A LONGITUDINAL STUDY OF THE CONTRIBUTION OF DENTAL EXPERIENCE TO DENTAL ANXIETY IN CHILDREN BETWEEN THE AGES OF NINE AND TWELVE

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PATRICIA ANN MURRAY

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BY

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of the requirements of the degree of
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ABSTRACT

Previous research has indicated that there are several factors contributing to the development of dental anxiety in children. These include child characteristics, environmental influences and elements associated with the dental situation. One area which has not received adequate attention is the influence of dental experience on the dental anxiety reported by pre-adolescents. To examine this relationship more fully, a two part investigation was carried out on a group of school children, distributed equally by sex and presently 12 years of age. Part one, the longitudinal component of the study, assessed the dental anxiety of these children at the ages of 9 and 12 years, with Corah's Dental Anxiety Scale (DAS). Part two involved recording the dental treatment occurring during the intervening three years. This experience was quantified and qualified as follows: total number of dentists, planned visits and emergency visits, regular versus irregular attendance, check-up only versus restoration work and total number of injections, extractions and fillings. Additional factors also demonstrated to be relevant to the etiology of dental anxiety and included in this investigation are, prediction of good behaviour at the dentist, view of peers' attitudes towards going to the dentist, general fearfulness and SES. Results indicated that overall, there was a significant increase in dental anxiety between the ages of 9 and 12 years. Males and females responded differently, with females displaying an increase in dental anxiety while males displayed a slight decrease. Dental experience was not a great predictor of this anxiety. The strongest predictor, for both males and females, was the medical fears factor of the Fear Survey Schedule for Children-Revised (FSSC-R), which was used to measure general fearfulness. Implications of these results and suggestions for future research are presented.

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TABLE OF CONTENTS

INTRODUCTION 1

Assessment of Dental Anxiety 1
Overt behaviour 1
Physiological responses 4
Cognitive responses 4

Literature Review 8

Child Characteristics 8
Age 9
IQ 11
Sex differences 12
General fearfulness 13

Environmental Influences 16
Maternal anxiety 16
Modeling 19
Birth order 22
Parenting style 23
Socioeconomic status 24

Elements Associated With the Dental Setting 26
Dental experience 26
Traumatic experiences 29
Mothers' presence 29
Patient/dentist relationship 32
Avoidant versus regular attenders 32
Medical experience 33

Rationale for Present Study 34

METHOD 36

Procedure 36

Part 1-1983 School Survey 36

1983 Questionnaire 36
Dental anxiety 37
Rating of peers 38
Self-efficacy/prediction of good behaviour 38

1983 Survey Administration 38

1986 School Survey 38

1986 Questionnaire 39
General fearfulness 39
Procedure ranking 40
Socioeconomic status 40

1986 Survey Administration 41

Part 2-Collection of Dental Information In 1986 41

Consent Forms 41

Dental Information Record Form 42

RESULTS 43

Sample 43

Changes in Dental Anxiety Scores Over the Three Year period 45

Procedure Ranking 47

The Relationship of Dental Anxiety to Dental Experience 47

Contribution of Dental Experience to Dental Anxiety 50

Regression Analyses of Pre-Measures and Dental Experience Variables 51

Regression Analyses of Current Measures 56

Conclusions Based on Correlation and Regression Analyses 56

DISCUSSION 58

Differential Report of Dental Anxiety for Males and Females 58

The Contribution of Dental Experience to Dental Anxiety....59

Procedure Ranking....61

Significant Correlation Relationships....62

Significant Predictors of Dental Anxiety....64

General Observations....66

Conclusion....67

REFERENCES....68

APPENDIX A: 1983 Questionnaire....95

APPENDIX B: 1986 Questionnaire....106

APPENDIX C: 1983/1986 Questionnaire Instructions....118

APPENDIX D: Letters Requesting Permission of School Boards....122

APPENDIX E: Consent Form....127

APPENDIX F: Letter to the Newfoundland Dental Association....129

APPENDIX G: Dental Experience Record Form....131

APPENDIX H: Means and Standard Deviations of All Variables....134

LIST OF TABLES

Table 1: Sex Distribution for the Three Samples Considered in this Study 76

Table 2: Sample Distribution of Subjects in the Low/Average and Moderate/High Categories of Dental Anxiety in 1983 77

Table 3: Time of Evaluation by Sex Analysis of Variance 78

Table 4: Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with the Dental Experience Variables for the Dental Experience Sample and Males and Females Taken Separately 79

Table 5: Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with the Fear Survey Schedule for Children-Revised(FSSC-R) and its Five Factors, for the Study Sample and Males and Females Taken Separately 80

Table 6: Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with Child Characteristic Variables for the Study Sample and Males and Females Taken Separately 81

Table 7: Multiple Regression Analysis of the Contribution of the Pre-Measures and Dental Experience Variables, Including Sex, to 1986 Dental Anxiety Scores 82

Table 8: Multiple Regression Analysis of the Contribution of the Pre-Measures and Dental Experience Variables, Including Sex, to Females' 1986 Dental Anxiety Scores 83

Table 9: Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores 84

Table 10: Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including 1983 Dental Anxiety Scores to, Females' 1986 Dental Anxiety Scores 85

Table 11: Multiple Regression Analysis of the Contribution of the

Restoration Treatment Procedures, Including the Interaction Term 'Inject', Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores 86

Table 12: Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject' and 'Extract', Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores 87

Table 13: Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject', 'Extract' and 'Filling', Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores 88

Table 14: Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject', 'Extract' and 'Filling' and 1983 Dental Anxiety Scores, to Females' 1986 Dental Anxiety Scores 89

Table 15: Multiple Regression Analysis of the Contribution of the Current Measures, Including Sex, to 1986 Dental Anxiety Scores 90

Table 16: Multiple Regression Analysis of the Contribution of the Current Measures, to Males' 1986 Dental Anxiety Scores 91

Table 17: Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised(FSSC-R) Factors, Including Sex, to 1986 Dental Anxiety Scores 92

Table 18: Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised(FSSC-R) Factors, to Males' 1986 Dental Anxiety Scores 93

Table 19: Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised(FSSC-R) Factors, to Females' 1986 Dental Anxiety Scores 94

LIST OF FIGURES

Figure 1: Mean Dental Anxiety Scores as a Function of Time of Evaluation and Sex 46

Figure 2: Mean Rankings of Dental Treatment Procedures by Subjects in the Study Sample 48

Figure 3: Schematic Diagram of Components Contributing to the Multiple Regression Analyses 52

It is common for a trip to the dentist to elicit excessive uneasiness in children and adults. Yet a complete explanation of the evolution of dental anxiety has yet to be gained. Therefore, an investigation into the etiology of this fear seems timely. The present review will begin with a brief description of the assessment of dental anxiety to provide an operational definition of the phenomenon.

Assessment of Dental Anxiety

It is now customary to think of anxiety as expressing itself in three assessable response modes: overt behaviour, physiological and cognitive responses (Lang, 1978 & Rachman, 1978). Following is a brief overview of the techniques used to assess each of these expressions of anxiety as they apply to the dental situation.

Overt behaviour. Several investigators interested in dental anxiety have focused their research on how to eliminate children's acting out behaviour in the dental operatory (Corah, 1973; Cullen & Studer, 1985; Ginther & Roberts, 1982; Heffernan & Azarhoff, 1971; Holst & Crossner, 1984; Jackson, 1974; Klepac, 1974; Machen & Johnson, 1974; Melamed, Hawes, Heiby & Glick, 1975; Melamed, Weinstein, Hawes & Katin-Borland, 1975; Neiburger, 1978; Pinkham & Schroeder, 1975 & Williams, Hurst & Stokes, 1983). Acting out behaviour refers to disruptive activities such as biting, hitting, kicking, screaming and refusing to open one's mouth. As a result of this research, several scales have been devised to monitor and assess this problem behaviour. Frankl (Frankl, Shiere & Fogels, 1962) was one of the first to develop a behaviour rating scale specifically applicable to

the dental situation. His scale consisted of a four point response format of behaviour categories ranging from definitely negative which included crying forcefully and refusal of treatment, to definitely positive, which included good rapport with the dentist and enjoyment of the situation. This scale was employed in Frankl's original research to evaluate the child's behaviour during various dental procedures. Kleinknecht and his colleagues (Kleinknecht, Klepac & Alexander, 1973) devised a 27-item scale to "...identify specific fear stimuli and measure patients' reactions" (Kleinknecht et al., 1973, p.843). However, this scale was devised for an adult population. The test-retest reliability across 106 subjects was 0.74. The time interval between the two test administrations was not given. More recently Melamed and her colleagues (Melamed, Weinstein, Hawes & Katin-Borland, 1975) devised a 27-item scale to record the frequency and degree of disruptiveness of the child's acting out behaviour. Their scale was originally devised to help monitor the effects of filmed modeling on the child's behaviour in the dental operatory. These authors completed the scale while the child separated from mother and during his or her treatment in the dental operatory. The interrater reliability coefficient between four independent raters was 0.98. In a second study employing the same scale, the interrater reliability was 0.99 (Melamed, Hawes, Heiby, & Glick, 1975). This was the only psychometric property presented. When Frankl first published his instrument in 1962, he demonstrated that interrater reliability between three independent observers was 0.97. No other validity and reliability information was given. Johnson and Baldwin (1969) employed an adaptation of Frankl's scale. They were able to establish the reliability of observed ratings at an average of 84.5%. Koenigsberg

and Johnson (1972) also used an adaptation of Frankl's scale when examining the behaviour of 3-to 7-year-old children during sequential dental visits. They determined that interrater reliability between two independent observers ranged from 0.91 to 0.98. Unfortunately, the reliability data of Frankl and Melamed's scales is limited to interrater coefficients. However, the results are consistent and strong which at least partially supports the use of these instruments when recording children's acting out behaviour in the dental operatory.

The assumption underlying the development of the scales is that acting out behaviour is the overt representation of dental fear. In fact, the validity of the scales has been demonstrated by several investigators who have found a positive relationship between children's bad behaviour and their degree of reported dental anxiety (Johnson & Baldwin, 1968, Klorman, Michael, Hilpert & Sveen, 1979; Klorman, Ratner, Arata, King & Sveen, 1978 & Koenigsberg & Johnson, 1972). However, the child's bad behaviour is not the only predictor of dental fear, therefore other elements must be examined when attempting to explain the etiology of dental anxiety. Behaviourally, children and adults respond differently to the dental situation. On the one hand, adults either avoid the dentist if they are afraid or they display little overt behaviour when they do attend for dental treatment. On the other hand, it is customary for children to be taken to the dentist by their parents without being given the choice to stay away (Berggern & Meynert, 1984; Liddell & May, 1984; Lindsay, 1985; Klorman et al.,1978, 1979 & Kronenfield, 1979). Since children seldom have the option to avoid the dentist as anxious adults do, some will express their fear by hitting, biting, screaming or refusing to open their mouths (Lindsay & Woolgrave, 1982) while others will be fearful but remain quiet.

Physiological responses. Children's physiological responses to dental anxiety have been measured through heart rate (Myers, Kramer & Sullivan, 1972; Venham, 1979 & Venham, Bengston & Cipes, 1977, 1978), the Palmer Sweat Index (PSI) (Kleinknecht & Bernstein, 1978 & Melamed, Hawes, Heiby & Glick, 1975) and the galvanic skin response (GSR) (Corah, 1973). Heart rate tended to increase prior to an injection and during other invasive procedures. PSI did not differentiate between control and experimental groups of children, the latter of which viewed a filmed modeling prior to dental treatment. However, a trend emerged which indicated an increase in the PSI during treatment sessions for highly fearful subjects and a decrease with time for non-fearful subjects. GSR responses have been difficult to interpret. Unfortunately, recording children's physiological responses is particularly problematic. Children tend to fidget in the dental chair, which makes it difficult to keep monitoring devices in place. Therefore, this excessive movement will invalidate the instrument readings. Adults, on the other hand, remain quiet in the dental chair which makes the recording of their physiological responses more reliable. Although younger children display greater activity, monitoring the physiological responses in an older child population may be more useful. It is noted in Winer's review that "while the external manifestations of anxiety may be diminishing with age...internal manifestations are evident" (Winer, 1982, p. 1123).

Cognitive responses. Cognitive responses in children have received the least amount of attention in dental anxiety research. Two areas which have received some consideration are the exaggerated expectation of pain when attending for dental treatment and the patient's negative self-statements surrounding the dental

experience. Examples of such self-statements might include "this office has a strange smell and I don't like it" or "the dentist is always so rough, he is probably going to hurt me again this time". Several investigators have focused on the exaggerated expectation of pain in an adult population and have demonstrated that the degree of expected pain is significantly greater then the degree of experienced pain (Kent 1984, 1985; Kent & Warren, 1985; Lindsay, Wege & Yates, 1984 & Shoben & Borland, 1954). This is especially true in the case of women (Wardle, 1984) and dentally anxious subjects. The child's expectation of pain has received considerably less attention. Bailey and his colleagues (Bailey, Talbot & Taylor, 1973) looked at a sample of 80 dental patients between the ages of 9 and 12 years. The sample was distributed evenly by sex with half of the children attending for check-ups only and the other half receiving acute care. Among other measures, these children were administered a 5-item questionnaire first to establish the existence of dental anxiety and then to determine its cause. The response choice "I am afraid I will be hurt" was the most common cause selected by the 9, 10 and 11 year old subjects (50%, 30% and 40% respectively). In relation to this discussion on the anticipation of pain, it is suggested that a fear of being hurt can be interpreted as a fear of experiencing pain. Only 10% of the 12-year-olds attributed their fear to the belief they would be hurt. In fact 60% denied experiencing any fear at all. There was no measure employed to determine if a child had actually been hurt by the dentist during treatment. It is clear from these results that regardless what their past experience had been, 9-to 11-year-old children freely express the worry they may be hurt.

Children's self-talk in the dental situation has only recently received

attention (Hunt-Fitzgerald & Liddell, 1985). Through interviewing and observing a sample of 8-to 10-year-old girls and boys, Curry and Russ (1985) determined that children employ at least two different cognitive coping strategies when undergoing dental treatment. These strategies include: being aware of what the dentist is doing, concentrating on the positive aspects of the dental visit such as getting a prize, pretending procedures like an injection will just squirt water, repeating comforting self-statements such as "the session will be over soon", regulating one's behaviour by telling onself to sit still etc. and distracting oneself by thinking of pleasant activities or looking at a poster or mobile hanging in the dentist's office. Older children tended to use more of these strategies than younger children. This illustrates the older child's growing cognitive sophistication and ability to assimilate the situation and cope effectively with it. This further indicates that children are actively processing their dental experience and therefore should be taught and encouraged to employ positive cognitive coping strategies.

In summary, probably the most comprehensive way to assess dental anxiety is to evaluate it using all three measures: overt behaviour, physiological and cognitive responses. Employing behaviour rating scales is the most common way to record uncooperative behaviour in the dental operatory. There is a substantial amount of empirical evidence to support the notion that acting out behaviour is the overt representation of dental anxiety. Physiological responses monitored with children include the Palmer Sweat Index, the Galvanic Skin Response and heart rate. Yet given the child's overall activity level in the dental chair, physiological measures are more reliable with an adult population. Cognitive responses in the

dental situation have received the least amount of attention. The exaggerated expectation of pain experienced by women and those suffering from severe dental anxiety is the most widely researched cognitive influence on dental fear. The one investigation cited above considering children, determined that 9-,10- and 11-year-olds attributed the cause of their fear of the dentist to the belief they would be hurt. It is suggested that a fear of being hurt by the dentist can also be interpreted as a fear of experiencing pain. Unfortunately when considering these three response channels, the results have not been concordant (Kleinknecht & Bernstein, 1978; Melamed, Weinstein & Hawes & Katin-Borland, 1975 & Winer, 1982). Kleinknecht & Bernstein (1978) determined that self-report measures of adult dental anxiety were "surprisingly independent" (Kleinknecht & Bernstein, 1978, p. 631) of the patients' overt behaviour. This suggests adults may admit to an excessive fear of the dentist without displaying any outward signs of unease or discomfort. These authors also presented a weak and ambiguous relationship between self-reported fear and ratings on the Palmer Sweat Index. Melamed and her colleagues (Melamed, Hawes, Heiby & Glick, 1975 & Melamed, Weinstein, Hawes & Katin-Borland, 1975) demonstrated that self-report measures of dental anxiety in children did not correlate with the children's Behaviour Profile Rating scores. The authors suggest this result supports the multidimensional concept of fear where manifestations in one system such as behaviour can be altered without affecting another system such as subjective reports. The significance of these discrepancies, evident in the multi-method assessment of dental fear, has yet to be explained.

Literature Review

This review will focus on empirical studies in the area of the etiology of dental anxiety in children. Although there is a considerable volume of literature based on anecdotal accounts and the psychodynamic interpretation of dental fear, (Eli, Kleinhauz & Bar-Gil, 1983 & Lewis, 1957) no scientifically sound conclusions can be drawn, or generalizations made, on the basis of these sources. Therefore, these non-experimental studies will not be considered here. Investigators have examined several factors when attempting to explain the development of dental anxiety. These can be described under three major headings: child characteristics, environmental influences and elements associated with the dental situation. The terms fear and anxiety will be used interchangeably here. For the purposes of this discussion, restoration treatment and invasive procedures will refer to injections, fillings and extractions. Much of the research in this area has been conducted on a population of pre-school and primary school aged children attending the dentist for the first time. Less work has been carried out with elementary and junior high school pre-teen children.

