UPTAKE OF DENTAL SERVICES

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SUMMARY

Previous research has indicated that the majority of the UK dentate population suffers from dental disease. This problem was examined in terms of the supply of, and demand for, dental treatment: how might the uptake of dental services be increased and dental health improved?

The target population for the main survey was adolescents among whom demand for dental treatment has decreased. In 524 adolescents surveyed, fear of pain was the major deterrent to regular dental visits.

The theoretical literature was explored for illuminating and practical approaches to the problem. The theory of reasoned action developed by Fishbein seemed the most promising. This theory was tested and validated on the adolescent sample identifying clear differences between regular and irregular dental attenders which could be usefully exploited by dental health education. A repertory grid analysis study further illuminated perceptions of dental treatment.

A survey of a random sample of 716 dentists revealed that most dentists were in favour of delegating work to auxiliary help but few could do so. Auxiliary help would increase supply of services: data revealed an encouraging trend for younger dentists to be more in favour of delegation than older dentists. A survey was carried out of computer systems available for dentists suggesting that this might reduce the need for clerical assistance but would not usually affect the supply of treatment. However in some dental practices computerisation might increase demand. For example a personalised reminder was developed and evaluated in a controlled study of 938 appointments demonstrating an uptake in dental services.

Conclusions are that demand for treatment can be increased in various ways especially by teaching dentists behavioural strategies to deal with fear and pain. Various recommendations on this are made. If demand were to outstrip supply increased delegation to auxiliary help could provide a viable way of increasing supply.

Key words: dental health, dental attendance, patient compliance, reasoned action.

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Chapter 1 : INTRODUCTION

A number of major government reports have shown that dental disease is rife in the United Kingdom. The most recent survey indicated that 60% of dentate adults had some decay in their teeth, 72% had some calculus present and 82% had gingivitis (Todd, Walker and Dodd, 1982). Moreover, some 30% of the adult British population had lost all their natural teeth and a further 21% had lost so many teeth that they needed to wear partial dentures. Each dentate adult in the United Kingdom had on average 9 teeth missing. Although there has been a marked improvement in recent years, children also suffer high levels of dental disease: the most recent survey of children showed that 41% of 5 year olds and 49% of 8 year olds had decay in the deciduous teeth while 19% of 5 year olds and 46% of 8 year olds had gingivitis (Todd and Dodd, 1985).

These high levels of disease are disappointing nearly 40 years after the inception of our National Health Service. It appears that many people still do not make use of the dental services. Only 43% of dentate adults claim to attend the dentist for regular check-ups, while 14% attend only for occasional check-ups and as many as 43% attend only when their teeth give trouble (Todd, Walker and Dodd, 1982). These patterns may be established early in life - in one survey mothers reported that only 55% of 5 year olds and 62% of 8 year olds were regular dental attenders (Todd and Dodd, 1985).

Research in Scotland has suggested that the reported attendance behaviour quoted in the major surveys above has produced an

overestimate in the percentage of regular dental attenders because people tend to give the answer they think is right (Eddie, 1984). Unfortunately complete statistics for delivery of dental treatment in the United Kingdom are not available. However, figures published by the Scottish Dental Estimates Board have enabled Elderton and Eddie (1986) to calculate that only 34% of the Scottish population attended a dentist in the General Dental Service during 1983. It is not possible to derive a corresponding figure for England and Wales because the Dental Estimates Board that collects data for England and Wales publishes its information in a different form. Nevertheless, Elderton and Eddie (1986) concluded that there seems to be vast room for improvement in dental attendance for most people and therefore a considerable potential for improved dental health.

The Health Education Council unequivocally endorses regular dental check-ups (Levine, 1985) but the optimal frequency of dental check-ups has been the subject of considerable debate (Sheiham, 1977; Anonymous, 1985; Elderton, 1985; Lock, 1985; Anonymous, 1986a). The problem is that each clinician must decide the appropriate recall period for each of his or her patients. The speed of tooth decay and the progress of gum disease vary enormously depending on both environmental and innate factors (Silverstone, 1978; Manson, 1980).

Previous studies have examined attendance behaviour from many aspects. The major survey reported by Todd and Dodd (1985) indicated a number of demographic characteristics of regular attenders: the proportion of regular attenders was higher amongst social classes I, II and III non-manual than amongst classes IV and V, higher among

females than males and higher among 25- to 44-year olds than other age groups. An investigation by Eddie and Davies (1985) confirmed that people in the higher social classes were more likely to have attended a dentist frequently than those in the lower social classes.

Parkin and Yule (1985) conducted an economic analysis of the impact of patient charges on the demand for dental services in Scotland using data from 1962 to 1981. They found that patient charges had only a small effect on utilisation of dental care and that the most important influence was supply of dentists per capita. They concluded that manpower policy may be more important than charging policy in influencing the use of dental services. However, it would be unwise to extrapolate their results to present conditions: changes in charges and number of dentists occured very slowly from 1962 to 1981, but both have increased with great rapidity during the 1980's.

Todd, Walker and Dodd (1982) found that 43% of dentate adults in the United Kingdom admitted to putting off dental visits because of fear. A number of other studies have shown that anxiety about dental treatment deters people from seeking dental care (Lidell and May, 1984, Green and Green, 1985, Woolgrove and Cumberbatch, 1986). One study in The Netherlands by Schuurs et al (1980, 1981) found that not only anxiety but also preference for preservation of the teeth and family dental attendance pattern influenced dental attendance, while a later study by the same authors (Schuurs et al, 1984) concluded that anxiety, sex, dental upbringing and the interaction between education and anxiety were all important factors in dental attendance.

The brief review above shows that previous investigators have found a wide variety of factors can influence uptake of dental services. However, each investigator has focused on only a small area of the field. The present study sought to gain a more comprehensive understanding by investigating uptake of dental services from a holistic perspective. Delivery of dental treatment was viewed as a human activity system and so a systems approach was appropriate (Checkland, 1981).

Any increase in uptake of dental services requires both an increase in supply and an increase in demand and so both supply and demand were studied. The relevant literature is reviewed in each section.

Chapter 2 : INCREASING DEMAND

2.1 Overview

Some of the material in this chapter must be declared as previously published: Woolgrove (1983), Woolgrove (1986) and Woolgrove, Cumberbatch and Gelbier (1987).

In order to increase demand, it would be helpful to know why so many people do not visit the dentist regularly. The obvious way to find out is to ask people, as was done by Todd, Walker and Dodd (1982) in a major government survey of over 5,000 randomly selected adults. In this study those people who said that they went to the dentist only for an occasional check-up or only when having trouble with their teeth were asked "What is the main reason for you not going for a regular check-up?"

The results, shown in Table 1, indicated that the most common reasons given were "scared" and "no trouble with teeth". However, the same survey found that of the irregular attenders who responded "no trouble with teeth", nearly two thirds (64%) had decayed teeth. Thus most people who do not go to the dentist because they have "no trouble with (their) teeth" do in fact need treatment. A number of smaller studies have confirmed that fear is a deterrent to seeking dental care (Lidell and May, 1984; Green and Green, 1985; Woolgrove and Cumberbatch, 1986).

Table 1. Reasons for not visiting the dentist for a regular check-up

	Occasional check-up	Only with trouble	Both attendance patterns
Scared	15%	29%	26%
No trouble with teeth	30%	29%	29%
Apathy	25%	17%	19%
No time	24%	15%	17%
Not worth it now	3%	6%	6%
Other reason	9%	13%	12%

Fear of pain during dental treatment has been widely documented from the 1920's to the present (Dinjian, 1921; Bregstein, 1923; Macfarlane, 1938; Gale, 1972; Wardle, 1982; Woolgrove and Cumberbatch, 1986). Both fear and pain have been studied in some detail and a review of these phenomena has been carried out (see section 2.2)

In order to illuminate why people do or do not attend for regular dental treatment, a variety of approaches was considered. The most useful approach seemed to lie within the methodology of Kelly (1955). Kelly's repertory grid technique was used to explore the personal constructs people use in the context of regular dental visits (see section 2.3). Following from this study the attitudes of adolescents were assessed with a questionnaire (see section 2.4). Finally the theory of reasoned action (Ajzen and Fishbein, 1980) was used to measure differences between regular and irregular attenders (see

section 2.5). The outcome of this applied research was that a personalised reminder system was used in an attempt to increase uptake of service in a community dental clinic (see section 2.6).

2.2 Background

2.21 Anxiety

Terminology

Some psychologists distinguish between anxiety, fear and phobia. Such distinctions were adopted by Freud and have proved useful to psychiatrists and clinical psychologists. However, behavioural psychologists have argued for many years that these distinctions have produced "terminological and conceptual confusion" (Cattell, 1966).

This confusion is certainly apparent in the literature on dental anxiety: a number of researchers have selected their subjects using a similar criterion, namely that the subject's anxiety was so great that they had delayed seeking dental care; yet Lautch (1971) described his subjects as displaying "phobia" while Molin and Seeman (1970) suggested their subjects exhibited "anxiety" and yet Schoben and Borland (1954) used the term "fear". A more recent study used subjects "with a phobia" and yet "their fear varies from mild to severe" (Hall and Edmondson, 1983). Unfortunately, very few investigators have defined their terms and so readers are left to their own interpretation.

Some authors have avoided the problem of distinguishing between different terms by using the terms interchangeably. They consider dental anxiety to be a bi-polar construct varying in intensity (Sermet, 1974; Ingersoll, 1982): one pole of this construct represents

zero anxiety and the other pole represents maximum possible anxiety. For any patient a point representing his or her level of anxiety can be plotted between the poles. This construct has been adopted in this review.

Measurement of anxiety

Anxiety is a complex phenomenon and can be manifest in three ways: physiological changes, affective responses and overt behaviour (Martin and Venables, 1980).

Physiological changes are caused by activation of the sympathetic nervous system to produce the "fight or flight" response. Changes in cardiac rate (Stricker and Howitt, 1965; Howitt and Stricker, 1970), sweat gland activity (Corah and Pantera, 1968; Corah, 1969a), muscle tension (Davies and Payne, 1980) and blood concentration of metabolites (Edmondson et al, 1972) have all been measured during dental treatment.

Subjective feelings can be assessed by questioning the patient. Two commonly used questionnaires are the Dental Anxiety Scale (Corah et al, 1978) and the Dental Fear Survey (Kleinknecht et al, 1973). Both have been shown to be valid and reliable measures of dental anxiety.

Amongst adults dental anxiety causes avoidance of dental visits (Todd and Walker, 1982). Researchers have sought differences in behaviour during dental treatment between anxious adults and calm adults. Such differences have proved difficult to detect, perhaps because

anxious adults respond to the social pressure to conform to the demands of the situation (Kleinknecht and Bernstein, 1978).

Disruptive behaviour (such as pushing the dentist away and closing the mouth at an inappropriate time) is more common from anxious children than from calm children (Lindsay et al, 1978; Glennon and Weiss, 1978). It has been suggested that this is the greatest source of stress upon the clinician (Lindsay and Woolgrove, 1982).

The physiological, affective and behavioural changes accompanying fear can vary independently (Rachman and Hodgson, 1974 a,b) and some investigators have monitored several manifestations of anxiety simultaneously. For example, skin resistance has been measured at the same time as the head and body movements of children (Corah, 1973) and skin resistance has been used in conjunction with questionnaires for adults (Corah et al, 1979a,b, 1981).

Aetiology

The aetiology of dental anxiety is not fully understood. Few authors offer an explicit model of fear, but articles can be classified as variously favouring psychoanalytic, social learning or cognitive theories.

Psychoanalytic theory

Psychoanalytic theory, developed by Freud during 50 years of treating emotionally disturbed people, emphasises the role of unconscious

motives in directing behaviour. A number of authors, mainly in the 1950's and 1960's, attempted to explain dental anxiety in terms of unconscious worries, especially those concerned with the mouth (Zeifert, 1953; Kaho, 1955; Hllman, 1962; Borland, 1962; Kleisker, 1966; Dworkin, 1967; Blum, 1969; Sandler and Dare, 1970; Shipp, 1971; Richardson, 1972; Todes, 1972). As recently as 1978 one book claimed that a tooth was a phallic symbol and therefore extraction aroused a fear similar to that aroused by castration, and the similarity of the mouth to the vagina caused some females to equate dental treatment wth being raped (Morse and First, 1978).

Unfortunately, not a single one of these publications offers any empirical evidence to substantiate its assertions. Perhaps this is not surprising - most of the hypotheses would be extremely difficult to test experimentally. This has rendered such theorists open to harsh criticism from behaviourally orientated researchers; they state that psychoanalysis is not a science but a "mythopoetic anecdotal method" (Gale and Ayer, 1969) and they dismiss its concepts as "speculations" (Kleinknecht et al, 1973). This may explain why so few dental researchers have used this paradigm in the 1970's and 1980's.

