the need arises.

We can conclude from this study that children aged five to ten years have remarkably little access to their past painful experiences with which to aid their current verbal, or non-verbal, pain descriptions. The causes of many of their pains remain unknown; especially for those 'hidden' pains with no observable, physical, manifestation. Children had greater recall of pain intensity than quality, and across age-groups, described many of their pains in emotional, rather than sensory terms. The spontaneous production of pain descriptors in this study revealed that the children had fewer of these available than they showed in the recognition format of Experiment One, although the older children, aged nine and ten years, showed good use of figurative ability.

The sixth experiment conducted addressed the issue of whether children were merely limited in their pain communications by lack of verbal ability. It sought to determine by what age children can use non-verbal rating scales to estimate pain intensity, in a reliable way. Three non-verbal rating scales were investigated in this study; two visual analogue scales and a graphic rating scale. Sternbach (1978), commenting on test-retest reliability in this area has suggested that coefficients of 0.6 are acceptable, 0.8 are good and 0.9 are excellent.

Results show a developmental trend towards increased reliability, with increasing age, when children, aged between five and ten years of age, made successive ratings of the pain intensity, of the same pain situation, on the same non-verbal rating scale. However, although the value of the observed relationships for the five and six year olds were small, they reached the 'acceptable' criterion for two of the three scales. The seven year olds responses varied between 'acceptable' and 'good', and the eight, nine and ten year olds reached the 'good' to 'excellent' criteria.

When the children's responses on the three rating scales were compared with their pain intensity estimates using a different procedure, it was found that the coefficients for the six year olds failed to meet even the 'acceptable' criterion. The slight improvement on this by the five year olds, it was suspected, may be a function of their response strategies and will be discussed in the following paragraph. The seven to ten year olds all satisfy the 'acceptable' criteria, but no age-group progressed into the 'good' area.

The errors which the children made between successive presentations of the three scales were analysed. This analysis indicated that the size of the errors decreased with increasing age. It was also found that the response strategies which the five and six year olds adopted may have led to an under-estimate of their errors made on this procedure; if these children retained a narrow range, stereotyped response pattern they made smaller errors, when they attempted to make wider discriminations their errors increased. For the seven years and older, their smaller absolute errors occurred independently of whichever strategy they used.

The conclusion to be drawn from this study is that the reliability of non-verbal rating scales remains unproven for children under seven years of age. Between seven and ten years, reliability increases with increasing age. A further important point to emerge is that this study also suggests that the younger child's lack of ability to describe, and discriminate between, painful situations may not be merely a function of their restricted vocabulary.

Experiment Seven investigated changes in the behaviour of children in pain. Children undergoing a routine, painful, medical procedure were given an analgesic or placebo in a single blind, crossover design study. When facial expressions and vocalisations which raters saw as indicating pain were rated concurrently, the number of pain faces was nearly halved, and their rated intensity reduced. Painful vocalisations were also less common. However, when facial expression and vocalisations were rated independently, no difference was found on either behaviour between the analgesic and placebo conditions. In this study, it remains unclear as to whether the children are able to rate their own pain intensity.

The conclusion suggested, is that concurrent rating of the frequency and intensity of behaviour thought to represent pain can be useful. The study does not support the usefulness of the rating of these behaviours independently.

4. Brief restatement of theories of semantic acquisition and findings on figurative development

The following two sections give a brief description of the theories of semantic acquisition, and figurative development, which were outlined in the introductory chapter, before we go on to integrate the above findings with pain language issues.

4.1 Semantic acquisition

Each of the competing theories put forward to explain semantic acquisition in the child has elements which are unique to it: the Semantic Feature Hypothesis (Clark 1973), the Functional-Core Hypothesis (Nelson 1974), the Prototype Hypothesis (Bowerman 1978) and the Contrastive Hypothesis (Barrett 1978, 1982; Clark 1983, 1987). None of these, however, has been accepted as a complete and full account of semantic acquisition in the child. However, we are less interested in proving, or disproving, a particular theory, than in using the points raised by the theories to understand certain elements of the child's semantic acquisition process; in this case the ability to communicate pain.

It appears to be accepted in the above theories that words are composed of perceptual features and/or functions. Words also range from those which have meanings which are very similar to one another, through to those which are very dissimilar to one another. Whether these are the sole basis for word meaning is in considerable doubt.

Words also appear to be organised in some way. This organisation appears to be in the form of semantic categories or semantic fields. For each category of words, or words closely related in the semantic category or field, there are 'best examples', or prototypes, of that particular semantic domain.

4.2 Figurative development

Studies of the child's figurative ability show a wide variation in the age at which they are prepared to attribute figurative competence to the child.

Children of two to three years of age can be shown to produce spontaneous figurative utterances (Billow 1981), and three and four year olds can generate suitable figurative endings to incomplete stories Gardner et al (1975). Vosniadou et al (1983) have concluded that children know literal vs figurative distinction by age four years. Children of six years of age are better able to enact metaphors than to explain them. (Vosniadou et al 1980). Winner et al (1976), conclude that by age ten children are able to demonstrate a basic understanding of metaphor, although they cannot explain it fully. Reynolds (1980) and Vosniadou et al (1986) found that children seem to find simile easier to deal with than metaphor. Similarly, Windmeuller et al (1986) found that children were better able to explain allegories than similes.

Therefore, we see that this apparent difference in ages at which figurative competence appears seems to depend, to some extent, upon whether one is concerned with the child's spontaneous production of figures, the eliciting of figures from the child, or the child's explanation of their own, or someone elses, figures.

5. Integration of study findings and theoretical issues

Research to date which has investigated the communication of pain in children has been largely atheoretical. Studies which have been carried out, the best of which were reviewed in the introductory chapter, have concentrated on gathering evidence of children's performance in this area. Little attempt has been made to locate these empirical findings in a theoretical background. With the exception of Gaffney and Dunne (1986 and 1987), who operate within a Piagetian framework and Gaffney (1988) who has investigated the development of analogy in children's pain descriptions, there have been no attempts to construct a theory and then test, empirically, the predictions made of that theory.

It has become clear that throughout this thesis, and in the work of other researchers which has been reviewed, two complimentary, but perhaps quite different, themes have been investigated in seeking to understand children's pain describing abilities.

The first of these is the study of the child's descriptions of their own pain experiences. That is children have been asked to describe their current painful experiences, or recall and describe things they have experienced in the past.

The second approach is the child's ability to demonstrate their knowledge of pain concepts as evidenced in their language; this latter approach seems aimed more at tapping children's 'cognitive capacity'. For example, children can be asked to describe the pain that other people may be experiencing, they can be asked to perform laboratory, almost psychophysical, tasks with pain language, they can be asked to describe, or define, 'pain in general'.

Although both approaches have been adopted, it is clear that they can potentially yield quite different kinds of data. The following sections consider why this should be so, and the implications of this for our understanding of children's pain describing ability.

5.1 What is language for?

Language does not exist merely for psychologists to study it. It is a complex skill which has evolved for a quite specific purpose; communication. Like all things which have evolved, it survives because it provides benefit to the organism; adults and children.

When we think of communication by language there is a tendency to think of adults as being good at it and children as, by succesive approximations, somehow arriving at adult competence. However, in this process it is clear that children, of all ages, are not merely passive recipients of other peoples verbalisations. It appears that they play an active role in the acquisition of meaning by building plausible interpretations of words and utterances from what they know, and from cues in the immediate context (Clark and Clark 1976). In other words, they generate hypotheses about what words mean and how they can be used.

A very familiar example would be that children come to use the rule, or hypothesis, that the suffix 's' denotes more than one; shoe-shoes. But of course children would also make mistakes in over-extending this rule if they always adhere to it; for example sheep-sheeps. It would appear that the feedback which they receive from others, when they express this rule verbally, leads to a refinement in its use.

It is, therefore, wise to state clearly, and to keep firmly in mind, two basic assumptions about the function and content of language. These are that;

a) language is for communication.
b) language makes sense in context.

This first assumption probably grows out of children's reliance on adults gestures which accompany their verbalisations, and the second from the assumption that there is a relationship between what a speaker says in a particular situation and the situation itself.

Therefore, if adults adhere to the level of usual utility (Brown 1958) and describe their own, or a child's, experience as 'pain', 'hurt' or 'sore', the child will interpret the accompanying gestures, facial expressions and vocalisations as being a 'communication', and the verbalisations of the adult as describing the 'current experience'.

As we have noted, children appear to form hypotheses about word meanings. As we have seen (section * this chapter), theories of semantic acquisition have been put forward which argue that in doing this they are drawing on their perceptual or conceptual knowledge about the objects, events, properties and relations which are most familiar to them.

Children then go on to treat their particular 'meaning' of a word as a rule for how to use it. As they find out how other people within their language environment use the word, and how well they are understood when using it, they acquire adult meaning for that word.

This argument may be sufficient to account for the acquisition and use of the Primary, and to some extent the Tertiary, pain descriptors (Fabrega and Tyma 1976), but not the Secondary pain descriptors. These latter descriptors are used figuratively. Their use as pain descriptors deliberately violates the rules under which they were acquired. Their initial use as pain descriptors may be entirely novel (for example, 'like a bus on a mouse') although their continued use may be dependent upon feedback from others.

5.2 Conceptual and semantic knowledge

A further problem in investigating pain communications is that children, like adults, may make a conceptual distinction without having a word for it. As pain is a private event, it is entirely possible, if not probable, that children may make conceptual, or perceptual, distinctions between different qualities and quantities of pain without our being able to share that experience, simply because the children may not have words to describe the experiences.

A very important point to keep in mind is that a concept only takes on linguistic significance once it has been linked to some aspect of language. Therefore, I, and others working in this field, am working at the level of investigating the child's ability to communicate their pain verbally, rather than a direct investigation of the child's pain concepts.

An implication of this may be that we will tend to under-estimate the extent, or sophistication, of the child's concept, as we may expect the acquisition of a verbal descriptor would only follow the development of a concept.

Another important consideration is that children may use words when they have acquired only a partial, by adult standards, meaning for them. In this sense we may actually over-estimate children's ability to communicate, verbally, their pain.

5.3 Complexity and experience

As we see, understanding the acquisition of the simplest Primary pain descriptors is complex. Words with even more complex meanings, such as Secondary and Tertiary descriptors must include these simpler meanings plus other components. In the present context we may have, for example, the following progression;

Pain Context	Hurt) Sore)	pain (initially synonyms)
Non-pain Context	Throbbing) Thumping)	temporal pattern
Non-pain Context	Throbbing) Thumping)	temporal pattern + intensity
Pain Context	Throbbing) Thumping)	pain + temporal pattern + intensity

This describes a small part of the development of the pain vocabulary. The child acquires, in a pain context, the descriptors hurt, sore, pain, as their unique pain vocabulary. In a different, non-pain, context, the child acquires meaning for the words throbbing and thumping, and comes to see them, over time, as representing similar qualities but different intensities of experience, perhaps in terms of the similar features and functions which they possess. These words are then incorporated in the pain vocabulary, when required, to fill out the pain descriptions of the person.

But, differences between acquisition of these other words may not only be complexity, but experience and exposure to certain words. A word can be used even though we do not know its meaning. For example, a child may hear those around it using the pain description 'a splitting headache'. The child comes to associate the words with pain in the head, and use it to describe that experience, without knowing the 'non-pain context' meaning of the words.

Therefore, we are faced with two methods of acquisition of a pain language. In the first, the child constructs meaning for a word and uses it to describe an experience. In the second, the child hears a word in a given context and uses it without necessarily appreciating its meaning.

Although children may use words in a novel way, it is not suggested that they construct novel words. These words, and their associated meanings, have certainly been 'acquired' by the child from interactions with other people who make up the child's language environment.

It would follow then that we can query whether the child's, and adults, ability to describe pain is dependent upon their past (pain) experiences?

When a child has a pain experience, there is the assumption that certain words can be used to describe this experience. These combinations of words can be simply repetitions of descriptions they have heard because of their experience within a language environment. But, children also generate their own novel descriptions. Certainly these words have been acquired, but for a different purpose, in the ways discussed above. Their status as pain descriptors follows after their initial acquisition. However, as we see, the investigation of children's pain descriptions are fraught with complexity.

An apparently simply task is to determine whether certain words are regarded by the child as being pain descriptors. We can listen to the child's spontaneous speech and pick out those words which appear to describe their pain experience. This can establish the status of a word as a 'pain descriptor', but we are not able to infer any further 'meaning'; the description may be a simple repetition of previously heard utterances as in 'splitting headache' discussed above.

If we attempt to explore in a more structured way the meaning of the words, we can be faced with a paradox. One may ask of a child; "Is this word a pain descriptor?" or, "Can this word be used to describe a pain?" We may then go on to ask the child to describe pain. We find that we are faced with the following possible outcomes. The child may respond initially, yes or no.

a) then uses the word to describe a pain.

YES -

b) then doesn't use the word to describe a pain.

a) then uses the word to describe a pain.

NO -

b) then doesn't use the word to describe a pain.

What could we safely conclude from these alternative responses? In terms of understanding the child's pain concept we have learned nothing at all. In terms of the child's verbal ability to describe their pain experience we may have learned only a modest amount. We can consider each possible alternative.

Child responds, 'Yes', then uses the word to describe a pain: Child recognises, and subsequently uses, the pain descriptor. However, even in this situation we can not conclude, for certain, that child understands the correct meaning of the word.

Child responds, 'Yes', then doesn't use the word to describe a pain; May be that child was mistaken in identifying the word as a pain descriptor. Alternatively, did correctly identify descriptor, but this did not then represent the child's described pain experience.

Child responds, 'No', then uses the word to describe a pain; Made a mistake and incorrectly rejected the word as a pain descriptor. Alternatively, given the context of a pain experience, the child now recognises the word as being appropriate to describe the pain experienced.

Child responds, 'No', then doesn't use the word to describe a pain; Does not know word as pain descriptor with and without context of current experience. But, given an alternative experience, the word may then be appropriate to describe that pain experience.

Given these problems, is it possible to study meaning in children's pain descriptions?

5.4 How then do we study meaning in children's pain language?

In contrast with the acquisition of meaning in words to describe concrete objects, or observable events, the major obstacle to understanding meaning in the child's language of pain is that pain is a private event, an abstract concept. Therefore, by its very nature we can not observe it, or measure it, with any true objectivity.

As a useful way of clarifying the problem, it is useful to consider the ways in which we can study meaning in language in general, as well as the study of meaning in children's pain descriptions in particular. There are two alternative research strategies;

a) Carefully study what children actually say.
b) Conduct careful tests of children's comprehension, which have no non-linguistic cues.

However, even within this simple division we have to be aware that there are subtle, but important, sub-divisions. When we ask children to show their paces in using language to describe pain there are at least five different types of task which one can ask children to perform.

1	2	3	4	5
describe your own current pain	recall and describe past pain experiences	recognise and categorise pain words	describe anothers pain experience	discuss the general pain experience

One might argue that as we move from example one through to example five, we are also moving from the concrete through to the more abstract. However, all are potentially inter-related. Tasks two, three and four were used in collecting the data presented in this thesis.

The first example is investigated in the clinical situation. The child is interviewed and asked to describe his/her current pain experience. These are the clinical studies reviewed in the Introduction to this thesis. This is, arguably, the most meaningful question to ask of a child. It has the highest face validity. It contains the essential elements of real language use; it asks for communication of a current state, located in a real context.