Child Characteristics

Winer (1982) compiled the first comprehensive review of children's fearful behaviour at the dentist. His review was restricted to articles published in English, based on empirical evidence and considering a population of children who did not display signs of pathology, such as phobias. He evaluated several factors which

investigators have considered relevant to the development of dental anxiety. The child characteristics to be addressed here include: age, sex, IQ, and general fearfulness.

Age. From a developmental perspective, it is interesting to map the evolution of dental anxiety as it unfolds during childhood. The difficulty, as Winer (1982) points out, is that the progression of this anxiety does not develop in a linear fashion and therefore is not easily explained. In other words, dental anxiety does not simply increase or decrease with age. The early course of dental fear has been previously investigated by Venham and his colleagues (Venham, Bengston & Cipes, 1977). They used a sample of pre-school children and recorded anxiety levels during each of the children's first six dental visits. Venham et al. found that observer ratings of the children's behaviour and anxiety increased over the first four visits and then decreased for the final two. However, the children's self-report ratings of their anxiety remained the same across visits. This shows that the children did not acknowledge a qualitative difference in their experience. Yet, observers noted decreases in acting out behaviour and other overt signs of anxiety.

Venham and Quatrocelli (1977) suggested that as children become more comfortable with the mirror/explorer examination, they also become more sensitized to invasive procedures such as an injection. This suggests that with experience children are able to discriminate between the minimal discomfort experienced during a check-up and the more severe discomfort experienced during restoration procedures. By administering a self-report measure to junior high, senior high and college students, Kleinknecht and his colleagues (Kleinknecht et

al., 1973) determined that there was a significant increase in dental anxiety between junior and senior high school students. Junior high subjects were the least fearful of the three groups, senior high subjects were the most fearful and college students fell between these two samples. The results imply that anxiety increases with age through adolescence and then levels out as students reach adulthood. According to the responses on Kleinknecht's scale, fear of injection and fear of the drill were the most fear arousing stimuli regardless of which group the subject belonged to. Bailey et al. (1973) in their study of acute care versus check-up only subjects, revealed that at 9 years 20% of the sample reported not being afraid while at 12 years 60% reported not being afraid. Yet, Liddell (1985) in a cross-sectional study of the same age group, found that there was a significant increase in the self-reported dental anxiety between 9 and 12 year olds. Klorman and his colleagues, (Klorman et al.,1978, 1979) considering a sample of 3 to 13 year olds with and without dental experience, found that anxiety decreased significantly with age for those who had previous experience with invasive treatment. No such relationship was evident for those without such previous experience.

In summary, Venham and Quatrocelli's (1977) results suggested that dental anxiety would increase with inereased exposure to stressful procedures, while Kleinknecht et al, (1973) looking at an older population, determined that anxiety increases proportionately across stressful and non-stressful situations between junior and senior high school. Bailey et al. (1973), looking at a sample of 9 to 12 year olds, suggested that fear decreases between these two age groups while Liddell (1985) determined that fear increases between these two age groups.

Neither author looked at specific dental experience. Klorman et al. (1978, 1979), considering a sample of 3 to 13 year olds with and without experience, determined that anxiety decreases for those with experience of dental procedures. Therefore, it is obvious that experience may be playing a role in the acquisition of dental anxiety and therefore should be considered when clarifying discrepancies in the developmental changes evident in dental fear.

Winer (1982) suggests two possible explanations for the ambiguity surrounding age and dental anxiety. First of all an increase in dental anxiety could be attributed to an increase in exposure to invasive procedures. To address this question, what is needed is a detailed examination of just what this exposure might consist of and how it might be influencing dental anxiety at different ages. To date, such a detailed examination has not been reported. The second possibility is that with increased exposure there is decreased anxiety. Brown and his colleagues (Brown, Wright & McMurray, 1986) support this idea through their finding that high anxiety children have fewer fillings and diseased teeth while low anxiety children had more fillings and diseased teeth. This implies that children, through habituation, assimilate the experience and cope effectively with it. An additional consideration may be that as children grow older, they become more cognitively sophisticated and in turn more aware of the overall competence of the dentist (Kleinknecht et al., 1973 & Winer, 1982). This may lead to an increase in dental anxiety as these children begin to worry about what might go wrong during dental treatment.

IQ. Very few investigations have considered the child's level of intellectual

functioning as a predictor of his or her dental anxiety. The few studies Winer (1982) did review found a curvilinear relationship between IQ and dental fear. Subjects evaluated as very high and very low in intelligence were reported to have an overall higher degree of dental anxiety (Dibona, 1973 & Rud & Kisling, 1973). How these authors assessed IQ was not reported in Winer's review. However, other investigators have employed instruments like the Columbia Test of Mental Maturity (Howitt, 1967) and the Peabody Picture Vocabulary test (Venham, Murray & Gaulin-Kremev, 1976). These measures have limited norms and weak validity and reliability. Therefore, results must be considered with caution. A more complete and scientifically acceptable IQ measure should be employed such as the Wechsler Intelligence Scale for Children-Revised (WISC-R) (Wechsler, 1974), or the McCarthy Scales of Children's Abilities (McCarthy, 1972). Both measures have acceptable norms and good validity and reliability. Before any empirically sound conclusions can be drawn, considerably more examination is required.

Sex differences. It is widely accepted and has been empirically demonstrated that throughout the general population women admit to their fears more readily than do men (Carlsson, 1985; Geer, 1965; Ollendick, 1979, 1983; Ollendick, Matson & Helsel, 1985 & Scherer & Nakamura, 1968). Due to socialization influences this sex difference becomes prominent when children reach puberty (Winer, 1982). Such is also the case with boys' and girls' level of dental anxiety (Kleinknecht et al., 1973 & Venham, 1979). In Kleinknecht et al.'s study of junior high, senior high and college students, females rated themselves significantly higher on his dental anxiety scale. In her study of 9-to 12-year-old males and

females, Liddell (1985) reported a significant sex difference in the children's self-reported dental anxiety after the age of 9. These findings fit with the "...hypothesis that sex differences increase with age because of socialization" (Winer, 1982, p.1127). However, the question still remains, are girls simply more likely to report their fear than boys or are they genuinely more afraid? Dental anxiety is a unique fear in that it tends to be acceptable in North American society, therefore, it should be equally probable for males and females to admit to it. Yet, only a portion of investigators have failed to produce a significant sex difference (Berggren & Carlsson, 1984 & Bernstein, Kleinknecht & Alexander, 1979). Wright, Lucas and McMurray (1980) presented a puzzling result. By examining a sample of 307 children, aged between 4 to 9 years and distributed evenly by sex, they were able to demonstrate that females had a significantly higher score on the dental anxiety scale than did males. This sex variable also accounted for the greatest amount of the variance in a step-wise multiple regression equation with the dental anxiety score acting as the dependent variable. Children in this age category are young to be displaying such a significant sex difference for the phenomenon of dental anxiety. The authors acknowledge that this result has not been previously reported; but were unable to offer any explanation for it. Clarification of these conflicting results is warranted. However, the overall evidence does appear to support the well established notion that with fears in general as well as with dental anxiety, sex differences emerge with the onset of puberty.

General fearfulness. In his review article, Winer states "...it seems likely that the anxiety shown in the dental situation reflects more general and more basic

types of anxieties or fears, such as bodily harm and invasion" (Winer, 1982, p. 1122). In fact, investigators have demonstrated that the child's degree of general anxiety does influence his or her degree of dental anxiety. Brown et al. (1986) determined that general anxiety was a significant contributor to the child's self-reported level of dental anxiety by assessing general anxiety in a population of 7- to 11-year-old Australian children. The eleven anxiety items on the Piers Harris Children's Self-Concept scale (Piers, 1969) were used to assess general anxiety. With several additional factors included in the backward regression analyses, general anxiety accounted for the greatest amount of the variance. Two notable weaknesses in this study must be considered here. First of all, the specific amount of the variance accounted for by each of the significant predictors of dental anxiety was not presented. Secondly, the measure employed to evaluate general anxiety was limited in that it did not include a sufficient number of potentially fearful objects and situations. Therefore, before these results can be accepted, a more encompassing measure of the child's overall fearfulness is needed. It is also important to determine the magnitude of the individual predictor variables to better explain the contribution of each to the child's level of dental anxiety.

The pattern of general fears in childhood remains ambiguous. Earlier literature in the area suggested fears were age specific. For example, pre-school children are afraid of the dark, dogs, supernatural creatures and to a lesser degree, bodily injury. Older children worry about success at school, how they are viewed by their peers and, bodily injury (Bauer, 1976; Berecz, 1968 & Morris & Kratochwill, 1983). Therefore, while fears of the dark and dogs tend to decrease over time, fear of bodily injury increases with age. However, in a recent article by

Ollendick and his colleagues (Ollendick et al., 1985), fears were found to be more consistent across age groups. There was no evidence of the developmental trends indicated in the literature. Ollendick acknowledged that fears in childhood are common, but his results suggest that such childhood fears may not necessarily be transitory. It is important to note that Ollendick did not consider children under 7 years of age. His results are therefore limited in suggesting that between the ages of 7 and 18, fears tend to be common and stable. How dental anxiety fits into this fear structure is not clear. A certain uneasiness about attending for dental treatment is common at all ages. A fear of bodily injury, which can be related to dental anxiety, becomes more prominent at approximately 7 years (Morris et al., 1983) and is said to increase with age (Bauer, 1976). This could explain why dental anxiety increases with age. However, the discussion above indicates that developmental changes in dental anxiety have yet to be clarified.

Researchers have also examined the children's manifest anxiety level as it relates to dental anxiety. Castaneda and his colleagues (Castaneda, McCandless & Palermo, 1956) devised the children's form of the Taylor Manifest Anxiety Scale for adults (Taylor, 1953). The original items on the adult scale were modified to be more comprehensible to a younger population. When adult fear survey schedules, such as Geer's (1965), and Wolpe and Lange's (Grossberg & Wilson, 1965), are correlated with the adult version of the Taylor Manifest Anxiety Scale, resulting correlations are 0.38 and 0.40 respectively. Fear survey scores for children have also been correlated with the children's version of the manifest anxiety scale (Scherer & Nakamura, 1968). The resulting correlation was 0.45. These correlations indicate that manifest anxiety and general fearfulness share a

common dimension. However, manifest anxiety is more a measure of general reactivity while general anxiety is a measure of reactivity to individual stimuli. The question remains, is dental anxiety a unique fear unrelated to overall anxiety, or is it simply reflecting a more general degree of fearfulness. To address this issue, it is believed that a more complete evaluation of general anxiety is necessary.

Environmental Influences

Winer (1982) also included several environmental influences in his review when attempting to explain the etiology of dental anxiety. Those to be addressed here include: maternal anxiety, modeling, birth order, parenting style and socioeconomic status.

Maternal anxiety. One of the most common influences on the child's level of dental anxiety is the level of the mothers' general and dental anxiety. Several investigators have considered this factor when attempting to further clarify the phenomenon of dental fear in children (Bailey et al., 1973; Johnson & Baldwin, 1968, 1969; Klorman et al., 1978, 1979; Koenigsberg & Johnson, 1972; Lindsay, 1984 & Scott, Hirschman & Schroder, 1984). In many cases it was the child's first visit to the dentist. Johnson and Baldwin (1968, 1969) investigated the relationship between mothers' manifest anxiety and children's behaviour during dental visits. These investigators considered a sample of 60 children between the ages of 3 and 7 years. Mothers' manifest anxiety was assessed on Taylor's scale (Taylor, 1953). Children's behaviour during dental visits was assessed with the

Frankl Behaviour Rating Scale (Frankl et al., 1962). These authors did not include a measure to assess dental anxiety. Instead, they assumed overt behaviour represented fear in the dental situation and therefore considered Frankl's scale to be an accurate means of determining dental anxiety. The results indicated that if the mother had a high degree of manifest anxiety, the child displayed significantly more negative behaviour. Mothers with a mild amount of manifest anxiety had children who were better behaved in the dental situation. The authors concluded that given the correlational design of the study, no causative statements could be made. However, they offered two possible explanations for their results. They suggested that a child's misbehaviour at the dentist could lead to a high level of manifest anxiety in his or her mother. Alternatively, it could be that an anxious mother models her fear for her child to emulate in the form of acting out behaviour.

Looking at sequential dental visits, Koenigsberg and Johnson (1972) also looked at a sample of 3-to 7-year-olds. The child's behaviour was assessed according to an adaptation of Frankl's Behaviour Rating Scale (Frankl et al., 1962). The mother's manifest anxiety was evaluated by Taylor's Manifest Anxiety Scale (Taylor, 1953). These investigators determined that high anxiety mothers had disruptive children during the children's first dental visit. However, no such significant relationship was evident when these authors evaluated the second and third visits of the children. Again the relationships were correlational, therefore no causal statements can be made. However, the authors suggest that with time the children appear to be more successful at adjusting to the dental environment regardless of their mothers' levels of manifest anxiety. Previous research has

suggested that family modeling of anxiety was one of the main contributors to dental anxiety (Shoben & Borland, 1954). Scott et al. (1984) looked at a sample of 339 university students to determine the historical antecedents of the students' dental fear. Based on responses given on a questionnaire designed specifically for this investigation, Scott and his colleagues determined that the highly anxious students had parents, siblings and friends who also displayed excessive dental anxiety. The validity and reliability of the questionnaire employed were not presented. Bailey and his colleagues (Bailey et al., 1973) failed to produce the expected positive relationship between mothers' manifest anxiety level and children's acting out behaviour at the dentist. However, previous research in the area monitored behaviour at specific intervals throughout the treatment session, whereas Bailey et al. took one global rating to represent the entire session. This is a less sensitive measure because even if the child had demonstrated acting out behaviour, his or her overall behaviour may have been positive.

Lautch (1971), in his now-classic study of dental phobics, demonstrated that one of the four main factors contributing to dental anxiety in adults was the fear of dental treatment displayed by other family members, especially mothers. Results were recorded as ratios. For example, of the 34 control subjects only 3 reported an extreme fear of the dentist in a family member while 9 of the 34 phobic subjects reported such a familial fear. These results suggest the influence of the family could be contributing to the development of dental anxiety in its members.

The ambiguous results surrounding age and the influence of maternal

anxiety on child behaviour and/or anxiety could be attributed to the mothers' ability to hide their true feelings. In those studies which did not demonstrate a significant contribution of the mother's high level of anxiety to the child's degree of negative behaviour at different ages, the mother may have been able to effectively keep her fear from her child. An interesting aside, based on Bailey et al.'s (1973) research, was the curious result that as anxious mothers attempted to calm and relax their children the children's anxiety increased. This finding suggests that children are able to sense their mothers' anxiety even without the benefit of overt signs. Shoben and Borland (1954) and Forgione and Clark (1974) determined through a structured interview that negative family attitude was one of the significant contributors to adult dental anxiety. Clearly, the influence of family and friends, mothers in particular, is an important contributing factor to the etiology of dental anxiety.

Modeling. Observing the appropriate or inappropriate behaviour of significant others in the dental situation is also said to contribute to the child's development of dental anxiety (Melamed, Hawes, Heiby & Glick, 1975 & Melamed, Weinstein, Hawes & Katin-Borland, 1975). Melamed and her colleagues have conducted several studies to determine the effect of appropriate filmed modeling by a peer on a child's behaviour at the dentist. These authors looked at a sample of 16, 5-to 11-year-olds who were experiencing their first three dental visits. The children's behaviour during this initial dental treatment was recorded on Melamed's Behaviour Rating Profile, which has been discussed above. After viewing the model's effective behaviour in the dental situation, the experimental group scored significantly lower on the Behaviour Profile which was completed by

an independent observer blind to the experimental placement of the child. Low scores on this instrument indicate an absence of acting out behaviour. Experimental subjects viewed the film shortly before their third visit when restoration treatment was to be administered. There were no significant differences between the groups on the Palmer Sweat Index or the Children's Fear Survey Schedule (CFSS) (Sherer & Nakamura, 1968). There were also no significant differences on the Behaviour Rating on the first two visits. However, there was a significant difference on the third visit. The lack of significance between the two groups on the fear score and the physiological measure, prior to intervention, indicates that changes over time between the control and experimental groups cannot be attributed to initial fear levels or variance across subjects in physiological arousal. Given the significance after viewing the model, this indicates that observing a peer modeling appropriate coping behaviour has a positive influence on the child's future behaviour in the dental operatory. With more positive modeling by significant others in the child's life, specifically family and friends, the likelihood of displaying positive behaviour and attitudes concerning the dentist is increased. As Thrash and his colleagues (Thrash, Russel-Duggon & Mizes, 1984) noted, effects of positive modeling is in accordance with the observational learning theory. This theory postulates that by viewing another cope successfully in a given situation one is able to observe the necessary skills and eventually practise them on his or her own. Kleinknecht et al.'s (1973) Behaviour Rating Scale (discussed above), also assessed families' and friends' reactions to dentistry. Seventeen percent of of their sample of junior high, senior high, and college students, reported that family, friends and television fostered, in these

subjects, the expectation of trauma in the dental situation. In adults, Wardle suggests "cultural stereotypes, personal experience, and vicarious experiences combine to generate expectations of harm which understandably produce anxiety" (Wardle, 1984, p.556).