Social learning theory

Classical conditioning, as pioneered by Pavlov, suggests that learning takes place when two stimuli become associated together. In the early part of this century most dental treatment was performed without any analgesia and a number of authors asserted that anxiety

arose from the association of dentistry with pain (Dinjian, 1921; Bregstein, 1923; Macfarlane, 1938).

More recent studies have shown that many people still associate dentistry with pain (Gale, 1972; Wardle, 1982; Woolgrove and Cumberbatch, 1986). Local analgesia is widely used in modern dental treatment, so why is pain still associated with dentistry? Several studies have shown that traumatic dental experiences can cause this association (Molin and Seeman, 1970; Shaw, 1975); even one traumatic experience may produce a phobia in susceptible individuals (Lautch, 1971).

Some people may have a predisposition towards dental anxiety. Two studies have found that anxious patients have a low pain tolerance (Lautch, 1971; Forgione and Clarke, 1974). This would cause such individuals to perceive dentistry as more painful than other individuals. However, other workers have been unable to reproduce these results (Klepac et al, 1980). Several studies have found that anxious patients have unusual personalities - high neuroticism and low extraversion (Lautch, 1971; Forgione and Clark, 1974; Hall and Edmondson, 1983): hence some people may have a personality that encourages them to appraise dental treatment adversely. Although such factors are interesting they are not especially helpful in understanding how interventions could be made. However, anxious patients often have relatives (usually mothers) who are also anxious about dentistry (Johnson and Baldwin, 1968, 1969; Lautch, 1971; Bailey et al, 1973; Johnson amd Machen, 1973; Kleinknecht et al, 1973; Forgione and Clark, 1974; Shaw, 1975; Barenie and Ripa, 1977).

This indicates that vicarious learning of dental anxiety may occur and recommends that early non-traumatic experience of the dental situation should be offered to young children so that dentistry is not introduced by both an anxious relative and the need for treatment. Treatment factors appear to trigger dental anxiety. Injections and the drill arouse the greatest anxiety (Gale, 1972; Kleinknecht et al, 1973). However, the dentist's own comments can also arouse anxiety. Thus Gale (1972) found that the dentist telling the patient that he has bad teeth could produce even more anxiety than an injection. It seems likely that these elements of treatment have become associated with pain.

Patients who are very anxious about experiencing pain with treatment are likely to experience pain because anxiety actually reduces pain threshold and tolerance (Sternbach 1968; Dworkin et al, 1978). Hence expectation of pain can become a self-fulfilling prophecy, reinforcing the association of anxiety with dentistry.

Cognitive theory

The model shown in figure 1 borrows the notions of perception and schemata from cognitive psychology. According to cognitive psychologists such as Neisser (1976), perception is much more than the passive registration of stimuli on the sense organs; it is the active process of selecting a sample of stimuli from the environment and interpreting them.

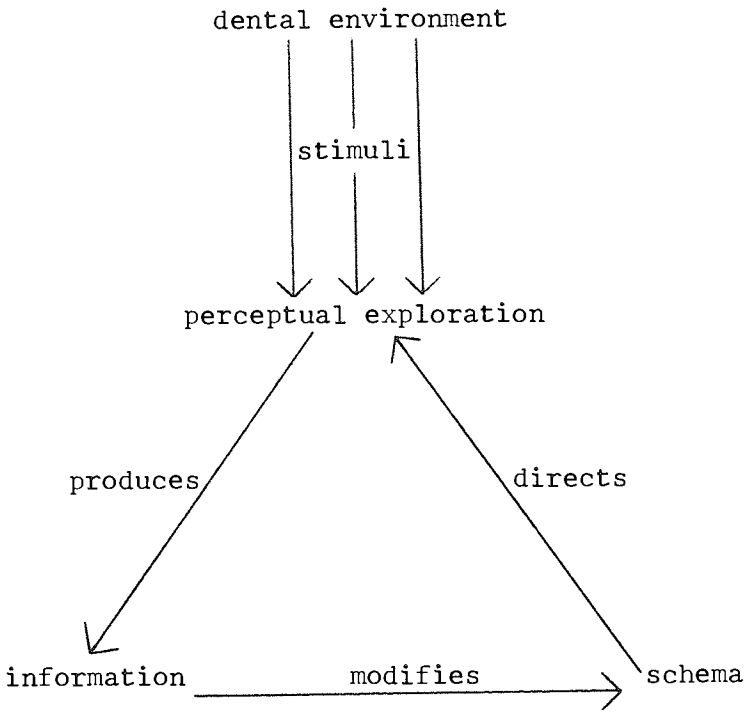


Figure 1. Cognitive model of perception of dental environment

The perceptual process of selection and interpretation is directed by the relevant schema. A schema is a hypothetical construct, stored in memory, that preserves and organises information about an event (Hilgard, Atkinson and Atkinson, 1979). A schema is based on a person's perceptions and so may be incomplete, distorted or include information that does not exist in reality. Thus a person's mental state is not influenced directly by the world but results from his or her personal schemata influencing the selection and interpretation of stimuli. New information is incorporated into a schema, thereby modifying it.

An anxious dental patient may have a schema that directs perception towards stimuli that are associated with pain, such as the sight of the needle, the sound of the drill and the feel of the

instrumentation. The stimuli derived from these sources may be interpreted adversely and reinforce the original schema. Furthermore such patients may have schemata that reconstruct memories and apply heuristic rules to be consistent with anxiety.

In dentistry this cognitive model has received little attention so far but it is supported by recent evidence that anxious patients expect more pain than they actually experience (Kent, 1984; Lindsay, 1984; Wardle, 1984). Kent (1985) found that highly anxious patients remembered more pain 3 months after dental treatment than immediately afterwards suggesting that anxious patients may well reconstruct their memories.

Management strategies

Dental anxiety can be modified by a variety of management strategies incorporating feelings of security, distraction, locus of control, information, modelling, relaxation training and desensitisation.

Security

People can face difficult situations more easily if the people around them are supportive. Many people seem to choose a dentist because he has "a friendly manner" and "puts them at ease" (Bulman et al, 1968; Von Groenestijn et al, 1980). What the dentist says is obviously important, but non-verbal communication is possibly even more important in transmitting emotional support - eye contact, facial expression, tone of voice, posture and touch can all help build rapport and trust (e.g. Argyle, 1978).

Distraction

Anxiety can be reduced by distracting the patient from anxiety arousing procedures. Clark and Hirschman (1980) reduced patients' subjective levels of anxiety during a simulated dental procedure by "paced respiration" - subjects were asked to breathe at a rate of eight breaths per minute. Corah et al (1979a) reduced subjective and physiological levels of anxiety during dentistry by permitting patients to play a television ping-pong game. Many patients can be distracted simply by talking to them, children can be distracted by simple tasks such as holding the saliva ejector in place.

Hypnosis has been used successfully to reduce dental anxiety in many patients (Hartland, 1971), even when the anxiety is extreme (Morcas, 1984). Hypnosis is not fully understood but uses distraction - Gindes (1953) proposed a 'hypnotic formula': 'misdirected attention, belief, expectation, plus subject's imagination = hypnosis'. It has been suggested that hypnosis should be taught to all dental undergraduates in order to improve their patient management (Smith, 1977).

Locus of control

Individuals seem to react differently to stressful events depending on whether they perceive them as being under their control or not (Averill, 1973; Auerback et al, 1976; Gatchel, 1980a). When individuals believe they can stop a stressful event, then they perceive that event as less stressful. Thus, when children were

given a device to signal to the dentist to stop, they experienced less stress during injections and drilling (Corah, 1972). Woolgrove, Atkins and Cumberbatch (1980) gave 50 adults a cut-out switch which they could use to switch off all dental apparatus in the surgery. Not a single person used the switch - apparently patients felt reassured because they knew that they had control. In a clinical situation, patients can be given control just by telling them that the drill (or dental procedure) will be stopped if they raise their hand.

Information

Uncertainty arouses anxiety and so anxiety can be reduced by giving patients information. The tell-show-do routine (Adelston, 1959) provides a framework in which to impart appropriate information. This recommends not only explanations of procedures, but also descriptions of what the patient is likely to feel (Dworkin et al, 1978; Herbert and Innes, 1979). Anxiety impairs cognitive functioning and so clinicians must give plenty of time for anxious patients to absorb information, repeating explanations as necessary.

Telling people what will happen can present enormous problems of communication for the dentist familiar with the jargon of treatment. Dental jargon can confuse and frighten people (reminding them of other areas such as medical situations) and so euphemisms may be usefully employed so as to avoid causing alarm. Jackson (1974) and Wright (1975) both offer a list of euphemisms for children, as shown in Table 2.

Table 2. Examples of euphemisms for dental jargon

Dental jargon	Euphemism
Air blast	Wind
Alginate material	Jelly
Local anaesthetic	Sleepy tooth
Stainless steel band	Ring for tooth
Stainless steel crown	Hat for tooth

With adults one must be careful not to patronise - patient management requires a sensitivity on the part of dentists. Additionally, too much explanation may be counterproductive - for example advising that only the tip of the needle will penetrate the gum and that the length of the needle assists with withdrawing the instrument should it break is unlikely to reassure anyone. However, explaining that the needle will be introduced to an insensitive membrane (a bit like acupuncture) might be useful.

Modelling

Modelling (observing the behaviour of other people, otherwise known as observation learning or social learning theory) has been used to reduce dental anxiety in children, producing better behaviour (Adelson and Goldfried, 1970; Melamed et el, 1975, 1978). Video modelling is one of the few means of reaching the people who avoid dentistry because of anxiety and it can be used for large numbers of people simultaneously. One commercially produced video is claimed to help 8 to 12 year olds overcome dental anxiety (Gibbs Oral Hygiene Service, 1985).

Relaxation training

Jacobsen (1938) pioneered progressive relaxation training by alternate tensing and relaxing of various muscle groups. This has been widely used in the clinical psychology field for treating all manner of phobias. Relaxation training has proved effective against dental anxiety (McAmmond et al, 1971; Corah et al, 1981). Even tape recorded instructions can be used to reduce demands on costly professional time: in 1986 the British Dental Health Foundation produced a relaxation tape for anxious patients but no details are currently available on its efficiency.

Desensitisation

Systematic desensitisation has been recommended for many types of phobias (Marks, 1969; Wolpe, 1973). The technique requires the subject to generate a hierarchy of anxiety arousing items. The subject is usually taught to relax (as above) and then presented with the item causing least anxiety. Gradually, while in a relaxed state, the subject progresses through all the items in the hierarchy. The technique has beeen widely used to cure dental anxiety (Gale and Ayer, 1969; Machen and Johnson, 1974; Shaw and Thoresen, 1974; Klepac, 1975). Unfortunately, as Ingersoll (1982) points out, few dentists can be expected to provide this treatment especially under the present remuneration system simply because it is so time consuming. However, researchers have now modified the technique in order to increase its efficiency. Modifications include group administrations (Gatchel, 1980b) and videotaped presentations

(Carlsson et al, 1980). In these the gain in efficiency does not appear to result in much loss of efficiency for individual patients.

Combination of strategies

Combinations of modelling and desensitisation have proved very successful even for extreme dental anxiety (Gordon, 1974; Kleinknecht and Bernstein, 1979). Clearly, even though evaluation for combined approaches is difficult in a scientific sense and thus may only rarely emerge in academic journals, in professional practice this is more likely to be the usual solution and must be encouraged.

2.22 Pain

Many studies, both old and new, have shown that public opinion associates dentistry with pain (Dinjian, 1921; Bregstein, 1923; Gale, 1972; Wardle, 1982; Woolgrove and Cumberbatch, 1986). However, pain research by behavioural scientists has received little attention from the dental profession; most texts on dental pain concentrate upon the more traditional sciences of anatomy, physiology and biochemistry (Mumford, 1976; Anderson and Matthews, 1977; Curro, 1978; Howe and Whitehead, 1981). This section is an attempt to remedy, in some small measure, this deficiency, by reviewing some of the behavioural science research into pain and assessing its contribution to dentistry.