The second requires that we interview the child and ask them to recall, and describe, their own past painful experiences. This is the format used in the non-clinical verbal studies included in the Introductory chapter, and Experiment Five. This can be conducted in the clinical, or non-clinical, situation. This task imposes extra demands upon the child. They have to recall experiences, and then communicate how they felt in this reconstructed context.

The third is undertaken within a laboratory type paradigm; the child is involved in a structured experimental situation (Experiments One, Two and Three). The aim is to reduce tasks to the minimum complexity. Typical questions asked may be, "Is . . . a pain descriptor?", or, "Which is most painful, a . . . pain, or a . . . pain?". Whilst the strength of this approach can be that it reduces demands upon the child, it does so at the expense of removing context from these verbalisations.

The fourth example involves supplying the child with a scenario in which a child is experiencing pain. Using a structured format, such as a pain questionnaire, the child has to decide which words on the questionnaire describe the child's experience This method was used, non-verbally, by Lollar and Smits ( ) and verbally, in Experiment Four. It was also used in the non-verbal Experiment Six. The strength of this approach is that it provides a range of contexts in which children can show their pain describing, or communication, abilities. However, it does ask that the child imagine themselves into a range of different situations.

The fifth example is an interview format where the child is asked to generate answers to questions such as 'Pain is . .?'. This format was adopted by Gaffney and Dunne (1986, 1987) and Gaffney (1988). It may be argued that with the complete removal of context, we can tap the child's underlying pain concepts. However, it is doubtful whether this could ever be the case. As argued above, concepts only take on linguistic significance once they have been linked to some aspect of language. As it is language which we are investigating, we are still working at the level of investigating the child's ability to communicate, rather than a direct investigation of the child's pain concepts. There would appear to be a link between this method and method two, although the nature of the link is unclear.

Therefore, we are faced with a range of research methods, three of which have been used in collecting data presented here. What have they enabled us to conclude about the child's language of pain?

5.5 Primary, Secondary and Tertiary pain descriptors

A prediction made earlier, was that because in pain description we have no external referent, acquisition of a language in which to describe pain will lag behind more concrete language development. Although not tested directly in the studies carried out, because we did not look at semantic development of concrete objects, we can still make comment on this in the following paragraphs.

A useful heuristic distinction was proposed by Fabrega and Tyma (1976) between Primary, those words which are acquired to describe only pain, 'pain', 'ache', 'sore' and 'hurt'; Secondary, those words which are used in a figurative way to describe an individual's pain, these are words which were initially acquired for a different purpose, but which become part of the pain vocabulary alongside, or in place of, the Primary pain words, as and when the need arises; and Tertiary pain descriptors, terms of qualification, which are not acquired uniquely to describe pain but are brought into use as and when required

This led to the hypothesis that children should acquire Primary pain descriptors first, followed by Tertiary pain description and finally by Secondary pain description. This was based upon two lines of argument. First of all, in line with Brown's (1958) argument about level of usual utility, one would expect parents, and others, to describe pain for the child initially in very general terms, i.e. Primary pain description, such as 'pain' and 'sore'. Once established, we might then expect adults to use terms which describe in some way qualifications to these pain terms, Tertiary pain description. For example, 'an awful pain', 'a little ache', 'a big pain', 'a horrible pain', 'very sore', 'not very painful'. Finally the adults, and older children, will use the more complex, figurative language, to describe pain.

This leads to the second line of argument in that these figurative descriptions require different capacities of the child, as well as the adult. Secondary pain terms require very different skills and knowledge, on the part of the child, both in terms of language comprehension and production. Clearly, these terms are used figuratively; one may describe a pain as feeling 'cutting' without actually meaning that one has been cut. If these communications are to have adult-like meaning for the child, the child has to understand that these words have been used in a non-literal sense. Similarly, if the child produces these secondary pain descriptors, they are creating figures, even if they cannot fully explain the rationale behind the figure. The figurative use of language, by definition, must lag behind the literal use of language. The question remains as to how great this lag is.

The hypothesis that the progression would be Primary, Tertiary and then Secondary pain description, receives some support from the studies carried out. In the following three sections, we will consider, in turn, Primary, Tertiary and Secondary pain descriptors.

5.5.1 Primary pain terms

For those words which are acquired exclusively to describe pain, Primary pain terms, we have to, apparently, account for the acquisition of four words; 'ache', 'pain', 'sore' and 'hurt'.

The speculation made earlier that these Primary pain descriptors will be the first acquired by children does receive some support.

It was shown that, for children from five to ten years of age, 'sore', 'hurt' and 'ache' were the most often recognised pain descriptors (Experiment One). This occurs even though children below the age of seven cannot reliably discriminate between pain and non-pain words in a recognition task.

However, it is important to emphasise that for children below nine years of age these words appear not to be marked for quality (Experiment Two), and below age seven, they are not marked for intensity (Experiment Three). From age nine onwards we see that these words do appear to become marked for quality and intensity (Experiments Two and Three), and form a category of pain quality which Melzack and Torgerson (1971) labelled 'Dullness'.

This goes some way to suggesting their mode of acquisition; initially these words are acquired from the language environment from those people whom the child hears speaking. These words are uttered in the context of a state within the child which becomes labelled as 'pain', 'ache', 'sore' or 'hurt'. Initially, these words form prototypes of the child's developing pain describing ability and are used to create a new 'pain' semantic field. These words are, at least initially, viewed as synonyms. These are the generic words, or words of the type which Brown (1958) has described as having the maximum level of utility. They can be used to describe any painful experience.

Subsequently, these words develop a two fold function. When first acquired, as we have noted, although they are differentiated from the rest of the lexicon and assigned to a new semantic field, there appear to be no features, or functions, which make them similar to, or contrasts them with, each other. At later ages they appear to be still used in this way and retain their status as the 'unique pain vocabulary', but they can also be used to describe a specific quality of pain; 'dullness', and represent different intensities of pain within that quality (Experiment Two and Three; Melzack and Torgerson 1971).

But, it is clear that from at least age five onwards, children do not only recognise, and are not only using, Primary pain descriptors. However, in terms of pain description, these Secondary and Tertiary descriptors do not produce problems of acquisition. These words are not acquired as pain descriptors. They are acquired as part of the general vocabulary, and the problem becomes one of understanding when, and how, children use these other words to describe their painful experience.

5.5.2 Tertiary pain descriptors

These words do not form part of the pain vocabulary per se, but are borrowed from the remaining lexicon as required. An important distinction separates these words from Secondary pain descriptors; they are borrowed for use in a literal, rather than figurative, sense.

For example, when a child describes a pain as 'awful', or 'horrible', the words retain their 'general vocabulary' meaning. That is, they convey negative feelings about the situation. This remains true whether the child, or adult, is describing 'awful homework', or a 'horrible pain'.

In a similar way, when the Primary pain terms are qualified in terms of intensity, such as 'very' and 'not very', they follow the convention that 'very' means more, and the 'not' negates that. Therefore, 'very painful' is worse than 'painful', which in turn is worse than 'not very painful'.

Experiments One and Five clearly show that children know, at an early age, Tertiary pain descriptors. When generating pain descriptors, as many five year olds produced 'horrible' as produced 'hurts', the two most popular descriptors. Indeed, for all age-groups, a significant number of words which are borrowed from the general vocabulary have been utilised either to describe recalled pain, or were generated as pain descriptors.

Therefore, although it is argued that Primary descriptors are acquired as the initial pain vocabulary, the use of other words which have been acquired in different contexts are very early brought into use to supplement these Primary descriptors. This is most apparent in the use of words to describe the emotional dimensions of pain and also the children's descriptions of pain intensity.

5.5.3 Secondary pain description

These Secondary pain descriptors are quite different to the other pain words we have considered. These are words borrowed from the general vocabulary, but which are then utilised in pain description in a figurative, rather than literal, sense. The problem we face is in understanding when, and how, and indeed why, children acquire the ability to describe pain figuratively.

What we might expect is that children will take the features, functions, prototypes and contrasts, as highlighted by the theories of semantic acquisition, into account when they come to use language figuratively.

Some of the words which the children recognised in Experiment One, and then went on to categorise in Experiment Two were figurative pain descriptors; 'nipping', 'pinching' and 'biting'. The children aged seven years and older grouped these three words into a category, above chance levels, and nine year olds, and older, did this at adult levels. Therefore, we see that, in this instance, the qualitative categorising of figurative pain descriptors can precede the categorising of the Primary pain descriptors.

In Experiment Five, both in their recall of pain words, and in their descriptions of recalled pain, we see little evidence of figurative ability in children below the age of seven years. It is only by nine years of age that at least half of the children produce at least one example of figurative pain description. These findings are broadly in agreement with the findings of Gaffney (1988). The figurative descriptions are never metaphorical; the majority of the figurative descriptions are similes.

This goes some way to answering the question of by what age do children have, and use figurative ability. Before considering how they achieve this, we have to consider why they need to be able to do this.

Clearly, when we are talking about our pains, we don't have concrete words to use to describe them, as pain is an entirely private experience. Therefore, we have to use figures of speech to allow us to externalise this internal state. The usefulness of figurative ability seems to be that it allows us to describe certain private experiences in terms of other sensations or situations. Normally this involves explaining something fairly abstract in terms of something more concrete.

Several skills are required to allow us to use figurative language. First of all we need to have experience of the world. We need to build up a knowledge base of such things as concrete objects. We have to appreciate the existence of possible different internal states too, in ourselves, and others. We have to appreciate that language can be used figuratively. That is, the child must know that it is perfectly acceptable to describe a current sensation, for example, in terms of a non-present physical state.

We also have to appreciate that when someone describes their sensations or emotions in other than concrete terms, that implicit in this is that we have to violate our normal assumptions that the meaning implied is a concrete meaning. We have to infer a different meaning, a figurative, non-literal meaning. Research has shown (Billow 1981) that the ability to produce spontaneous metaphor appears to be a very early developing ability, which is evident by three or four years of age.

Comprehending the figurative descriptions generated by other people is a much more complex task, children of 8 to 9 years have been shown to do this. However for children to display the complex meta-cognitive ability of fully describing how figures of speech work, and to comprehend, fully, the metaphoric speech of others, is a late-developing skill. Children are over ten before they can do this.

How can we account for the apparently late developing use of figurative pain description (Experiment 5). As we may expect, based on the literature on general figurative ability in children, that even the youngest children studied in these experiments should be able to produce spontaneous figures of speech, we will have to look elsewhere to explain the low number of figures produced.

The simplest explanation may be that the level of usual utility (Brown 1958) applies as much to the children's speech to adults, as adults speech to children. That is, children use general descriptions such as 'hurt' and 'sore', possibly accompanied by 'very', 'not very', 'horrible' or 'awful'. This is all that is necessary, under most circumstances; it has communicated the existence of a pain, and conveyed something about its emotional impact and its intensity.

Another factor to take into account is that children require experience of the world to allow them to utilise figurative ability. We have certainly seen in Experiment Five that young children do not have ready access to their own past painful experiences with which to aid their current pain descriptions. Figurative ability appears to increase with the number of painful experiences recalled.

When children have used figures of speech to describe their pain in Experiment Five, there appears to be a change in the complexity of the figures produced at different ages. The few examples of figurative use in the five year olds are of a primitive type, that is 'like a pin', a direct perceptual figure. This contrasts with the older children's descriptions, which go beyond direct perception.

We have seen that the child's pure pain vocabulary remains small, consisting of the Primary pain descriptors. Once these descriptors are acquired children can elaborate on them by the use of words taken from the remaining lexicon. These take two forms which vary in complexity. Tertiary descriptors are borrowed first and are used in a literal sense, and their use appears at about the same time as children begin to use the Primary descriptors. The second form is Secondary pain descriptors. These words are borrowed from the main lexicon and are used in a figurative sense to describe pain.

We have seen that children are able to produce spontaneous figures to describe their pain. These figures, however, are novel descriptions, the action of a creative language user rather than the repetition of some previously heard description.

We now have some confidence that children of seven years, and older, do have access to a vocabulary with which they could, to some extent, describe their pain. It may be the case that these children could use their verbal abilities to complete pain questionnaires to communicate their pain. The use of questionnaires will be considered in the following section.

6. Pain questionnaires

The use of pain questionnaires by children is quite different from their providing spontaneous pain descriptions. Questionnaires require the child to be able to use a language provided by others, rather than using their own spontaneous productions. To a large extent, the language provided is in the form of figurative descriptions. In line with previous studies of children's figurative ability, we might expect that the ability to use pain questionnaires should develop later than the child's ability to produce spontaneous figurative pain descriptions.

We have also seen that these spontaneous pain figures appear later than the literature on figurative productions might suggest. In line with this, we could expect that children's ability to use pain questionnaires may also develop later than the figurative literature would indicate; perhaps not until the age of nine or ten years.

The marked difference between the number of pain words recognised (Experiment One) and pain words generated as pain descriptors (Experiment Five) argued in favour of providing a pain questionnaire format to aid children of seven years and older in their pain descriptions. This is because although children of seven and over clearly had words available to describe their pain, they appeared not to have spontaneous access to them.

This belief that a questionnaire format could be used with children over seven is further reinforced by the findings, in Experiment Two, that not only are these Primary pain descriptors marked for quality in children by nine years of age, but that other, figurative, categories of pain descriptors appear to be marked for quality in children by the age of seven years. Experiment Three has also shown that pain words are marked by intensity in children aged seven years and older.

The results of Experiment Four show that children of seven and eight years of age show only rudimentary discrimination between pain situations in terms of the different qualities of pain selected from a pain questionnaire. The older children, aged nine and ten do show improved discrimination, with the adult comparison group, as might be expected, showing best discrimination ability of all.

The ability to make qualitative pain discriminations appears to be related to age and cognitive abilities in that older children are achieving their greater qualitative discriminations by incorporating words into their descriptions that they had not recognised earlier as pain descriptors (Experiment 4). This suggests that the 'context' provided by the pain situations allows these older children to appreciate that it is appropriate to use the figurative descriptions implied in their use of these pain descriptors.

The conclusion, based upon the data we have available, is that although children aged five to eight years have shown evidence of being able to use Primary, Tertiary and to a small degree Secondary pain descriptions, they have shown only a limited ability to use these abilities to complete pain questionnaires to discriminate between several painful situations. Children aged nine and ten years appear able to use these questionnaires with some effect.

7. Pain intensity

In contrast with the finding, in Experiment Four, of poor verbal discrimination between pain situations in terms of the quality of the pain anticipated, all age-groups studied, from age seven onwards, showed the verbal ability to communicate the difference in intensities of pain arising from these different painful situations. This early ability to appreciate and describe the intensity dimension of pain is in line with the findings of good spontaneous ability to describe this dimension in Experiment Five.

It is also interesting to note that Experiment Four shows that anticipated pain intensity levels are not related to age, intelligence, general vocabulary ability, or the number of pain descriptors children recognised. This contrasts with the children's qualitative pain questionnaire discriminations in that study, which were shown to be related to age and the number of pain descriptors the children had recognised previously. This is a point which requires some explanation.

Anticipated pain intensity levels were shown to be related to several personality dimensions rather than to age, or the more cognitive abilities described above.

The question then arises that if some of the children of five years and older have shown spontaneous ability to describe pain intensity and children of seven years and older have been shown able to use verbal pain questionnaires to describe the intensity of pain, can we investigate further whether the poorer performance of the younger children is merely caused by their limited verbal ability.

8. Non-verbal pain communication

If children were limited in their pain communications by their poorer verbal ability, then a non-verbal pain estimation, such as a visual analogue scale should prove easier for the younger children. However, it is argued that this may be an oversimplification of the problem.