Williams and his colleagues (Williams, Hurst & Stokes, 1983) looked at 5 young boys between the ages of 4 and 9 years who were displaying highly disruptive behaviour at the dentist. The authors were interested in assessing the effects of mastery versus coping models on such uncooperative behaviour. Three of the boys observed and were observed by a peer during dental treatment while two of the boys did not observe a peer but were observed by a peer. All peers participating in the study who were not actually subjects, also received treatment. Behaviour was rated according to a criterion established by the authors for the purposes of this investigation. Results were presented as the percentage decrease of disruptive behaviour between baseline and the proceeding dental visits when the children observed and were observed by peers. Statistical significance was not calculated, however, the face validity of the results is impressive. For example, one subject's difficult behaviour decreased substantially from 54% during the first visit to 2% during a later session. Therefore, while some bad behaviour persisted, overall there was an improvement when the peer was present. Furthermore, the observers displayed cooperative behaviour throughout their own treatment sessions. Behaviour improved regardless of whether the subject viewed a cooperative model or an uncooperative model. Therefore, these authors and other investigators (Ginther & Roberts, 1982) questioned the relevance of the mastery/coping distinction. What the peer observers did was note the

improvement in the children they were watching and emulate this coping behavior without displaying the initial uncooperativeness. It is important to realize that the sample size was small and therefore the statistical analysis was limited. However, these results do suggest peer influence is sufficiently powerful to alter the child's behavior while receiving dental treatment. Whether or not the child's experience of fear was also altered, is impossible to determine from these data. Ginther and Roberts employing both coping and mastery models, found no decrease in their subjects' degree of fearfulness. Given the success reported in previous modeling research (Melamed, Hawes, Heiby & Glick, 1975 & Melamed, Weinstein, Hawes & Katin-Borland, 1975), Ginther and Roberts were led to conclude that modeling may only be beneficial for those who experience a minimum amount of fear. They suggest greater attention should be paid to the initial level of dental anxiety expressed by the subject. For example, Melamed recorded the dental anxiety of her subjects, however, she did not report the results. Since it is impossible to know how anxious they were to begin with, the magnitude of the modeling effect requires further clarification.

Birth order. Birth order as a predictor of dental anxiety has received little attention. However it warrants consideration as ordinal position in the family has been shown to relate to general anxiety. Defee and Himelstein (1969), who conducted one of the few studies in the area, examined a sample of 146 children between the ages of 5 and 10 years. This sample was equally distributed between first-born and later-born children who came from families having at least three children. A rating scale questionnaire was developed to note the subjects' age, sex, birth order, family size, level of cooperation, degree of fearfulness, amount of

crying behavior and sensitivity to pain. Three dentists were asked to complete these forms for their 5-to 10-year-old patients. A median test was performed which demonstrated that first-born children displayed significantly greater anxiety than later-born children. First-born children also cried more in the dental setting, cooperated less and evidenced a greater sensitivity to pain than did later-born children. Researchers have considered birth order as one of several predictors of dental anxiety in an adult population (Schuurs, Duivenvarden, Thaden van Velzen, Verhage, Eijkman & Makkes, 1985) with no significant relationships being presented. Other investigators have produced numbers too small to be analysed (Johnson & Baldwin, 1969). Future investigations in the area of dental anxiety should include birth order to substantiate these clearly suggestive but sparce results.

Parenting style. The literature suggests it is worth considering child rearing practices as they relate to dental anxiety. Again, very little work has been done in this area. However, parenting styles on their own have received considerable attention. Investigators have suggested there are three main parent-child relationships: authoritative, authoritarian and permissive. Authoritative parents encourage independence in their children and include their children in decision making while also exercising a reasonable amount of control and guidance. Authoritarian parents simply enforce rules without consulting or considering their children's views and deal with protest by employing punitive measures. Permissive parents avoid their parental responsibility by not providing sufficient support and guidance for their children (Baumrind, 1972). Of these three generally accepted parenting styles, Venham (1979) suggested that the authoritative parenting style is

most supportive and tends to produce more cooperative patients. Conversely, permissive parents and less structured environments foster bad behaviour by failing to provide adequate modeling, direction and discipline to their children. As indicated earlier, overt behaviour is closely related to anxiety in the dental situation. Authoritarian parents impose too much discipline and structure forbidding the child to display any negative behaviour. Therefore, while an authoritarian parent would not permit any expression of discomfort and fear and a permissive parent may not notice the child's distress, the authoritative parent would accept the child's fear and lack of confidence in the dental situation while acting as a model of more appropriate behaviour. Heffernan and Azarnoff (1971) looked at children's anxiety responses to attending for medical treatment. Mothers who allowed their children to express fear and uneasiness openly, had significantly less anxious children than did mothers who would not tolerate any apprehension or acting out behaviour. These authors also demonstrated that if the mother explained the medical visit in great detail, the child displayed more anxiety. However, if the mother simply responded to the child's particular questions, the child displayed significantly less anxiety. Therefore, the mother who is sensitive to the unique concerns of her child, is likely to have a behaviourally competent child in stressful situations. These findings support the necessity of considering parenting style when examining the etiology of dental anxiety in children.

Socioeconomic status. The socioeconomic status (SES) of the child's family has been a common factor taken into account when studying children's dental anxiety. Investigators have examined SES levels individually and cross-sectionally. One difficulty encountered when examining SES is the variety of formulas

employed to classify occupations. Several researchers have employed the Hollingshead two factor index of social position which is an American scale categorizing according to occupation and level of education (Johnson & Baldwin, 1969 & Koenigsberg & Johnson, 1972). The five resulting categories range from unskilled to professional or college-educated. Other investigators have categorized SES according to education and/or income level without utilizing an established classification system (Kronenfeld, 1979 & Neiburger, 1978). Although the resulting divisions, regardless of the criterion used, tend to be similar, some are more detailed then others. Therefore, it is necessary to be aware of this limitation when evaluating the influence of the various SES classifications.

Several researchers have controlled for SES by considering a restricted subsample of classifications (Maj, Squarzoni Grilli & Belletti, 1967; Melamed, Hawes, Heiby & Glick, 1975 & Venham et al., 1977), or by matching across categories (Lautch, 1971; Machen & Johnson, 1974 & Melsen & Agerbek, 1980), as opposed to comparing categories. In all of these studies, SES was not a significant contributing factor in defining group membership or predicting treatment outcome. Other investigators have compared across SES levels with a substantial portion of the evidence supporting the hypothesis that a lower SES population attend for dental treatment less frequently (Kronenfeld, 1979 & Lindsay, 1984), have poorer dental health (Kronenfeld, 1979), have more fears (Berecz, 1968), and have a less positive attitude about attending for dental treatment (Neiburger, 1978). When considered with a number of additional factors, results suggest that lower SES subjects experience greater dental anxiety (Franco & Croft, 1979; Venham, 1979 & Wright et al., 1980). Yet, once these subjects begin attending

the dentist regularly, they continue to do so as readily as higher SES subjects (Kronenfeld, 1979. & Nikias, Bidmen & Breakstone, 1982). Nikias and his colleagues further demonstrated that rates and patterns of oral home care practices were very similar in high and low SES samples. In summary, it appears that overall, lower SES subjects attend the dentist less frequently and display greater dental anxiety. However, there is a portion of this population which attends the dentist on a regular basis. Furthermore, on the whole, SES does not influence oral hygiene at home. Therefore, Winer concludes that "...social class variables have not been consistently related to fearful and anxious behaviour" (Winer, 1982, p. 1126). To further clarify these results, it is important to include SES as a potential predictor in future research examining dental anxiety.

Elements Associated With The Dental Setting

The third major contributing factor to the acquisition of dental anxiety is related to elements associated with the dental setting. The six elements to be considered here are: dental experience, the influence of a previous traumatic experience, mothers presence in the dental operatory, the patient-dentist relationship, avoidant versus regular attendance at the dentist and the child's medical experience.

Dental experience. Intuitively it makes sense that the quantity and quality of treatment the child experiences at the dentist would make a significant contribution to his or her level of dental anxiety. Unfortunately, researchers have failed to document a comprehensive record of actual dental experience. In an

attempt to determine the relationship between dental anxiety and the various dental treatments, self-report measures, behaviour rating scales and physiological monitoring are often completed during a specific procedure, such as a filling, to demonstrate the amount of anxiety experienced during that particular procedure. Assessment may also take place across a variety of treatments to establish the differential anxiety levels for each one (Fanning & Leppard, 1973; Lindsay, 1984; Myers, Kramer & Sullivan, 1972; Venham et al., 1977 & Venham & Quatrocelli, 1977). However, three potentially influential factors: the quantity and quality of treatment performed, the total number of dentists, and the nature of the visit - regular versus emergency - have not been considered.

When evaluating dental experience, Brown et al. (1986) examined a sample of 247 Australian children between the ages of 7 and 11 years. These investigators looked at the condition of each child's teeth to determine the amount of restoration work and extractions the child had experienced. They calculated the total number of *d*iseased, *m*issing and *f*illed *t*eeth (dmft=primary teeth, DMFT=permanent teeth). What this does not take account of is the unique influence of each invasive procedure, the total number of dentists and the contribution of the previously ignored factors listed above. Results of a multiple regression analysis indicated that 'DMFT' was the third of four significant contributors which together accounted for 30% of the total variance. The three additional contributors were: general anxiety, frequency of dental visits, and sex, in that order. The exact amount of the variance accounted for by these factors individually was not given. The relationship between DMFT and dental anxiety was negative which suggested that those children with high anxiety had

experienced less invasive dental treatment. This in turn suggested that since these children had not had much opportunity to assimilate and process the various procedures, their anxiety remained high. The 'frequency of dental visits' factor also produced a negative relationship to dental anxiety. The fewer dental visits the child experienced, the greater his or her dental fear. This further supports the idea that lack of exposure contributes to an increase in dental anxiety. The authors concluded that dentally anxious children tended to have healthier teeth and therefore had not experienced as much invasive treatment as less anxious children. The significant contribution of the overall state of the permanent teeth (DMFT) presents an indirect indication of what dental procedures the child has experienced. The frequency of dental visits is also a measure of direct experience. Thus, the significant contribution of these two factors to dental anxiety, is a strong indication that dental experience is playing an important role in the acquisition and maintenance of dental fear in children. Yet, the technique used by Brown et al.(1986) does not determine the quantity and quality of dental experience and is therefore inadequate for predicting the contributors to dental anxiety. Other investigators have considered adult and child experience dichotomously as experience/no experience with dental treatment (Ginther & Roberts, 1982; Klorman et al., 1978, 1979 & Lindsay et al., 1984). The weakness here is that classifying experience into two categories makes no attempt to determine the amount and extent of this treatment. It is therefore impossible to extract the relevant aspects of dental experience contributing to dental anxiety. The next logical step is to investigate the elements of dental experience more specifically, to demonstrate their relationship to dental fear.

Traumatic experiences. It is widely accepted in both the folklore and the research literature that a past traumatic experience in the dental situation is one of the strongest predictors of an individual's present level of dental anxiety. The influence of this early experience is commonly determined via retrospective investigations whereby subjects, most frequently adults, are asked to recall their past dental encounters in an attempt to trace the onset of their present dental fear (Lautch, 1971). In fact, a number of authors studying the antecedents of dental anxiety in adults, have found that a previous traumatic experience occuring during childhood accounts for current dental anxiety in a considerable number of the fearful subjects examined (Bernstein et al., 1979; Carlsson, Linde & Ohman, 1980; Klepac, 1974 & Scott et al., 1984). Sermet (1974) related past traumatic medical experience to high anxiety in child dental patients. A thorough description of these traumatic experiences has not been presented. Furthermore, the actual timing of the experience is also unclear. Subjects have reported the trauma occuring as young as 2 years and as old as 18 years (Bernstein et al., 1979 & Lautch, 1971). However, these data were collected retrospectively which is frequently inaccurate because people tend to forget or exaggerate their past experiences. Memories of past dental experience may be influenced by the person's present level of dental anxiety. Dentally anxious subjects recall earlier experiences more negatively then the average dental patient (Bernstein et al., 1979; Holst & Crossner, 1984; & Scott et al, 1984). A current account of what children experience during dental visits may shed some light on what traumatic experiences consist of and when they are occuring.

Mothers' presence. There have been several studies carried out in the area of

dental anxiety in children which have focused on the influence of the mother's presence during dental treatment on the child's overall experience of, and behaviour at, the dentist. In an earlier investigation, Frankl et al. (1962) divided 112 pre-school children aged 42 to 66 months, into two groups. Half of the children had their mothers present for dental treatment while the other half did not. The mothers who remained with their children were instructed to remain passive. The children's behaviour, while in the dentist's chair, was assessed by two independent observers and the practising clinician. In general, children with mothers present displayed fewer negative behaviours, thus implying a limited amount of anxiety experienced by these children. As the children grew older, the mothers' presence no longer had a significant effect. Therefore, for the subjects between the ages of 42 and 49 months, behaviour was significantly better when mother was present. For the 50 to 66 month old subjects, no significant difference in the behaviour they displayed with and without mother present, was observed. Furthermore, the behaviour these older subjects displayed was "overwhelmingly positive" (Frankl et al., 1962, p.158).

Venham and his colleagues (Venham, 1979 & Venham et al., 1978) demonstrated no significant difference in the child's behaviour based on the mother's presence during treatment sessions. When the parent and child were given the opportunity to decide if the parent would remain with the child during dental treatment, presence decreased as dental visits increased. During the initial visit, 86% of the parents remained present in the dental operatory with only 45% of the parents remaining with their children during the sixth and final visit. However, it is the quality of the relationship between parent (most frequently

mother) and child which appears to determine how the parent's influence is perceived by the child. Some children clenched their mother's hand for comfort while other children seemed unaware or reacted badly to having their parent present. Venham observed, but did not record, these differential parent-child interactions in the dental situation. It was clear that some mothers were effective at calming their anxious children while other mothers only facilitated their child's fear. The significance of this relationship has yet to be examined. Frankl and his colleagues (Frankl et al., 1962) have suggested that the mother's presence in the dental operatory is necessary to reassure the child during initial visits to the dentist. However, as the child grows older, other environmental cues become more salient and mother's presence is no longer required. As the child becomes increasingly more familiar with, and comfortable in the dental setting, he or she is able to process the sights, sounds and smells of the dental operatory more effectively. This is clearly a fruitful area for further investigation.

The overall influenoe of mothers' fears and behaviours on children, is a complicated phenomenon. It is difficult to separate the specific contribution of mother's general and dental anxiety to her child's dental anxiety as discussed in the previous section, from the effect of her presence in the dental operatory. Several factors such as personality variables, intensity of fear etc., are operating at any given time to shape the mother's behaviour and in turn impact on her child's behaviour. Investigators cited in both sections acknowledge that the mother-child relationship operates on several levels. Therefore, while it is necessary to state the complexity of this interaction, unfortunately, as Venham et al. (1978) note, researchers have yet to clarify its quality.

Patient/dentist relationship. The patient/dentist relationship also appears to influence one's level of dental anxiety. Swallow and Sermet (1969) questioned children while Bernstein et al. (1979), Biro, & Hewson (1976) , Kleinknecht et al. (1973) and Lindsay (1984) questioned adults on how they got along with their dentist. These investigators independently determined that low anxiety subjects had a higher opinion of their dentist both personally and professionally, then did high anxiety subjects. In the case of children, with their growing cognitive sophistication, there also develops an awareness of the dentist's potential to make mistakes. Logically this may lead to an increase in worry and anxiety. Several investigators have examined the child's perceptions of the dentist and the dental situation (Rosenzweig, Sforza & Addelston, 1968; Swallow & Sermet, 1969 & Wright et al.; 1980). Rosenzweig et al. and Swallow and Sermet employed the sematic differential technique devised by Osgood (Osgood, Suci & Tannenbaum, 1957) to determine that children generally have a positive view of their dentist. These authors also determined that the dentist should clearly explain the various procedures to the child to set the child at ease and foster a more pleasant relationship. Sermet and Swallow further demonstrated that subjects preferred to hear how painful the treatment process was likely to be. These children appeared prepared and willing to hear the truth concerning the amount of discomfort they could expect. In summary, the dentist has the potential to encourage a positive relationship with the child by clearly explaining procedures and warning about the amount of discomfort the child might expect.

Avoidant versus regular attendance. Avoidant and regular attendance also appear to be related to one's level of dental anxiety (Liddell & May, 1984).

However, this is not such a relevant predictor for children since their parents tend to determine whether or not they attend for dental treatment. In retrospective adult studies, irregular attenders tended to report greater fear and a higher degree of anticipated pain (Kent, 1984; Kent & Warren, 1985; Lindsay & Woolgrave, 1982 & Schuurs et al., 1985). Irregular attendance therefore has the detrimental effect of causing avoidant behaviour in such dentally anxious subjects. Lindsay (1985) in an anecdotal description of the anxious dental patient, acknowledged that an emergency visit may serve to escalate the fear which kept the person from attending in the first place. Therefore, in future investigations, it would be useful to assess the nature of the visit as either regular or emergency.