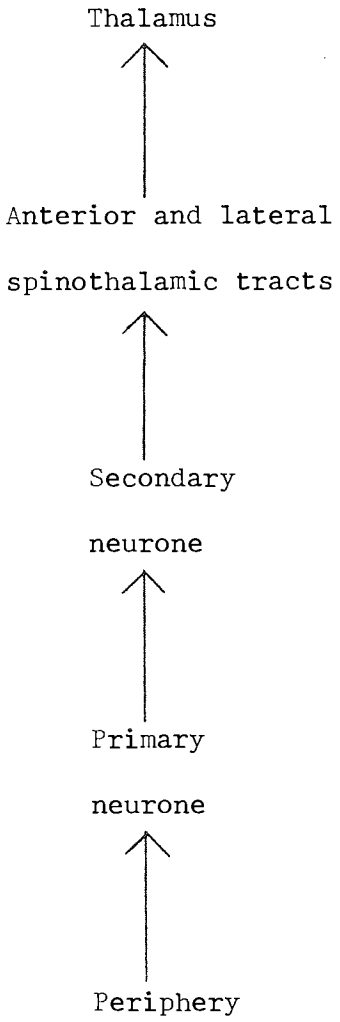
Theories of pain perception have caused bitter controversies in the past (Dallenbach, 1939) and many areas of disagreement remain today. This review will outline the commonest theories.

Specificity theory

This theory, proposed by Von Frey a century ago, postulates a specific pain pathway from somatic pain receptors to a pain centre in the brain (figure 2).

This simple view is implied by many anatomical diagrams. Specificity theory predicts that intensity of pain will be proportional to the extent of tissue damage and leads one dental text (Howe and

Figure 2. A diagram representing specificity theory. This suggests that impulses signalling noxious stimuli are transmitted across synapses without control.



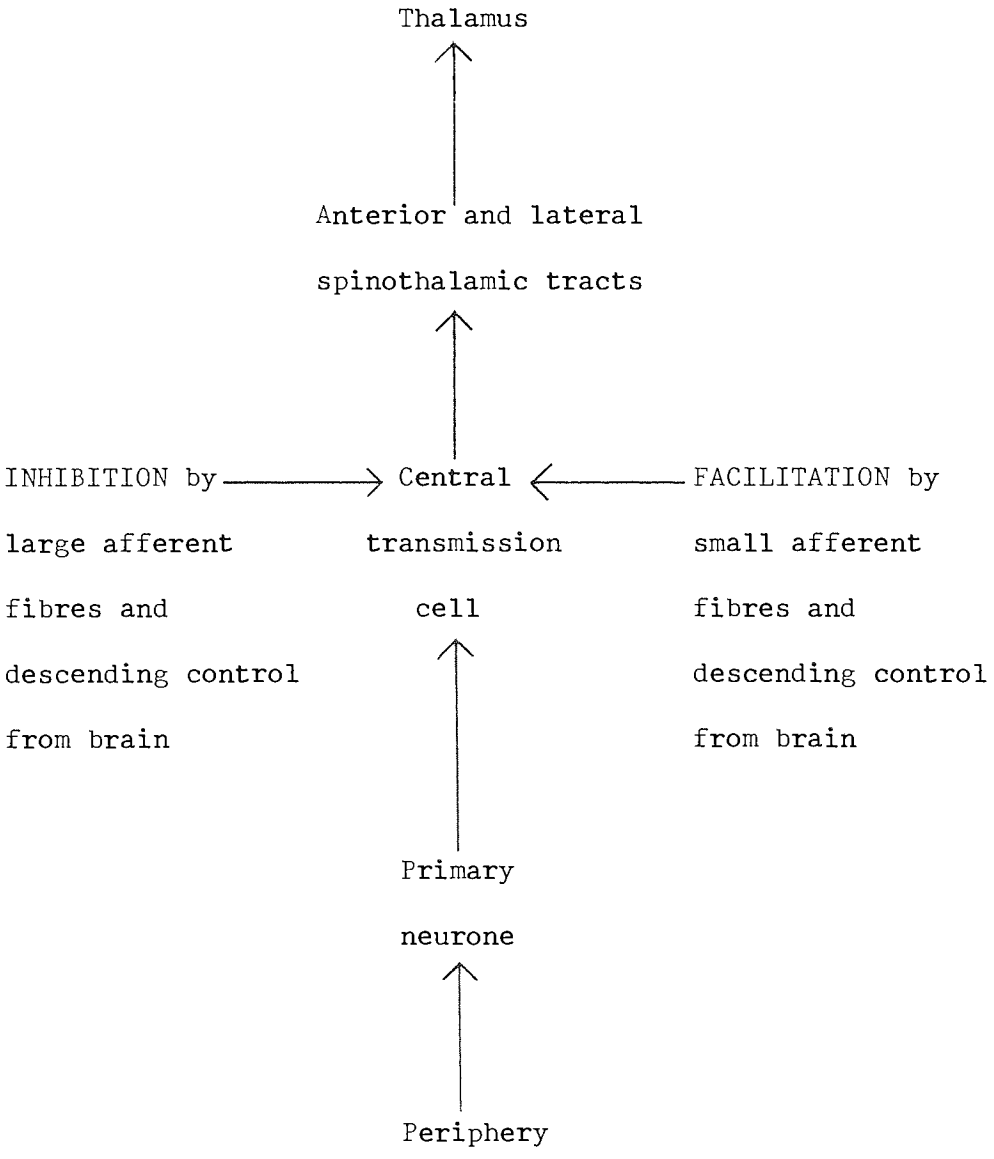
Whitehead, 1981) to state: "It is generally agreed that if a unit stimulus is applied to two individuals, they should both perceive the same amount of pain." Acceptance of this theory encourages methods of pain control that reduce pain impulses (for example, local anaesthesia) or render the pain centre inactive (for example, general anaesthesia).

Gate control theory

Concerned that the specificity theory did not explain certain phenomena, such as phantom limb pain and neuralgia, Melzack and Wall formulated the gate control theory (Melzack and Wall, 1965). This theory essentially proposes that mechanisms in the spinal cord act like a gate to increase or decrease the flow of impulses along afferent neurones. Sensory input is therefore subjected to a modulating influence of a gate before it evokes pain perception - a direct contradiction to specificity theory in the quotation above.

The gate control theory contains several important elements. Injury produces nerve impulses in small afferent fibres; these impulses excite central transmission cells in the spinal cord. Central transmission cells also receive excitatory and inhibitory influences from large afferent fibres. Hence transmission is controlled not simply by the presence or absence of injury but also by impulses signalling non-noxious stimuli. Futhermore, impulses descending from the brainstem and the cortex also strongly influence the excitability of the transmission cells. Consequently, the message transmitted towards the brain is not a simple message of the existence of nerve impulses in injury detection fibres but is dependent for its strength on activity in other afferents and on activity in descending pathways (figure 3). Pain is a state of perception in which the organism as a whole reacts to apparent injury and is only triggered if the gate is favourably set.

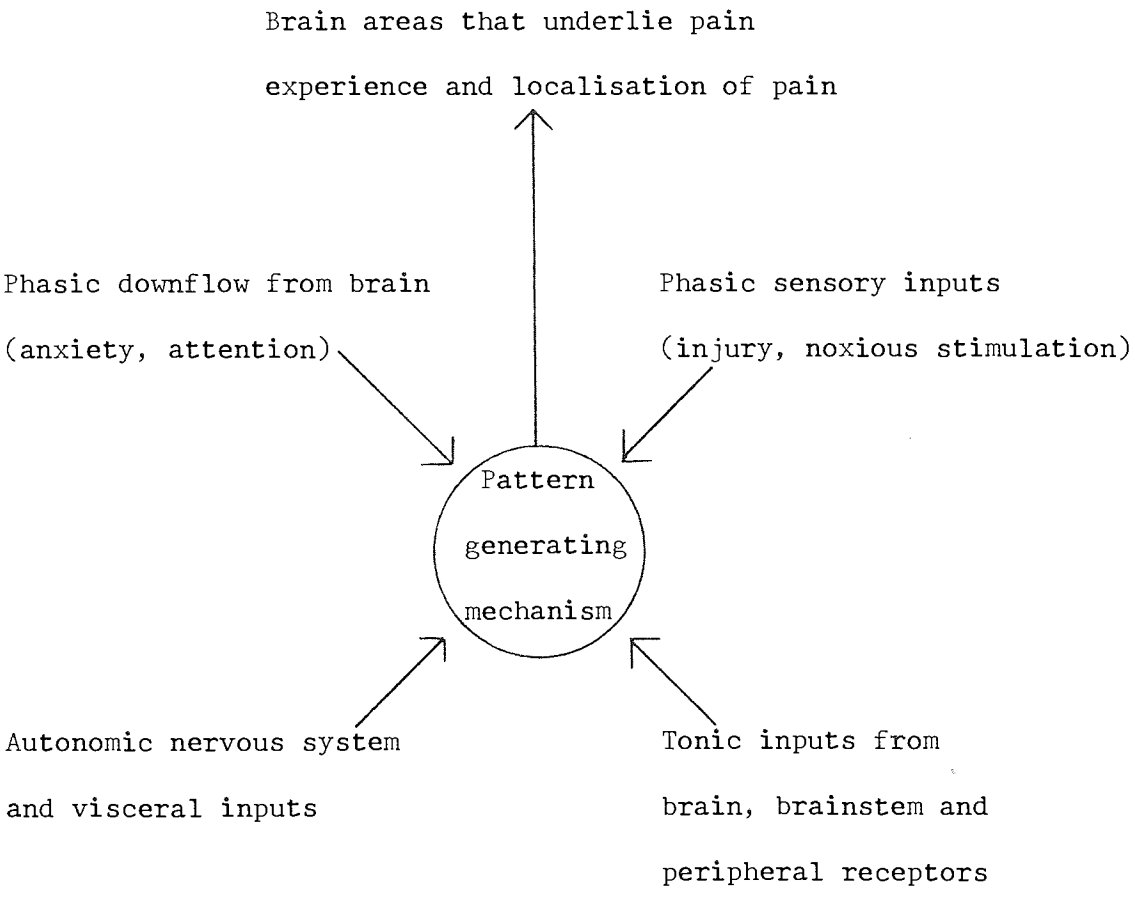
Figure 3. A diagram representing gate control theory. This suggests that the transmission of impulses signalling noxious stimuli can be inhibited or facilitated by other sensory impulses and by descending control.



Pattern generating mechanisms

Melzack and Loeser (1978) have reviewed cases of patients who had sustained total spinal cord sections at thoracic or lumbar levels, yet continued to suffer severe pain in the abdomen, groin or legs. This led them to extend the gate control theory by proposing that neurone pools at many levels of the spinal cord and brain can be gated or modulated by visceral and somatic inputs as well as by neural activities that descend from the brain (figure 4).

Figure 4. A diagram representing a pattern generating mechanism. This suggests that pain is perceived when an appropriate pattern of impulses is generated from multiple inputs.



The model of pattern generating mechanisms which are triggered and modulated by multiple inputs can enhance our understanding of the phenomenon of pain. Some of the factors that can influence the prception of pain in the dental surgery will be examined within the framework of this model.

Melzack and Loeser (1978) believe that the phasic downflow from the brain is influenced by attention (or distraction), anxiety and expectation. These are cognitive factors and offer opportunities for exploitation by patient management techniques.

Distraction has reduced the perception of pain from noxious stimuli during laboratory research: pain threshold was elevated by merely instructing subjects to divert attention away from the stimulus (Blitz and Dinnerstein, 1971). Dental patients produced lower ratings of discomfort during dental treatment when they were distracted by playing a television ping-pong game (Corah, Gale and Illig, 1979a). Similarly, audioanalgesia appears to reduce pain in part by distracting the patient (Melzack, Weiss and Sprague, 1963).

On the other hand, anxiety reduces tolerance of pain (Sternbach, 1968; Dworkin, Ference and Giddon, 1978) and unfortunately dentistry evokes anxiety in very many children and adults (Todd, 1975; Woolgrove, Atkins and Cumberbatch, 1980; Todd, Walker and Dodd, 1982). Not surprisingly, relaxation training is highly effective in reducing anxiety from many sources including dentistry, but it is time consuming (McAmmond, Davidson and Kovitz, 1971; Corah et al, 1981).

Anxiety can also be reduced by accurate expectations. Expectations for the future (or predictions) are based on the information acquired and on the degree of control available, and may be manipulated by placebos and hypnosis.

Research using experimentally induced pain demonstrated that both pain threshold and pain tolerance are increased if subjects are given more information about the situation (Johnson, 1973; Johnson and Leventhal, 1974). These results are mirrored by hospital experiments involving patients scheduled for gastrointestinal endoscopy: patients required fewer drugs and experienced less distress if they were informed of the sensations likely to be experienced (Johnson, Morrisey and Leventhal, 1973). Other clinical studies have confirmed that full pre-operative information reduces post-operative need for analgesics (Ley, 1977; Leigh, Walker and Jamaganathan, 1977).