Children require several skills to undertake non-verbal pain intensity estimation on scales of this type. They have to see the experience as painful. They have to recall past experiences to construct a dimension of 'painfulness'; from 'no pain', to 'worst pain that they can imagine'. After all it only makes sense to talk of pain intensity relative to other pain intensities. The child then has to locate this present pain intensity on this internally constructed pain dimension and transfer this to the externally represented spatial dimension.

It becomes clear that this is a variant of figurative ability. In the same way that verbal figurative ability requires the child to appreciate that the metaphoric descriptions are not 'real', but that normal language restrictions are being violated in order to emphasise a point, or to describe an unseen state, the child using the visual analogue scale has to appreciate that the pain estimation made is not 'real' but does reflect some aspect of their unseen experience.

One can argue, however, that the relationship between the use of numbers and other amounts, for example temperature, is closer than the relationship between figuratively used adjectives and their referents. Therefore, although non-verbal pain estimation requires figurative ability, it is an easier form of a figurative task than verbal pain description.

Experiment Six showed that children of seven years and older were able to use visual analogue scales to provide, in a reliable way, pain intensity estimates. Children of five and six years were shown to adopt strategies which minimised their errors, but which showed a reduced pain intensity discrimination ability, or at least a reduced ability to communicate this ability using visual analogue scales.

The explanation for this lies in the other studies carried out. Experiment Five showed that children of five and six years have little recall of their past painful experiences; a prerequisite for the construction of a pain dimension. They can recall on average one past painful experience. Several of these children could not recall any. We have also argued, in some depth, that children of five and six have very limited figurative ability in this area.

It is concluded that this indicates that five and six year old children's lack of pain describing ability is not merely a function of their limited verbal skills. It is a function of their limited memory for pain and their limited figurative ability, coupled with their limited verbal skills.

9. Clinical implications of study findings

We are now in a position to consider the clinical implications of the results of the studies carried out. On the basis of these studies, it appears reasonable to make the general statement that reliable pain communication, in children below the age of seven years, remains unproven. It is also important to point out that no attempt was made at assessing the validity of these communications.

It may be useful to consider the finding that none of the children who took part in the experiments reported here either refused to do the tasks asked of them, or said that they failed to understand what was required of them in order for them to do the tasks. We may query whether the children below the age of seven did have the ability to do the task, or to understand what they had to do. It is worth include the precautionary warning; children tend to do tasks we ask of them, even if they can not do, or do not understand, what they have to do.

Specific implications and recommendations, based on these studies, will be considered under the headings of verbal, non-verbal and behaviour.

9.1 Verbal

As we have seen, children and, of course, adults need to have available considerable abilities before they can undertake verbal pain communication.

Children below the age of seven have access to a very limited pain vocabulary. Below the age of seven, children tend not to be able to discriminate between pain and non-pain words. However, for older children, and adults, pain descriptors have been shown to represent specific qualities and intensities of the pain experience.

It has been shown that when describing pain, children place a strong emphasis on their emotional reactions to the pain. They do not merely restrict themselves to concern with the sensory dimension. They are as concerned with what it felt like to experience the pain, as they are with what the pain felt like.

The ability, or the desire, to communicate the intensity of a painful experience appears to be earlier developing than qualitative communication. However, many of these descriptions are highly idiosyncratic. Children can generate a huge variety of pain intensity descriptions, although it may be worth attempting to construct an intensity dimension consisting of the most common words that the children normally use.

Two formats can be used for eliciting children's verbal pain descriptions; generate and supplied. A generate format refers to children's spontaneous descriptions of their painful experience. A supplied format presents a list of potential descriptors to children and asks them to select those which correspond to the pain that they are experiencing. It may prove useful to consider the respective merits of each of these approaches.

Generate format: Data produced in this way are very difficult to analyse. The strength of this approach may lie in allowing, or encouraging, the individual to talk about their experience, rather than in producing statistically useful data for which the supplied format is much better.

In the studies carried out, many children were able to describe their past painful experiences, although, these spontaneous pain descriptions tend to be highly idiosyncratic. The younger children studied, age five to seven years, were very limited in the number of painful experiences that they could recall experiencing. They were also limited in their pain descriptions, mainly restricting themselves to general descriptions such as 'hurt' and 'sore', or 'awful' and 'horrible'.

It appears that older children have greater recall of their past painful experiences. They also describe these experiences in a different way to the younger children. Children of nine and ten years of age are beginning to use figures of speech to describe their pain. This use of figurative ability allows the children to communicate a much greater range of qualitative differences between the pains that they experience.

Supplied format: In essence, this refers to pain questionnaires. Children are supplied with a range of pain descriptors and choose those which represent the quality and intensity of pain that they are experiencing. An alternative administration could be in the form of a structured interview. This format is superior to the generate format in terms of producing analysable data.

However, we must be aware that younger children have very limited figurative ability and will, therefore, be able to make only limited use of questionnaires which assume, or rely upon, an individual possessing this ability.

In the studies undertaken, little discrimination was shown by children, aged seven and eight years, between different types of pain, in terms of the quality of the pain described. However, by nine and ten years of age children showed good discrimination between different painful conditions. The children of all ages studied, aged five to ten years, showed greater discrimination in terms of pain intensity, than pain quality.

Information from the supplied and generate formats do suggest the possible usefulness of pain questionnaires for use by children seven years of age, and older.

9.2 Non-verbal

It may be thought that non-verbal pain communication is easier for younger children than verbal. However, this appears not to be the case. Non-verbal communication has a similar degree of cognitive complexity as verbal.

Younger children have little access to their past experiences upon which to construct a dimension of painfulness. Children aged five and six years of age can only recall, on average, one past painful experience.

It appears that the use of non-verbal rating scales is to be conceived very much seen as a figurative task.

We have seen that although children below seven years of age may be prepared to make these non-verbal assessments, we have queried the reliability of these judgements. For these younger children one may query whether they actually understood the task they were asked to perform.

9.3 Behaviour

In terms of the study of behaviour as a means of communicating pain in children, we have little to offer. There are two observations which could lead to one recommendation. The first is that frequency and intensity ratings of painful expressions and vocalisations, when they were rated concurrently, were shown to be able to discriminate between a drug and a placebo condition. The second is that there were no differences found in intensity or frequency of these behaviours when they were rated independently.

The reasons for the discrepancy between the independent and concurrent ratings are unclear. One possible interpretation is that bits of behaviour are not independent, and we may have to consider children's behaviour as a whole; bits do not necessarily make sense on their own and only constitute a legitimate communication when considered together.

10. Overall conclusions from studies undertaken

In terms of the ability to communicate their pain experiences, the studies presented in this thesis have shown that the period from five to ten years of age sees quite dramatic changes in this ability, with the ages seven to nine years showing the most dramatic improvements. The results of the studies undertaken suggest that verbal pain description by children under the age of seven is limited by several factors.

Prior to this age children were shown to be very poor at discriminating between pain and non-pain words. Before seven years of age pain words were shown not share the same meaning as they did for older children and adults. When asked to generate, spontaneously, pain descriptors, five year olds were shown to produce, on average, only one descriptor. This number increases with increasing age.

When describing their own past painful experiences, children were shown to have limited recall of these experiences; five year olds recalled only one through to ten year olds recalling, on average, six. The younger children had limited verbal skills in describing these experiences, but this improved with age.

A major element in this improved pain describing ability is the ability to use figurative language. Children below the ages of nine or ten were shown to display limited figurative ability in their spontaneous productions, and to display limited ability in using a pain questionnaire which contained figures of speech, to describe a range of painful situations. Nine and ten year old children were shown to be able to generate figurative pain descriptions, and to use a pain questionnaire to describe and discriminate between a range of pain situations.

It was argued that non-verbal pain description was a complex task, differing from verbal description, but not necessarily easier than verbal description. It requires the child to have access to past experience upon which to construct a pain intensity dimension, and to then to communicate this current pain experience, in a figurative way, via a rating scale. Given the limited ability of children below seven years of age in these areas, it is not surprising that we find that errors made by children below seven suggest that they adopt restricted strategies which makes their non-verbal pain communication unreliable.

11. Future research

There are three broad areas, which have not been addressed in this thesis, which are in need of research; pain in the clinical setting, the social nature of pain communication and the problem of pain communication in the pre-school child. The first can be only undertaken with clinical populations, the second and third with clinical or non-clinical populations.

How reliable and valid are these pain measures with clinical pain?

There is a clear need to determine the reliability and validity of the verbal, non-verbal and behaviour measures of pain, as discussed in this thesis, in children undergoing painful medical procedures.

An individual's 'pain' can be thought of as an unobservable theoretical construct. The study envisaged will use two versions of all three measures (verbal, non-verbal and behaviour) administered concurrently to assess this construct; the individual's pain. The measures used are to be based upon the findings of the experiments reported here. The resulting data will be analysed using a variation of multi trait - multi method analysis. In essence this analysis will allow for the separation of measurement error into its constituent parts.

The error generated by these measures is composed of two components. The first is the error caused by the lack of reliability, and the second is the error caused by lack of validity of the measurement instruments. This analysis will allow for the separation out of the error variance due to unreliability of the scales, and/or to their lack of validity.

Where does the child's pain construct, and the ability to communicate pain come from?

This second research question requires that we look at the role of parents and significant others in the aetiology of the child's pain vocabulary, and in their contribution to the way the child constructs an understanding of pain, and its impact.

Throughout this thesis we have had to assume that the child acquires his vocabulary from interactions with others. Although this may be a reasonable assumption, consideration needs to be given to the way individual styles of interaction lead to different styles of pain communication.

As an example, families may have differing pain styles, in that some families may ignore pain or minimise its importance. This may lead to a reduced concern with pain differentiation and may affect the individual's pain communication ability, or style. The opposite may be true of those families who perceive pain as a major cause for concern.

A major factor in verbal pain communication is the individual's figurative ability. The child's familiarity with constructing their own, or understanding other peoples, general figurative descriptions, may be an important factor in understanding the individual's ability to produce figurative pain communications. It would be at present an assumption to say that these are derived from their interactions with significant others.

Pain communication for the pre-school child

The studies undertaken in this Thesis have indicated that school-age children have, or are developing, tools to aid them in communicating their pain. The problem remains of the pre-school child and their pain communications.

With older children, and adults, the focus has been on developing measurement instruments which enable comparison between and within age-groups. With the younger child we may have to abandon this concept and yield to more pragmatic measurement devices which individual children may find useful aids to communication.

To this end, a series of single case studies could be carried out to determine the range of possible communication strategies individuals within this age-group may find helpful. These may include some of the equipment reviewed earlier in the thesis; colours, counters, shapes of different sizes. The careful analysis of the language used by these younger children to describe their experiences would also provide very useful data to enable us to comment on the origins of this extremely complex linguistic task.

APPENDIX 1

CHILD PERSONALITY QUESTIONNAIRE (CPQ) AND EARLY SCHOOL PERSONALITY QUESTIONNAIRE (ESPQ) FACTOR DEFINITIONS

FACTOR A

Reserved, Detached, Critical, cool	vs	**Warmhearted**, Participating, Outgoing, Easygoing

The high scorer is generally characterised as warm and sociable, the low scorer as more cool and aloof. Factor A is positively related to most measures of scholastic achievement.

FACTOR B

Less intelligent, Concrete thinking	vs	**More intelligent**, Abstract thinking, Bright

The child who scores high on Factor B tends to be 'bright' and abstract thinking, while a low scoring child is more concrete thinking. This scale is intended only as a brief estimate of general ability.

FACTOR C

Affected by feelings, Emotionally less stable, Easily upset, Changeable, Low Ego strength	vs	**Emotionally stable**, Faces reality, Calm, Higher Ego strength

High scorers appear relatively calm, stable, and socially mature for their age, and are better prepared to cope effectively with others than are low scorers, who are relatively lacking in frustration tolerance and more subject to loss of emotional control.

FACTOR D

Phlegmatic, Deliberate, Inactive, Stodgy	vs	**Excitable**, Impatient, Demanding, Overactive

Individuals scoring high on D often report that they are restless sleepers and are easily distracted from their work by noise or the inherent difficulty of the task. They often overreact on slight provocation. The low scorer may be described as emotionally placid.

FACTOR E

Obedient, Mild, Conforming, Submissive	vs	Assertive, Aggressive, Stubborn, Dominant

The high-scoring child is relatively active, assertive, and aggressive, while the low scorer is more docile. At the childhood level, aggressive behaviour is a more likely expression of this factor than is dominance.

FACTOR F

Sober, Prudent, Serious Taciturn	vs	Happy-go-lucky, Impulsively lively, Enthusiastic, Heedless

The high scorer is rather enthusiastic and optimistic. The low scorer is serious and restrained. Research on origins shows that F+ persons have generally had an easier, less punishing, more optimism-creating environment than low scorers.

FACTOR G

Expedient, Disregards rules, Undependable, Bypasses obligations, Weaker superego strength	vs	Conscientious, Persevering, Staid, Rule-bound, Stronger superego strength

This scale apparently reflects the extent to which the child has incorporated the values of the adult world.

FACTOR H

Shy, Restrained, Threat-sensitive, Timid	vs	Venturesome, Socially Bold, Uninhibited, Spontaneous

High H individuals are sociable in the sense that they interact freely and boldly with people. The low factor H child is more easily intimidated, and seeks, through withdrawal, to avoid social threat and overstimulation.

FACTOR I

Tough-minded, Realistic, Self-reliant	vs	Tender-minded, Sensitive, Overprotected

The high scoring child is one who tends to show greater dependence, fearful avoidance of physical threat, and more sympathy for the needs of others than the low scorer, who is more self-reliant, robust and practical.

FACTOR J

Zestful, Goes readily with group	vs	Circumspect, Individualistic, Reflective

The high scorer tends to be individualistic, guarded, critical of others, and circumspect, while the low scorer is more freely expressive, active, and uncritical.

FACTOR N

Forthright, Natural, Unpretentious, Sentimental	vs	Shrewd, Calculating, Astute

High scorers seem more 'wise' to the ways of adults and peers and, therefore, better able to advance their own interests than low scorers.

FACTOR O

Self-assured, Placid, Secure, Serene	vs	Apprehensive, Prone to feel guilty, Worrying, Troubled, Insecure

High scorers on this factor often have a sense of inferiority and inadequacy and easily become downhearted and, especially, remorseful and guilty. They do not feel accepted by others and free to participate with them and, thus, often say they are lonely. Low O scorers on the other hand, typically feel entirely adequate and self-confident.

FACTOR Q3
(CPQ only)

Casual, Careless of social rules, Follows own urges, Low integration	vs	Controlled, Socially precise, Compulsive, High self-concept control

With older groups, this factor tends to reveal those who have strong control of their general behaviour, and who are especially socially aware and careful. Low Q3 indicates one who is not bothered by will control nor the regard for social demands. A child with low Q3 score might, for example, be more frequently in trouble with school regulations, but not with delinquent intent, but through carelessness and neglect.

FACTOR Q4

Relaxed, Tranquil, Torpid, Unfrustrated	vs	Tense, Driven, Overwrought, Fretful

The high Q4 child feels frustrated and may give way to displays of temper and irritability. The low, relaxed end of the scale seems to reflect a kind of composure that makes for easy sociability.