Medical experience. There have been few investigations specifically addressing the relationship of medical experience to dental anxiety in children. Shoben and Borland stated that "...there is a kind of equivalence between dentists and physicians for many individuals and that by generalization acquired fears of physicians and the medical situation may be evoked by dentists and the dental situation" (Shoben & Borland, 1954, p. 171). However, according to Forgione and Clark (1974), traumatic medical experience did not contribute significantly to dental anxiety in adults. The story is somewhat different for children. When children's medical experience was examined, Bailey et al. (1973) and Sermet (1974) found that dentally anxious subjects had a significantly greater dislike for doctors, more unpleasant painful medical experiences, a higher proportion of psychosomatic illnesses, were more frequently taking tranquilizers and had more hospital admissions, treatments and traumatic medical experiences than nonanxious subjects. These results are based on a semi-structured interview with

mothers. Therefore, a more objective and complete account of medical experience seems warranted before empirically sound conclusions can be drawn. Mechanic (1964) noted, in his investigation of how mothers influence their children's health behaviour and attitudes, that mothers teach their children when and how to respond to signs of illness. As with mothers' dental anxiety, it would also appear that mothers health practices in general might be contributing to the children's experiences of the dentist. It is worth pursuing the possible relationship between medical experience and dental anxiety, especially in children.

Rationale for Present Study

It is clear throughout this review that there are several areas which require further investigation. The main aspect of the problem to be addressed here is the contribution of dental experience to the pre-adolescents' self-reported dental anxiety. Investigators cited above (Bailey et al., 1973; Kleinknecht et al., 1973; Klorman et al., 1978, 1979; Liddell, 1985 & Venham et al., 1977) have produced conflicting results concerning the development of dental anxiety in children of different ages with a variety of dental experience. Klorman et al. (1978, 1979) has suggested that dental anxiety decreases with experience. Kleinknecht et al.'s (1973) results implied that the type of procedure determined the degree of anxiety. Subjects employed in both studies included the pre-adolescent age group of 9 to 12 year olds. The children's dental experiences appear to be playing a role in their level of dental anxiety, however, its specific influence remains ambiguous. Therefore, in an attempt to clarify the contribution of dental experience to dental anxiety, a more complete and accurate record of children's dental experiences was

collected and assessed. A longitudinal design was employed in order to record the changes in dental anxiety while also evaluating the contribution of dental experience to these changes, over a pre-determined period of time. It was hypothesized that the quantity and quality of dental treatment experienced would contribute significantly to the present level of dental anxiety in the sample employed.

METHOD

To evaluate the contribution of dental experience to dental anxiety over a three year period, between the ages of 9 and 12 years, the present two-part investigation was carried out. The first part was conducted to assess the subject's present level of dental anxiety. The second part focused on gathering a complete and objective record of the child's dental treatment between the ages of 9 and 12.

Procedure

Part 1-1983 School Survey

In 1983 a questionnaire was administered to the entire grades 4 to 7 population in the Mount Pearl school system. Mount Pearl is a suburban community adjacent to St. John's, Newfoundland. These childen were attending six separate schools of the local Roman Catholic and Consolidated School Boards. The sample consisted of 1541 children. The age range was 8 to 15 years with the majority falling between 9 and 12 years. Mean age was 10.5 years (SD= 1.3 years).

1983 Questionnaire

The questionnaire consisted of six parts (see Appendix A). The relevant sections to the present investigation included: a page to note relevant demographic information, the Corah Dental Anxiety Scale (DAS) (Corah, 1969) with a fifth question added to evaluate the child's view of how his or her peers feel about

attending for dental treatment, and an exercise developed to determine the child's prediction of his or her behaviour at the dentist. Following is a brief review of these sections.

Dental anxiety. The Corah Dental Anxiety Scale (DAS) is a self-rating scale designed to measure the degree of one's dental anxiety (see page 2, Appendix A). This scale has been widely used in evaluating dental fear in both children and adults (Corah, 1973; Corah, Gale & Illig, 1978; Melamed, Hawes, Heiby & Glick, 1975; Melamed, Weinstein, Hawes & Katin-Borland, 1975 & Wright, Lucas & McMurray, 1980) Corah established its reliability and validity when the scale was originally published in 1969. His sample consisted of 1,232 college students. The mean score for the total group was 8.89 (SD=2.99). Test-retest reliability over a period of three months produced a correlation coefficient r= 0.82. Validity was determined by having two dentists blindly rate their patients as falling into the lower, middle or upper level of dental fearfulness. These ratings were then correlated with the patients' pre-treatment rating of the DAS. The resulting correlations for the two dentists were r=0.41 and r=0.42 respectively. In later publications Corah presented further supportive evidence of the sound reliability and validity displayed by his scale (Corah, 1978). The wording of the response items for the DAS was slightly altered. The response choice "worried about it" was substituted for "tense" because pilot data indicated that children did not fully understand the meaning of "tense". In addition, "very frightened" replaced the word "anxious" to make this response choice clearer. This measure of dental anxiety was selected over other similar instruments because it was brief and easy to administer to a group.

Rating of peers. An additional question (question 5) was added to the end of the DAS to evaluate how children thought their peers felt about going to the dentist (see bottom of page 2, Appendix A). The identical modified response format described above, was used. This question was analysed separately.

Self-Efficacy/ Prediction of Good Behaviour. The scale used to determine the child's prediction of his or her good behaviour at the dentist is found on page 8 of Appendix A. It employed the micro-analysis technique devised by Bandura (1977).

1983 Survey Administration

This survey was administered to groups averaging 30 students and took approximately one class period to complete. The information was collected during various classes throughout the school day. A standard set of instructions was devised specifically for the administration of this questionnaire (see Appendix C). These instructions were read aloud to each group of children completing the questionnaire, by a female investigator who conducted the entire 1983 survey.

1986 School Survey

In 1986, the 382 students from Mount Pearl, who had taken part in the earlier survey, were aged 12 years or older and were re-assessed to replicate what had been done in 1983. This sample included the 9-year-old students from the previous survey who were still within the Mount Pearl school system. The longitudinal component of this investigation involved evaluating the same

subjects' dental anxiety at 9 years of age and then again at 12 years. Children in the 1986 sample were housed in three schools as opposed to the six in the 1983 survey. Again the schools represented both the Roman Catholic and Consolidated School Boards. Permission was obtained from these boards before the school principals were contacted (see Appendix D).

1986 Questionnaire

The relevant sections of the 1983 questionnaire employed in this portion of the investigation, were identical to those discussed above (see Appendix B). However, two components were added to the original survey. Following is a brief review of these sections.

General fearfulness. To evaluate the child's level of general fearfulness, the Fear Survey Schedule for Children-Revised (FSSC-R) was employed (Ollendick, 1983 & Ollendick et al., 1985) (see pages 7 to 9 in Appendix B). This scale consisted of 80 potentially fearful items which Ollendick borrowed from an earlier schedule devised by Scherer and Nakamura (1968). He reduced the response array from five choices to three which he believed would simplify the task for children. He also noted the reliability and validity of the earlier fear survey had not been sufficiently demonstrated so through his later research Ollendick concentrated on establishing this information. Employing two samples of 8-to 11-year-old school children from Virginia and Indiana, he performed several tests of reliability and validity. Through "internal consistency, test-retest reliability and stability of scores over 1-week and 3-month intervals" (Ollendick, 1983 p. 686), Ollendick

determined the FSSC-R has high internal consistency and is more reliable over a 1-week rather than 3-month period. Validity was evaluated by correlating the FSSC-R score with trait anxiety, self-concept and locus of control, factor analysing the schedule, examining fear scores by child's sex and by using samples of school-phobic children and matched controls to determine if this instrument could discriminate between the two. Correlations indicated a positive relationship between the FSSC-R and trait anxiety and a negative relationship with self-concept and locus of control. Girls reported higher fear than boys and this instrument was able to distinguish between controls and school-phobic subjects (Ollendick, 1983). Overall, it has the potential to be a useful clinical and research tool. A factor analysis of the scale produced five factor clusters: fear of failure and criticism, fear of the unknown, fear of injury and small animals, fear of danger and death and medical fears (Ollendick, 1983). These factors will be considered in the present study.

Procedure ranking. Children were also asked to rank five common dental procedures, from most liked (1) to least liked (5) (see page 11 of appendix B). These procedures included: having a tooth filled, having a tooth pulled, receiving an injection, having teeth cleaned and having the dentist probe with a metal instrument during a mirror/explorer examination.

Socioeconomic status. As an additional control, socioeconomic status was measured by recording the occupation of the father or head of household, according to Pineo and Porter's scale of occupational prestige (Pineo & Porter, 1967). Their ten categories included: professional, semi-professional, proprietors,

managers and officials-large, proprietors, managers and officials-small, clerical and sales, skilled, semi-skilled, unskilled, farmer, and not in labor force. As only one school was willing to release this information, it was necessary to consult the City Directory (1987) for the remaining subjects.

1986 Survey Administration.

This part of the investigation was carried out in a similar manner to that of the 1983 segment. The questionnaire took approximately 45 minutes (one class period) to complete and was administered during class time throughout the school day to groups of approximately 30 children. In addition to the standard set of instructions devised for the 1983 survey, directions for the FSSC-R were read aloud according to Ollendick's specifications (1983) (see Appendix C). Instructions for the ranking of procedures exercise were printed just above the exercise and were also read aloud to the children (see Appendix C). A second female investigator conducted the entire 1986 survey.

Part 2-Collection of Dental Information in 1986

Consent Form

Consent forms (see Appendix E) were distributed at the schools, to the children who had participated in the 1983 study. These forms consisted of a written explanation of the investigation, and a statement for the parents to sign, giving the name of their child's dentist and permission for his or her dental records to be examined. Forms were either mailed directly to the investigators or

picked up at the schools by the author. Once these were received, initial contact was made with the Newfoundland Dental Association, (see Appendix F) whose president agreed to circulate a letter to the dentists named, requesting their cooperation. The author then contacted each dentist to arrange a time to visit his or her office and collect the information from the dental records. For those dentists with fewer than three patients involved, the information was obtained over the phone from the dentist or the dental assistant.

Dental Information Record Form

The child's dental experience was determined by examining his or her dental records and recording the specific dental treatments he or she had received between November 1, 1983 and November 1, 1986. This treatment information was noted on a form (see Appendix G) amended from an earlier version devised but unpublished by Lindsay, Liddell and May (1982). The original version was designed in consultation with British dentists for a study conducted in England several years ago. That form was slightly altered by two Mount Pearl dentists who had treated the largest number of children in this survey.

RESULTS

Sample

Of the 1541 subjects surveyed in 1983, 1525 completed enough information to be analysed. The present investigation followed the 9-year-old subjects from this earlier study and therefore will only be considering the 382 children who fell into that age group, hereafter referred to as the original sample. In 1986, 277 (72%) of the 382 subjects who were now 12 years old, were still within the Mount Pearl school system and will hereafter be referred to as the study sample. Questionnaires were completed by all 277 children. It was therefore possible to evaluate the dental anxiety of these subjects when they were 9 years old and then again when they were 12. This sub-sample had a mean age of 12.4 years (SD = 3 months) and consisted of 132 (48%) boys and 145 (52%) girls.

Part two of this investigation involved recording the dental experience of the study sample over the three year period between 1983 and 1986. This information was collected for 223 (81%) of the 277 subjects, hereafter referred to as the dental experience sample. Dental experience was not gathered on the remaining 54 subjects for the following reasons: 41 consent forms were not returned therefore it was not permissible to contact the dentists, 6 children's files could not be located at their dentists' offices, 2 dentists refused to provide the required information causing 4 children to be excluded from the analysis, 2 children had incomplete dental records and 1 child refused to complete the 1986 questionnaire.

Given that 28% of the original sample was no longer available to be

surveyed, it was necessary to establish the similarity between the 105 subjects who were lost and the 277 subjects to be evaluated in this investigation. The two variables for which it was most important to ensure comparability across samples were sex and the allocation of dental anxiety scores. An unequal sex distribution would bias the results as would a disproportionate scatter of dental anxiety scores. In a later assessment of his 1969 Dental Anxiety Scale, Corah et al., (1978) determined that a score of 13 or above, out of a possible 20 points, indicated moderate to extreme anxiety. Therefore, it can be inferred that a score of 12 points or less indicates low/average anxiety. The two groups evaluated in the present investigation consisted of low/average dentally anxious subjects and moderate/high anxiety subjects. To test for significant differences in sex and 1983 level of dental anxiety between the dental experience sample and the sample of subjects who were unavailable, chi-square tests of independence were calculated. For these analyses, three samples were employed: the original sample who were unavailable in 1986 (105 subjects), the study sample who did not have dental experience information accessible (54 subjects), and the dental experience sample (223 subjects). Results indicated there was no significant difference for the dental anxiety score distribution. The two levels of anxiety were about the same in each sample, χ^2 (2, N=382) = 5.51, n.s. (see Table 2). This establishes that any significant differences demonstrated in further analyses cannot logically be attributed to sample bias for 1983 dental anxiety. However, there was a significant difference in the sex distribution, with an over-representation of females in the dental experience sample, χ^2(2, N=382) = 6.61, $p < .05$ (see Table 1). Therefore, the following results concerning this sample must be interpreted with caution.

Changes in Dental Anxiety Scores Over the Three Year Period

It was of interest to evaluate the changes in dental anxiety scores between the two time periods, 1983 and 1986. It was also of interest to determine if males and females responded differently on the dental anxiety questionnaire and if this possible difference was influenced by the timing of its administration. Dental anxiety scores of the study sample for 1983 and 1986 were analysed. For the purposes of this analysis, the design was conceptualized as consisting of two independent variables, one which operated between subjects, sex, and one which operated within subjects, the time of evaluation (1983 and 1986). An analysis of variance (ANOVA) was performed. The ANOVA summary statistics are presented in Table 3. The mean dental anxiety scores by sex and time of evaluation, are presented in Figure 1. Main effects for sex and time of evaluation, and the interaction term, were all significant. The significant main effect for sex indicates that, in general, over the three year period, males reported experiencing less anxiety than did females $F(1,275) = 10.04$, $p<.005$. The main effect for time of evaluation indicates that, on average, dental anxiety scores increased over the three year period, $F(1,275) = 6.74$, $p < .01$. The time of evaluation by sex interaction is showing that the girls' mean level of dental anxiety increased over time while the boys' mean score showed a slight decrease, $F(1,275) = 8.60$, $p < .005$ (see Appendix H for means and standard deviations of this variable and all other variables considered in these analyses).

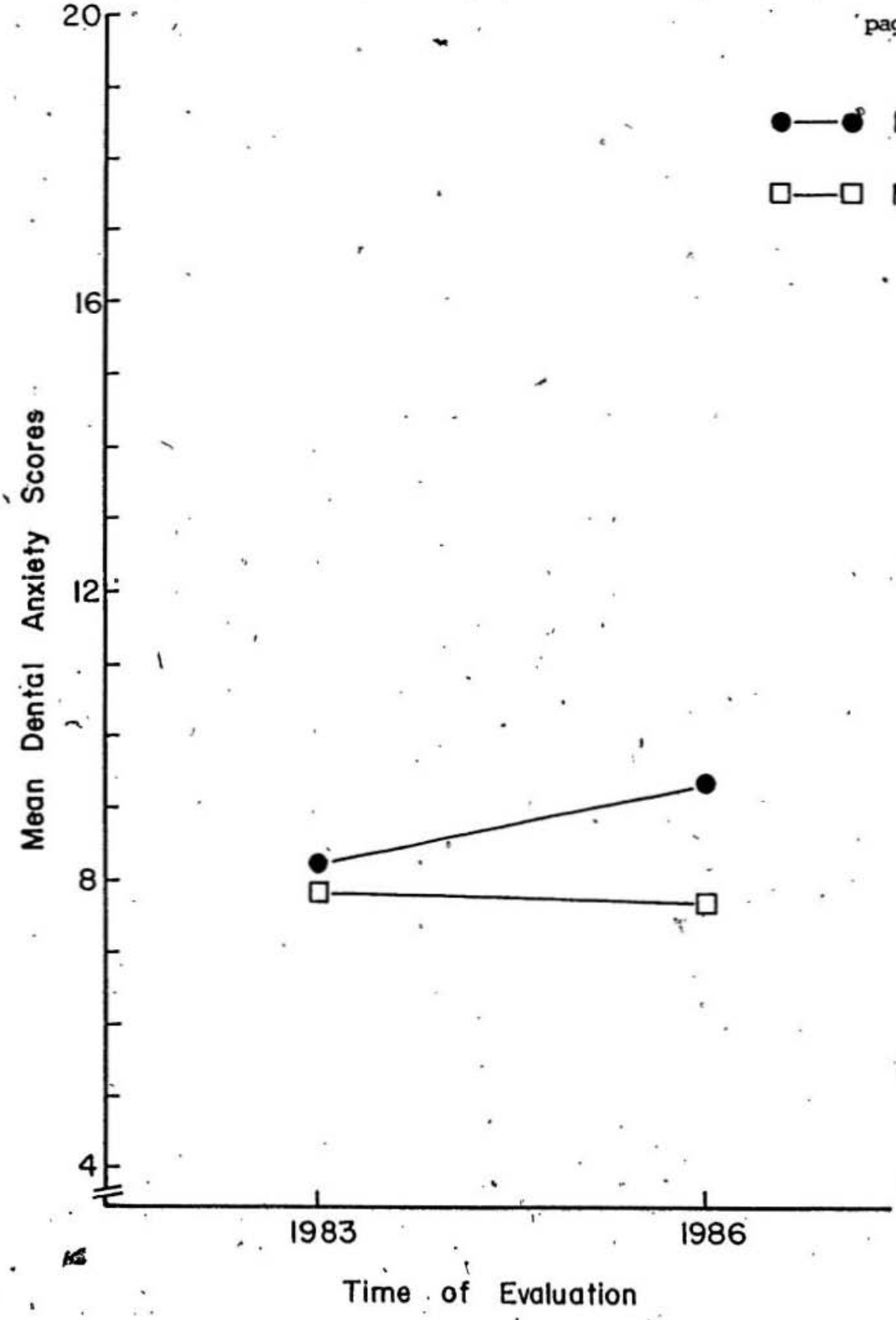


Figure 1 - Mean dental anxiety scores as a function of time of evaluation and sex.