Bandura has suggested that modelling is a major mode of human learning (Bandura, 1969). Investigations which subjected people to electric shocks found that their assessment of pain was greatly influenced by the reaction of other subjects in the experiment (Craig and Neidermayer, 1974). Film modelling has improved the behaviour of children during dental treatment (Melamed et al, 1975) and has reduced avoidance of dental treatment in adults (Staub, Tursky and Schwartz, 1971).

As discussed in section 2.21, individuals react differently to stressful events depending on whether they perceive them as being under their control or not. For example, one experiment found that

subjects who had control over the electric shocks they received, tolerated more intense shocks than subjects who had no control (Staub, Tursky and Schwartz, 1971), and the subjects who had control perceived the shocks as less painful. Furthermore, during dental treatment patients experience less stress during injections and drilling if they are given a device to signal to the dentist to stop (Corah, 1973). However, dentists (and doctors) are often reluctant to share control with patients, perhaps because they feel more secure in a dominant role (Linn, 1967; Waitzkin and Stoeckle, 1972).

Placebos have little effect on experimentally induced pain but have great clinical value. After reviewing studies involving over 1000 patients who suffered pain from wounds, angina pectoris and other conditions, Beecher (1975) calculated that placebos gave satisfactory relief in 35% of the total. He explained that procedures as well as drugs may have a placebo effect: ligation of the internal mammary arteries produced impressive results in patients with angina pectoris, but when these results were compared with those of placebo operations, no difference was found!

Hypnotic analgesia has beeen well established in laboratory and clinical situations. The analgesia is complete in about 20% of subjects and is partial in many more (Hartland, 1971).

Phasic sensory inputs include counterpressure, electroanalgesia (electrical counter-stimulation) and acupuncture. These techniques stimulate large diameter afferent fibres and have a profound effect on the pattern generating mechanism.

Some texts mention that counter-pressure (for example, squeezing the patient's lip) prevents the perception of pain during an injection of local anaesthetic (Haglund and Evers, 1975).

Recent clinical trials on haemophiliac patients have demonstrated the efficacy of electroanalgesia for cavity preparation by passing 40-50 microamps of current through the the patient's tooth via the drill (Savage 1982). One dental text claims that electroanalgesia blocks pain by causing depolarisation of nerve fibres (Roberts and Sowray, 1979), but this mechanism is refuted by Wall and Gutnick (1974) because the production of such a block would actually cause pain.

Acupuncture can produce analgesia, but the magnitude of this effect is in dispute. Chinese reports of acupuncture anaesthesiology for major surgery have claimed success rates of 90% (Shanghai Acupuncture Anaesthesia Coordinating Group, 1975), but critical observers have suggested that these assessments are based on unacceptable criteria - the acupuncture was judged effective even when patients felt considerable pain (Taub, 1976).

Acupuncture is often supplemented with local anaesthetics and narcotic analgesics, and further analgesic effect may be produced by cultural conditioning and pre-treatment indoctrination.

Laboratory studies using electrical stimulation of human teeth showed that acupuncture produced greater analgesia than a placebo (Chapman, Wilson and Gehrig, 1976), and was roughly equal to that produced by 33% nitrous oxide inhalation (Chapman, Gehrig and Wilson, 1975).

This level of analgesia would sometimes be adequate for cavity preparation (Janhunen and Narhi, 1977).

Tonic (or continuous) inputs cannot be rapidly modified and so are of little value in deriving pain control techniques, but can explain some of the anomalies of pain.

It is known that cultural factors (Weisenberg, 1977), personality variables (Sternbach, 1974) and past dental experiences (Lautch, 1971) can all increase the perception of pain, either directly or by producing anxiety, and tonic downflow from the brain provides a mechanism by which these factors may operate.

Melzack and Loeser (1978) claim that phantom limb pain is caused by abnormal activity in neurone pools: the loss of sensory input to the brainstem areas of paraplegics reduces descending inhibition and so permits non-noxious inputs to trigger pain.

Kerr and Miller (1966) claimed that the trigeminal ganglia of patients with trigeminal neuralgia show marked changes in the myelin sheaths of large fibres. Melzack and Wall (1970) believe that this would cause a reduction in large-fibre input to the neurone pool and so permit pain to be triggered by minor stimulation of trigger zones.

Inputs fron the autonomic nervous system and the viscera are not amenable to direct manipulation by dentists although they are influenced by cognitive factors: for example, anxiety will affect the autonomic nervous system and viscera.

2.23 Conclusions

The preceding review has shown that both fear and pain can be attenuated by behavioural strategies such as providing security, imparting information, giving control, distraction, modelling, relaxation training, desensitisation and suggestion. However, fear and pain appear to continue to be associated with dentistry.

Two questions merit consideration. Firstly, have dentists failed to implement appropriate behavioural strategies? Secondly, is the association of fear and pain with dentistry merely an artefact caused by the instruments used to measure it?

Dentists may fail to use behavioural strategies because of lack of skills or lack of motivation. It has been reported that dentists receive little training in the behavioural sciences (Blinkhorn et al, 1979; Anonymous, 1986b; Kent, 1987) and undergraduate dental textbooks have failed to update their content in line with developments in the behavioural sciences (for example, Howe and Whitehead (1981) as mentioned in section 2.22). More behavioural science teaching is urgently required and this important issue will be discussed in chapter 4. Most dentists are paid on a piece-work basis and so are not motivated to spend time using behavioural strategies. Indeed, they are penalised financially if they spend time allaying fear or reducing pain when they could be performing dental procedures. Hopefully, the introduction of a pilot capitation scheme heralds the start of a new payment system in dentistry which may eliminate the financial disincentive to using behavioural

strategies (Coventry et al, 1986).

Could the association of fear and pain with dentistry be an artefact caused by the instruments used to measure it? The main evidence for this association derives from questionnaire and interview responses. When the actual questionnaires and interview schedules were examined, it was clear that they often used closed questions which implied that fear was normally associated with dentistry! For example, Green and Green (1985) asked "Which of these makes you feel anxious? Pain, injections, dentist's manner....." The question suggested that some of the responses must make the subject anxious. Liddell and May (1984) and Woolgrove and Cumberbatch (1986) used the Corah Dental Anxiety Scale which contains such questions as "When you are in the dentist's waiting room, how do you feel? Relaxed, a little uneasy, tense, anxious, so anxious that I sometimes break out in a sweat or almost feel physically sick." All but one response contain some degree of anxiety, implying that anxiety is the norm. The survey by Todd Walker and Dodd (1982) showed respondents a card stating "I put off going to the dentist because: I'm scared of the dentist, it's difficult to get time off work, I don't like having fillings....." The question is worded in a leading way, with "I'm scared" as the first response.

These failings in the question wording cast some doubt on the validity of the results. It was therefore necessary to reconsider the hypothesis that fear of pain is widely associated with dentistry. The hypothesis needed to be examined without any possibility of the methodology biasing the results. Instead of a questionnaire

supplying constructs such as fear and pain, a technique was needed to elicit relevant constructs from the subjects themselves. A product of personal construct theory - repertory grid technique - offered such a technique and was therefore selected for the initial exploration of dental attitudes.

2.31 Exploring personal constructs: introduction

Kelly's book The Psychology of Personal Constructs (Kelly, 1955) has stimulated an almost cult-like movement excited by Kelly's assertion that people act like scientists trying to understand and predict the world around them. Kelly suggested that people form personal constructs through which they perceive and understand the world. He further suggested that these constructs may be elicited by the repertory grid technique which requires that individuals should articulate how they perceive 'elements' in the world (people, objects, activities) to be different from each other. This is conventionally done by triadic sort, that is, interviewees are presented with the elements of interest in groups of three and invited to say how two are similar to each other and thereby different from the third.

The theory and the method have been enthusiastically developed and applied in a wide variety of contexts (see for example Epting and Landfield, 1985; Beail, 1985; Valerie, Stewart and Fonda, 1981; Ryle, 1975). In the present context the attraction of a repertory grid study was in "gaining access to private worlds" (Kelly, 1955) of how people might perceive visiting the dentist. The constructs elicited from such a study would then be used either directly, or as intended here fed into a questionnaire so that the questions could tap the constructs people hold and reflect their language.

It is worth adding that in the context of dental behaviour the repertory grid approach was not thought likely to produce novel

ideas. Those practising as dentists are likely to find social intercourse focusing on their profession so that it seems quite easy to explore constructs in natural conversation. While this is not scientific, the literature on attitude measurement offers precious little advice on how an exhaustive list of attitude items might be developed. The repertory grid method seems a useful approach to achieve this.

2.32 Exploring personal constructs: method

Subjects

Nineteen volunteers from Aston University student population were used as subjects. This population was chosen so that the main part of the experiment could run on-line on a computer on the Aston campus. The sample included both people who visited the dentist regularly and people who rarely made dental visits. Volunteers were motivated by the promise of learning something of repertory grid technique ("a computer interview") both by participating in the experiment and from a debriefing afterwards.

Element selection

Much of the method of this study followed the suggestions offered by Fransella and Bannister (1977). The study focused on the construing of dental visits. Interviews with subjects were held to decide which elements should be used alongside dental visits. These interviews revealed that dental visits often had two interpretations: some dental visits were for toothache while others were for a routine check-up. Interviewees' attitudes towards these two types of dental visits were markedly different and so it was necessary to split dental visits into two elements: routine dental visits and emergency dental visits. A total of six similar elements emerged from the interviews, as shown in table 3.

Table 3. Elements used for repertory grids

1 Routine dental visits

2 Emergency dental visits

3 Visits to family doctor

4 Visits to hospital

5 Visits to hairdresser

6 Visits to optician

Grid generation

The six elements were fed into Pegasus, a commercial software package for grid technique, running on the Aston University Applied Psychology Department PDP 11 computer. Each subject used an on-line terminal so that his or her personal grid could be constructed. The computer conducted a triadic sort of elements to elicit constructs. The computer would display three of the elements from those shown in Table 3 and ask the subject: "Try to think of some way of separating one from the other two, some way in which two are alike and one is different." The computer then invited the subject to name the construct that he or she had used to separate the elements: "Do so by labelling each end or pole of the construct." The subject then rated every element on the construct, assigning values between 1 and 5. This process was repeated until 4 constructs had been elicited: this usually took 30 to 40 minutes. The computer then printed out the raw grid, construct matching score, element matching score and focused grid.

2.33 Exploring personal constructs: results and discussion

The verbal labels chosen for the constructs by the subjects show a recurrence of certain themes. Many of the 76 constructs elicited (shown in appendix 1) relate to just 5 factors - pain, fear, cost, pleasantness and frequency. Table 4 gives some examples.

Table 4. Examples of personal constructs illustrating certain themes

Theme	Construct
Pain	Painful - not painful
	Can be painful - enjoyable
	High discomfort - low discomfort
Fear	Fear - no fear
	Normal - fear
	Nervous - not nervous
Cost	Low cost - high cost
	Expensive - free
	No expense - expense involved
Pleasantness	Pleasant - tiresome
	Like going - do not like going
	Neutral - unpleasant
Frequency	High periodicity - low periodicity
	Regular - rare
	Irregular - regular

The matching scores of routine dental visits (element 1) with each other element exhibit wide variation between subjects (see Table 5). No single element is consistently matched closest to regular dental visits. In fact, apart from visits to hospital (element 4) all other elements were most closely matched to routine dental visits for some subjects. It would seem that construing varied enormously from one subject to another.

It appears that different people may use similar constructs but place upon them different evaluations for the elements used here. The themes of pain, fear, cost, pleasantness and frequency will be explored in section 2.4.

Table 5. Matching scores of element 1 (routine dental visits) with each other element

Subject	Element 2 (Dentist)	Element 3 (Doctor)	Element 4 (Hospital)	Element 5 (Hair)	Element 6 (Optician)	Highest Element
1	43	100	56	56	68	3
2	100	50	75	0	43	2
3	62	93	62	37	87	3
4	75	50	37	43	62	2
5	25	62	43	75	87	6
6	31	56	37	56	50	3 & 5
7	93	56	81	6	37	2
8	43	25	18	62	62	5 & 6
9	56	43	43	62	56	5
10	56	37	31	56	37	2 & 5
11	31	100	87	56	93	3
12	37	62	68	75	68	5
13	75	50	56	50	50	2
14	37	62	37	56	68	6
15	31	31	25	50	87	6
16	45	35	50	40	55	6
17	75	50	50	37	50	2
18	50	18	18	56	43	5
19	56	31	31	68	68	5 & 6

2.41 Attitude survey: method

Sample

The sample was drawn from 14 to 16 year old children attending 4 schools in the inner city London Boroughs of Lambeth, Lewisham and Southwark.