A P P E N D I X 2

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

FIVE YEAR OLDS

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Pain in knee	Fell off bike	Horrible	Not very	Horrible
2.	Pain in knee	Falling over	-	Very	-
3.	Pain in belly	-	-	-	-
4.	Tummy pain	-	-	-	-
5.	Pain in leg	Slid off slide	Very bad	-	(Sore
	Pain in knee	Fell down	Sore	-	(
6.	Tummy pain	-	Felt swelled up	Very	-
7.	Headache	-	-	Little bit	-
8.	Chickenpox	-	Bit nasty	Very	(Nasty
	Tummy pain	Eating sweets	Horrible	-	(Horrible
9.	Tummy pain	Fell over	Sick	Bad	(Hurted
	Head pain	Banged by door	Hurted	A lot	(Stinged
					(Sick
10.	Headache	Noise	-	Just a bit	(Ticklish
	Earache	-	-	Just a bit	(Itchy
11.	Chickenpox	-	Like a pin	A lot	(Hurts
	Tummy pain	-	Felt like spots	A lot	(Horrible
					(Like a pin
12.	-	-	-	-	Hurts

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

FIVE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
13.	Pain in elbow	Fell over	Very sore	Very, very	(Hurt
	Pain in knee	Fell over	Hurting a bit	A bit	(Stings
	Scraped leg	Slipped	Hurt very much	Very	(Sore
14.	Tummy pain	-	Nasty	Very	Nasty
15.	Cut eyebrow	Fell off bike	-	Not very	-
16.	Pain in knee	Fell over	Bad pains	Very	(Bad
17.	Pain in knee	Fell over	Sore	-	(Sore
18.	Tummy pain	-	Not very nice	Not that bad	(Horrible
	Throat pain	A stuck pill	Very bad	Very bad	(Bad
19.	Hurt head	Jumped off frame	Like a bruise	Just a little	-
	Twisted ankle	Fell down steps	Little pain	A little bit	-
20.	Tummy pains	Dinner	Like a bug pain	-	-
21.	-	-	-	-	-
22.	Pain in throat	-	Hurting	Little bit	Hurting
23.	Pain in tummy	-	Awful	Very, very	(Awful
	Toothache	-	Dreadful/awful	-	(Dreadful
24.	Tummy pain	-	Lumpy	-	Lumpy
25.	Tummy pain	Food	Awful	-	(Awful
	Head pain	Jelly babies	Awful	Bit better	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

FIVE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
26.	Tummy pain	-	Horrible/stings	A lot	(Horrible (Stings
27.	-	-	-	-	-
28.	Tummy pain	-	Horrible	Very	Horrible
29.	Pain in knee	Fell down	Hurt a bit	Not very	Hurt
30.	Pain in leg	Fell over	Sore	-	Sore

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SIX YEAR OLDS

	PAINS	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Pain in knee	Falling down	-	-	-
2.	-	-	-	-	-
3.	Sore thumb	Jammed in door	Tickly	Very	(Tickly
4.	Headache	-	Sore	Really hurting	(Hurting
	Tummy ache	Eating too much	Hurting	Not that sore	(Sore
5.	Headache	-	Horrible	Not very	(Horrible
	Tummy pain	Growing pains	Horrible	Not very	(
6.	-	-	-	-	-
7.	Headache	-	Nasty-hurting	Not very much	(Nasty
	Pain in foot	-	Quite nasty	Very	(Hurting
8.	Pain in knee	Fell over	-	Very	(Nasty
	Sunburn	Sun	Nasty	Very	(
9.	-	-	-	-	(Sickly
					(Hurts
10.	Headache	Noise	Horrible	A lot	(Horrible
					(Nasty
11.	Headache	-	-	A little bit	(Nasty
					(Horrible
12.	-	-	-	-	-

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SIX YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
13.	Blisters	Sun	Itchy - like something bit me.	Very	(Nasty (
	Head pains	-	Like you bumped your head.	Very nasty	(Very nasty
14.	-	-	-	-	-
15.	-	-	-	-	-
16.	Sore leg	Fell off wall	It hurt	Very	(Bad (Hurt
	Black eye	Bumped into door	Awful	Very	(Awful
17.	-	-	-	-	-
18.	Tummy pain	Diarrhoea	Tight	A lot	(Hurting (Tight
19.	Bumped head	Fell over	Stinged	Not that painful.	(Sore (Stinged
	Pain in knee	Fell over	Hurt	Not much	(Hurt
20.	Tummy pain	-	Nasty	-	(Hurts (Nasty
21.	Tummy pain	Car travel	Sick	-	(Hurting
	Sore throat	Cough	Croaky	-	(Itchy
	Pain in foot	Cramp	Going round the bend.	Like a bone	((
22.	Tummy pains	Too many sweets	Sore	Not very very	Sore

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SIX YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
13.	Blisters	Sun	Itchy - like something bit me.	Very	(Nasty (
	Head pains	-	Like you bumped your head.	Very nasty	(Very nasty
14.	-	-	-	-	-
15.	-	-	-	-	-
16.	Sore leg	Fell off wall	It hurt	Very	(Bad (Hurt
	Black eye	Bumped into door	Awful	Very	(Awful
17.	-	-	-	-	-
18.	Tummy pain	Diarrhoea	Tight	A lot	(Hurting (Tight
19.	Bumped head	Fell over	Stinged	Not that painful.	(Sore (Stinged
	Pain in knee	Fell over	Hurt	Not much	(Hurt
20.	Tummy pain	-	Nasty	-	(Hurts (Nasty
21.	Tummy pain	Car travel	Sick	-	(Hurting
	Sore throat	Cough	Croaky	-	(Itchy
	Pain in foot	Cramp	Going round the bend.	Like a bone	((
22.	Tummy pains	Too many sweets	Sore	Not very very	Sore

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SIX YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
23.	Scraped leg	Fell over	Painful	Very	(Aching (Stinging (Hurting
24.	Tummy ache	Eating too much	-	Very	-
25.	Headaches	Noise	Horrible	-	(Hurted (Ache (Horrible
26.	Chickenpox	-	Horrible	Not very	(Horrible
	Tummy pain	Eating too much	Horrible	Very	(
	Chest pains	Running about	Horrible	Very	(
27.	Skin pain	Eczema	Itchy	A lot	-
	Pain in knee	Fell down	-	A lot	-
28.	Hand pain	Fell off bike	Pinching	Not very.	Pinching
	Head pain	-	Like hair sticking up.	Like dots banging in my head	
29.	Tummy pain	-	Feel sick	-	(Sore
	Pain in ankle	Fell off bike	Very sore	Very sore	(
30.	Tummy pain	Tummy bug	Hurt	Half	Hurt

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SEVEN YEAR OLDS

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Pain	Caught it while playing.	Stings	Not very	(Stings (Hurting (Bloody
2.	Pain in knee	Fell over	Very sore	Very	Sore
3.	Hurt hand	Fell off bike	Horrible	Very	Horrible
4.	-	-	-	-	-
5.	-	-	-	-	-
6.	Earache	-	Hurting off and then on.	-	(Hurting (
	Tummy ache	-	Hurting all the time.	A little bit	((
7.	Tummy pains	-	-	Not very much	(Horrible
	Pain in leg	-	Horrible	Not much	(
8.	Tummy pain	-	Felt I was going to be sick	Not very	(Sick (
9.	Pain in leg	-	-	Very	
10.	Cut knee	Fell off bike	Very sore	Very	Sore
11.	Tummy pain	Riding fast on bike.	Stitch	Very baddish	(Stitch (Baddish
	Tummy pain	Jogging	-	Not so bad	(
12.	Tummy ache	Feeling sick	Sort of tickly	Very, very	(Sick
	Cough pain	Very bad cold	Horrible	Very	(Sore

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SEVEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
13.	Headaches	Nutting things	-	Bit	-
	Tummy ache	Fighting my brother	-	Bit	-
14.	Tummy aches	-	-	Quite	(Sore (Aching
15.	Throat pain	Coughs	Very sore	Very	(Sting
	Headache	Coughing	Like somebody hurting my head.	Very	(Tingle (Funny
	Pain in elbow	Bumped it	A lot of tingles	Bad	(
16.	Tummy pain	Being sick	-	Just a bit	(Stinging
	Pain in knee	Fell over	Sore	Just a bit	(Hurts (Painful
17.	Pain in elbow	Falling over	Sore	-	(Awful (Horrible (Not very well
18.	Headache	Noisy	Hurts	A lot	(Hurts
	Tummy ache	When I fell on tummy	Squeezes	Very	(Stings (
19.	Tummy ache	Eating too many sweets	Pain	A little bit	Sick
20.	Pain in back	-	Feels strike-strike when I move.	Quite	(Stitch (Painful (Very bad
	Tummy bug	-	Squeezing pain.	Quite	(
	Stitches	Bitten by dog	Sore	Very bad	(
	Pain in eyes	Ice in eye	Hurting	Very	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SEVEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
21.	Tummy pains	A bug	Hurts like someone punched you	Not very	(Hurts (Painful
	Headache	Noisy things	-	Quite	(
22.	Tummy pains	Haven't been to toilet.	Squeezing/sharp	Very	(Painful
	Pain in cheek	-	All sharp	A little bit	(Hurts
	Pains in leg	-	Going round in circles.	A lot	(Sharp (Squeezing
	Hand pains	-	Hurts sharp	A little bit	(
	Pain in mouth	Frostbite	Hurted/sharp	A lot	(
23.	Sore hand	-	Hard/hurts	Not much	(Sore
	Sore lips	They dry up	Hurts	Hurts a lot	(Hurts
	Thigh pain	Running	-	Very	(Hard
24.	Stomach pain	Running a lot	-	Not very	(-
	Pain in knee	Fall over	-	-	(-
25.	Tummy ache	-	Aches	Not that bad	(Aches
	Headache	Noise	Stinging/aching	Worse	(Stinging
26.	Tummy pains	Need toilet	Like a pin	Very	(Like a pin
	Tummy pains	Hungry	Like a pin	Very	(
27.	Tummy ache	Eaten something	Hard	Very	(Hard
	Headache	Noise	-	Very	(Aches
	Cramp in leg	Lay in bed and sat on leg	Aches	Little bit	((

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

SEVEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
28.	Tummy pains Blister on foot	Too much to eat Skidding on floor	Stung Stinging a bit	Medium Down the bottom	(Stinging (Hurting (Painful
29.	Tummy bug	-	-	Quite	Stinging
30.	Cut	Fell over	-	Quite	Hurt

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

EIGHT YEAR OLDS

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Pain in chest	-	Achey pain	Not that	(Ache
					(Sharp
2.	Stitch	Jogging	Painful	Not much	(Ache
					(Painful
	Headache	Banged head	Drowsy/dizzy/cold	Not much	
	Pain in tummy	Punch	Can't breathe	Quite	
	Pain in mouth	Toothache	Rotten	Quite a bit	
	Sore foot	Stamped on	Hot	Not much	
	Leg pain	Kick	Hard	Quite	
3.	Scratch	Cat	Hurt	A lot	Hurt
4.	Swollen throat	-	Hurt	Quite	(Hurt
	Leg pain	Bumped leg	Painful/hurt	Not that	(Stings
	Pain in finger	Jammed in door	Stings	Very	
	-	Fell over	Stings		
5.	Cut	Scratch on tree	-	Wasn't that	Sore
6.	-	When I fell over	Sore	Not very	Needles
7.	Stitch	Running	Something jogging in your bones.	A lot	Hurts
	Pain foot	Spelk	Hurt like a needle.	Not quite	
	Pain in head	Split open	Hurt	Quite a lot	
	Broken arm	Jumped off bunks	Felt loose	A lot	
8.	Chest pains	Hotness	A big pain	Very	(Sore
					(Hurts
9.	Tummy pains	-	Like sticking a needle through me.	Very very	(Stabbed
					(Punched
	Pain in arm	Fell on it	Like I've been shot	Not very	(Thumped

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

EIGHT YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
10.	Pain in arm	Hit arm playing tennis.	-	Very	(Needle (Hurts
	Pain in leg	Twisted while running.	A needle going in	Not very	
11.	Headache	-	Fuzzy	Little bit	(Fuzzy (Horrible
12.	Leg pain	Fell over	Hurting	A little bit	Hurting
13.	Stitch	Football	Hurt	Not much	(Hurts
	Tummy ache	In car	Painful	A lot	(Painful
14.	Measles	-	Pressing in my tummy/hurting	Not so	(Pressing (Hurting
15.	Tummy ache	-	Something horrible	Not very	(Horrible (Nasty
16.	Cuts	Falling down	Awful	Very	(Burning
	Tummy pains	Eating too much	Quite	Quite	(Prick
	Foot pains	Walking too far	Sore	Quite	(Sore
	Earache	-	Like a prick	Very	(Sick
	Pins and needles	-	Like you were pricked		(Awful
17.	Stitch	Ate too much	Painful	Very	(Painful
	Pain in neck	Pillow was too high	Quite bad	Quite	(Bad

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

EIGHT YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
18.	Tummy pains	-	Sharp	Not very	(Hot
	Pain in head	-	-	Not very	(Cold
	Cut knee	Falling down	Sore	Very	(Funny
					(Sore
					(Stinging
					(Sharp
19.	Sick	-	-	Painful/not very	(Horrible
					(Painful
					(Not nice
					(Bad
					(Awful
20.	Sore throat	Infection	Awful	Quite	Awful
21.	Pain in lip	Operation	Hurt/went on and on	Very	(Pins and needles
	Growing pains	Growing	Pins and needles	Quite	(Wonky
					(Burning
					(Watery
					(Hurt
22.	Tummy aches	Too much food	Worse/bad/horrible	Very	(Bad
	Sore throat	Tonsillitis	-	-	(Horrible
	Nose bleed	Got thumped	-	-	(Painful
					(Terrible
23.	Headache	-	Awful	Mild	(Awful
	Stomach ache	-	Awful	Hot	(Not nice

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

EIGHT YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
24.	Abdominal migraine	Tummy bug	Sickly	Very	(Horrid
	Stitches	Glass	Like my finger fell off	Very	(Sickly
					(Painful
	Measles	-	Horrid	Very	(Sore
	Cough	Going out in shorts and T-shirt	Painful	Very	
	Flu	-	Horrid	Very	
	Sore throat	-	Horrid	Very	
25.	Tummy ache	-	Like a pin	Very	(Awful
	Stitch	Running	Awful	Very	(Painful
	Toothache	A wobbley tooth	Very painful	Very	(Like a pin
	Injection	A needle	Awful	Very	
26.	Stomach pain	Tiredness	Like pins	Very	(Sore
	Illness	Bugs	Hurt when I moved	A lot	(Hurtful
	Growing pains	-	Very sore	Very much	(Horrid
	Tummy pain	Bug	Like sick	A lot	(Nasty
27.	Tummy ache	-	Horrible	Very	(Horrible
	Pain in ankle	Falling over	Very sharp	Very	(Sharp
28.	Pain in head	-	-	-	(-
	Pain in leg	-	-	-	(-
29.	Tummy ache	Excitement	Horrible	Very	(Horrible
	Headache	Noise	Not very nice	Not much	(Revolting
					(Not very nice
30.	Tummy pain	Too much to eat	A lot	Very	(-
	Headache	Too much noise	Not much	Very	(-

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Tummy pains	Philip Gibson	It felt flat	Very	(Painful
	Toothache	Sweets	It spread	Very	(Sore
	Eye pain	Rubbing	-	-	(Horrid
					(Flat
					(Spreading
2.	Knocking my funnybone.	Knocking it	It felt hard	Not very	(Hot
					(Cold
	Tummy pain.	-	It felt funny	Quite	(Funny
	Falling down.	-	It felt hot	Very	(Hard
	Cutting my finger.	-	-	Not very	(Sore
					(Stinging
3.	Stitch	Running a lot	Awful	Not very bad	(Tickly
	Pins and needles	Being still	Tickly	Not very bad	(Hot
	Stomach ache	Eating too much	Terrible	Not very bad	(Awful
	Tonsillitis	-	Not very nice	-	(Terrible
					(Sticky
					(Funny
					(Spotty
					(Sore
					(Stinging
4.	Earache	-	Cold	Very	(Hot
	Tummy pains	-	Hot	Not very	(Painful
	When I have been stung.	From a nettle	Hot	Very	(Cold
	When I was burned.	A lamp	Hot	Very	