Procedure Ranking

To determine how children perceived the various dental procedures, histograms were charted to illustrate the ranking pattern of the study sample for the five most common dental techniques. These techniques included injections, extractions, fillings, a mirror/explorer examination and a cleaning. Findings were similar for males, females and the total sample combined, and indicated that extractions, injections and fillings were seen as the least pleasant procedures, in that order. The histogram, displaying the rankings by the entire sample, is presented in Figure 2.

The Relationship of Dental Anxiety to Dental Experience

To establish the relationship between dental anxiety and dental experience, the eight dental experience variables for the dental experience sample were correlated with current level of dental anxiety (see Table 4). These variables were operationalized by recording: the total number of dentists the child saw within the three year period, the total number of dental visits over the three years, the total number of planned visits, the total number of emergency visits, whether the visits were regular or irregular and whether the children had received check-ups only over the three year period or if they had received restoration treatment. Emergency visits were noted as such on the children's charts. Regular visits were defined as three visits per three years, not exceeding one year between each visit (coded 1). Irregular visits were defined as not fitting into the

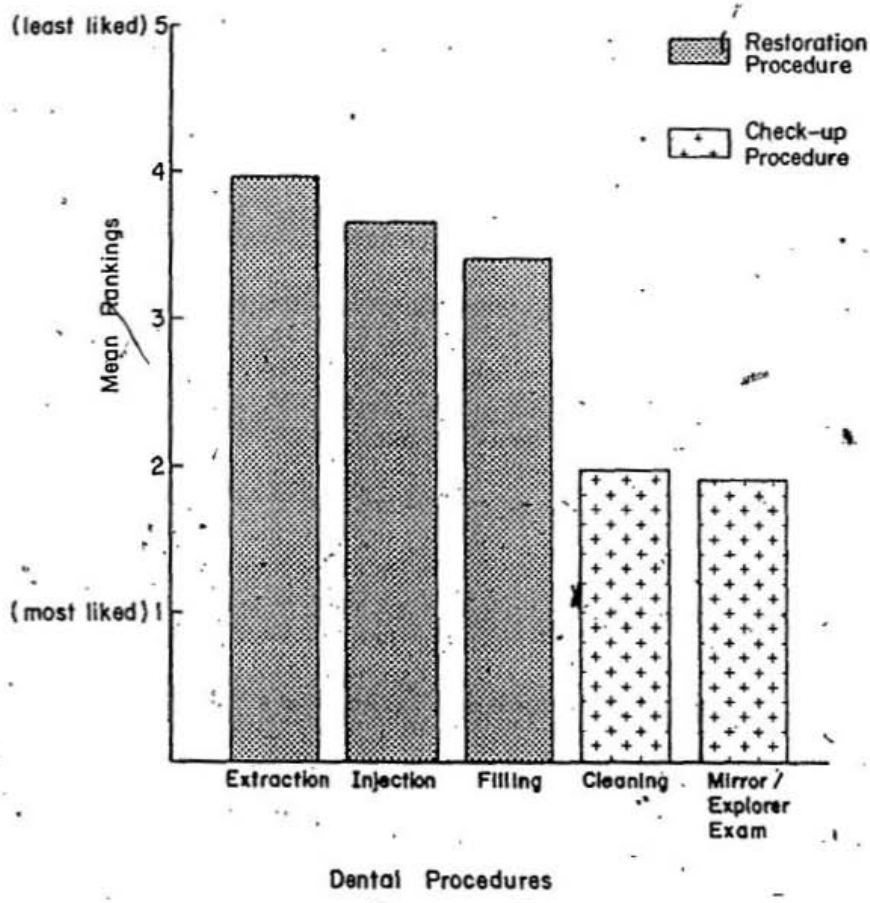


Figure 2 – Mean rankings of dental procedures by subjects in the study sample.

above formula for regular visits (coded 2) (see Appendix II). For each visit, the following information was obtained: the total number of procedures performed, the type, location, and quantity of each, the rinsing apparatus used and the child's dentist. Based on the children's rankings of the five dental procedures, this information was further classified as total number of injections, extractions and fillings. All dentists were available to answer any questions that arose concerning the relevant treatments recorded. In addition to this, dental anxiety scores were also correlated with general fearfulness (see Table 5) and the child characteristic factors (see Table 6), for the study sample, to determine if there were any significant relationships. Pearson correlation coefficients for males, females and the total sample combined, are displayed. As Table 4 illustrates, the total dental experience sample produced significant but weak negative correlations for 'number of injections' and 'number of extractions'. Females also displayed the negative relationship between 'number of injections' and 1986 level of dental anxiety and males produced a weak but significant correlation for 'number of dentists'. General fearfulness and its five factors were significantly related in almost all cases (Table 5). The 'failure' factor was not significantly correlated with 1986 dental anxiety for females. The child characteristic variables presented mixed results (Table 6). On the whole, there appeared to be very few sex differences. However, to evaluate these gender differences, tests of significance between two correlation coefficients for independent samples were performed (Ferguson, 1981). Two correlations yielded significant sex differences, 1983 dental anxiety scores and 1983 prediction of good behaviour (see Table 6). The resulting z score for 1983 dental anxiety scores was, $z = 3.36$, $p<.05$ and for 1983 prediction of good

behaviour, $z = 2.21$, $p<.05$. In the first relationship, considering 1983 dental anxiety scores, females produced a moderate positive correlation, $r = .4288$, $p<.001$, while the males produced a weak correlation, $r = .0512$, $p>.05$. This suggests that females with high dental anxiety scores in 1983 also produced high scores in 1986. Male 1983 dental anxiety scores appear to be unrelated to their 1986 scores. In the second relationship, considering 1983 prediction of good behaviour, the females displayed a moderate negative correlation, $r = -.3498$, $p<.001$. The males showed a weak negative correlation, $r = -.0951$, $p>.05$. These results suggest females who predicted they would not behave well at the dentist in 1983, had higher dental anxiety scores in 1983. This relationship, in turn, may have contributed to their dental anxiety in 1986. For males, only their 1986, view of peers, $r = .2440$, $p<.05$, and prediction of good behaviour, $r = -.3848$, $p<.001$, correlated significantly. This suggests that boys are concerned with how their peers react to going to the dentist at 12 years of age but are less affected by this at 9 years of age. Also, the less sure boys are of their good behaviour in 1986, the higher their dental anxiety in 1986. Unlike females, males' previous prediction of their behaviour at the dentist is not related to their present level of dental anxiety.

Contribution of Dental Experience to Dental Anxiety

To further clarify the actual contribution of each of the variables entered into the correlation analyses to current level of dental anxiety, several regression analyses were performed. As both the correlational results and the following regression results demonstrate, the major trends in the data indicate that overall,

dental experience between the ages of 9 and 12 years does not contribute substantially to dental anxiety. Instead, general fearfulness, in particular medical fears, accounts for the greatest amount of the total variance in the statistical procedures performed.

To aid in conceptualizing the time sequence and relevance of the factors to be considered in these analyses, a schematic diagram is presented in Figure 3. As the diagram illustrates, there is a progression of accumulated information beginning with the 1983 questionnaire results, adding the three years of dental experience and finally assessing the present status on the relevant factors. These three units of information will be analysed according to this progression and will hereafter be referred to as: pre-measures, dental experience variables and current measures. The pre-measures consisted of 1983 dental anxiety scores and factors contributing to these scores gathered in 1983 which were prediction of good behaviour in the dental situation and view of how peers feel about attending for dental treatment. Dental experience variables consisted of total number of dentists, total number of emergency visits, total number of planned visits, regular versus irregular attendance at the dentist and check-up only versus restoration work received over the three year study period, with restoration work further classified as total number of injections, fillings and extractions. With this account, it was possible to determine how frequently the child had attended the dentist, under what circumstances, and the type and number of procedures he or she had experienced. The current measures consisted of the 1983 factors re-assessed along with SES and general fearfulness.

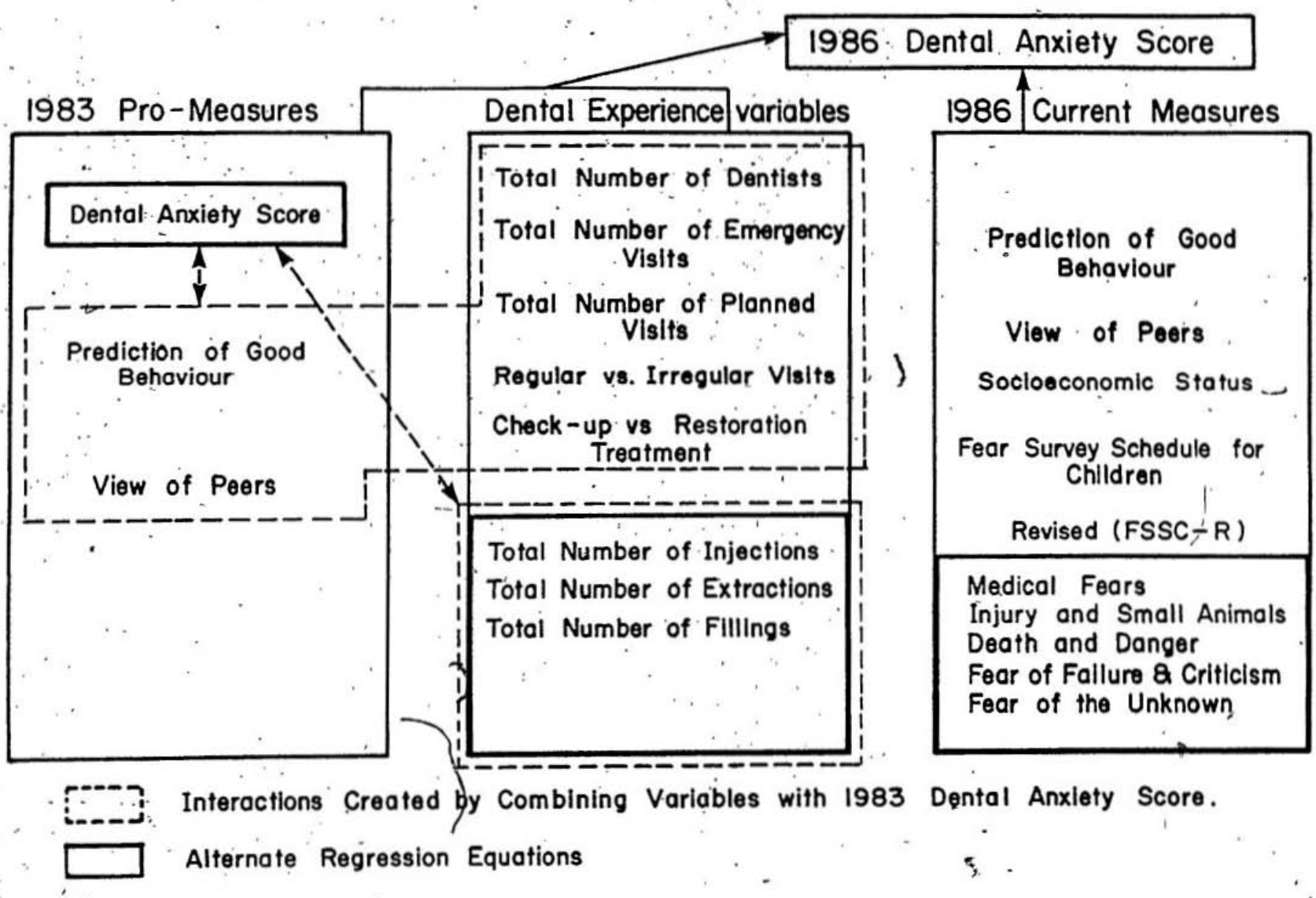


Figure 3 - Schematic Diagram of Components Contributing to the Multiple Regression Analysis

Regression Analyses of Pre-Measures and Dental Experience Variables to 1986 Dental Anxiety -

To determine the contribution of dental experience to present level of dental anxiety, it was first necessary to consider the child's original level of functioning, thereby providing a baseline to work from and then to consider dental experience variables. The nine factors constituting the pre-measures and dental experience variables, including sex, were entered into a multiple regression equation (see Table 7). The statistical data reported here include the total amount of the variance accounted for when all variables are entered into the regression equation (R^2). Also included is the unique contribution of the significant predictors, independent of the influence of the remaining variables in the equation. This is calculated using the part correlation (Howell, 1982). Therefore, the percentages noted in the text represent the specific amount of the variance accounted for by the predictor indicated. All other percentages represent the total amount of the variance accounted for. With sex, the 1983 dental anxiety score and prediction of good behaviour, accounting for 5%, 5% and 3% of the total variance, respectively, the dental experience factors made no significant contribution to dental anxiety. Separate analyses for males and females determined that none of the eight variables was contributing significantly to dental anxiety in males. For females, the 1983 level of dental anxiety and prediction of good behaviour contributed 12% and 4% respectively, to the total variance (See Table 8). As stated above, the main focus of this investigation was to examine the influence of dental experience over a three year period, on changes in dental anxiety scores of the same children between the ages of 9 and 12 years. It was therefore of interest

to determine if the original level of dental anxiety, assessed in 1983, would interact with the experience factors and alter their contribution to the recent measure of dental anxiety. Therefore, several trait-treatment interactions were calculated (Edwards, 1979 & Pedhazur, 1982). This statistical procedure combines the influence of the trait variable, in this case dental anxiety, and the various treatment variables, in this case the dental experience variables listed above. When these interaction terms were entered into this regression equation, there was no significant improvement in the outcome. In other words, these interactions did not alter the contribution pattern of significant predictor variables noted above.

Given that the check-up only (coded 3) versus restoration work variable (coded 2) (see Appendix H for means and standard deviations of this variable) and the individual dental procedures variables consisted of the same information, it was necessary to construct an additional regression equation to establish the unique contribution of the total number of injections, extractions and fillings to 1986 dental anxiety (see Table 9). Again, 1983 dental anxiety scores (7%) and sex (5%) contributed significantly. The only significant dental experience variable was total number of injections, which accounted for 2% of the total variance. To interpret further the relationship of sex to how children experience the three major dental treatment procedures, separate regression equations were constructed for males and females. For males, only a small portion of the variance was accounted for (4%) and none of the factors entered into the equation contributed significantly to this variance. The results were somewhat different for females (see Table 10). Total number of injections, accounted for 3% of the variance. Original level of dental anxiety accounted for 20% of the variance. Considering all five

factors, the total variance accounted for was 25%. It was of interest to examine the check-up only subjects versus those who had experienced restoration treatment. However, the number of check-up only subjects was too small, n=29, to support a regression analysis.

When the interaction terms were considered, as described on page 54, the unique contribution of each procedure was combined with the 1983 dental anxiety level to see if the child's original degree of dental fear was related to how he or she interpreted the various effects of these dental treatments. When the interaction terms were entered one by one, three separate regression equations were produced. The 'inject' interaction term was entered in the first equation (see Table 11). The 'extract' interaction term was entered in the second equation (see Table 12) and the 'filling' interaction term was entered in the third equation (see Table 13). In all three cases, sex accounted for 4% to 5% of the variance. For the first equation, both the 'inject' interaction term (3%), and 1983 dental anxiety score (4%), were significant predictors. In the second equation, both interaction terms, 'inject' and 'extract' contributed 2% to the total variance, as did 'total number of extractions'. For the third equation only 'extract' (2%) and the 'total number of extractions' contributed significantly, in addition to sex. The significance of these interaction terms indicates that the child's level of dental anxiety in 1983 influenced his or her experience of the dental procedures over the proceeding three years. A high level of dental anxiety at nine years suggested that the child would respond negatively to invasive dental treatments received following that time. With the addition of each interaction term, the distribution of the variance changed. For example, when the 'filling' interaction term was

included in the equation, the 'inject' term was no longer significant. In this way, the 'filling' term accounted for some of the variance previously accounted for by the 'inject' term causing neither term to contribute significantly. Overall, the contribution of these dental experience variables was minimal. When males' and females' scores were analysed independently, there were no significant predictors for males. In all three equations, 'inject' or 'extract' and 1983 dental anxiety contributed significantly for females. The contribution of the dental experience factors was between 3% and 4% (see Table 14).

Regression Analyses of Current Measures to 1986 Dental Anxiety

Considering the current measures variables demonstrated how the child's present disposition contributed to his or her 1986 degree of dental anxiety. The study sample data was used in these analyses. For the total group, sex, the total score on the Fear Survey Schedule for Children-Revised (FSSC-R), 1986 prediction of good behaviour and sex contributed 5%, 4% and 2% respectively to the total variance (see Table 15). The sex difference indicated that there were no significant predictors for females. For males, general fearfulness (FSSC-R) (10%) and 1986 prediction of good behaviour (9%) contributed significantly to current dental anxiety (see Table 16).

A second equation was constructed to account for the unique contribution of the five factors of the FSSC-R (see Table 17). Sex accounted for 3% of the variance, while the medical fears factor accounted for 14% of the total variance. When analysed separately by sex, the medical fears factor was a significant contributor for both males (13%) (see Table 18) and females (16%) (see Table 19).