The age of 14 to 16 years was selected because the attitudes of this age group are particularly important: the decision-making of adulthood is imminent. Furthermore, data from Elderton and Eddie (1986) suggests that youngsters of this age are entering a period of reduced dental attendance.

Elderton and Eddie (1986) used treatment data from the Dental Estimates Boards to examine the uptake of General Dental Services; they calculated that from 1965 to 1980 the number of dental examinations per head (for all age groups) was increasing. However, from 1980 to 1983 the number of dental examinations per head for 14 to 16 year olds had decreased from 0.75 to 0.69, whilst the number of examinations per head had increased for all other age groups. The authors speculate that the reason for this may have been the introduction of patient charges for the 18 to 21 year olds in 1981.

A deprived inner city area was chosen because it contained a high proportion of people in social class IV and V and would thus boost the number of trouble-only attenders - it is known that people in the lower social classes are likely to attend the dentist less often than

those in the higher social classes (Eddie and Davies, 1985; Todd and Dodd, 1985). Personal contact with the district dental officer, district dental health education officer and district health education officer indicated that all would support the administration of the study in Lambeth, Lewisham and Southwark.

Questionnaire

The questionnaire was designed to include assessments of reported attendance behaviour, past dental experience, future dental expectations, dental anxiety and knowledge about dental charges. The recommendations of Moser and Kalton (1979) were followed and closed questions were used wherever possible to simplify analysis and interpretation. It was anticipated that the data would be analysed using the Statistical Package for the Social Sciences version 9 mounted on a Harris mainframe computer (Nie et al, 1975; Hull and Nie, 1981) and Aston University Computer Centre gave advice regarding the lay out of the questionnaire to facilitate data entry.

Question 1 asked if the respondent had ever been to the dentist - this question was intended to produce an appropriate mental set and to encourage the respondent as it was easy to answer. Question 2 assessed attendance pattern in the same way as the major national surveys (Todd and Walker, 1980; Todd Walker and Dodd, 1982; Todd and Dodd, 1985). Questions 3 and 4 asked about parental attendance pattern.

Questions 5 to 8 enquired about past dental treatment, including

assessments of how much treatment had been performed and how much pain the treatment had caused.

Questions 9 to 20 asked about the respondent's last course of treatment. The name of the dentist was requested so that the reported treatment could be compared with the dentist's records. As reported in section 2.21, Kent (1985) suggested that anxious patients reconstruct their memories to be consistent with their anxiety. Thus it was hypothesized that anxious patients would give more information about treatment than would non-anxious patients. According to Corah (1969), questions 23 to 26 provided a reliable and valid measure of dental anxiety so that this hypothesis could be tested.

Questions 21 and 22 assessed future expectations of treatment and questions 27 to 29 asked about knowledge of dental charges. Both of these might be powerful deterrents to regular dental visits. Questions 30 to 38 asked about dental attitudes. Some of these questions (32 to 34) have been used previously by the major national surveys and thus would afford the opportunity of comparing the present sample with a random sample.

The main body of the questionnaire (questions 39 to 88) was devoted to testing the theory of reasoned action which is covered in some detail later (in section 2.5). The respondent's name and some personal details were sought at the end of the questionnaire.

An explanatory letter was drafted to explain the survey and instruct the respondents how to complete the questionnaire.

A pilot study of the questionnaire was conducted using patients at the Lister Health Centre Dental Clinic. For one week, the age of each patient was checked before they received treatment. All 14 to 16 year olds presenting themselves (n = 26) were asked to fill in the questionnaire. Three declined; the remaining 23 completed the questionnaire and were asked if there were any difficulties with it. Some minor amendments were made to the questionnaire, and the final version is reproduced in appendix 2.

Administration

In autumn 1984, teachers at Malory, Bonus Pastor, Lilian Bayliss and Walworth schools were asked to administer the questionnaire to pupils aged 14, 15 or 16. It was explained that the questionnaire had educational value because pupils would soon be leaving school and have to fill in forms for themselves. It was emphasized that pupils should give their own answers - teachers should not encourage any particular answers and teachers should ensure that the youngsters did not copy their friends' answers.

The questionnaires were administered between January and June of 1985, some delay being caused by the teachers' action. The researcher was not present at all administrations. Most youngsters completed the questionnaire within half an hour enabling teachers to administer and collect the questionnaire within a single lesson. Most children seemed to experience little difficulty with the questions.

Response

Teachers administered and finally returned 556 questionnaires, but 32 were spoiled or had less than half the questions answered. Thus 524 useful questionnaires were analysed. The sample comprised 272 boys (51.9%) and 252 girls (48.1%).

2.42 Attitude survey: results and discussion

Frequency distributions

A full list of frequency distributions for the responses of the inner city sample is shown in Table 6, following which the salient points are discussed.

Table 6. Frequency distributions of responses in attitude survey

Summary of question	Response	n	%
1) Ever been to a dentist?	1) Yes	519	99.6
	2) No	2	0.4
	Total	521	100.0
2) What do you go for?	1) Regular check	257	49.5
	2) Occasional check	148	28.5
	3) Trouble only	114	22.0
	Total	519	100.0
3) Father has regular checks?	1) Yes	110	21.3
	2) No	222	43.0
	3) Don't know	184	35.7
	Total	516	100.0
4) Mother has regular checks?	1) Yes	228	43.9
	2) No	165	31.8
	3) Don't know	126	24.3
	Total	519	100.0

Table 6. (Continued)

Summary of question	Response	n	%
5) Age at first treatment?	1) 0-3 years	89	17.9
	2) 4-5 years	228	45.9
	3) 6-9 years	125	25.2
	4) 10-12 years	45	9.1
	5) over 12 years	10	2.0
	Total	497	100.1
6) Had extractions?	1) Yes	341	65.5
	2) No	180	34.5
	Total	521	100.0
7) Had fillings?	1) Yes	444	85.4
	2) No	76	14.6
	Total	520	100.0
8) Treatment been painful?	1) Yes	353	67.9
	2) No	167	32.1
	Total	520	100.0
How often?	1) On most visits	60	16.5
	2) On half visits	67	18.4
	3) On few visits	237	65.1
	Total	364	100.0
How much?	1) Slight pain	167	43.3
	2) Moderate pain	164	42.5
	3) Severe pain	55	14.2
	Total	386	100.0

Table 6. (Continued)

Summary of question	Response	n	%
9) Time since last visit?	1) 6 months or less	345	66.9
	2) 6-12 months	80	15.5
	3) 1-2 years	48	9.3
	4) 2-3 years	15	2.9
	5) More than 3 years	28	5.4
	Total	516	100.0
10) Reason for last visit?	1) Trouble	135	25.8
	2) Check	340	65.0
	3) Other reason	48	9.2
	Total	523	100.0
11) Length of last treatment?	1) One visit	287	55.6
	2) Two visits	136	26.4
	3) Three visits	46	8.9
	4) Four visits	47	9.1
	Total	516	100.0
12) Teeth polished?	1) Yes	279	54.1
	2) No	237	45.9
	Total	516	100.0
13) Orthodontic treatment?	1) Yes	98	18.9
	2) No	420	81.1
	Total	518	100.0

Table 6. (Continued)

Summary of question	Response	n	%
14) Fillings?	0) None	293	55.9
	1) One	112	21.4
	2) Two	72	13.7
	3) Three	13	2.5
	4) Four or more	34	6.5
	Total	524	100.0
15) Extractions?	0) None	435	83.0
	1) One	47	9.0
	2) Two	22	4.2
	3) Three	2	0.4
	4) Four or more	18	3.4
	Total	524	100.0
16) Radiographs?	0) None	261	49.8
	1) One	119	22.7
	2) Two	107	20.4
	3) Three	28	5.3
	4) Four or more	9	1.7
	Total	524	99.9
17) Type of dentist?	1) NHS	238	46.5
	2) Private	80	15.6
	3) School	80	15.6
	4) Hospital	45	8.8
	5) Don't know	69	13.5
	Total	512	100.0

Table 6. (Continued)

Summary of question	Response	n	%
18) You know your dentist's name?	1) Yes	153	30.1
	2) No	356	69.9
	Total	509	100.0
20) Was usual dentist seen on last visit?	1) Yes	420	82.2
	2) No	91	17.8
	Total	511	100.0
21) Do you need treatment?	1) Yes	192	37.4
	2) No	321	62.6
	Total	513	100.0
Need fillings?	1) Yes	141	43.3
	2) No	185	56.7
	Total	326	100.0
Need extractions?	1) Yes	28	7.6
	2) No	342	92.4
	Total	370	100.0
22) Expect next treatment to be unpleasant?	1) Not at all	262	51.1
	2) Slightly	169	32.9
	3) Fairly	51	9.9
	4) Very	31	6.0
	Total	513	99.9
23) How do you feel about dental visits?	1) Enjoyable	40	7.7
	2) Wouldn't care	266	51.3
	3) Uneasy	161	31.0
	4) Afraid	30	5.8
	5) Very frightened	22	4.2
	Total	519	100.0

Table 6. (Continued)

Summary of question	Response	n	%
24) How do you feel in the waiting room?	1) Relaxed	182	35.1
	2) Uneasy	219	42.2
	3) Tense	74	14.3
	4) Anxious	29	5.6
	5) Very anxious	15	2.9
	Total	519	100.1
25) How do you feel while the dentist gets his drill ready?	1) Relaxed	102	20.0
	2) Uneasy	197	38.6
	3) Tense	129	25.3
	4) Anxious	45	8.8
	5) Very anxious	37	7.3
	Total	510	100.0
26) How do you feel while the dentist gets his instruments ready?	1) Relaxed	212	41.2
	2) Uneasy	211	41.1
	3) Tense	59	11.5
	4) Anxious	19	3.7
	5) Very anxious	13	2.5
	Total	514	100.0
27) Do you know the age at which you must pay for fillings?	1) Yes	356	69.1
	2) No	159	30.9
	Total	515	100.0
28) Do you know the age at which you must pay for dentures?	1) Yes	98	19.4
	2) No	407	80.6
	Total	505	100.0

Table 6. (Continued)

Summary of question	Response	n	%
29) Do you know where to find out about dental charges?	1) Yes	87	17.4
	2) No	412	82.6
	Total	499	100.0
30) How sensitive are you to pain compared to most people?	1) Much more	53	10.6
	2) Slightly more	181	36.1
	3) Slightly less	210	41.8
	4) Much less	58	11.6
	Total	502	100.1
31) Ever had toothache?	1) Yes	407	79.0
	2) No	108	21.0
	Total	515	100.0
32) Would you want an aching BACK tooth taken out or filled?	1) Taken out	188	37.8
	2) Filled	310	62.2
	Total	498	100.0
33) Would you want an aching FRONT tooth taken out or filled?	1) Taken out	67	13.6
	2) Filled	427	86.4
	Total	494	100.0
34) Is the thought of having false teeth upsetting?	1) Very	224	43.7
	2) A little	234	45.6
	3) Not at all	55	10.7
	Total	513	100.0
35) Will your teeth last forever?	1) Definitely	69	13.7
	2) Probably	311	61.6
	3) Probably not	114	22.6
	4) Definitely not	11	2.2
	Total	505	100.1

Table 6. (Continued)

Summary of question	Response	n	%
36) How good are your teeth?	1) Very poor	9	1.8
	2) Quite poor	20	3.9
	3) Neither good nor poor	148	28.8
	4) Quite good	273	53.2
	5) Very good	63	12.3
	Total	513	100.0
37) How many times a day do you clean your teeth?	1) Less than once	21	4.1
	2) Once	122	23.9
	3) Twice	295	57.7
	4) More than twice	73	14.3
	Total	511	100.0
38) How concerned are you about the appearance of your teeth?	1) Not at all	29	5.7
	2) Slightly	88	17.3
	3) Fairly	180	35.4
	4) Very	212	41.7
	Total	509	100.1

Some of the results from the Children's Dental Health Survey (Todd and Dodd, 1985) provide an interesting comparison and are therefore included below. The Children's Dental Health Survey involved the dental examination of 20,000 children and a questionnaire study of 6,000 parents across the whole of the United Kingdom.

Question 1 asked if the respondents had ever been to the dentist. The vast majority stated that they had been, just 2 people (under

half a per cent) said that they had not. The Children's Dental Health Survey found that 1% of 15 year olds in England had never been to the dentist (Todd and Dodd, 1985).

Responses to question 2 revealed that half (50%) of the youngsters claimed to attend the dentist for regular check-ups, about one quarter (28%) for occasional check-ups and about one quarter (22%) only when having trouble from their teeth. A comparison with the Children's Dental Health Survey suggests that youngsters in this inner city sample were less frequent attenders than typical 15 year olds in England (Table 7).