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
5.	Tummy pain	-	Aching	Very very	(Itch
	Earache	Loud noise	Aching	Very very	(Ache
	Headache	Loud noise	Terrible	Very very	(Noisy
	Sore throat	-	Itch	Not very	(Terrible
6.	Aching legs	The cold	Stung	Very	(Aching
	Sore throat	-	Nipped	Not very	(Sore
	Nose bleed	Coming in from the cold.	It stung	Very	(Stinging
					(Kills
					(Nipped
					(Hurts
7.	-	Dinner	It hurt	Very	(Harsh
	-	Fell on a rock	-	-	(Burning
	-	Bronchitis	-	Very very	(Kill
					(Hurt
8.	Tummy pain	Eating too much	It stung inside my tummy	Very	(Harsh
					(Awful
	Headache	-	Aching	Quite	(Ache
	Migraine	-	Stinging	Not that	(Kill
	Eye ache	Too much to drink	Made me sick	Very very	(Horrible
	Had a cold	Staying outside.	Quite painful	Very	(Bad
	Bad cough	Eating something I don't like.	I don't like it.	Awful	(Boiling
					(Itchy
	Nose bleed	A bump	Awful	Very	(Hot
					(Stung

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
9.	Split head	Shock	-	Very	(Itchy
	Split eyebrow	Being silly	-	Quite	
	Tiring	Running about	-	Not very	
	Tummy ache	Eating too much	-	Was not	
10.	Chickenpox	-	Painful/harsh	Very	(Harsh
	Headache	Yelling	It was aching	Too	(Hot
	Migraine	-	Very painful	More painful	(Horrible
	Tummy pain	-	Very painful	Too	(Awful
	Whooping cough	Coldness	Horrible	Like a night-mare	(Ache
					(Boiling
11.	Pain in knee	Fell down	Stingy	Very	(Sore
	Tummy pain	Sweets	Sickly	Alright	(Painful
	Lip pain	A cut	Painful	Very	(Stingy
	Ear	Coldness	Loud	Very	(Lumpy
	Tooth	Ulcer	Lumpy	Alright	(Sickeningly
	Gum	Brush	-	Very	
12.	Tummy ache	-	Ached	A lot	(Ached
	Sore throat	-	Tickled	A little	(Tickled
	Cough	A tummy bug	Tickly	A lot	(Sore
	Indigestion	Food being digested.	Very sore	A lot	(Stingy
					(
	Sore gum	-	Not very sore	Not very	(
13.	Cut arm	Fell off bike	Burning	Very	(Burning
	Tummy pain	Eating too much	Felt sick	Quite	(Sick
	Earache	-	Awful	Quite	(Awful
	Throat pain	Infection	I felt poorly	Hurt a lot	(Hurt

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
14.	Hard pains	Fell over	Very horrible	Very very	(Horrible
	Sharp pains	I burnt myself	It was sore	Very sore	(Hard
	Stinging pains	A nettle	Very red	Sore	(Sharp
	Bad pains	A bee	It was so soft	It was hurting	(Stinging
					(Bad
					(Sore
					(Hurting
15.	Cough	Playing outside without a coat on.	Not very nice	Very	(Itchy
					(Awful
	Headache	-	Felt dizzy	Quite	(Unpleasant
	Chickenpox	-	Felt itchy	Very	(
	Blocked up nose	-	Not very nice	Very	(
	Split head	-	Itchy	Very	(
	Hay fever	Cut grass	Not very nice	Very	(
	Tummy ache	Eating too much	Unpleasant	Very	(
16.	Tummy pain	Too much medicine	Very awful	Very	(Sore
	Sore throat	-	Very sore	Very	(Funny
	Blocked nose	-	-	-	(Awful
	Earache	By a sore throat	Very painful	Very	(Like a pin
	Chickenpox	-	Felt like a pin	Painful	(Terrible
	Pins and needles.	-	Very funny	Was not	(Tickly
					(Stinging
17.	Sharp pains	Blood test	Like I fell over	Very very	(Hurting
	Stinging pains	Cut myself	Terrible	I could scream	(Sharp
	Bad pains	I fell over	Felt very bad	It stung	(Stinging
	Little pains	My sister	Hurt a bit	Not very	(Bad
	Terrible pains	Snowball	Stinging pain	-	(Terrible

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
18.	Leg pain	-	Felt awful	Very very	(Awful
	Tummy pain	-	Not too bad	Not very	(Painful
19.	Head pains	The cold	Hurt a lot	Very	(Painful
	Eye pains	Anaesthetic	Felt like light-	Quite	(Hurt
			ning going through.		(Harsh
	Tummy pains	-	Hurt	Not very	(Uncomfortable
	Pneumonia	-	-	Very	(Kill
	Nose pain	Hit on the nose	-	Very	(Angry
20.	Stitches in	Split head	Tingling	Very	(Stinging
	my head				(Throbbing
	Split my knee	Tripped over	Stinging	Not very	(Aching
	Headache	Noise	Throbbing	Not very	(Pain
	Broken arm	Falling off a bed	-	-	(Uncomfortable
	I was sick	Tummy bug	Aching	Quite	(Tingling
21.	Broken toe	A big swollen bump	Stinging/swelling	Very	(Swollen
	Bruised arm	Dislocated shoulder	Wobbly/shakey	Quite	(Numb
	Black eye	Somebody elbowed me	Stinging/watery	Very	(Bruised
	Nain through	-	Swollen/numb	Very very	(Sharp
	my tongue.				(Shocking
	Chest pains	A sharp sting	Sharp/shocking	Terrible	(Stinging
	Pin through my	The pin	Numb	Quite	(Watery
	toe.				(Horrible
	Pain in finger	Jammed in car boot	Numb/swollen	Horrible	(Terrible
	Sprained ankle	-	Swollen/bruised	Very	(Painful
					(Sweating

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
22.	Hurt chin	Tripped up	It shocked me	Awful	(Awful
	Tummy ache	-	Awful	Quite a lot	(Horrible
	Nettle sting	Fell into nettles	Stung/hurt a lot	-	(Shocked
	Sting	Bee	Stung/hurt a lot	Horrible	(Sting
	Sick	-	Not very nice	Awful	(Tickled
	Pins and needles	Sitting down for	Kind of tickled	Awful	(Nasty
		too long			(Hurt
	My leg hurt	Pulled muscle	Awful	Not very nice	(Painful
	Headache	People shouting	Not very nice	Not very nice	(Sickly
		at me.			(Bad
	Earache	-	Awful	Awful	(
	Leg ache	Running around	Awful	Bad	(
23.	Bee sting	A bee	Painful	20%	(Painful
	Stitches	Jammed my leg	Like a monster	56%	(Numb
			biting you		(Horrible
	Fell out of	Tripped	Painful	32%	(
	tree				(
	Fell off my	Slid round corner	Painful	29%	(
	bike				
24.	Toothache	Not brushing my	Horrible	Quite	(Unpleasant
		teeth			(Painful
	Headache	A lot of noise	Horrible	Not very	(Horrible
	Bleeding hand	Bumped into a car	It was stinging	Very	(Chronic
	Flu	Getting wet in the	Unpleasant	Not all that	(Sore
		snow.			(Stinging
	Tonsillitis	-	Not very nice	Quite	(
	Chickenpox	-	Sore	Quite horrible	(
	Tummy ache	Eating a lot	Horrible	Quite	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
25.	Broken arm	Fell off my roller boots.	I was in real pain	Very	(Bad (Hurt
	Sprained ankle	I jumped the sand pit and didn't make it.	Very bad	Quite	(
	Bruised arm	I fell and caught my arm on a chair	Hurt a lot	Not bad	(
	Stomach ache	A bad fruit	Hurt quite a bit	Quite	(
	Stitches	Fell off bike	It was bad	Very	(
26.	Flu	Cold/shivery	Hurts/stings/tired	Very	(Stings
	Stitch	Running around	Bumping up and down	Not very	(Hurts
	Chickenpox	Itching a lot	Sore	Very	(Sore
	Hurt tummy	Cold	Hurting a lot	Not very	(
	Stinging nettles	Touched it	All spots	Very	(
27.	Pain in leg	A big bruise	-	Not very	(Hurts
	Pain in knee	Tripped up	-	Very	(
	Pain in head	Fell down	-	Quite	(
	Pain in head	Fell off a wall	-	Very	(
	Pain in head	Blunt end of an axe	-	Very sore	(
28.	Pain in head	A cold	Like a headache	Not that	(Horrible
	Pain in tummy	-	Very painful	Painful	(Painful
	Pain in leg	-	Not very nice	Painful	(Sore
	Pain in neck	Lying a funny way in bed	-	-	(Achey (
	Pain in feet	Walking all day	All crying	-	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

NINE YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
29.	Pain in head	Noise	Horrible	Not very	(Terrible
	Pain in leg	Fell on the rake	Very sore	Painful	(Horrible
	Pain in ankle	Fell over on it	Sore	Quite painful	(Sore
	Pain in neck	-	Achey	Not very	(Aches
	Pain in tummy	-	Terrible	Sore	(
30.	Hole in my knee	Falling on gravel	-	Very	(Sting
	Falling on my knee.	Falling over	-	Very	((
	Sting	A bee	Sting	-	(
	My knee	Falling in the garden.	-	A sting	((

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS

	PAINS	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
1.	Pains in arm	Being run over	Like being kicked hundreds of times.	Very	(Horrible (Bruised
	Pains in head	Banged head	Felt bruised.	Quite	(Stinging
	Pains in knee	Knocked bone out of place.	Like I had no bones.	Very very	(Hurt (Twisted
	Pains in foot	Wearing different shoes.	Like I couldn't walk.	Very	((
	Pains in ankle	Caught my foot in a hole.	Like people were standing on it.	Very	((
	Pains in mouth	Banged lip	Felt like it wasn't there.	Very	((
2.	Headache	Running too hard	Aching	Quite	(Hurting
	Tummy ache	Eating too much	Aching	Quite	(Sharp
	Constipation	Being in bed too much.	Dull	Very	(Dull (Dead
	Bruise	Hitting a sharp edge.	Dull/hurt	Very very	(Hard (Off and on
	General anaesthetic	Something injected into you.	Like my brain was bursting	Quite	(Numb (Aching
3.	Sprained ankle	Fell	Like ankle was covered in heavy weights.	Very	(Stinging (Painful (Numb
	Nettled	Tripped up in nettles.	Stinging/burning	Painful	(Burning (Clamped
	Pain in finger	Cut finger to bone	Numb/sore	Very very	(Tired
	Run over	Run over by bike	Very heavy	Very	(Awful (Sprained (Heavy

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
4.	Headache	Bang on the head	Hard throbbing	Very	(Throbbing
	Sting	Stung by a bee	-	Quite	(Sharp
	Bitten	A dog	Very sore/stinging	Very	(Sore
	Pain in finger	Cut by penknife	A hard stinging	Not very	(Stinging
	Sprained ankle	Slipped and fell	Sore throbbing	Quite	
5.	Headache	Knocked my head	Came on and off	Wasn't too	(Ache
	Gastric flu	A cold	Felt as if stomach was blue.	Wasn't very	(Agony
					(Sore
	Pain in finger	Broken finger	Felt very bad.	Too painful	(Bad
	Scraped knee	Fell over	Felt very numb.	Not too bad	(Painful
	Septic knee	Gravel into scratch	Felt horrible.	Very very	(Numb
	Pains in heart	Great-Grandad died	Very throbbing	Very	(Horrible
	Headache	Blocked nose	Hurt all the time	Not very	(Thumping
	Whooping cough	-	Thumping in chest	Felt moderate	(Terrible
	Bronchitis	-	Very horrible	Very	(Awful
	A cold	The cold	Not very painful	Hardly any	(Deadly
	Felt sorry	When I hit sister	Had upset tummy	Quite	(Yuk
	Felt sick	Too much to eat	Felt bloated	Moderate	(Throbbing
	Dizzy	Banged head	Brain banging about	Very	
	Toothache	Tooth erupting	Like a tooth falling out.	Very	
6.	Pain in knee	Fell over	Thousand needles stuck in my knee.	Very very	(Needles
					(Sore
	Headache	-	Like a drum in head.	Very	(Scratching
	Sore throat	-	Like a flea scratching.	-	(Nibbling
	Grazed hand	-	Like a mouse nibbling	Very	

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
7.	Wind pain	-	Something inside me was sucking me together.	Very	(Ached (Sickly (Sore
	Stomach pain	-	Big pain.	Quite	(Niggley
	Headache	Noise and tension	Big nail in my head.	Very	(Hurt (
	Toothache	Chewing	Ached	Quite	
	Bad finger	Jamming it in door.	On and on	Quite	
	Feel sick	Sitting in car	Very sickly	Quite	
	Sore eyes	Hot air	Sore	Quite	
	Empty tummy	Been in the car	Sickly	Bad	
	Earache	Getting cold in ears.	Aching	Very	
	Funny bone	Hitting my funny bone.	Aching	Not all that	
	Cut finger	Glass	Painful	Bad	
	Being hit	Someone thumped me	Hurt and ached	Quite	
	Bad knee	I fell down	Felt sore	Quite	
	Hurt ankle	Falling down	It ached	Bad	
8.	Headache	Bumped it	Felt like a thunder storm.	Very	(Prick (Bruise
	Tummy ache	-	Like someone punching.	Very	((
	Bad ankle	Running	-	Very	(
	Bad thumb	Knocked it	-	Very	(
	Sore throat	Coughing	-	Very	(
	Hurt knee	Falling over	Like a prick	Very	(
	Banged door	Bruised	-	Very	