Conclusions Based on Correlation and Regression Analyses

The correlational analyses indicated that, in general, dental experience was only minimally related to current level of dental anxiety in these samples. The regression analyses further supported this by producing significant contributions only in females for some of the dental experience (procedure) variables. The significant relationship between 1983 and 1986 dental anxiety scores for females was also evident in several of the regression equations. The earlier level of dental fear contributed more to current dental anxiety in females than in males. This sex difference was confirmed by the statistical test comparing the male and female correlation coefficients. General fearfulness and in particular the medical fears factor produced the highest correlation coefficient with current level of dental anxiety and overall, accounted for the greatest amount of the variance in the multiple regression analyses, for both males and females. Clearly, information gained from these two statistical procedures was strikingly consistent. Significant relationships produced through correlating the relevant variables with current level of dental anxiety were further substantiated by the regression analyses. Factors noted to be related to dental anxiety could also be said to be predictive of it.

DISCUSSION

The main hypothesis was partially supported by the results, demonstrating that in general, the quantity and type of dental treatment as operationalized in this investigation, during the three year study period, did contribute significantly to the current levels of dental anxiety in the subjects examined here. However, the contribution was small and of limited predictive significance. It appeared that pattern of attendance was not related to dental anxiety but the type of procedure was. There was an interesting sex difference evident when type of procedure was examined. Of the additional factors considered in this investigation, general fearfulness, medical fears in particular, was the strongest predictor. What the results also indicated was that in general, dental anxiety did increase with age as suggested by previous investigations (Bailey et al., 1973; Kleinknecht et al., 1983 & Liddell, 1985). Again, boys and girls responded differently. Results further suggested that earlier levels of dental anxiety were significantly predictive of girls' present levels of dental anxiety. This was not the case for boys. However, both boys and girls demonstrated similar response patterns when ranking five common dental procedures.

Differential Report of Dental Anxiety for Males and Females

There was a significant increase in dental anxiety between the ages of 9 and 12 years. Given the sex distribution of the study sample, males 48%, females 52%, this increase cannot be attributed to an unequal sex distribution or a

disproportionate scatter of dental anxiety scores. While the actual increase was minimal and of no clinical significance, the sex difference evident over time is of particular interest. Girls' dental fear intensified with time while boys actually reported slight decreases in their fear. Although the girls' mean increase did not place them in the moderate or severe category of dental anxiety, it does suggest they are at greater risk for experiencing anxiety when attending for dental treatment. These results clearly support the finding that boys and girls begin responding differentially to dental anxiety as they reach adolescence (Liddell, 1985). Kleinknecht et al. (1973) suggested an increase in dental anxiety could represent an increase in cognitive sophistication which makes the pre-adolescent more attuned to the competence and personality of the dentist. This may serve to increase girls' overall sensitivity to the dental situation. However, this does not explain why the sensitivity is more pronounced for girls than for boys. This increase also supports Bauer's (1976) finding that fear of bodily injury increases with time. Greater dental anxiety could indicate a more pronounced concern for possible injury to the oral cavity which could, in turn, be generalized to bodily injury. Bauer did not consider the sexes separately so no conclusions addressing fear and gender differences can be drawn based on his results. It is also impossible to determine, from results of the present investigation, whether girls are in fact more fearful than boys or whether they are just more comfortable admitting to it.

The Contribution of Dental Experience to Dental Anxiety

Even considering the thorough and objective record of actual dental experience, this did not contribute strongly to the child's self-report of dental

anxiety. However, it does appear that the more anxious the child, the fewer number of injections he or she has experienced. This supports Winer (1982) and Brown et al.'s (1986) hypothesis that, with a lack of exposure to the various procedures, there is an increase in anxiety. The child with fewer injections has not had the opportunity to process the unpleasant experience and therefore cannot assimilate or habituate to it.

Given the significant sex difference demonstrated in mean dental anxiety scores, it was of interest to analyse these two groups separately. Therefore, several regression analyses were performed for the study sample and the two sexes. While the total number of injections, extractions and fillings received was similar for both sexes (see Appendix H), these constituted a moderate contribution to the girls' current level of dental anxiety but did not display any significance for the boys. For girls, it appeared that their original level of dental anxiety influenced their ongoing experience at the dentist. The greater the number of extractions and the fewer the number of injections, the more dentally anxious the girls were in 1986. Girls, on the whole, seemed more sensitive to the invasive dental procedures. While these results appear to be conflicting, it may be that the anticipation of receiving a needle is more worrisome than the injection itself. Having a tooth extracted was the least liked dental procedure, therefore it follows that the greater the exposure, the greater the fear. These results support both of Winer's (1982) alternate conclusions that increased exposure facilitates habituation or increased exposure fosters greater fear. The effect of exposure therefore remains unclear. With these factors individually accounting for 2% to 3% of the total variance, they are making a significant enough contribution to justify further consideration

in future studies. While pre-adolescent boys and girls concur in their ranking of the procedures, girls appear to be more sensitive to and therefore more influenced by these treatments.

One possible explanation for the less than impressive influence of dental experience on dental anxiety may be related to the age group considered. Perhaps children are more affected by their experience at an earlier age. Venham and Quatrocelli (1977) have suggested a sensitivity to stressful procedures increases with time. Unfortunately, their sample was very young so it is difficult to predict what direction the trend would have followed with an older population. Also, while the timing of traumatic experiences has been postulated to range from 2 years to 18 years, most researchers who have considered this variable suggested the trauma occurred before the age of 10. Therefore, it does appear that younger children could be more vulnerable to the negative influences of unpleasant dental experience which in turn may affect their dental anxiety in later years.

Procedure Ranking

Ratings by this sample of the five common dental procedures, were similar to ratings given by adults in earlier investigations (Kleinknecht et al., 1973, 1984 & Lindsay et al., 1984). Kleinknecht et al.'s subjects, consisting primarily of adults, ranked injections and fillings as the top two fears while Lindsay et al.'s sample of adults ranked extractions, injections and fillings as the most unpleasant procedures, in that order. Kleinknecht did not include extractions as a variable to be rated. It appears to have been assumed that children experience these

treatments in a similar manner to adults, since children have rarely been questioned on this issue. Therefore, results presented here are among the first which add validity to that assumption. Children do indeed dislike the treatment procedures considered unpleasant by adults i.e., extractions, injections and fillings. It is also interesting to note that there were no significant sex differences. Twelve-year-old boys and girls seem to rank dental procedures in the same way.

Significant Correlation Relationships

There were four weak but significant correlations of dental experience variables as they related to current dental anxiety. The one relationship which was not evident in the regression analyses was the male correlation of 1986 dental anxiety with 'the number of dentists seen over the past three years'. This suggests that anxious boys tend to employ the services of more dentists. Unfortunately, since the number of boys with more than one dentist was small, no statistical analyses could be carried out. However, this hypothesis was not supported by the raw data. Looking at the dental anxiety scores of boys with more than one dentist, only one of the six had a score in the moderate/high range. Therefore, the result is difficult to interpret. This relationship was not significant for the female sample.

The significant correlations relating dental anxiety to general fearfulness were evident for males and females. Given the more equal sex distribution of the study sample employed for here (males 48%, females 52%), the following conclusions addressing sex differences can be considered unbiased. The one

exception was the 'failure and criticism' factor. It would seem that boys who are more concerned about being punished, doing poorly in school and looking foolish in front of peers (these are the areas addressed by the questions on the FSSC-R constituting this factor), are also anxious about going to the dentist. Perhaps they are worried they will be chastised for their fear. Being sensitive to criticism initially makes their anxiety experienced in the dental situation more acute. Since fears are generally more accepted in girls, females are not so concerned about displaying their anxiety. When girls do demonstrate this fear, they are likely to be comforted where boys are likely to be ridiculed.

The positive relationship between females' original dental anxiety scores and their current scores is not surprising given the overall increase in dental fear evident over the three year period. Girls who were fearful in 1983 tend to be equally or more fearful in 1986. The significant difference between boys' and girls' correlation coefficients on this variable makes sense considering the decrease over time in boys' overall dental anxiety. Perhaps as boys approach puberty, they are less willing to admit to this fear.

How children view their peers in the dental situation also relates to their present level of dental anxiety. If children predict that their peers are functional in the dental setting, they will tend to see themselves as functional as well. The significant relationship in 1986, which was not presented in 1983, suggests that the onset of adolescence brings with it a heightened sensitivity to the image these children present to their peers. This partially explains the effects of peer modeling demonstrated by Melamed et al. (1975) and Williams et al. (1983). However, the

subjects in these studies were younger than the sample considered in the present investigation. Children who are more concerned about what peers are thinking of them are more likely to follow the peers' examples in an attempt to be consistent with the behaviour of these significant others. As previous investigations have considered a younger population, clearly there is a need for further research in this area.

The child's prediction of his or her own good behaviour while at the dentist shows a significant sex difference at age 9 but not at age 12. This suggests that younger females with greater dental anxiety are less sure of their good behaviour. This in turn contributes to the girls' more recent levels of dental anxiety. Such is not the case with males. Boys' prediction of their good behaviour at 9 years of age does not influence their present degree of dental anxiety. However, their current prediction of how they will behave at the dentist is moderately related to their 1986 dental anxiety score. Those who are currently less sure of their good behaviour at the dentist experience greater anxiety. This suggests that females are more aware of their behaviour at the dentist from an earlier age. This awareness appears to remain consistent and continues to contribute to their dental anxiety as they grow older.

Significant Predictors of Dental Anxiety

The present findings support Brown et al.'s (1986) earlier investigation. It seems clear from both studies, that general fearfulness is predictive of dental anxiety. In other words, those who are afraid in other situations also tend to be

afraid of going to the dentist. Even considering the more comprehensive measures of general fearfulness and dental experience employed in this investigation, the results of the two studies are strikingly similar. General fearfulness is the strongest predictor of dental anxiety with dental experience playing a less impressive but still significant role. In the present investigation, the contribution of general fearfulness was more pronounced in males than in females, contradicting the literature which suggested that girls tend to admit to their fears more readily than boys. This result is particularly difficult to explain given that the boys' reports of dental anxiety were significantly less than the girls' reports. However, in addition, the present study was able to demonstrate that medical fears accounted for a greater portion of the variance in females than in males. The prominence of medical fears may be attributed to the fact that a 'fear of the dentist' is included in this factor. What appears to be of even greater importance is the influence of past medical experience. Some researchers have examined this indirectly and found it to be of predictive significance (Bailey et al., 1973 & Sermet, 1974). How children react to the medical setting has been related to how they respond in the dental situation. If previous medical experience has been unpleasant, children may generalize this to the dental locale. Previous traumatic experiences have sometimes been noted to be medical rather then dental. Receiving a needle is also a relevant component to both medical and dental treatment. It therefore seems likely that an excessive fear of injections would contribute to overall dental anxiety. While "receiving an injection" did not prove to be the least liked procedure, it was a close second in the ranking exercise and the one significant dental experience predictor evident for the total sample.

It also appears that the child's prediction of his or her good behaviour at the dentist is a major contributing factor to the increase in dental anxiety. This implies that children are quite cognizant of how they will behave at the dentist. If they predict uncertainty about their good behaviour, this tends to indicate that they are anxious about the entire experience, which further supports the suggestion that overt behaviour is representative of dental fear.

General Observations

Some general observations are worth noting. Results indicated that children, on the whole, were not particularly afraid of going to the dentist. The majority reported experiencing only "a little" uneasiness. With the advances being made in dental procedures, it may be that the generation of children receiving dental treatment today is generally less anxious about the dentist than are previous generations. This may eventually lead to a decrease in dental fear when these same children reach adulthood. The frequency of dental anxiety reported by adults today reflects dental practices of years ago. It will be interesting to observe if future research in this area continues to demonstrate an overall decrease in dental anxiety.

The lack of significance for SES as a contributor to dental anxiety supports some of the earlier work done in this area (Kronenfeld, 1979 & Nikias et al., 1982). However, there is still a considerable volume of literature suggesting that lower SES families are not as attentive to the oral hygiene of their members (Berecz, 1968; Kronenfeld, 1979; Lindsay, 1984; & Neiburger, 1978). With further investigation, the stereotypic image of the poorer family may be reversed.

Considering the size of the sample, there were very few emergency visits made by the children. Perhaps younger children are more prone to falls and other accidents involving the oral cavity. The majority of students in this sample, attended the dentist on a regular basis.

Conclusion

In conclusion, dental experience between the ages of 9 and 12 years does not appear to be a great predictor of dental anxiety at 12 years of age. What these findings did suggest is that the sexes respond differently to past experience in general. Therefore, further investigations should consider the sexes separately when evaluating dental anxiety. The findings would indicate that fearful children are more sensitive to invasive dental procedures than nonfearful children, a fact which should be taken under consideration by the dentists who treat them. Since earlier levels of dental anxiety were predictive of later levels of dental anxiety, this suggests that a thorough developmental history would be necessary to complete the picture.

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Table 1

Sex Distribution for the Three Samples Considered in This Study

Sex	Sample		
	Original sample	Study sample	Dental experience sample
	Number of Subjects		
Girls	47	21	124
Boys	58	33	99

χ^2 (2, N=382) = 6.61, $p<.05$

Note: Each cell represents the number of subjects in one sample, independent of the other two samples.

Table 2

Sample Distribution of Subjects in the Low/Average and Moderate/High Categories of Dental Anxiety in 1983

1983 Dental anxiety level	Sample: Original sample	Study sample	Dental experience sample
	Number of Subjects		
Low/Average	88	52	198
Moderate/High	17	2	25

χ^2 (2, N=382) = 5.51, n.s.

Note: Each cell represents the number of subjects in one sample, independent of the other two samples.

Table 3

Time of Evaluation by Sex Analysis of Variance

Summary Table

Source	SS	df	MS	F	p of F
Between S's					
Sex	105.71	1	105.71	10.04	* *
Error	2895.44	275	10.53		
Within S's					
Time	44.46	1	40.46	6.74	*
Time x Sex	51.63	1	51.63	8.60	* *
Error	1650.91	275	6.00		
Total	4744.15	276			

* $p < .01$

** $P < .001$

Table 4

Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with the Dental Experience Variables for the Dental Experience Sample and Males and Females Taken Separately.

Dental Experience Variable	Total (N=223)	Male (n=99)	Female (n=124)
Number of dentists	.0183	.1925*	-.0877
Number of planned visits	-.0930	.0064	-.1043
Number of emergency visits	-.0106	.1211	-.0839
Regular versus irregular attendance	.0392	-.0118	.0480
Check up versus restoration treatment	-.0027	.0551	-.0705
Number of injections	-.1407*	-.0455	-.1596*
Number of fillings	-.0353	.1287	-.1164
Number of extractions	-.1125*	-.1021	-.0640

* $p < .05$
** $p < .01$
*** $p < .001$

Table 5

Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with the Fear Survey Schedule for Children-Revised (FSSC-R) and its Five Factors for the Study Sample and Males and Females taken Separately.

General Fearfulness	Study Sample (N=277)	Males (n=132)	Females (n=145)
FSSC-R	.3630***	.3456***	.2469***
Factors			
Medical Fears	.4907***	.4957***	.4333***
Injury and Small Animals	.3125***	.2298*	.1864**
Danger and Death	.2906***	.3421***	.1628*
Fear of the Unknown	.2860***	.2329*	.1935**
Failure and Criticism	.2548***	.3299***	.1240

* $p < .05$
** $p < .01$
*** $p < .001$

Table 6.

Pearson Correlation Coefficients of 1986 Dental Anxiety Scores with Child Characteristics Variables for the Study Sample and Males and Females taken Separately.

Child Characteristics Variables	Study Sample (N=277)	Males (n=132)	Females (n=145)
SES	-.0030	.1856	-.1405
1983 Dental Anxiety Score	.2817***	[.0512]	[.4288]***
1983 View of Peers	.0230	.0742	.0025
1986 View of Peers	.3071***	.2440*	.3770***
1983 Prediction of Good Behavior	-.2674***	[-.0951]	[-.3498]***
1986 Prediction of Good Behavior	-.3136***	-.3848***	-.2667***

* $p < .05$
** $p < .01$
*** $p < .001$

[] significant sex difference
Z $p < .05$

Table 7

Multiple Regression Analysis of the Contribution of the Pre-Measures and Dental Experience Variables, Including Sex, to 1986 Dental Anxiety Scores

Contributing variable	Unique Contribution		Significance of T
Sex	.0532	(5%)	.0002
1983 Dental Anxiety Score	.0482	(5%)	.0005
Prediction of good behavior (1983) (-)	.0263	(3%)	.0092

R^2 = .1963 (20%) N = 223

Factors Not Contributing Significantly to 1986 Dental Anxiety

Regular versus irregular attendance
Check-up versus restoration treatment
Total number of dentists
Total number of planned visits
Total number of emergency visits
View of others

Note: The (-) indicates the part correlation was negative.

Table 8

Multiple Regression Analysis of the Contribution of the Pre-Measures and Dental Experience Variables to Females' 1986 Dental Anxiety Score

Contributing variables	Unique contribution	Significance of T
1983 Dental Anxiety Score	.1223 (12%)	.0000
Prediction of good behavior (1983)	(-) .0362 (4%)	.0180

R^2 = 2783 (28%) N = 124

Factors Not Contributing Significantly to 1986 Dental Anxiety

Regular versus irregular attendance
Check-up versus restoration treatment
Total number of dentists
Total number of planned visits
Total number of emergency visits
View of others

Note: The (-) indicates the part correlation was negative.