Table 7. Attendance pattern of adolescents - England sample taken from the Children's Dental Health Survey (Todd and Dodd, 1985)

	Inner city sample	England sample
Attendance pattern	14 to 16 year olds	15 year olds
Regular check-ups	50%	61%
Occasional check-ups	28%	19%
Trouble only	22%	20%

A quarter (24%) of the teenagers said that they did not know if their mothers went to the dentist for regular check-ups while a third (36%) of the teenagers said that they did not know if their fathers went for regular check-ups (questions 3 and 4). Nearly half (43%) of mothers and under a quarter (21%) of fathers were reported to attend for regular check-ups. In England as a whole the Adult Dental Health Survey reported that 50% of females and 37% of males attended for regular check-ups (Todd Walker and Dodd, 1982). Thus, as expected,

reported attendance was lower in the present sample, but notably so for males.

Responses to question 5 suggested that 4 to 5 years was a common age to start dental treatment. Only one in five (18%) of respondents reported receiving treatment before this and over one in ten (11%) reported not receiving treatment until after 9 years of age. While these figures are similar to national figures (Todd and Dodd, 1985), they contrast sharply with the region's strategic plan which aimed for every child to be receiving regular dental care by the age of 3 years (South East Thames Regional Health Authority, 1985).

Answers to questions 6 and 7 showed that the vast majority of respondents had experienced potentially painful treatment. Thus two thirds (65%) of respondents claimed to have had teeth taken out by the dentist, a mean of 1.9 teeth per person. Some 85% claimed to have had fillings, with an overall mean of 3.0 fillings per person. Tables 8 and 9 show the number of respondents admitting to extractions or fillings.

About two-thirds (68%) of the youngsters stated that dental treatment had been painful (question 8). Of these, over one-third (35%) said that treatment had been painful on about half or more of their dental visits, and over one half (57%) said they had experienced moderate or severe pain.

Table 8. Number and percentage of respondents admitting to extractions

Number of extractions	n	%
1	84	16.0
2	80	15.3
3	34	6.5
4	52	9.9
5	16	3.1
6	19	3.6
more than 6	27	5.2

Table 9. Number and percentage of respondents admitting to fillings

Number of fillings	n	%
1	45	8.6
2	60	11.5
3	61	11.6
4	96	18.3
5	41	7.8
6	32	6.1
more than 6	54	10.3

Response to question 9 showed that about two-thirds (67%) of the teenagers claimed to have been to a dentist within the last 6 months, about one sixth (15%) in the last 6 to 12 months, and about one sixth (18%) said they had not attended for over 12 months.

Questions 10 to 16 asked about the respondent's last course of treatment. Nearly two-thirds (65%) of the youngsters said that their last visit to the dentist was for a check-up, one quarter (26%) because of trouble with their teeth, and about one tenth (9%) for other reasons. Over one half (56%) of respondents stated that their last course of treatment had comprised just one visit. A dental polish or radiograph were each received by about one half (54% and 50% respectively) of the sample. Under one half (44%) of respondents admitted to receiving fillings, under one fifth (19%) to orthodontic treatment and under one sixth (17%) to having teeth out during the last course.

When asked what type of dentist did the last treatment (question 17) 13% said they did not know, 46% said they went to a National Health Service dentist, 16% to a private dentist, 16% to a school or community dentist, and 9% to a hospital dentist. Although the vast majority (82%) of respondents said that this was their usual dentist (question 19), only just over one quarter (30%) said that they knew the name of the dentist (question 18). When challenged to name their dentist, less than a quarter (23%) attempted to do so.

About half (49%) of the teenagers said they expected their next treatment to be unpleasant to some degree (question 22). Corah's Dental Anxiety Scale was included in questions 23 to 26 and the mean score was 8.8 which is not discrepant with findings elsewhere (for example, Corah, 1969) but these results are discussed in more detail in the next section on anxiety scores.

Question 27 asked if the respondents knew at what age people had to pay for routine dental treatment. Although over two thirds (69%) of respondents said they knew, when asked to specify the age less than 1 in 5 (18%) knew the correct age of 18 (Table 10). Given that nearly half (41%) thought they had to begin paying at 16, this might explain why the decline in dental attendance begins at this age and thus recommends that children should be advised that routine treatment remains free until they are 18.

Table 10. Number and percentage of respondents specifying the age at which people had to pay for routine treatment

Age in years	n	%
under 16	7	1.4
16	216	41.2
17	13	2.5
18	95	18.1
over 18	3	0.6

When asked at what age people had to pay for dentures (question 28), only 19% claimed to know the answer and only 7% gave the correct age of 16 (Table 11).

Less than 1 in 5 (17%) seemed to know where to find out about National Health Service charges (question 29). Of those who did claim to know, a dental surgery or dentist was the most common suggestion (Table 12). Perhaps this reflects an awareness that current dental charges are so complex that dental expertise is necessary to calculate the cost.

Table 11. Number and percentage of respondents specifying the age at which people had to pay for dentures

Age in years	n	%
under 16	1	0.2
16	35	6.7
17	3	0.6
18	31	5.9
over 18	20	3.8

Table 12. Places where respondents thought they cound find out about NHS dental charges.

	n	%
No suggestion	442	84.4
Dental surgery/dentist	54	10.3
DHSS	11	2.1
Health centre/hospital/doctor	6	1.2
Post office	3	0.6
NHS	3	0.6
Telephone operator	2	0.4
Chemist	1	0.2
Council	1	0.2
School	1	0.2

Question 30 asked how sensitive respondents were to pain. Considerable variation was noted: a tenth (11%) rated themselves much more sensitive to pain than most people, and a similar number (12%) much less sensitive.

Nearly 4 out of 5 (79%) of the youngsters reported having had toothache (question 31). Over 1 in 3 (38%) said that if they had toothache in a back tooth, they would want to have the tooth extracted rather than filled. About 1 in 7 (14%) said that they would rather have an aching front tooth extracted. These figures are roughly similar to those reported for adults by Todd and Walker (1980), but they remain regrettably high.

Over 4 out of 10 (44%) said that they found the thought of losing all their own teeth and wearing dentures very upsetting, and only 1 in 10 (11%) said that it would not upset them at all (question 34). Again this is about the same as reported by Todd and Walker (1980). About 3 in 4 (75%) reported expecting to keep their teeth for the rest of their lives (question 35).

About 2 out of 3 (65%) of respondents said they thought their teeth were in good condition and only 1 in 20 (6%) that their teeth were in poor condition (question 36). Additionally, question 21 asked if the youngsters thought that they needed any dental treatment. Just over one third (37%) said they thought that they did need treatment. However, the Children's Dental Health Survey found that 42% of 15 year olds were suffering from decay and 48% were suffering from gingivitis - only 31% were free from these two diseases (Todd and Dodd, 1985). Thus it appears that youngsters underestimate rather seriously their level of dental disease. This is understandable, because early dental disease is usually symptomless, but highlights the need for better education.

Question 37 revealed that well over half the youngsters reported brushing their teeth twice a day, a quarter once a day. These figures are similar to those obtained in the Children's Dental Health Survey, but respondents to both surveys may have been tempted to give socially acceptable answers and thus exaggerate their frequency of brushing. Other studies of adolescents have revealed that brushing tends to be associated with grooming behaviour (Craft and Croucher, 1980; Hodge, Holloway and Bell, 1982). Three quarters of the respondents admitted that they were fairly or very concerned about the appearance of their teeth (question 38). This concern may provide an appropriate reference point for dental education programmes: it has been suggested that dental education will be more successful if it focuses on the promotion of attractivenes rather than the prevention of disease (Blinkhorn, Hastings and Leathar, 1983) - a line of reasoning consistent with Fishbein's theory of reasoned action which will be reviewed later.

Attendance patterns

Attendance patterns were classified as regular check-ups, occasional check-ups or trouble only in question 2. These patterns were crosstabulated with the responses to each other question as shown in Table 13.

Table 13. Responses in attitude survey broken down by attendance pattern (question 2). Summaries of the questions and responses may be found in Table 6. NS denotes no significant difference and * denotes significant ($p<0.01$) difference between responses calculated by chi square.

			Regular		Occasional		Trouble	
Question	Response	code	n	%	n	%	n	%
1	NS	1	256	99.6	148	100.0	113	99.1
		2	1	0.4	0	0.0	1	0.9
2	*	1	257	100.0	0	0.0	0	0.0
		2	0	0.0	148	100.0	0	0.0
		3	0	0.0	0	0.0	114	100.0
3	NS	1	62	24.2	30	20.4	17	15.3
		2	120	46.9	54	36.7	48	43.2
		3	74	28.9	63	42.9	46	41.4
4	*	1	143	55.9	58	39.2	26	23.0
		2	74	28.9	43	29.1	47	41.6
		3	39	15.2	47	31.8	40	35.4

Table 13. (continued)

Question	Response code		Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
5	*	1	64	26.2	16	11.0	8	7.5
		2	120	49.2	69	47.6	39	36.8
		3	45	18.4	41	28.3	38	35.8
		4	11	4.5	16	11.0	18	17.0
		5	4	1.6	3	2.1	3	2.8
6	NS	1	180	70.0	89	60.1	72	63.2
		2	77	30.0	59	39.9	42	36.8
7	NS	1	227	88.3	125	84.5	91	80.5
		2	30	11.7	23	15.5	22	19.5
8	part 1	1	174	68.0	99	66.9	79	69.3
	NS	2	82	32.0	49	33.1	35	30.7
8	part 2	1	18	10.1	20	19.2	22	27.2
	NS	2	36	20.2	16	15.4	15	18.5
		3	124	69.7	68	65.4	44	54.3
8	part 3	1	85	45.7	49	44.1	33	37.5
	NS	2	76	40.9	50	45.0	37	42.0
		3	25	13.4	12	10.8	18	20.5

Table 13. (continued)

Question	Response code		Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
9	*	1	234	91.4	80	54.4	30	27.0
		2	17	6.6	43	29.3	20	18.0
		3	4	1.6	18	12.2	26	23.4
		4	0	0.0	3	2.0	12	10.8
		5	1	0.4	3	2.0	23	20.7
10	*	1	40	15.6	35	23.6	60	53.1
		2	194	75.5	100	67.6	41	36.3
		3	23	8.9	13	8.8	12	10.6
11	*	1	161	63.6	79	53.4	43	39.1
		2	56	22.1	43	29.1	37	33.6
		3	17	6.7	10	6.8	18	16.4
		4	19	7.5	16	10.8	12	10.9
12	NS	1	151	59.2	77	52.4	48	44.0
		2	104	40.8	70	47.6	61	56.0
13	*	1	68	26.8	19	12.8	11	9.9
		2	186	73.2	129	87.2	100	90.1

Table 13. (continued)

Question	Response code	Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
14	NS						
	0	158	61.5	74	50.0	58	50.9
	1	53	20.6	37	25.0	21	18.4
	2	27	10.5	25	16.9	19	16.7
	3	8	3.1	2	1.4	3	2.6
	4	11	4.3	10	6.8	13	11.4
15	NS						
	0	221	86.0	126	85.1	84	73.7
	1	13	5.1	13	8.8	20	17.5
	2	12	4.7	5	3.4	5	4.4
	3	1	0.4	1	0.7	0	0.0
	4	10	3.9	3	2.0	5	4.4
16	NS						
	0	125	48.6	78	52.7	56	49.1
	1	54	21.0	36	24.3	26	22.8
	2	60	23.3	25	16.9	22	19.3
	3	13	5.1	8	5.4	7	6.1
	4	5	1.9	1	0.7	3	2.6
17	NS						
	1	130	51.4	62	42.8	44	40.4
	2	38	15.0	24	16.6	18	16.5
	3	40	15.8	25	17.2	13	11.9
	4	20	7.9	12	8.3	12	11.0
	5	25	9.9	22	15.2	22	20.2

Table 13. (continued)

Question	Response code	Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
18 NS	1	79	30.7	46	31.3	28	24.6
	2	170	66.1	99	67.3	82	71.9
20 *	1	222	87.7	115	79.3	79	72.5
	2	31	12.3	30	20.7	30	27.5
21 part 1	1	64	25.5	61	41.8	64	57.7
*	2	187	74.5	85	58.2	47	42.3
21 part 2	1	44	30.1	48	51,6	47	56.0
*	2	102	69.9	45	48.4	37	44.0
21 part 3	1	4	2.4	7	6.5	16	17.6
*	2	163	97.6	101	93.5	75	82.4
22 *	1	143	57.2	77	52.4	40	36.0
	2	89	35.6	48	32.7	30	27.0
	3	12	4.8	12	8.2	26	23.4
	4	6	2.4	10	6.8	15	13.5
23 *	1	26	10.2	6	4.1	8	7.1
	2	140	55.1	81	54.7	43	38.4
	3	72	28.3	53	35.8	35	31.3
	4	5	2.0	8	5.4	16	14.3
	5	11	4.3	0	0.0	10	8.9