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
9.	Pain in tummy	Clothes	Horrible	Very	(Horrible
	Pain on face	The door	Not very nice	Quite	(Stinging
	Pain in ankle	Running	Stinging	Very	(Disturbing
	Pain on thigh	Running	Very disturbing	Quite	(Not nice
	Pain on knee	Fell over	Not very nice	Very very	(
	Pain in arm	My dog	Stinging	Quite	(
	Pain on finger	Loose piece of	Very disturbing	Very	(
		skin.			(
	Pain in mouth	Pulling it	Horrible	Quite	(
10.	Bad tummy	Food	Very disturbing	Not that much	(Disturbing
	Cut hand badly	Fell onto glass	Painful	Very	(Painful
	Headache	Noise	Horrible	-	(Sore
	Hurt my leg	Fell over	Sore	Not very	(Horrible
	Nose bleed	Fell down steps	Couldn't feel it	Not very	(Tingley
	Cut my knee	Thorns	Tingley	Hurts a bit	(Stung
	Hurt my shoulder	Knocked it	Stung	-	(Funny
	Hurt ankle	Fell over	Funny	Tingley	(Disrupting
	Stood on a nail	Stood on it	Horrible	-	(Hurt
11.	Migraine	Migraine	Felt like someone	Very	(Stinging
			hit my head.		(Throbbing
	Head got split	A bamboo cane	Like a sword	Not that bad	(Earthquake
			gashed my head.		(Like a sword
	Broken finger	Someone bent it	-	Very	(
		right back.			(
	Sprained ankle	Bent round	-	Very	(
	Tummy pain	Tummy bug	Felt like there	Wasn't that bad	(
			was an earthquake		(
			in my stomach.		(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
12.	Chest pains	Hit with music stand.	A car in a crusher	Very	(Stinging (Throbbing
	Pains in leg	Falling down stairs.	A twisted ankle	Very	(Hurting
	Headache	Falling out of bed.	Getting your head flattened.	Not as	
	Pains in arm	Getting arm jammed.	A broken arm	Very	
13.	Broken hand	Tripped up	Numb/helpless	Very	(Weary
	Sprained foot	-	Sting	Quite	(Bad
	Broken arm	Fell out of tree	Felt droopy	Very	(Helpless
	Twisted ankle	Kicked	Stinging	Very	(Horrible
	Squint	The injection	As though I couldn't open my eye.	Quite	(Not nice (Ugly (Droopy
	Pain in neck	Sleeping and twisted my head	Couldn't move my neck.	Not very	(Killing
14.	Pain in head	Fell off bike	Very sore	Very	(Sharp
	Pain in leg	Fell down stairs	Very sore	Very	(Glares (Fire (Hot (Sore
15.	Pain in finger	All the skin came off.	It stung	Pretty	(Stung (Stiff
	Pain in head	Bashed into wall.	Made me see less	Very	(Sore
	Pain in chest	Ate too much	Felt numb	Not very	(Bad
	Pain in back	Fell on my back	It stung	Very	(Funny
	Pain in leg	-	It stung	Pretty	(Ache
	Pain in neck	Ripped muscle	Made me stiff	Very	
	Pain in arm	I cut it	It stung	Not very	
	Pain in rib	Fell down	Made me stiff	Very	

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
16.	Tummy ache	-	Like I was punched.	Not very	(Stinging
	Sore throat	Cold	Like I lost my	Very	(Numb
			voice.		(Bruised
	Fell off swing	My hand slipped	Felt like I was in	Very	(
			a different place.		(
	Banged into door	I wasn't looking	It felt numb.	Very	(
	Headache	-	Like I bumped my	Not very	(
			head.		(
	Banged into wall	Couldn't stop bike	-	Very	(
	Fell off swing	Tried to jump off	Like I was thrown	Very	(
			off cliff.		(
17.	Pain in ear	Wax in ear	Sore	Very	(Sore
	Headache	Migraine	Like banging in	-	(Banging
			head.		(Horrible
	Cut leg	Fell over	Sore	Not that sore	(
	Toothache	A bad pulp	Horrible	Very	(
	Pain in elbow	Fell over	Very horrible	Very	(
18.	Migraine	Lot of noise	Like a needle	A lot	(Sore
			sticking in me		(Pins and needles
	Tummy ache	Eating too quick	Like ice cutting me.	Really hard	(Cramp
	Sore throat	Out in the cold	Like a golf ball	Sore	(
			in my throat.		(
	Cramp	Crouching down	Your bones breaking.	Very	(
	Pins and needles	Kneeling	Pins and needles.	Awful	(
19.	Dog bite	A dog	-	Not very	(Painful
	Dart in back	A dart	-	Quite	(Bad
	of head				(Not nice

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
20.	Headache	-	Very painful	Quite	(Stinging
	Stomach ache	Sweets	Sharp/prick	Not too bad	(Horrible
	Split lip	Cut it	Horrible	Wasn't bad	(Sharp
	Sprained wrist	Fell over	Not too bad	Quite	(Nasty
	Grazed knee	Fell over	Quite bad	Quite	(Disturbing
	Bumped head	Tripped over	Nasty	Painful	(Prick
	Burnt my hand	Getting dinner out of oven.	A sharp sting	Very	(
21.	Top of thumb chopped off.	Playing with hammer.	Like I had my fingers chopped off	Very	(Stinging (
	Split head.	Fell off roundabout.	Someone hitting me with sharp instrument.	Very	(((
	Bad leg	Fell on stone	A rock dropped on my leg.	Quite	((
22.	Hit my head	My mum was getting me.	Like a bus on a mouse.	Very	(Bad (Not nice
	Hurt leg	Football	A brick on my leg	Very	(Painful
	Being ill	Being in the sea.	-	Not very	(Horrible
23.	Infected blister	Germs getting into it.	Numb	Quite	(Agonising (Painful
	Pain in ankle	Football boot	Pair of tongs gripping hard.	Very	(Throbbing (It's a killer
	Catarrh	-	Could hardly breathe.	Very	((
	Circumcised	-	-	Very very	(
	Bruised leg	Being kicked	Throbbed	Quite	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
24.	Bruised hand	Jonah fell on me	Like in cold weather when you have no gloves.	Quite	(Stinging (Sharp (Hard
	Stung by five wasps	Sat on a wasps' nest.	-	Very	(Quick (
	Broken arm	Fell off rocking horse.	-	Very	((
	Bruised head	Fell off skate-board.	Stinging	Not too bad	((
	Bust lip	Football boot.	Stinging	Quite	(
25.	Twisted ankle	Stood on a ball	Like something heavy pressing on foot.	Very	(Sore (Painful (Achey
	Headache	Flu	Thumping	Painful	(Sickly
	Earache	The cold	Felt it had something in that was growing bigger.	Quite	(Horrible (Tender (Shivery
	Grazed knees	Fell over	Lots of sharp needles.	Very	((
	Toothache	The cold	Like someone was trying to pull it out.	Achey	(((
	Sore neck	Jerked it	Like something was pulling my neck.	Tender/sore	((
	Tummy ache	Ate too much	Felt sick.	Wasn't very	(

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

	PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
26.	Split head	-	-	Very	(Itchy
	Sinusitis	Headache	Head felt like dropping off.	Aching	(Sleepy (Unhappy
	Chickenpox	Spots	Itchy	All itchy	(Ache
	Scarletina	A rash	Very bad	-	(
	Being sick	Tummy bug	-	Horribly	(
27.	Growing pains	My bones growing	Throbbing	Not very	(Throbbing
	Headache	-	A hammer hitting my head.	Quite	(Hitting (Pins and needles
	Sore eyes	-	-	Not very	(
	Pain in wrist	-	-	Quite	(
	Pins and needles	-	Pins and needles	Quite	(
	Earache	-	Someone hitting my ear.	Quite	((
	Banged funnybone	I banged it	Not sure	Quite	(
28.	Headache	My brother	Felt my head was made of lead.	Quite	(Sore (Painful
	Grazed knee	Fell over	A tingle in my knee.	Quite	(Irritating (Tingle
	Cut hand	Fell on playground	Like a tingle	Not very	(Cramp
	Bruised shin	My brother kicked me.	Like I had cramp.	Very	(Heavy (
	Bruised knee	Fell over	Didn't feel much pain.	Not very	((
	Split head	Fell off swing	It was like my head was full of lead and everything was soft.	Very very after I woke me	((((
	Thick lip	Somebody's head	As if my lip was 10 times as big as it was.	Quite	(((

PAIN SITUATIONS RECALLED WITH THEIR CAUSES, PAIN DESCRIPTIONS, ESTIMATE OF HOW PAINFUL IT WAS AND THE PAIN DESCRIPTORS GENERATED BY THE CHILDREN

TEN YEAR OLDS (CONTD.)

PAIN	CAUSES	DESCRIPTORS	HOW PAINFUL	DESCRIPTORS KNOWN
Tummy ache	A bug	A stone rumbling in my tummy.	Quite	((
My leg going off	I was sitting on my leg too long.	When I hit it it felt as if I didn't hit it in the first place.	Not very	((((
Sore eyes	Chlorine	As if I could close my eyes any minute.	Quite	((

A P P E N D I X 3

FIGURATIVE LANGUAGE USED BY THE CHILDREN TO DESCRIBE THEIR RECALLED PAIN

Five year olds N=5:

Tummy pains;	Like spots (5.11) Like a bug pain (5.20) Felt swelled up (5.6) Lumpy (5.24)
Pain in the head;	Like a bruise (5.19)
Chickenpox;	Like a pin (5.11)

Six year olds N=3:

Blisters;	Itchy - like something bit me (6.13)
Pain in the head;	Like you bumped your head (6.13) Like hair sticking up (6.28)
Pain in foot;	Going round the bend (6.21)
Hand pain;	Pinching (6.28)

Seven year olds N=8:

Tummy pains;	Squeezing pain (7.20) Squeezing (7.22) Squeezes (7.18) Hurts like someone punched you (7.21) Like a pin (7.26)
Sore hand;	Hard (7.23)
Headache;	Like somebody hurting my head (7.15)
Back pain;	Feels strike-strike when I move (7.20)
Pain in leg;	All going round in circles (7.22)

FIGURATIVE LANGUAGE (cont.)

Eight year olds N=12:

Tummy pains;	Like sticking a needle through me (8.9) Like a pin (8.25) Like pins (8.26) Pressing in my tummy (8.14) Sharp (8.18)
Sore foot;	Hot (8.2)
Leg pain;	Hard (8.2)
Pain in finger;	Stings (8.4)
Pain in foot;	Hurt like a needle (8.7)
Stitch;	Something jogging in your bones (8.7)
Pain in arm;	Like I've been shot (8.9)
Pain in leg;	A needle going in (8.10)
Earache;	Like a prick (8.16)
Pins and needles;	Like you were pricked (8.16)
Growing pains;	Pins and needles (8.21)
Stitches;	Like my finger fell off (8.24)

FIGURATIVE LANGUAGE (cont.)

Nine year olds N=15:

Tummy pain;	It felt flat (9.1) Hot (9.4) It stung inside my tummy (9.8)
Knocked funnybone;	It felt hard (9.2)
Falling down;	Hot (9.2)
Earache;	Cold (9.3)
Being stung;	Hot (9.4)
Sore throat;	Nipped (9.6)
Ear;	Loud (9.11)
Cut arm;	Burning (9.13)
Bad pains;	It was so soft (9.14)
Chickenpox;	Felt like a pin (9.16)
Blood test;	Like I fell over (9.17)
Eye pain;	Felt like lightening going through (9.19)
Stitches;	Like a monster biting you (9.23)
Stitch;	Bumping up and down (9.26)
Pin in head;	Like a headache (9.28)
Pain in feet;	All crying (9.30)

FIGURATIVE LANGUAGE (cont.)

Ten year olds N=22

Pains in arm;	Like being kicked hundreds of times (10.1)
Pain in knee;	Like I had no bones (10.1) Thousand needles stuck in my knee (10.6) Like a prick (10.8)
Grazed knees;	Lots of sharp needles (10.25)
Pain in foot;	Like I couldn't walk (10.1)
Pain in ankle;	Like people were standing on it (10.1) Pair of tongs gripping hard (10.23)
Sprained ankle;	Like ankle was covered in heavy weights (10.3)
Twisted ankle;	Like something heavy pressing on foot (10.25)
Anaesthetic;	Like my brain was bursting (10.2)
Nettled;	Burning (10.3)
Run over;	Very heavy (10.3)
Headache;	Hard throbbing (10.4) Like a drum in head (10.6) Big nail in my head (10.7) Felt like a thunderstorm (10.8) Felt like someone hit my head (10.11) Like a sword hit my head (10.11) Getting your head flattened (10.12) Like I bumped my head (10.16) Like banging in head (10.17) Like a needle sticking in me (10.18) Thumping (10.25) A hammer hitting my head (10.27) Felt my head was made of lead (10.28)
Gastric flu;	Felt as if stomach was blue (10.5)
Dizzy;	Brain banging about (10.5)
Toothache;	Like a tooth falling out (10.5) Like someone was trying to pull it out (10.25)
Sore throat;	Like a flea scratching (10.6) Like a golf ball in my throat (10.18)

FIGURATIVE LANGUAGE (10 year olds cont.)

Grazed hand;	Like a mouse nibbling (10.6)
Bruised hand;	Like in cold weather when you have no gloves (10.24)
Wind pain;	Something inside me was sucking me together (10.7)
Tummy ache;	Like someone punching (10.8) Felt like there was an earthquake in my stomach (10.11) Like I was punched (10.16) Like ice cutting me (10.18) Sharp prick (10.20) A stone rumbling in my tummy (10.28)
Chest pain;	A car in a crusher (10.12)
Squint;	As though I couldn't open my eye (10.13)
Fell off swing;	Felt like I was in a different place (10.16) Like I was thrown off cliff (10.16)
Cramp;	Your bones breaking (10.18)
Burnt hand;	A sharp sting (10.20)
Top of thumb chopped off;	Like I had my fingers chopped off (10.21)
Split head;	Someone hitting me with a sharp instrument (10.21) It was like my head was full of lead and everything was soft (10.28)
Bad leg;	A rock dropped on my leg (10.21)
Hurt leg;	A brick on my leg (10.22)
Bruised leg;	Throbbed (10.23)
Hit my head;	Like a bus on a mouse (10.22)
Earache;	Felt that it had something in that was growing bigger (10.25) Someone hitting my ear (10.27)

FIGURATIVE LANGUAGE (10 year olds cont.)

Sore neck;	Like something was pulling my neck (10.25)
Sinusitis;	Head felt like dropping off (10.26)
Growing pains;	Throbbing (10.27)
Bruised shin;	Like I had cramp (10.28)
Thick lip;	As if my lip was ten times as big as it was (10.28)

APPENDIX 4

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

FIVE YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Hurt	Head pain	Banged by door	A lot
	Pain in knee	Fell over	A bit
	Scraped leg	Slipped	Very
	Pain in throat	-	Little bit
	Pain in knee	Fell down	Not very
Awful	Tummy pains	-	Very very
	Toothache	-	-
	Tummy pains	Food	-
	Head pain	Jelly babies	Bit better
Sore	Pain in knee	Fell down	-
	Pain in elbow	Fell over	Very very
	Pain in knee	Fell over	-
	Pain in leg	Fell over	-
Horrible	Pain in knee	Fell off bike	Not very
	Tummy pain	Eating sweets	-
	Tummy pain	-	A lot
	Tummy pain	-	Very
Nasty	Chickenpox	-	Very
	Tummy pain	-	Very
Very bad	Pain in leg	Slid off slide	-
	Throat pain	Stuck pill	Very bad
Bug pain	Tummy pain	Dinner	-
Dreadful	Toothache	-	-
Like a bruise	Hurt head	Jumped off frame	Just a little
Like a pin	Chickenpox	-	A lot
Like spots	Tummy pain	-	A lot
Little pain	Twisted ankle	Fell down steps	A little bit
Lumpy	Tummy pain	-	-
Not very nice	Tummy pain	-	Not that bad
Sick	Tummy pain	Fell over	Bad
Stings	Tummy pain	-	A lot
Swelled up	Tummy pain	-	Very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

SIX YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Horrible	Headache	-	Not very
	Tummy pain	Growing pains	Not very
	Headache	Noise	A lot
	Headache	Noise	-
	Chickenpox	-	Not very
	Tummy pain	Eating too much	Very
	Chest pains	Running about	Very
Hurting	Tummy ache	Eating too much	Not that sore
	Headache	-	Not very much
	Sore leg	Fell off wall	Very
	Pain in knee	Fell over	Not much
	Tummy pain	Tummy bug	Half
Nasty	Pain in foot	-	Very
	Headache	-	Not very
	Sunburn	Sun	Very
	Tummy pain	-	-
Sore	Headache	-	Really hurting
	Tummy pain	Too many sweets	Not very very
	Pain in ankle	Fell off bike	Very sore
Itchy	Blisters	Sun	Very
	Skin pain	Eczema	A lot
Sick	Tummy pain	-	-
	Tummy pain	Car travel	-
Awful	Black eye	Bumped into door	Very
Croaky	Sore throat	Cough	-
Going round the bend	Pain in foot	Cramp	Like a bone
Like hair sticking up	Head pain	-	Like dots banging in my head
Pinching	Hand pain	Fell off bike	Not very
Stinged	Bumped head	Fell over	Not that painful
Tickly	Sore thumb	Jammed in door	Very
Tight	Tummy pain	Diarrhoea	A lot