Table 9

Multiple Regression Analysis of the Contribution of the Restoration-Treatment Procedures, Including Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores

Contributing variable	Unique Contribution		Significance of T
1983 Dental Anxiety Score	.0722	(7%)	.0000
Sex	.0544	(5%)	.0002
Total number of injections (-)	.0148	(2%)	.0511

R^2 = .1629 (16%) N = 223

Factors Not Contributing Significantly to 1986 Dental Anxiety

Total number of extractions
Total number of fillings

Note: The (-) indicates the part correlation was negative.

Table 10

Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including 1983 Dental Anxiety Scores, to Females' 1986 Dental Anxiety Score

Contributing variables	Unique contribution	Significance of T
1983 Dental Anxiety Score	.1998 (20%)	.0000
Total number of injections	(-) .0282 (3%)	.0380
R^2 = 2456 (25%) N = 124		
Factors Not Contributing Significantly to 1986 Dental Anxiety		
Total number of extractions		
Total number of fillings		

Note: The (-) indicates the part correlation was negative.

Table 11

Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Term 'Inject', Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores

Contributing Variable	Unique contribution	Significance of T
Sex	.0480 (5%)	.0004
1983 Dental anxiety score	.0395 (4%)	.0014
Inject	.0264 (3%)	.0085

R^2 = .1894 (19%) N = 223

Factors Not Contributing Significantly to 1986 Dental Anxiety

Total number of extractions
Total number of fillings
Total number of injections

Table 12

Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject' and 'Extract', Sex, and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores

Contributing variables	Unique contribution	Significance of T
Sex	.0446 (4%)	.0006
Total number of extractions	.0184 (2%)	.0269
Extract	.0161 (2%)	.0378
Inject	.0150 (2%)	.0449

R^2 = .2055 (20%) N = 223

Factors Not Contributing Significantly to 1986 Dental Anxiety

Total number of fillings
Total number of injections
1983 dental anxiety

Table 13

Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject', 'Extract', and 'Filling', Sex and 1983 Dental Anxiety Scores, to 1986 Dental Anxiety Scores

Contributing variable	Unique Contribution	Significance of T
Sex	.0427 (4%)	.0008
Extract	.0165 (2%)	.0356
Total number of extractions	.0149 (2%)	.0459

R^2 = .2082 (21%) N = 223

Factors Not Contributing Significantly to 1986 Dental Anxiety

Total number of fillings
Total number of injections
Inject
Filling
1983 Dental Anxiety

Table 14

Multiple Regression Analysis of the Contribution of the Restoration Treatment Procedures, Including the Interaction Terms 'Inject', 'Extract' and 'Filling' and 1983 Dental Anxiety Scores, to Females' 1986 Dental Anxiety Scores

Contributing Variables	Unique Contribution	Significance of T
1983 Dental Anxiety Score	.0340 (3%)	.0131
Extract	.0261 (3%)	.0432
R^2 = .2769 (28%) N = 124		

Factors Not Contributing Significantly to 1986 Dental Anxiety

Total number of extractions
Total number of fillings
Total number of injections
Inject
Filling

Table 15

Multiple Regression Analysis of the Contribution of the Current Measures, Including Sex to 1986 Dental Anxiety Scores

Contributing variable	Unique Contribution	Significance of T
Total Fear Survey Schedule for Children-Revised	.0501 (5%)	.0028
Prediction of good behavior (1986)	(-) .0442 (4%)	.0049
Sex	.0209 (2%)	.0511
R^2 = .1941 (19%) N = 155		
Factors Not Contributing Significantly to 1986 Dental Anxiety		
SES		
1986 View of Others		

Note: N represents the subjects with SES information. The regression method used here did not consider cases with missing data.

The (-) indicates the part correlation was negative.

Table 16

Multiple Regression Analysis of the Contribution of the Current Measures, to Males' 1986 Dental Anxiety Scores

Contributing variables	Unique contribution	Significance of T
Total Fear Survey Schedule for Children-Revised Score	.0946 (10%)	.0053
Prediction of good behavior (1986)	(-) .0906 (9%)	.0063
R^2 = .2481 (25%) N = 71		
Factors Not Contributing Significantly to 1986 Dental Anxiety		
SES		
1986 View of others		

Note: The (-) indicates the part correlation was negative. N represents the number of male subects with SES information. The regression method used here did not consider cases with missing data.

Table 17

Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised (FSSC-R) Factors, Including Sex, to 1986 Dental Anxiety Scores

Contributing Variables	Unique Contribution	Significance of T
Medical Fears	.1352 (14%)	.0000
Sex	.0305 (3%)	.0008
R^2 = .2819 (28%) N = 277		

Factors Not Contributing Significantly to 1986 Dental Anxiety

Fear of failure and criticism
Danger and death fears
Fear of the unknown
Fear of injury and small animals

Table 18

Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised (FSSC-R) Factors, to Males' 1986 Dental Anxiety Scores

Contributing Variables	Unique Contribution	Significance of T
Medical Fears	.1275 (13%)	.0000
R^2 = .2681 (27%) N = 132		

Factors Not Contributing Significantly to 1986 Dental Anxiety

Fear of failure and criticism
Danger and death fears
Fear of the unknown
Fear of injury and small animals

Table 19.

Multiple Regression Analysis of the Contribution of the Fear Survey Schedule for Children-Revised (FSSC-R) Factors, to Females' 1986 Dental Anxiety Scores

Contributing Variable	Unique Contribution	Significance of T
Medical Fears	.1575 (16%)	.0000
R^2 = .2118 (21%)	$\underline{N}$ = 145	

Factors Not Contributing Significantly to 1986 Dental Anxiety

Fear of failure and criticism
Fear of danger and death
Fear of the unknown
Fear of injury and small animals

APPENDIX A: 1983 Questionnaire

No. .....

Today's Date: _____

School: _____

Class: _____

Name: _____

Age: _____

Sex(Boy or Girl): _____

Date of Birthday: _____

Address: _____

Telephone: _____

Have you ever visited a dentist?

Yes _____ or No _____

No. .....

1. Imagine you have just received an appointment to go to the dentist tomorrow - how would you feel about going?

(a) I would look forward to it as a reasonably enjoyable experience. (...)
(b) I would not care one way or the other. (...)
(c) I would feel a little uneasy or squirmish about going. (...)
(d) I would be afraid that it would be unpleasant or painful. (...)
(e) I would really be very frightened of what the dentist may do. (...)

2. When you are waiting in the dentist's waiting room for your turn in the dental chair, how do you feel?

(a) Relaxed and happy. (...)
(b) A little uneasy but not too bad. (...)
(c) Worried about it. (...)
(d) Afraid. (...)
(e) Really very frightened. (...)

3. When you are sitting in the dental chair waiting while the dentist gets ready to clean your teeth, how do you feel?

(a) Relaxed and happy. (...)
(b) A little uneasy but not too bad. (...)
(c) Worried about it. (...)
(d) Afraid. (...)
(e) Really very frightened. (...)

4. When you are in the dental chair waiting to have a filling done, how do you feel?

(a) Relaxed and happy. (...)
(b) A little uneasy but not too bad. (...)
(c) Worried about it. (...)
(d) Afraid. (...)
(e) Really very frightened. (...)

5. How do you think most children your age feel about going to the dentist?

(a) Relaxed and happy. (...)
(b) A little uneasy but not too bad. (...)
(c) Worried about it. (...)
(d) Afraid. (...)
(e) Really very frightened. (...)

I. Imagine you have just received an appointment to go to the dentist tomorrow. Think as hard as you can about it, and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

2. Imagine you are waiting in the dentist's waiting room for your turn in the dental chair. Think as hard as you can about it, and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

3. Imagine you are sitting in the dental chair waiting while the dentist gets ready to clean your teeth. Think as hard as you can about it and when I say "Stop", please write as quickly as can, in the space below, what you were saying to yourself.

4. Imagine you are in the dental chair waiting to have a filling done. Think as hard as you can about it and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

I. How often do you go to see your dentist?

(a) Once or twice a year (...)
(b) Less than once a year (...)

2. Do you go to your dentist for regular check-ups?

(a) Yes (...)
(b) No (...)

3. Do you go to see your dentist only when you have a toothache?

(a) Yes (...)
(b) No (...)

1. How sure are you that you could jump as high as 1 foot (or 30 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

2. How sure are you that you could jump as high as 2 feet (or 60 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

3. How sure are you that you could jump as high as 5 feet (or 150 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

4. Children who are well-behaved at the dentists' try to keep still without moving their heads, do what the dentist tells them to do, and don't complain or cry. If you went to the dentist today, how sure are you that you would be well-behaved?

Please circle the number on the line below that matches how sure you are that you would be well-behaved. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle. Please be honest and mark how you really feel right now.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Department of Psychology

Telex: 016-4101
Tel.: (709) 737-8496

Dear Parents,

Following our earlier letter regarding a research project to study children's behaviour and experience at the dentist's clinic, we would like to ask you to complete the attached questionnaire and return it directly to the University in the self-addressed envelope provided.

Thank you once again for your co-operation.

Andrée Liddell, Ph.D.
Associate Professor

STRICTLY CONFIDENTIAL

Child's Name: _____

Child's Age: _____

1. Has your child ever visited a dentist?

   Yes _____ No _____

2. If "Yes" do you (or would you) take your child to the dentist (please make a tick for one answer only):

   (a) For regular check-ups. (...)

   (b) Only when he (she) is in pain. (...)

3. When did your child last see a dentist? (please give the approximate date)

   Month _____ Year _____

Child's Regular Dentist: _____

If no regular dentist, please give name of last dentist seen:

_____

APPENDIX B: 1986 Questionnaire

Today's Date: _____

School: _____

Class: _____

Name: _____

Age: _____

Sex (Boy or Girl): _____

Date of Birthday: _____

Address: _____

Telephone: _____

Have you ever visited a dentist?

Yes _____ or No _____

1. Imagine you have just received an appointment to go to the dentist tomorrow - how would you feel about going?

   (a) I would look forward to it as a reasonably enjoyable experience (...)
   (b) I would not care one way or the other (...)
   (c) I would feel a little uneasy or squimish about going (...)
   (d) I would be afraid that it would be unpleasant or painful (...)
   (e) I would really be very frightened of what the dentist may do (...)

2. When you are waiting in the dentist's waiting room for your turn in the dental chair, how do you feel?

   (a) Relaxed and happy (...)
   (b) A little uneasy but not too bad (...)
   (c) Worried about it (...)
   (d) Afraid (...)
   (e) Really very frightened (...)

3. When you are sitting in the dental chair waiting while the dentist gets ready to clean your teeth, how do you feel?

   (a) Relaxed and happy (...)
   (b) A little uneasy but not too bad (...)
   (c) Worried about it (...)
   (d) Afraid (...)
   (e) Really very frightened (...)

4. When you are in the dental chair waiting to have a filling done, how do you feel?

   (a) Relaxed and happy (...)
   (b) A little uneasy but not too bad (...)
   (c) Worried about it (...)
   (d) Afraid (...)
   (e) Really very frightened (...)

5. How do you think most children your age feel about going to the dentist?

   (a) Relaxed and happy (...)
   (b) A little uneasy but not too bad (...)
   (c) Worried about it (...)
   (d) Afraid (...)
   (e) Really very frightened (...)

I. Imagine you have just received an appointment to go to the dentist tomorrow. Think as hard as you can about it and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

2. Imagine you are waiting in the dentist's waiting room for your turn in the dental chair. Think as hard as you can about it and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

3. Imagine you are sitting in the dental chair waiting while the dentist gets ready to clean your teeth. Think as hard as you can about it and when I say "Stop", please write as quickly as can, in the space below, what you were saying to yourself.

4. Imagine you are in the dental chair waiting to have a filling done. Think as hard as you can about it and when I say "Stop", please write as quickly as you can, in the space below, what you were saying to yourself.

SELF-RATING QUESTIONNAIRE (FSSC-R)

DIRECTIONS: A number of statements which boys and girls use to describe the fears they have are given below. Read each fear carefully and put an X in the box in front of the words that describe your fear. There are no right or wrong answers. Remember, find the words which best describe how much fear you have.

1. Giving an oral report	☐ None	☐ Some	☐ A lot
2. Riding in the car or bus	☐ None	☐ Some	☐ A lot
3. Getting punished by mother	☐ None	☐ Some	☐ A lot
4. Lizards	☐ None	☐ Some	☐ A lot
5. Looking foolish	☐ None	☐ Some	☐ A lot
6. Ghosts or spooky things	☐ None	☐ Some	☐ A lot
7. Sharp objects	☐ None	☐ Some	☐ A lot
8. Having to go to the hospital	☐ None	☐ Some	☐ A lot
9. Death or dead people	☐ None	☐ Some	☐ A lot
10. Getting lost in a strange place	☐ None	☐ Some	☐ A lot
11. Snakes	☐ None	☐ Some	☐ A lot
12. Talking on the telephone	☐ None	☐ Some	☐ A lot
13. Roller coaster or carnival rides	☐ None	☐ Some	☐ A lot
14. Getting sick at school	☐ None	☐ Some	☐ A lot
15. Being sent to the principal	☐ None	☐ Some	☐ A lot
16. Riding on the train	☐ None	☐ Some	☐ A lot
17. Being left at home with a sitter	☐ None	☐ Some	☐ A lot
18. Bears or wolves	☐ None	☐ Some	☐ A lot
19. Meeting someone for the first time	☐ None	☐ Some	☐ A lot
20. Bombing attacks--being invaded	☐ None	☐ Some	☐ A lot
21. Getting a shot from the nurse or doctor	☐ None	☐ Some	☐ A lot

No. .....

22. Going to the dentist	☐ None	☐ Some	☐ A lot
23. High places like on mountains	☐ None	☐ Some	☐ A lot
24. Being teased	☐ None	☐ Some	☐ A lot
25. Spiders	☐ None	☐ Some	☐ A lot
26. A burglar breaking into our house	☐ None	☐ Some	☐ A lot
27. Flying in a plane	☐ None	☐ Some	☐ A lot
28. Being called on by the teacher	☐ None	☐ Some	☐ A lot
29. Getting poor grades	☐ None	☐ Some	☐ A lot
30. Bats or birds	☐ None	☐ Some	☐ A lot
31. My parents criticizing me	☐ None	☐ Some	☐ A lot
32. Guns	☐ None	☐ Some	☐ A lot
33. Being in a fight	☐ None	☐ Some	☐ A lot
34. Fire--getting burned	☐ None	☐ Some	☐ A lot
35. Getting a cut or injury	☐ None	☐ Some	☐ A lot
36. Being in a big crowd	☐ None	☐ Some	☐ A lot
37. Thunderstorms	☐ None	☐ Some	☐ A lot
38. Having to eat some food I don't like	☐ None	☐ Some	☐ A lot
39. Cats	☐ None	☐ Some	☐ A lot
40. Failing a test	☐ None	☐ Some	☐ A lot
41. Being hit by a car or truck	☐ None	☐ Some	☐ A lot
42. Having to go to school	☐ None	☐ Some	☐ A lot
43. Playing rough games during recess	☐ None	☐ Some	☐ A lot
44. Having my parents argue	☐ None	☐ Some	☐ A lot
45. Dark rooms or closets	☐ None	☐ Some	☐ A lot
46. Having to put on a recital	☐ None	☐ Some	☐ A lot
47. Ants or beetles	☐ None	☐ Some	☐ A lot
48. Being criticized by others	☐ None	☐ Some	☐ A lot
49. Strange looking people	☐ None	☐ Some	☐ A lot
50. The sight of blood	☐ None	☐ Some	☐ A lot

9

No. .....

51. Going to the doctor	☐ None	☐ Some	☐ A lot
52. Strange or mean looking dogs	☐ None	☐ Some	☐ A lot
53. Cemeteries	☐ None	☐ Some	☐ A lot
54. Getting a report card	☐ None	☐ Some	☐ A lot
55. Getting a haircut	☐ None	☐ Some	☐ A lot
56. Deep water or the ocean	☐ None	☐ Some	☐ A lot
57. Nightmares	☐ None	☐ Some	☐ A lot
58. Falling from high places	☐ None	☐ Some	☐ A lot
59. Getting a shock from electricity	☐ None	☐ Some	☐ A lot
60. Going to bed in the dark	☐ None	☐ Some	☐ A lot
61. Getting car sick	☐ None	☐ Some	☐ A lot
62. Being alone	☐ None	☐ Some	☐ A lot
63. Having to wear clothes different from others	☐ None	☐ Some	☐ A lot
64. Getting punished by my father	☐ None	☐ Some	☐ A lot
65. Having to stay after school	☐ None	☐ Some	☐ A lot
66. Making mistakes	☐ None	☐ Some	☐ A lot
67. Mystery movie	☐ None	☐ Some	☐ A lot
68. Loud sirens	☐ None	☐ Some	☐ A lot
69. Doing something new	☐ None	☐ Some	☐ A lot
70. Germs or getting a serious illness	☐ None	☐ Some	☐ A lot
71. Closed places	☐ None	☐ Some	☐ A lot
72. Earthquakes	☐ None	☐ Some	☐ A lot
73. Russia	☐ None	☐ Some	☐ A lot
74. Elevators	☐ None	☐ Some	☐ A lot
75. Dark places	☐ None	☐ Some	☐ A lot
76. Not being able to breathe	☐ None	☐ Some	☐ A lot
77. Getting a bee sting	☐ None	☐ Some	☐ A lot
78. Worms or snails	☐ None	☐ Some	☐ A lot
79. Rats or mice	☐ None	☐ Some	☐ A lot
80. Taking a test	☐ None	☐ Some	☐ A lot

1. How sure are you that you could jump as high as 1 foot (or 30 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

2. How sure are you that you could jump as high as 2 feet (or 60 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

3. How sure are you that you could jump as high as 5 feet (or 150 centimeters)? Please circle the number on the line below that matches how sure you are that you could jump this high. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

4. Children who are well-behaved at the dentists' try to keep still without moving their heads, do what the dentist tells them to do, and don't complain or cry. If <u>you</u> went to the dentist today, how sure are you that you would be well-behaved?