Table 13. (continued)

Question	Response code		Regular		Occasional		Trouble	
			n	%	n	%	n	%
24	NS	1	98	38.4	47	31.8	34	30.6
		2	105	41.2	71	48.0	41	36.9
		3	39	15.3	15	10.1	20	18.0
		4	9	3.5	11	7.4	9	8.1
		5	4	1.6	4	2.7	7	6.3
25	*	1	51	20.4	26	18.1	22	19.8
		2	99	39.6	65	45.1	33	29.7
		3	68	27.2	36	25.0	25	22.5
		4	14	5.6	12	8.3	18	16.2
		5	18	7.2	5	3.5	13	11.7
26	NS	1	115	45.3	53	36.3	41	37.6
		2	100	39.4	68	46.6	42	38.5
		3	29	11.4	17	11.6	12	11.0
		4	4	1.6	6	4.1	9	8.3
		5	6	2.4	2	1.4	5	4.6
27	NS	1	184	72.4	95	65.1	75	67.6
		2	70	27.6	51	34.9	36	32.4
28	NS	1	58	22.9	20	14.5	20	18.2
		2	194	76.7	118	85.5	90	81.8

Table 13. (continued)

Question	Response code	Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
29	NS						
	1	37	14.9	25	18.1	25	23.1
	2	212	85.1	113	81.9	83	76.9
30	NS						
	1	24	9.6	12	8.7	16	14.7
	2	90	36.0	54	39.1	35	32.1
	3	108	43.2	55	39.9	46	42.2
	4	28	11.2	17	12.3	12	11.0
31	NS						
	1	196	76.9	119	82.6	90	80.4
	2	58	22.7	25	17.4	22	19.6
32	NS						
	1	96	38.9	43	30.5	47	44.3
	2	151	61.1	98	69.5	59	55.7
33	NS						
	1	29	12.1	19	13.5	18	16.5
	2	211	87.9	122	86.5	91	83.5
34	NS						
	1	105	41.2	64	44.1	52	48.1
	2	123	48.2	66	45.5	43	39.8
	3	27	10.6	15	10.3	13	12.0
35	NS						
	1	41	16.3	12	8.5	16	14.8
	2	147	58.6	98	69.5	63	58.3
	3	57	22.7	30	21.3	25	23.1
	4	6	2.4	1	0.7	4	3.7

Table 13. (continued)

Question	Response code		Regular n	Regular %	Occasional n	Occasional %	Trouble n	Trouble %
36	*	1	4	1.6	0	0.0	5	4.5
		2	9	3.5	5	3.5	6	5.5
		3	58	22.7	43	30.1	46	41.8
		4	150	58.8	78	54.5	42	38.2
		5	34	13.3	17	11.9	11	10.0
37	NS	1	9	3.5	7	4.9	5	4.6
		2	53	20.9	38	26.6	30	27.5
		3	151	59.4	83	58.0	58	53.2
		4	41	16.1	15	10.5	16	14.7
38	NS	1	16	6.3	9	6.3	4	3.7
		2	42	16.6	19	13.3	25	23.1
		3	84	33.2	57	39.9	38	35.2
		4	111	43.9	58	40.6	41	38.0

Calculation of chi square values revealed a number of crosstabulations that were significant at a level of $p<0.01$. These are discussed below.

Question 4 confirmed reports by other researchers that there is a tendency towards a common family pattern of attendance (Todd and Dodd, 1985; Schuurs et al, 1984). Thus well over half (56%) of regular attenders stated that their mothers went to the dentist

regularly, while under a quarter (23%) of the trouble-only attenders reported that their mothers went regularly. The influence of parents is also revealed in other data. For example, regular attenders generally started dental visits at an earlier age than trouble-only attenders: question 5 showed that 26% of regular attenders stated that they had visited a dentist by 3 years of age, while only 7% of trouble-only attenders had done so. Early dental attendance is recommended by current knowledge that dental disease is common in young children (Todd and Dodd, 1985) and that disease in deciduous teeth can damage the developing permanent teeth. Moreover, early attendance before the disease has become serious can enable the dentist to adopt a preventive approach and so reduce the possibility of dental anxiety later.

Not surprisingly regular attenders attended far more frequently than trouble only attenders: question 9 showed that 91% of regular attenders claimed to have visited a dentist in the last 6 months, against only 27% of the trouble-only attenders. Question 10 asked why the respondent went to the dentist on the last occasion: over twice as many of the regular attenders (75%) as of the trouble-only attenders (36%) went for a check-up. Conversely 53% of the trouble-only attenders, but only 16% of the regular attenders, went because of trouble.

Question 11 showed that nearly two thirds (64%) of the regular attenders needed only one visit to the dentist for their last course of treatment whereas just 39% of the trouble-only attenders needed only one visit. This indicates the value of regular dental

attendance. Regular attenders were more likely to receive orthodontic treatment than trouble-only attenders: question 13 revealed that while 27% of regular attenders had orthodontic treatment during their last course of treatment, only 10% of trouble-only attenders did so. Trouble-only attenders seemed more likely to change their dentist than regular attenders: question 20 showed that 27% of trouble-only attenders did not visit their usual dentist last time, compared with only 12% of regular attenders.

Question 21 revealed that most (58%) of the trouble-only attenders thought that they were in need of treatment compared with only 25% of regular attenders. More trouble-only attenders than regular attenders thought that they needed fillings (56% against 30%) and extractions (18% against 2%).

More regular attenders (72%) than trouble-only attenders (48%) thought that their teeth were in good condition (question 36). Compared with regular attenders, more trouble-only attenders expected their next treatment to be unpleasant: question 22 showed that 37% of trouble-only attenders, but only 7% of regular attenders, expected their next treatment to be fairly or very unpleasant. It is not surprising, therefore, that the trouble-only attenders scored significantly more highly on questions 23 and 25, 2 of the constituents of the Corah anxiety scale. In view of the importance of these anxiety scale results for understanding reluctance to attend regularly, they will be considered in the following section.

Anxiety scores

The mean Corah dental anxiety score for the whole sample, derived from questions 23 to 26, was 8.8. When Corah first published his anxiety scale, he reported a similar value of 8.9 for American students (Corah, 1969). On the other hand, some British studies have recorded higher scores: Lidell and May (1984) found that their sample of London workers had a mean score of 9.7; Woolgrove and Cumberbatch (1986) calculated a mean score of 10.2 for their sample of people attending Birmingham Dental Hospital for treatment.

Anxiety scores were broken down by responses to each question as shown in Table 14. One way analysis of variance was performed to test for statistical significance. A level of significance of 0.01 was chosen in order to minimise the risk of a type 1 error (as over 40 tests were performed, a 0.05 level would have been likely to produce 2 errors). This seems preferable to attempting to use some pooled variance estimate as used in most multiple comparison techniques (Howell, 1982). The questions that produced significantly different anxiety scores are discussed after the table.

Table 14. Mean anxiety score (derived from questions 23 to 26) for each group of respondents in attitude survey. Summaries of questions and responses are given in Table 6. NS denotes no significant difference and * denotes significant ($p<0.01$) difference between anxiety scores calculated by one way analysis of variance.

Question		Response code	Anxiety score
1	NS	1	8.8
		2	8.8
2	*	1	8.4
		2	8.7
		3	9.8
3	NS	1	8.8
		2	8.7
		3	8.9
4	NS	1	8.6
		2	8.9
		3	9.1
5	NS	1	8.6
		2	8.8
		3	8.9
		4	9.4
		5	8.2

Table 14. (continued)

Question	Response code	Anxiety score
6 NS	1	8.8
	2	8.7
7 NS	1	8.9
	2	8.2
8 part 1	1	9.4
*	2	7.3
8 part 2	1	11.2
*	2	10.1
	3	8.7
8 part 3	1	8.7
*	2	9.5
	3	10.2
9 NS	1	8.6
	2	8.7
	3	10.4
	4	9.0
	5	8.6
10 NS	1	9.3
	2	8.5
	3	9.5

Table 14. (continued)

Question		Response code	Anxiety score
11	NS	1	8.5
		2	9.1
		3	9.7
		4	8.7
12	NS	1	8.5
		2	9.0
13	NS	1	8.2
		2	8.9
14	NS	0	8.6
		1	8.9
		2	9.3
		3	8.2
		4	8.9
15	NS	0	8.7
		1	9.6
		2	8.5
		3	7.0
		4	9.2

Table 14. (continued)

Question	Response code	Anxiety score
16 NS	0	8.5
	1	8.9
	2	9.5
	3	7.9
	4	10.6
17 NS	1	8.7
	2	9.5
	3	8.5
	4	8.2
	5	8.6
18 NS	1	8.7
	2	8.8
20 NS	1	8.7
	2	9.2
21 part 1	1	9.7
*	2	8.2
21 part 2	1	9.4
NS	2	8.9
21 part 3	1	10.6
*	2	8.9

Table 14. (continued)

Question		Response code	Anxiety score
22	*	1	7.5
		2	9.4
		3	11.5
		4	11.6
23	*	1	5.9
		2	7.3
		3	10.4
		4	12.6
		5	15.1
24	*	1	6.0
		2	8.9
		3	11.9
		4	13.1
		5	15.2
25	*	1	5.5
		2	7.6
		3	10.3
		4	12.4
		5	14.4

Table 14. (continued)

Question		Response code	Anxiety score
26	*	1	6.7
		2	9.2
		3	12.1
		4	13.5
		5	14.6
27	NS	1	8.9
		2	8.4
28	NS	1	9.1
		2	8.7
29	NS	1	9.2
		2	8.7
30	*	1	9.7
		2	9.4
		3	8.4
		4	7.2
31	*	1	9.0
		2	7.9
32	NS	1	8.8
		2	8.8

Table 14. (continued)

Question	Response code	Anxiety score
33 NS	1	8.7
	2	8.7
34 NS	1	8.8
	2	8.8
	3	8.8
35 NS	1	8.3
	2	8.6
	3	9.4
	4	9.4
36 *	1	9.1
	2	9.1
	3	9.4
	4	8.6
	5	7.4
37 NS	1	8.9
	2	9.0
	3	8.7
	4	9.0

Table 14. (continued)

Question		Response code	Anxiety score
38	NS	1	7.9
		2	9.0
		3	8.9
		4	8.7

The questions that produced significantly ($p<0.01$) different anxiety scores, as revealed by one way analysis of variance, are discussed below.

Questions 23 to 26 are the constituent questions of the Corah Dental Anxiety Scale - they ask how respondents feel during various items of dental treatment. As anticipated, each of these questions split respondents into groups with greatly different anxiety scores: for each of these questions, respondents giving response 1 (relaxed) had a mean score of about 6 while those giving response 5 (very anxious) scored about 15. This confirms that each question is measuring the same phenomenon.

Question 22 revealed that youngsters expecting their next treatment to be fairly or very unpleasant had a very high mean anxiety score of 11.5; those expecting it to be not at all unpleasant scored only 7.5. Question 30 showed that people who thought they were particularly sensitive to pain were more anxious (score 9.7) than those who rated themselves less sensitive (score 7.2). People who rate themselves as particularly sensitive may expect dental treatment to be unpleasant

and therefore be anxious about the prospect of treatment.

Question 21 also produced significant differences in anxiety scores: respondents who thought they needed dental treatment were more anxious than those who thought otherwise; this was most marked if they believed the treatment would involve extractions (question 21 part 3). Question 36 showed that teenagers who thought that their teeth were in poor or average condition were more anxious than those who thought that they had good teeth. People who think they have bad teeth may expect extensive treatment which would be unpleasant; this would arouse anxiety.

Question 8 produced a large range of anxiety scores: respondents who reported having had painful dental treatment in the past had a significantly higher anxiety score (of 9.4) than those who reported otherwise (7.3). Those who reported having had severe pain recorded a significantly higher mean anxiety score of 10.2, and those who reported having had pain on most dental visits recorded an even higher score of 11.2.

Question 2 revealed that irregular attenders had a higher mean anxiety score of 9.8 than regular attenders who scored 8.4. This supports the suggestion, by various investigators, that anxious patients delay or avoid dental visits (Todd, Walker and Dodd, 1982; Woolgrove and Cumberbatch, 1986). Question 31 showed that respondents who had suffered toothache had a higher mean anxiety score (of 9.0) than those respondents who had not (7.9). It is possible that anxious patients defer visits and so render themselves

more prone to toothache. This could lead to a vicious circle because when anxious patients eventually go to the dentist they are more likey to need extensive treatment; this may be unpleasant and hence justify the person's anxiety. This provides an excellent example of a self fulfilling prophecy.