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

SEVEN YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Hurt	Earache	-	-
	Tummy ache	-	A little bit
	Headache	Coughing	Very
	Headache	Noisy	A lot
	Pain in eyes	Ice in eye	Very
	Tummy pains	A bug	Very
	Hand pain	-	Little bit
	Pain in mouth	Frostbite	A lot
	Sore hand	-	Not much
	Sore lips	They dry up	Hurts a lot
Sore	Pain in knee	Fell over	Very
	Cut knee	Fell off bike	Very
	Throat pain	Coughs	Very
	Pain in knee	Fell over	Just a bit
	Pain in elbow	Falling over	-
	Stitches	Bitten by dog	Very bad
Sharp	Tummy pain	Haven't been to toilet	Very
	Pain in cheek	-	A little bit
	Hand pain	-	A little bit
	Pain in mouth	Frostbite	A lot
Stings	Pain in hand	Caught it while playing	Not very
	Headache	Noise	Worse
	Tummy pain	Too much to eat	Medium
	Blister on foot	Skidding on floor	Down the bottom
Aches	Tummy ache	-	-
	Headache	Noise	Worse
	Cramp in leg	Lay in bed and sat on leg	Little bit
Horrible	Hurt head	Fell off bike	Very
	Pain in leg	-	Not much
	Cough pain	Very bad cold	Very
Squeezes	Tummy ache	I fell on tummy	Very
	Tummy bug	-	Quite
	Tummy pain	Haven't been to toilet	Very
Hard	Sore hand	-	Not much
	Tummy ache	Eaten something	Very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

SEVEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Going round in circles	Pains in leg	-	A lot
Sick	Tummy pain	-	Not very
Stitch	Tummy pain	Riding fast on bike	Very baddish
Strike-strike	Pain in back	-	Quite
Tickly	Tummy ache	Felling sick	Very very
Tingles	Pain in elbow	Bumped it	Bad

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

EIGHT YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Hurt	Scratch	Cat	A lot
	Swollen throat	-	Quite
	Pain in foot	Spelk	Hurt
	Pain in head	Split open	Quite a lot
	Leg pain	Fell over	A little bit
	Stitch	Football	Not much
	Measles	-	Not so
	Pain in lip	Operation	Very
	Illness	Bugs	A lot
	Leg pain	Bumped leg	Not that
Awful	Cuts	Falling down	Very
	Sore throat	Infection	Quite
	Headache	-	Mild
	Stomach ache	-	Hot
	Stitch	Running	Very
	Injection	A needle	Very
Painful	Stitch	Jogging	Not much
	Tummy ache	In car	A lot
	Stitch	Ate too much	Very
	Cough	Going out in shorts & T-shirt	Very
	Toothache	Wobbly tooth	Very
Horrible	Tummy ache	-	Not very
	Tummy ache	Too much food	Very
	Tummy ache	-	Very
	Tummy ache	Excitement	Very
Sore	Fell over	-	Not very
	Foot pain	Walking too far	Quite
	Cut knee	Falling down	Very
	Growing pains	-	Very much
Horrid	Measles	-	Very
	Flu	-	Very
	Sore throat	-	Very
Bad	Pain in neck	Pillow was too high	Quite
	Tummy pain	Too much food	Very
Like a pin	Tummy ache	-	Very
	Tummy ache	Tiredness	Not much
Like a needle	Tummy pain	-	-
	Pain in leg	Twisted while running	Not very
Prick	Earache	-	Very
	Pins & needles	-	-

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

EIGHT YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Sharp	Tummy pain	-	Not very
	Pain in ankle	Falling down	Very
Stings	Pain in finger	Jammed in door	Very
	Fell over	-	Very
Sickly	Tummy pain	Tummy bug	Very
	Tummy pain	Bug	A lot
Ache	Pain in chest	-	Not that
A lot	Tummy pain	Too much to eat	Very
Big pain	Chest pain	Hotness	Very
Can't breathe	Pain in tummy	Punch	Quite
Drowsy/dizzy/ cold	Headache	Banged head	Not much
Fuzzy	Headache	-	Little bit
Hard	Leg pain	Kick	Quite
Hot	Sore foot	Stamped on	Not much
Like my finger fell off	Stitches	Glass	Very
Loose	Broken arm	Jumped off bunks	A lot
Not much	Headache	Noise	Very
Not very nice	Headache	Noise	Not much
Pins & needles	Growing pains	Growing	Quite
Pressing	Measles	-	Not very
Quite	Tummy pains	Eating too much	Quite
Rotten	Pain in mouth	Toothache	Quite a bit
Shot	Pain in arm	Fell on it	Not very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

NINE YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Stinging/Stung	Aching legs	The cold	Very
	Nose bleed	Coming in from the cold	Very
	Tummy pain	Eating too much	Very
	Migraine	-	Not that
	Pain in knee	Fell down	Very
	Terrible pains	Snowball	-
	Split my knee	Tripped over	Not very
	Broken toe	Big swollen lump	Very
	Black eye	Somebody elbowed me	Very
	Nettle sting	Fell into nettles	-
	Sting	Bee	Horrible
	Bleeding hand	Bumped into car	Very
	Flu	Cold/shivery	Very
	Stung	A bee	-
Painful	Had a cold	Staying outside	Very
	Chickenpox	-	Very
	Migraine	-	More painful
	Tummy pain	-	Too
	Lip pain	A cut	Very
	Earache	Sore throat	Very
	Bee sting	A bee	20%
	Fell out of tree	Tripped	32%
	Fell off my bike	Slid around corner	29%
	Pain in tummy	-	Painful
Awful	Nose bleed	A bump	Very
	Earache	-	Quite
	Tummy pain	Too much medicine	Very
	Leg pain	-	Very very
	Tummy ache	-	Quite a lot
	My leg hurt	Pulled muscle	Not very nice
	Earache	-	Awful
	Leg ache	Running around	Bad
Sore	Indigestion	Food being digested	A lot
	Sore gum	-	Not very
	Sharp pains	Burnt myself	Very sore
	Sore throat	-	Very
	Chickenpox	-	Quite horrible
	Chickenpox	Itching a lot	Very
	Pain in leg	Fell on rake	Painful
	Pain in ankle	Fell over on it	Quite painful

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

NINE YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Aching	Tummy pain	-	Very very
	Earache	Loud noise	Very very
	Headache	-	Quite
	Headache	Yelling	Too
	Tummy ache	-	A lot
	I was sick	Tummy bug	Quite
	Pain in neck	-	Not very
Hurt	-	Dinner	Very
	Little pain	My sister	Not very
	Head pains	The cold	Very
	Bruised arm	Fell	Not bad
	Stomach ache	A bad fruit	Quite
	Flu	Cold & shivery	Very
	Hurt tummy	Cold	Not very
Not very nice	Cough	Playing outside with no coat on	Very
	Blocked up nose	-	Very
	Hay fever	Cut grass	Very
	Sick	-	Awful
	Headache	People shouting at me	Not very nice
	Tonsillitis	-	Quite
	Pain in leg	-	Painful
Horrible	Whooping cough	Coldness	Like a nightmare
	Hard pains	Fell over	Very very
	Toothache	Not brushing my teeth	Quite
	Headache	A lot of noise	Not very
	Tummy ache	Eating a lot	Quite
	Pain in head	Noise	Not very
Bad	Bad pains	Fell over	Stung
	Tummy pains	-	Not very
	Sprained ankle	Jumping	Quite
	Stitches	Fell off bike	Very
Swelling	Broken toe	Big swollen bump	Very
	Pain in finger	Jammed in car boot	Very very
	Nail through my tongue	-	-
	Sprained ankle	-	Very
Hot	Falling down	-	Very
	Tummy pains	-	Not very
	Stung	A nettle	Very
	Burned	A lamp	Very
Numb	Nail through my tongue	-	Very very
	Pin through my toe	The pin	Quite
	Pain in finger	Jammed in car boot	Horrible

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

NINE YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Sick	Eye ache	Too much to drink	Very very
	Tummy pain	Sweets	Alright
	Tummy pain	Eating too much	Quite
Terrible	Headache	Loud noise	Very
	Stinging pains	Cut myself	I could scream
	Pain in tummy	-	Sore
Tickled	Sore throat	-	A little
	Cough	A tummy bug	A lot
	Pins & needles	Sitting down for too long	Awful
Funny	Tummy pain	-	Quite
	Pins & needles	-	Was not
Itchy	Sore throat	-	Not very
	Split head	-	Very
Unpleasant	Tummy ache	Eating too much	Very
	Flu	Getting wet	Not all that
All crying	Pain in feet	Walking all day	-
All spots	Stinging nettles	Touched it	Very
Bruised	Sprained ankle	-	Very
Bumping up and down	Stitch	Running around	Not very
Burning	Cut arm	Fell off bike	Very
Dizzy	Headache	-	Quite
Don't like it	Bad cough	Eating something I don't like	Awful
Flat	Tummy pain	My friend	Very
Hard	Funny bone	Knocking it	Not very
Harsh	Chickenpox	-	Very
Like a pin	Chickenpox	-	Painful
Like I fell over	Sharp pain	Blood test	Very very
Like a headache	Pain in head	Cold	Not that
Like lightning	Eye pains	Anaesthetic	Quite
Like a monster biting	Stitches	Jammed my leg	56%

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

NINE YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Loud	Ear	Coldness	Very
Lumpy	Tooth	Ulcer	Alright
Nipped	Sore throat	-	Not very
Poorly	Sore throat	Infection	Hurt a lot
Real pain	Broken arm	Fell off my roller boots	Very
Red	Stinging pain	A nettle	Sore
Shocked me	Hurt chin	Tripped up	Awful
Soft	Bad pains	A bee	Hurting
Spread	Toothache	Sweets	Very
Throbbing	Headache	Noise	Not very
Tingling	Stitches in head	Split head	Very
Watery	Black eye	Elbowed me	Very
Wobbly/shakey	Bruised arm	Dislocated shoulder	Quite

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Sting	Sprained foot	-	-
Stinging	Pain in ankle	Running	Very
Stinging	Pain in arm	My dog	Quite
Stinging	Twisted ankle	Kicked	Very
Stinging	Bruised heae	Fell off skateboard	Not too bad
Stinging	Bust lip	Football boot	Quite
Stung	Hurt my shoulder	Knocked it	-
It stung	Pain in finger	All the skin came off	Pretty
It stung	Pain in back	Fell on my back	Very
It stung	Pain in leg	-	-
It stung	Pain in arm	I cut it	Not very
A sharp sting	Burnt my hand	Getting dinner out of oven	Very
A hard stinging	Pain in finger	Cut by penknife	Not very
Stinging/burning	Nettles	Tripped up in nettles	Painful
Horrible	Pain in tummy	Clothes	Very
Horrible	Pain in mouth	Pulling it	Quite
Horrible	Headache	Noise	-
Horrible	Stood on nail	Stood on it	-
Horrible	Toothache	A bad pulp	Very
Horrible	Split lip	Cut it	Wasn't bad
Felt horrible	Septic knee	Gravel into scratch	Very very
Very horrible	Bronchitis	-	Very
Very horrible	Pain in elbow	Fell over	Very
Sore	Sore eyes	Hot air	Quite
Sore	Hurt my leg	Fell over	Not very
Sore	Pain in ear	Wax in ear	Very
Sore	Cut leg	Fell over	Not that sore
Felt sore	Bad knee	I fell down	Quite
Very sore	Pain in head	Fell off bike	Very
Very sore	Pain in leg	Fell down stairs	Very
Very sore/ stinging	Bitten	A dog	Very
Sore/throbbing	Sprained ankle	Slipped and fell	Quite
Aching	Headache	Running too hard	Quite
Aching	Tummy ache	Eating too much	Quite
Aching	Earache	Getting cold in ears	Very
Aching	Funny bone	Hitting my funny bone	Not all that
Ached	Toothache	Chewing	Quite
Ached	Hurt ankle	Falling down	Bad
Numb	Infected blister	Germs getting into it	Quite
Felt numb	Pain in chest	Ate too much	Not very
Felt very numb	Scraped knee	Fell over	Not too bad
Numb/helpless	Broken hand	Tripped up	Very
Numb/sore	Pain in finger	Cut finger to bone	Very very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Painful	Cut finger	Glass	Bad
Painful	Cut hand badly	Fell onto glass	Very
Very painful	Headache	-	Quite
Not very painful	A cold	The cold	Hardly any
Felt very bad	Pain in finger	Broken finger	Too painful
Not too bad	Sprained wrist	Fell over	Quite
Quite bad	Grazed knee	Fell over	Quite
Very bad	Scarletina	A rash	-
Very disturbing	Pain on thigh	Running	Quite
Very disturbing	Pain on finger	Loose piece of skin	Very
Very disturbing	Bad tummy	Food	Not that much
Throbbed	Bruised leg	Being kicked	Quite
Throbbing	Growing pains	My bones growing	Not very
Hard throbbing	Headache	Bang on the head	Very
Very throbbing	Pains in heart	Great-Grandad died	Very
Dull	Constipation	Being in bed too much	Very
Dull/hurt	Bruise	Hitting a sharp edge	Very very
Hurt all the time	Headache	Blocked nose	Not very
Hurt and ached	Being hit	Someone thumped me	Quite
Made me stiff	Pain in neck	Ripped muscle	Very
Made me stiff	Pain in rib	Fell down	Very
Not very nice	Pain on face	The door	Quite
Not very nice	Pain on knee	Fell over	Very very
Pins and needles	Pins and needles	Kneeling	Awful
Pins and needles	Pins and needles	-	Quite
Sickly	Empty tummy	Been in the car	Bad
Very sickly	Feel sick	Sitting in car	Quite
Thumping	Headache	Flu	Painful
Thumping in chest	Whooping cough	-	Felt moderate
Felt bloated	Felt sick	Too much to eat	Moderate
Felt bruised	Pains in head	Banged head	Quite

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Felt droopy	Broken arm	Fell out of tree	Very
Funny	Hurt ankle	Fell over	Tingley
Very heavy	Run over	Run over by bike	Very
Itchy	Chicken pox	Spots	All itch
Nasty	Bumped head	Tripped over	Painful
Sharp/prick	Stomach ache	Sweets	Not too bad
Tingley	Cut my knee	Thorns	Hurts a bit
A broken arm	Pains in arm	Getting arm jammed	Very
A brick on my leg	Hurt leg	Football	Very
A car in a crusher	Chest pains	Hit with music stand	Very
A hammer hitting my head	Headache	-	Quite
A rock dropped on my leg	Bad leg	Fell on stone	Quite
A stone rumbling in my tummy	Tummy ache	A bug	Quite
A tingle in my knee	Grazed knee	Fell over	Quite
A twisted ankle	Pains in leg	Falling down stairs	Very
As if I could close my eyes any minute	Sore eyes	Chlorine	Quite
As if my lip was 10 times as big as it was	Thick lip	Somebody's head	Quite
As though I couldn't open my eye	Squint	The injection	Quite
Big nail in my head	Headache	Noise and tension	Very
Big pin	Stomach pain	-	Quite
Brain banging about	Dizzy	Banged head	Very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Came on and off	Headache	Knocked my head	Wasn't too
Could hardly breathe	Catarrh	-	Very
Couldn't feel it	Nose bleed	Fell down steps	Not very
Couldn't move my neck	Pain in Neck	Sleeping and twisted my head	Not very
Didn't feel much pain	Bruised knee	Fell over	Not very
Felt as if stomach was blue	Gastric flu	A cold	Wasn't very
Felt it had something in that was growing bigger	Earache	The cold	Quite
Felt like a thunderstorm	Headache	Bumped it	Very
Felt like I was in a different place	Fell off swing	My hand slipped	Very
Felt like it wasn't there	Pains in mouth	Banged lip	Very
Felt like something hit my head	Migraine	Migraine	Very
Felt like there was an earthquake in my stomach	Tummy pain	Tummy bug	Wasn't that bad
Felt my head was made of lead	Headache	My brother	Quite
Getting your head flattened	Headache	Falling out of bed	Not as
Had upset tummy	Felt sorry	When I hit sister	Quite
Head felt like dropping off	Sinusitis	Headache	Aching
It was like my head was full of lead and everything was soft	Split head	Fell off swing	Very very after I woke me
Like a bus on a mouse	Hit my head	My mum was getting me	Very
Like a drum in head	Headache	-	Very