   Please circle the number on the line below that matches how sure you are that you would be well-behaved. Remember that the more sure you are the higher the number you circle and the less sure you are the lower the number you circle. Please be honest and mark how you really feel right now.

10	20	30	40	50	60	70	80	90	100
Not Sure			Maybe			Pretty Sure			Real Sure

11 No. .....

Please rank the following dental treatments from 1-5 according to your likes and dislikes. The treatment you like best would receive a 1. The treatment you like almost as much would receive a 2, the next one would receive a 3, the next a 4 and the treatment you like the least would get a 5.

_____ Having a tooth filled
_____ Having a tooth pulled
_____ Receiving an injection
_____ Having your teeth cleaned-(Fluoride)
_____ Having the dentist probe in your mouth with a metal instrument

APPENDIX C: 1983/1986 Questionnaire Instructions

INSTRUCTIONS

Hello my name is _____. I'm a research psychologist at the university and I would like to know what you think about going to the dentist. Most of you will remember a similar survey carried out in 1983, when you were in elementary school.

Again I will give each of you some forms with questions on them. I'll read each question to you, one at a time, so that everyone is answering the same question at the same time. There is no right or wrong answer to these questions; I just want to know what your opinion is. If there is something you do not understand, or if I'm going too fast, please raise your hand.

As I read each question, I would like you to read silently along with me.

P A S S O U T F O R M S

Everybody please look at the first page.

READ THROUGH ALL QUESTIONS AND MENTION FOR DATE OF BIRTH TO WRITE DAY, MONTH, AND YEAR OF BIRTH. IN LAST QUESTION, TELL STUDENTS TO PUT A TICK IN EITHER BLANK FOR "YES" OR BLANK FOR "NO"

Is anyone not finished?

Everybody turn to page 2.

On this page there are a number of questions with five possible answers - a, b, c, d & e. I want you to choose the answer that is most like the way you feel and put a tick in the space next to it. Please make a tick for only one of the answers.

For example, **(DEMONSTRATE)** in Question 1, if you choose (a) as your answer, you would put a tick right here; if you choose (d), you would put a tick right here.

Is there anyone who doesn't understand?

READ ANSWERS FOR QUESTIONS 1 & 2 BUT NOT FOR 3, 4 & 5

Is anyone not finished?

Everybody turn to page 3

On the next four pages, you will see the same questions as you have seen before. But I want you to do something different with them. The first question asks you to imagine you have just received an appointment to go to the dentist tomorrow. I'll give you some time to think as hard as you can on this and make it as real as possible. If it helps you to think better, you can close your eyes. When I say "Stop", I want you to write as quickly as you can what you were saying to yourself while you were imagining.

Is there anyone who doesn't understand?

READ EACH QUESTION IN THE FOLLOWING WAY:

Imagine . . . . . .

Now start thinking hard as you can about it.

Stop thinking and write as quickly as you can, in the space below, what you were saying to yourself.

Turn to page 4

Turn to page 5

Turn to page 6

Everybody turn to page 7.

A number of statements which boys and girls use to describe the fears they have are given below. Read each fear carefully and put an "X" in the box in front of the words that describe your fear. There are no right or wrong answers. Remember, find the words which best describe how much fear you have.

Is anyone not finished?

Now turn to page 8.

Answer these questions in the same way you answered the quesitons on page 7.

Is anyone not finished?

Now turn to page 9.

Again, answer these questions in the same way as the previous pages.

Is anyone not finished?

Everybody turn to page 10.

Now I'm going to ask you some questions about how high you can jump. But first I want you to look at the line in Question 1 with numbers from 10 to 100. This question asks you how sure you are that you can jump as high as 1 foot or 30 centimeters. The more sure you are the higher the number that you would circle and the less sure you are the lower the number you would circle. If you're real sure that you could jump as high as 1 foot or 30 centimeters, you would circle 100; if you're pretty sure, you would circle 70; if you think maybe you could do it, you would circle 40; and if you're not sure, you would circle 10. Or if you're somewhere in between 70 or 100, for example, you would circle 80 or 90. Remember the more sure you are the higher the number you circle and the less sure you are the lower the number you circle.

D E M O N S T R A T E

Is there anyone who doesn't understand?

(READ THROUGH EACH QUESTION AND DEMONSTRATE HEIGHT)

Now lets do another.

Question 4 is not about jumping as in the first three questions. But you answer it in the very same way.

Is anybody not finished?

Now turn to page 11.

You will see 5 dental procedures listed. I want you to number them from 1-5, using each number only once. Start with the one you like the most and end with the one you like the least. Demonstrate. For example: if you like having your teeth cleaned the most, you would give that item a "1". If you like having a tooth pulled almost as much, you would give it a "2" and go on until you have numbered all 5.

Is there anyone who doesn't understand?
Is anybody not finished?

APPENDIX D: Letter Requesting Permission of School Boards

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Department of Psychology

Telex: 016-4101
Tel.: (709) 737-8496

October 6, 1986

Mr. N. Kelland,
Superintendent, The Avalon
Consolidated School Board,
P.O. Box 1980
St. John's, NF A1C 5R5

Dear Mr. Kelland:

Following my recent telephone conversation to Mr. Lafosse, I should like to ask the Board's permission to carry out a follow-up study to the survey of dental behaviour and experience we carried out in the Fall of 1983. I enclose a copy of the questionnaire which was then given to the children in Grades 4 to 7 inclusive in the following Mount Pearl Schools, Morris Academy, Newtown Elementary and Park Avenue.

Among the findings of the 1983 survey, we confirmed what had been suspected in previous studies, that is, children between 9 and 12 years show an age increase in apprehension at the thought of attending for dental treatment. (see appended Figure 1). This finding is generally considered to be contrary to common sense which would predict a decrease in apprehension with age. In view of this and bacause so many dentally anxious individuals claim to have developed their fears in childhood, the present study aims to examine the contribution of actual dental experiences to changes in apprehension of the youngest children tested in 1983 by retesting those children and relating their self-reports to a close examination of their dental appointment records over the intervening three years. We sought advise from the Association of Newfoundland Dentists and there is no objection to the records being examined provided they are not taken out of their respective clinics. I enclose a list of the names of the children we would like to retest by school. I understand from Mr. Lafosse that these children are now conveniently housed in one school, the Central Junior High.

We are making minor modifications to the original questionnaire by taking out p. 7 since we will be studying the dental records directly. We are also adding one questionnaire dealing with general fears to see if dental apprehension is specific or part of a general picture of fearfulness and, another one, to elicit a ranking for likes and dislikes of different dental procedures. These are also appended with a draft letter we would like to have distributed to the parents to request their permission again to include their child in our investigations. We anticipate that the whole testing procedure can be fitted inside a class period as it was three years ago. We would like to be able to start our testing sessions during this month, if possible, and look forward to hearing from you.

Yours sincerely,

Andree Liddell, Ph.D.
Associate Professor

AL/sh

Enclosure

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Department of Psychology

Telex: 016-4101
Tel.: (709) 737-8496

October 6, 1986

Mr. W.F. Whelan,
Superintendent, Roman Catholic
School Board for St. John's
Belvedere
Bonaventure Avenue
St. John's, NF A1C 3Z4

Dear Mr. Whelan:

Following me recent telephone conversation to Mrs. Roe, I should like to ask the Board's permission to carry out a follow-up study to the survey of dental behaviour and experience we carried out in the Fall of 1983. I enclose a copy of the questionnaire which was then given to the children in Grades 4 to 7 inclusive in the following Mount Pearl Schools, Mary Queen of the World and St. Peter's Elementary.

Among the findings of the 1983 survey, we confirmed what had been suspected in previous studies, that is, children between 9 and 12 years show an age increase in apprehension at the thought of attending for dental treatment. (see appended Figure 1). This finding is generally considered to be contrary to common sense which would predict a decrease in apprehension with age. In view of this and because so many dentally anxious individuals claim to have developed their fears in childhood, the present study aims to examine the contribution of actual dental experiences to changes in apprehension of the youngest children tested in 1983 by retesting those children and relating their self-reports to a close examination of their dental appointment records over the intervening three years. We sought advise from the Association of Newfoundland Dentists and there is no objection to the records being examined provided they are not taken out of their respective clinics. I enclose a list of the names of the children we would like to retest by school.

We are making minor modifications to the original questionnaire by taking out p. 7 since we will be studying the dental records directly. We are also adding one questionnaire dealing with general fears to see if dental apprehension is specific or part of a general picture of fearfulness and, another one, to elicit a ranking for likes and dislikes of different dental procedures. These are also appended with a draft letter we would like to have distributed to the parents to request their permission again to include their child in our investigations. We anticipate that the whole testing procedure can be fitted inside a class period as it was three years ago. We would like to be able to start our testing sessions during this month, if possible, and look forward to hearing from you.

Yours sincerely,

Andree Liddell, Ph.D.
Associate Professor

AL/sh

Enclosure

APPENDIX E: Consent Form

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Department of Psychology

Telex: 016-4101
Tel.: (709) 737-8496

Dear Parents,

You may remember our earlier survey of your child's evaluation of dental experiences to which you had given consent. We are replicating the survey with a proportion of the children who took part in the first study and wish to include your child. This time we are also interested in the type of experiences each child has had at the dentist over the three years since the last study and would like to examine their dental records.

Again the project has the approval of the School Board and the Principal of your child's school as well as of the Ethical Committee of Memorial University. The children will be asked to fill in a questionnaire during class time and information regarding dental experiences will be obtained from their dentist. The investigation is conducted in strict confidence and no one will be mentioned by name in any written report. Our aim is to obtain a better understanding of the type of dental experiences which shape children's attitude to dentistry. This should assist parents and dentists alike to help children cope with these experiences. If you wish more information, please do not hesitate to call at the above number. Finally, we would like to ask you to give your consent by filling in the form below and returning it in the envelope provided.

Thank you for your co-operation.

Andree Liddell, Ph.D.
Associate Professor

AL/sh

CONSENT FORM

As the parent/guardian of _____ I give my permission for him/her to take part in the study described above at school as well as permission for his/her dental records to be examined. These records are with Dr. _____ who is my child's dentist (Please list any other dentists your child may have seen over the last three years).

_____
(signature of parent/guardian)

APPENDIX F: Letter to Newfoundland Dental Association

MEMORIAL UNIVERSITY OF NEWFOUNDLAND
St. John's, Newfoundland, Canada A1B 3X9

Department of Psychology

Telex: 016-4101
Tel.: (709) 737-8496

January 8, 1987.

Dr. T.J. Gushue
Executive Secretary
Newfoundland Dental Association
211 LeMarchant Road
St. John's, NF
A1C 2H5

Dear Dr. Gushue:

Following our recent telephone conversation, I should like to let you know that we are now ready to carry out the examination of the dental records of the children we surveyed last Fall. I enclose the letter we sent to the parents with the consent form they were asked to sign as it contains a brief description of the aim of this stage of the study. There is also a list of the dentists concerned.

My assistant, Patricia Murray, will examine the records and tabulate the data on the sheet enclosed. She proposes to get in touch with each of the dentists on the enclosed list after they have been informed of the investigation by you to make suitable arrangements for her visits.

We are very grateful for the encouragement and support we are receiving from the Newfoundland Dental Association and would be glad to provide any other information you may wish. Once the study is completed and the results known, we will be happy to share them with you.

Yours sincerely,

Andree Liddell, Ph.D., F.B.Ps.S.
Associate Professor

AL/sh

APPENDIX G: Dental Experience Record Form

Dental Procedures

Name: _____ Date of Visit: _____

Total No. of Visits: _____

Type of Visit Planned: _____ Crisis/Emergency: _____

Interval between Visits Regular (6 mo): _____ Irregular: _____

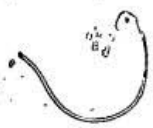
Dentist: _____ Same as last visit: Yes___ No___

If no, reason for change: _____

Type of Procedure	Carried Out
1. Visual inspection of teeth only	
2. Dental examination with probe	
3. X-rays to one part of mouth	
4. X-rays to whole mouth	
5. Injection to upper left front side alone	
6. Injection to upper right front side alone	
7. Injection to upper left back side alone	
8. Injection to upper right back side alone	
9. Injection to lower left front side	
10. Injection to lower left back side	
11. Injection to lower right front side	
12. Injection to lower right back side	
13. Two or more injections during same visit	
14. Use of a fast compressed air drill on:	
(a) upper front tooth	
(b) lower front tooth	
(c) upper back tooth	
(d) lower back tooth	

15. Use of a slow-compressed air drill on:
    (a) upper front tooth _____
    (b) lower front tooth _____
    (c) upper back tooth _____
    (d) lower back tooth _____
16. Scraping of one cavity _____
17. Scraping between teeth for cleaning _____
18. Process of filling one cavity with dental cement _____
19. Use of drill on two/more teeth same visit _____
20. Filling of more than one cavity/visit _____
21. Rubber dam _____
22. Removal of one tooth: (a) upper front _____
    (b) lower front _____
    (c) upper back _____
    (d) lower back _____
23. Removal of more than one tooth _____
24. Use of motorized brush to clean teeth _____
25. Polishing of filling to:
    (a) upper front tooth _____
    (b) lower front tooth _____
    (c) upper back tooth _____
    (d) lower back tooth _____
26. Removal of a hard scale using a scraper _____
27. Taking an impression of a) upper teeth: _____
    material in mouth 2-3 minutes _____
    b) lower teeth; material in mouth 2-3 minutes _____
28. Capping of a tooth _____
29. Flouride Treatment _____
30. Placement of rinsing apparatus in mouth, and use of it once/visit. _____
31. Use of rinsing apparatus more than once/visit _____

APPENDIX H: Means and Standard Deviations of All Variables



Pre-Measures Means and Standard Deviations for the Study Sample and for Males and Females taken Separately

Pre-measures	Sample		
	Study Sample (N= 277)	Males (n=132)	Females (n= 145)
	Means and standard deviations		
1983 Dental anxiety score	8.08 SD 3.2	7.89 SD 3.2	8.26 SD 3.2
1983 View of peers	2.30 SD 1.1	2.32 SD 1.1	2.30 SD 1.1
1983 Prediction of good behavior	89.75 SD 19.9	91.74 SD 19.4	87.94 SD 20.2

Dental Experience Variables Means and Standard Deviations for the Dental Experience Sample and for Males and Females, taken Separately.

Dental experiences variables over three year period	Sample: Dental experience sample (N= 223)	Males (n= 99)	Females (n= 124)
	Means and standard deviations		
Number of dentists	1.03 SD .38	1.03 SD .42	1.03 SD .36
Total number of planned visits	6.65 SD 2.9	7.10 SD 3.1	6.30 SD 2.6
Total number of emergency visits	.202 SD .58	.172 SD .50	.226 SD .64
Regular versus irregular attendance	1.26 SD .44	1.23 SD .42	1.27 SD .45
Check-up versus restoration treatment	2.08 SD .42	2.03 SD .36	2.12 SD .45
Number of injections	2.77 SD 2.1	3.07 SD 2.3	2.52 SD 2.0
Number of fillings	2.18 SD 1.9	2.50 SD 2.1	1.92 SD 1.7
Number of extractions	.830 SD 1.2	.798 SD 1.0	.855 SD 1.3

Current Measures Means and Standard Deviations for the Study Sample and for Males and Females Separately.

Current Measures	Sample: Study Sample (N=277)	Males (n=132)	Females (n=145)
	Means and standard deviations		
1986 Dental anxiety scores	8.67 SD 2.6	7.88 SD 2.0	9.39 SD 2.9
1986 View of peers	2.24 SD 0.8	2.24 SD 0.9	2.25 SD 0.8
1986 Prediction of good behavior	88.48 SD 21.3	90.00 SD 20.5	87.10 SD 22.0
SES	4.70 SD 2.5	4.47 SD 2.5	4.91 SD 2.5
Fear survey schedule for children-revised (FSSC-R)	131.99 SD 22.7	122.64 SD 20.2	140.50 SD 21.5
FSSC-R Factors			
Medical Fears	10.22 SD 2.3	9.65 SD 2.2	10.74 SD 2.3
Fear of failure and criticism	30.70 SD 5.8	29.32 SD 5.7	31.95 SD 5.6
Fear of injury and small animals	30.98 SD 6.1	27.36 SD 5.0	34.10 SD 6.8
Fear of danger and death	29.58 SD 5.8	27.95 SD 6.1	31.08 SD 5.0
Fear of the Unknown	24.36 SD 5.2	22.50 SD 4.2	26.05 SD 5.5