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Like a flea scratching	Sore throat	-	-
Like a golf ball in my throat	Sore throat	Out in the cold	Sore
Like a mouse nibbling	Grazed hand	-	Very
Like a needle sticking in me	Migraine	Lot of noise	A lot
Like a prick	Hurt knee	Falling over	Very
Like a sword gashed my head	Head got split	A bamboo cane	Not that bad
Like a tingle	Cut hand	Fell on playground	Not very
Like a tooth falling out	Toothache	Tooth erupting	Very
Like ankle was covered in heavy weights	Sprained ankle	Fell	Very
Like banging in head	Headache	Migraine	-
Like being kicked hundreds of times	Pains in arms	Being run over	Very
Like I couldn't walk	Pains in foot	Wearing different shoes	Very
Like I had cramp	Bruised shin	My brother kicked me	Very
Like I had my fingers chopped off	Top of thumb chopped off	Playing with hammer	Very
Like I had no bones	Pains in knee	Knocked bone out of place	Very very
Like I lost my voice	Sore throat	Cold	Very
Like I was punched	Tummy ache	-	Not very
Like I was thrown off cliff	Fell off swing	Tried to jump off	Very
Like ice cutting me	Tummy ache	Eating too quick	Really hard
Like in cold weather when you have no gloves	Bruised hand	Jonah fell on me	Quite

PAIN DESCRIPTORS USED TO DESCRIBE THE RECALLED PAINFUL EXPERIENCES WITH THE ASSOCIATED PAINS, CAUSES AND HOW PAINFUL IT WAS

TEN YEAR OLDS (CONTD.)

PAIN DESCRIPTOR	PAIN	CAUSE	HOW PAINFUL
Like my brain was bursting	General anaesthetic	Something injected into you	Quite
Like people were standing on it	Pains in ankle	Caught my foot in a hole	Very
Like someone punching	Tummy ache	-	Very
Like something heavy pressing on foot	Twisted ankle	Stood on a ball	Very
Like something was pulling my neck	Sore neck	Jerked it	Tender/sore
Like someone was trying to pull it out	Toothache	The cold	Achey
Lots of sharp needles	Grazed knees	Fell over	Very
Made me see less	Pain in head	Bashed into wall	Very
Not sure	Banged funny bone	I banged it	Quite
On and on	Bad finger	Jamming it in door	Quite
Someone hitting me with sharp instrument	Split head	Fell off roundabout	Very
Someone hitting my ear	Earache	-	Quite
Something inside was sucking me together	Wind pain	-	Very
Thousand needles stuck in my knee	Pain in knee	Fell over	Very very
When I hit it, it felt as if I didn't hit in in the first place	My leg going off	I was sitting on my leg too long	Not very
Your bones breaking	Cramp	Crouching down	Very

A P P E N D I X 5

APP. 5(a)

SUBJECT	DIAGNOSIS	AGE AT ONSET	AGE AT TIME OF STUDY
1	JCA	2.0	9.4
2	JCA	2.0	8.0
3	JRA	7.1	11.5
4	JCA	5.3	14.8
5	JCA	2.7	13.9
6	JCA	1.9	12.4
7	JCA	9.1	15.7
8	JRA	14.0	14.5
9	Dermatomyocitis	6.5	12.5
10	JCA	0.11	8.8
11	Dermatomyocitis	4.8	10.4
12	JCA	4.1	16.2

JRA = Juvenile Rheumatoid Arthritis
JCA = Juvenile Chronic Arthritis

<u>Diagnosis and age of children who took part in the study</u>

APP. 5(b)

1	Patient prone	(a) Hip extension - leg lifted by patient - slight overstretch by physio and hold position (b) Bend knee towards bottom - slight overstretch by physio - pull and hold position (c) Back extension - hold by patient
2	Sitting with legs out straight	(a) Tightening quadriceps (b) Straight leg raising (c) Knee flexion and extension
3	Sitting over edge of bed	(a) Knee extension - hold position while resistance given by physio. Knee flexion (b) Ankle movements - sitting with legs out straight: i) Dorsiflexion ii) Plantarflexion iii) Inversion - slight overstretch and hold iv) Eversion
4	Sitting over edge of bed	(a) Knee extension - active - assisted by physio - hold position (b) Knee flexion - active and resisted movements - then hold position (c) Patellas movements - sideways and up and down by physio (left stuck)
5	Sitting over edge of bed	(a) Knee extension - active - assisted by physio
6	Patient sitting	(a) Shoulder flexion - active - assisted by physio with overstretch (b) Shoulder abduction (c) Neck extension - active - overstretch by physio (d) Neck rotation with overstretch (e) Neck side flexion with overstretch
7	Lying on bed	(a) Knee and hip flexion - active - assisted by physio with overstretch (b) Hip abduction - active - assisted by physio with overstretch
8	Patient sitting	(a) Wrist extension - slight overstretch by physio - flexion - lateral movements (b) Finger flexion/extension (c) Neck flexion/extension (d) Neck rotation (e) Neck side flexion
9	Patient sitting	(a) Shoulder flexion - active - assisted by physio (b) Shoulder abduction with overstretch (c) Elbow extension/flexion with overstretch (d) Suprination/pronation with overstretch (e) Wrist extension/flexion (f) Finger flexion/extension - with overstretch
10	Lying on bed	(a) Neck traction - extension/flexion - side flexion and rotation with overstretch
11	Patient sitting	(a) Shoulder flexion/extension with overstretch by physio (b) Shoulder abduction/adduction with overstretch by physio (c) Elbow flexion/extension with overstretch at extremes of movement (d) Pronation/suprination of forearm against resistance plus overstretch at extremes of movement
12	Sitting with legs out straight	(a) Mobilisation of patella (b) Sitting over edge of bed - knee flexion/extension - hold/relax

Exercises which individual children carried out on each day of the study

APP. 5(c)

Probability of occurrence of pain faces and pain vocalisations for each subject on each day of the study

SUBJECT	DAY 1				DAY 2				DAY 3				DAY 4			
	DURATION OF SESSION	PROBABILITY OF PAIN FACE	PROBABILITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	PROBABILITY OF PAIN FACE	PROBABILITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	PROBABILITY OF PAIN FACE	PROBABILITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	PROBABILITY OF PAIN FACE	PROBABILITY OF VOCALISATION	DRUG (D) OR PLACEBO (P)
1	3' 57"	0.82	0.68	D	2' 42"	0.84	0.54	D	2' 27"	0.89	0.75	P	1' 22"	1.00	0.70	P
2	2' 35"	0	0	P	1' 18"	0.11	0	P	1' 35"	0.21	0	D	50"	0.36	0	D
3	3' 51"	0.21	0.04	D	1' 26"	0	0	D	1' 37"	0.52	0	P	1' 36"	0.42	0.10	P
4	4' 18"	0.39	0.27	D	3' 17"	0.41	0.20	D	3' 18"	0.27	0.21	P	4' 04"	0.24	0.04	P
5	1' 52"	0.78	0	P	1' 33"	0.70	0	P	1' 47"	0.38	0	D	1' 25"	0.47	0	D
6	2' 25"	0.22	0.07	P	1' 50"	0.38	0.19	P	1' 47"	0.26	0.08	D	1' 36"	0.31	0.10	D
7	2' 30"	0.32	0	P	2' 44"	0.36	0	P	1' 53"	0.34	0	D	1' 55"	0	0	D
8	2' 50"	0.09	0	D	3' 30"	0	0	D	4' 26"	0.19	0	P	2' 39"	0.06	0	P
9	2' 42"	0.62	0.06	D	2' 56"	0.57	0.11	D	1' 44"	0.73	0.31	P	3' 00"	0.54	0.21	P
10	50"	0.57	0.28	P	50"	0.36	0.36	P	1' 03"	0.30	0.15	D	1' 14"	0.30	0.15	D
11	2' 25"	0.96	0.06	P	2' 46"	0.77	0.19	P	2' 36"	0.58	0	D	2' 38"	0.77	0.06	D
12	2' 27"	0	0	D	2' 50"	0.36	0	D	4' 29"	0.44	0.12	P	1' 50"	0.34	0.08	P

APP. 5(d)

Mean probability of occurrence of defined behaviours under drug and placebo conditions

	DRUG		PLACEBO	
Subject	Pain Face Expression	Pain Vocalisations	Pain Face Expression	Pain Vocalisations
1	0.83	0.61	0.97	0.73
2	0.28	0	0.05	0
3	0.10	0.02	0.47	0.05
4	0.40	0.23	0.26	0.12
5	0.43	0	0.74	0
6	0.28	0.09	0.30	0.13
7	0.17	0	0.34	0
8	0.04	0	0.12	0
9	0.60	0.08	0.63	0.26
10	0.30	0.15	0.46	0.32
11	0.67	0.03	0.86	0.12
12	0.18	0	0.39	0.10

APP. 5(e)

Mean intensity of pain faces and vocalisations for each day of the study

	DAY 1				DAY 2				DAY 3				DAY 4			
SUBJECT	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)
1	3' 57"	5.6	3.7	D	2' 42"	6.1	4.0	D	2' 27"	6.1	3.58	P	1' 22"	6.25	3.42	P
2	2' 35"	1.5	0	P	1' 18"	1.66	0	P	1' 35"	2.5	0	D	50"	2.0	0	D
3	3' 51"	1.9	3.0	D	1' 26"	1.33	0	D	1' 37"	1.2	0	P	1' 36"	1.33	0	P
4	4' 18"	3.58	1.75	D	3' 17"	4.73	1.5	D	3' 18"	5.06	1	P	4' 04"	5.27	2.0	P
5	1' 52"	4.6	1.0	P	1' 33"	4.25	0	P	1' 47"	3.77	0	D	1' 25"	3.5	0	D
6	2' 25"	1.57	0	P	1' 50"	2.57	1.5	P	1' 47"	1.2	0	D	1' 36"	3.0	1.0	D
7	2' 30"	5.9	1.0	P	2' 44"	5.37	1.0	P	1' 53"	5.63	1.0	D	1' 55"	4.18	0	D
8	2' 50"	1.16	0	D	3' 30"	1.00	0	D	4' 26"	2.89	0	P	2' 39"	1.8	0	P
9	2' 42"	4.37	1.0	D	2' 56"	4.17	1.0	D	1' 44"	5.0	1.0	P	3' 00"	4.76	1.0	P
10	50"	3.5	0	P	50"	4.6	1.0	P	1' 03"	2.6	1.0	D	1' 14"	3.33	0	D
11	2' 25"	6.53	1.0	P	2' 46"	6.33	1.0	P	2' 36"	4.5	0	D	2' 38"	5.46	0	D
12	2' 27"	2.0	0	D	2' 50"	3.41	0	D	4' 29"	3.6	0	P	1' 50"	3.25	0	P

APP. 5(f)

Mean pain intensity of defined behaviours under drug and placebo conditions

	DRUG CONDITION		PLACEBO CONDITION	
Subject	Facial Expression	Vocalisations	Facial Expression	Vocalisations
1	5.85	3.85	6.17	4.91
2	2.25	0	1.58	0
3	1.61	1.50	1.26	0
4	4.15	1.62	5.16	1.50
5	3.63	0	4.42	0.50
6	2.10	0.50	2.07	0.75
7	4.90	0.50	5.63	1.00
8	1.08	0	2.34	0
9	4.27	1.00	4.88	1.00
10	2.96	0.50	4.05	0.50
11	4.98	0.50	6.43	1.00
12	2.70	0	3.42	0

APP. 5(g)

Mean intensity of pain faces and vocalisations for each day of the study

	DAY 1				DAY 2				DAY 3				DAY 4			
SUBJECT	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)	DURATION OF SESSION	MEAN INTENSITY OF PAIN FACE	MEAN INTENSITY OF PAIN VOCALISATION	DRUG (D) OR PLACEBO (P)
1	3' 57"	4.44	4.00	D	2' 42"	4.47	4.00	D	2' 27"	4.63	3.5	P	1' 22"	4.13	3.00	P
2	2' 35"	1.75	0	P	1' 18"	2.32	0	P	1' 35"	2.17	0	D	50"	2.2	0	D
3	3' 51"	2.13	3.5	D	1' 26"	1.86	0	D	1' 37"	1.95	0	P	1' 36"	1.8	0	P
4	4' 18"	3.64	1.5	D	3' 17"	3.17	1.5	D	3' 18"	3.85	1.00	P	4' 04"	3.08	1.5	P
5	1' 52"	3.92	1.00	P	1' 33"	3.61	0	P	1' 47"	3.19	0	D	1' 25"	2.7	0	D
6	2' 25"	2.25	0	P	1' 50"	2.8	1.00	P	1' 47"	2.18	0	D	1' 36"	2.53	1.00	D
7	2' 30"	3.78	0.5	P	2' 44"	4.86	1.00	P	1' 53"	4.09	0.75	D	1' 55"	3.87	0	D
8	2' 50"	1.45	0	D	3' 30"	1.22	0	D	4' 26"	2.65	0	P	2' 39"	1.28	0	P
9	2' 42"	3.05	1.00	D	2' 56"	3.28	1.00	D	1' 44"	3.06	1.00	P	3' 00"	2.92	1.00	P
10	50"	3.00	1.00	P	50"	2.6	1.00	P	1' 03"	3.2	1.00	D	1' 14"	2.57	0	D
11	2' 25"	4.4	1.5	P	2' 46"	3.56	0.75	P	2' 36"	3.41	0	D	2' 38"	3.72	0	D
12	2' 27"	1.47	0	D	2' 50"	2.68	0	D	4' 29"	2.80	0	P	1' 50"	2.58	0	P

APP. 5(h)

Mean pain intensity of defined behaviours under drug and placebo conditions

	DRUG CONDITION		PLACEBO CONDITION	
SUBJECT	FACIAL EXPRESSION	VOCALISATIONS	FACIAL EXPRESSION	VOCALISATIONS
1	4.46	4.00	4.38	3.25
2	2.19	0	2.03	0
3	1.99	1.75	1.88	0
4	3.41	1.50	3.47	1.25
5	3.51	0	3.20	0.50
6	2.36	0.50	2.53	0.50
7	3.98	0.38	4.32	0.75
8	1.34	0	1.97	0
9	3.17	1.00	2.99	1.00
10	3.05	0.50	2.65	1.00
11	3.88	0	3.68	1.12
12	2.08	0	2.69	0

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