2.51 The theory of reasoned action: introduction

Fishbein and Ajzen claim that the theory of reasoned action can be applied to virtually any human behaviour (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980, 1983). The theory assumes that people usually act in accordance with their intentions. For example, if a person intends to telephone his dentist for an appointment, then (barring unforeseen circumstances) he is likely to do so; on the other hand, if someone has no intention of making an appointment, then he is unlikely to do so.

A person's intention is a function of two basic determinants: the attitude towards the behaviour and the subjective norm. The attitude towards the behaviour is the individual's positive or negative evaluation of performing the behaviour: is performing the behaviour a good thing or a bad thing? The subjective norm deals with perceived prescriptions: do most people who are important to us think that we should perform the behaviour? Generally speaking, individuals will intend to perform a behaviour when they evaluate it positively and when they believe that other people think that they should perform it. The relative weights of the attitudinal and normative factors may vary from one person to another and from one intention to another.

The theory specifies that the attitude towards the behaviour is derived from the beliefs that the behaviour leads to certain outcomes and from the evaluations of these outcomes. For example, a person may believe that regular dental visits will prevent dental decay (a

probable outcome) and that preventing decay is important (an evaluation). The subjective norm is derived firstly from the person's beliefs that certain people (called salient referents) think he should or should not perform the behaviour and secondly from his motivation to comply with these people. For example, a person may believe that his mother thinks that he should go to the dentist (a normative belief); he may also believe that he should comply with his mother's wishes (a motivation to comply).

As Miniard and Cohen (1981) observe, the Ajzen-Fishbein model has been applied to a diverse number of areas and "evidence for its validity flows largely from its generally good performance in predicting behavioral intentions" (p. 309). Since we already know that children's dental behaviour tends to follow the pattern of their parents, the model seems especially attractive in emphasizing the normative role and influence of referents. Such figures are absent in the health belief model (Becker, 1974; Becker, Haefner, Kasl, Kirscht, Maiman and Rosenstock, 1977) which has been applied to a wide range of health related behaviours. Both models essentially conclude that behaviour is an outcome of the individual's evaluation of whether the behaviour is good or bad overall. However, the health belief model is more specific about the factors contributing to this - perceived vulnerability to a health risk (for example, dental decay/gum disease), perceived severity of consequences (pain), perceived efficacy of health behaviours (cleaning teeth, going to dentist) and perceived costs and benefits of these behaviours (treatment may hurt).

In many ways the growing popularity of the health belief model has been in its extension through attribution research (e. g. King, 1983) which has become so fashionable of late. Thus patients' causal explanations about illness may determine specific health beliefs and remain an interesting study in themselves. In the context of this research the health belief model assisted in illuminating the range of variables which needed to be sampled but appeared to offer an almost bottomless theoretical pit if pursued too far. The research needed to be practical. Ajzen and Fishbein would suffice for an initial study.

In applying the theory of reasoned action to dental attendance behaviour, this study aimed to increase understanding of factors influencing this behaviour. Also the study would test the theory of reasoned action in the context of attendance behaviour.

2.52 The theory of reasoned action: method

Sample

As for the attitude survey in section 2.4, the sample was drawn from 14 to 16 year old children attending schools in the inner city London Boroughs of Lambeth, Lewisham and Southwark. The reasons for choosing these youngsters are presented in section 2.41.

Elicitation questionnaire

As recommended by Ajzen and Fishbein (1980), a short elicitation questionnaire (see appendix 3) was used to discover salient outcomes and salient referents. The elicitation questionnaire was completed by 96 14 to 16-year-old teenagers in schools within Lambeth, Lewisham and Southwark. The responses revealed 17 outcomes and 6 referents associated with regular dental visiting, as shown in Tables 15 and 16.

Table 15. Referents revealed by elicitation questionnaire

Family members

Mother

Father

Close friends

Dentists

Doctors

Table 16. Outcomes revealed by elicitation questionnaire

Getting dental advice

Preventing decay

Preventing pain

Having teeth checked

Teeth looking good

Having healthy teeth

Keeping teeth till old age

Spending time at the dentist

Spending money on teeth

Dentist hurting you

Noise at the dentist

Injections in the gum

Fillings

Extractions

Orthodontic braces

Being bored

Being frightened

Main questionnaire

The main questionnaire (shown in appendix 2) incorporated the 17 outcomes and 6 referents. It measured the subjective probability (questions 59 to 75) of and the evaluation (questions 42 to 58) of each outcome, and the normative belief (questions 77 to 82) of and motivation to comply with each referent (questions 83 to 88). Examples of questions are shown below.

To measure probability of outcome:

Do you think the dentist is likely to prevent decay in your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely

To measure evaluation of outcome:

How important to you is preventing decay in your teeth?

very important 1 2 3 4 5 not important

To mesure normative belief of referent:

Does your mother think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not

To measure motivation to comply with referent:

Generally speaking, do you want to do what your mother thinks you should do?

definitely yes 1 2 3 4 5 definitely no

The questionnaire included assessments of intention to visit the dentist regularly (question 39), attitudes to visiting the dentist regularly (questions 40 and 41) and subjective norm regarding visiting the dentist regularly (question 76). It also asked whether the respondents usually went to the dentist for a regular check-up, occasional check-up or only when having trouble with their teeth (question 2). The questionnaire included other questions as discussed in section 2.4.

As with the attitude survey, it was anticipated that the data would be analysed by computer using the Statistical Package for the Social Sciences (Nie et al, 1975; Hull and Nie, 1981). Staff at Aston University Computer Centre gave advice regarding the lay out of the questionnaire to facilitate data entry since this was to be done by professional data preparation staff. The questionnaire was piloted with the attitude survey, as described in section 2.41; minor adjustments were made to the questionnaire.

A 5 point scale was used between the poles of each answer and all the scales in the questionnaire itself were actually labelled from 1 to 5 in order to be simple for respondents. However, Ajzen and Fishbein (1980) emphasize that analysis requires that most of the measures be recorded on scales with a centre point of zero. Hence, apart from the motivation to comply measure wich remained on a scale of 1 to 5, all other scales were transformed to read from -2 to +2. Spearman rho correlations were then calculated to assess the relationship between attitudes, norms, intention and reported behaviour. Evaluations, probabilities, normative beliefs and motivations to comply were all broken down by attendance pattern to pinpoint differences between regular and irregular attenders.

Administration

The questionnaire was administered by teachers at Malory, Bonus Pastor, Lilian Bayliss and Walworth schools to pupils aged 14, 15 or 16. The questionnaire was administered along with the attitude survey as described in section 2.41.

Response

Teachers administered and finally returned 556 questionnaires, but 32 were spoiled or had less than half the questions answered. Thus 524 useful questionnaires were analysed. The sample comprised 272 boys (51.9%) and 252 girls (48.1%).

2.53 The theory of reasoned action: results and discussion

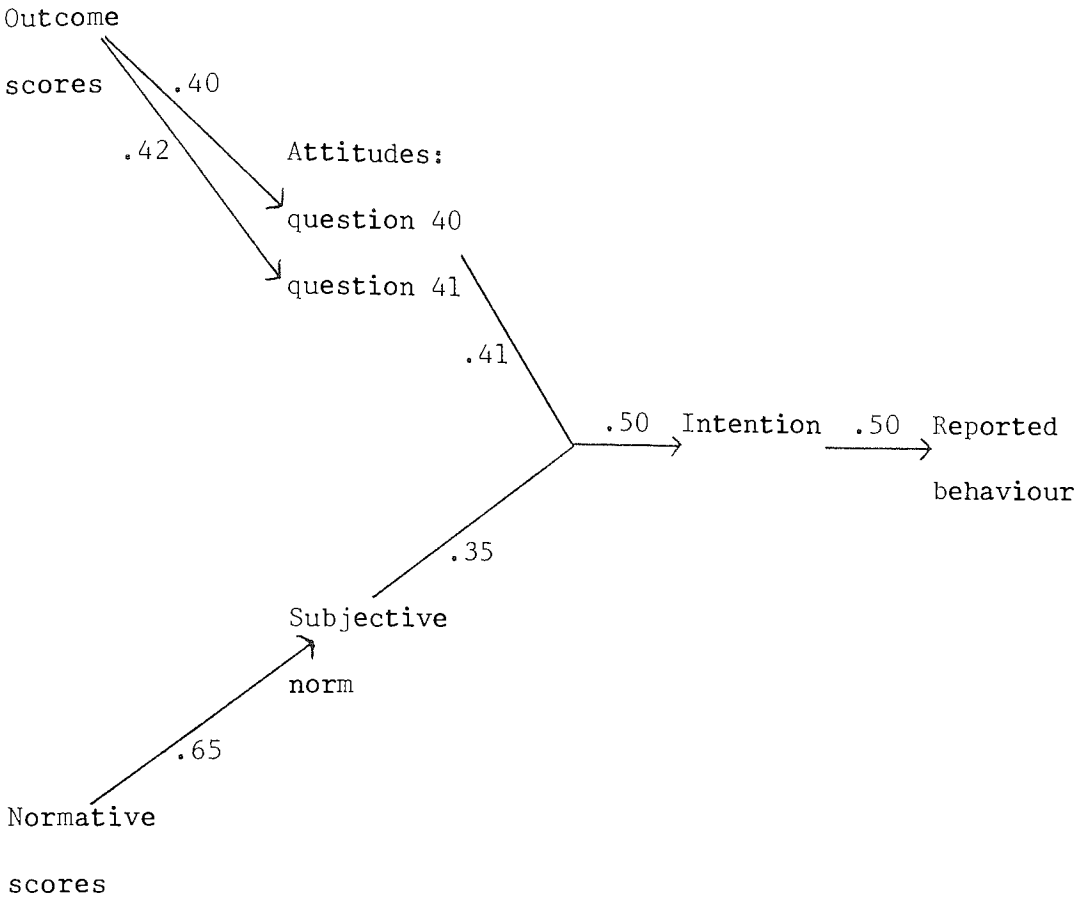
Validity of the theory of reasoned action with dental attendance behaviour

Intention to visit the dentist regularly (question 39) produced a substantial correlation with reported attendance behaviour (question 2) (spearman rho = +.50, $p<0.01$). Intention (question 39) also produced highly significant correlations with attitudes to visiting the dentist regularly (questions 40 and 41) and subjective normative belief regarding regular dental visiting (question 76) (spearman rho = +.30, +.38 and +.35 respectively, $p<0.01$ for all).

For each of the 17 salient outcomes, the probability was multiplied by the evaluation to produce an outcome score. Similarly, for each of the 6 salient referents, the normative beliefs were multiplied by each motivation to comply to produce a normative score. The multiple correlation coefficient of all 17 outcome scores and all 6 normative scores produced a multiple correlation coefficient of +.54 with intention. Computation of other multiple correlation coefficients are shown on figure 5.

The value of the theory of reasoned action in the context of dental attendance behaviour is indicated by the significant correlations shown in figure 5.

Figure 5. Correlation coefficients showing the relationships between beliefs, attitudes, subjective norm, intention and reported behaviour with respect to regular dental visiting.



Behavioural beliefs underlying intention to visit the dentist regularly

The evaluation (question 42 to 58) and probability (question 59 to 75) of each outcome were broken down by attendance pattern (question 2) to give the mean values of evaluation and of probability for regular, occasional and trouble-only attenders (Table 17). Also the evaluations and probabilities were broken down by attendance pattern so that chi square tests could be applied (Table 18).

Table 17. The mean evaluation and the mean probability of each outcome, broken down by attendance pattern. Each measure was calculated on a scale from -2 to +2. (Reg. = regular attender. Occ. = occasional attender. Trouble = trouble-only attender.)

	Evaluations			Probability		
	Reg.	Occ.	Trouble	Reg.	Occ.	Trouble
Getting dental advice	1.10	0.77	0.97	1.00	0.93	1.11
Preventing decay	1.61	1.54	1.44	1.07	1.05	0.87
Preventing pain	1.64	1.64	1.53	0.88	0.69	0.50
Having teeth checked	1.51	1.22	1.08	1.33	1.24	1.09
Teeth looking good	1.48	1.40	1.27	1.18	0.99	1.06
Healthy teeth	1.62	1.57	1.50	1.20	1.05	1.13
Keeping teeth	1.41	1.40	1.29	1.16	1.04	0.89
Time at the dentist	0.35	-0.03	-1.15	0.12	0.12	0.57
Money on teeth	0.11	-0.14	0.07	0.24	0.23	0.31
Dentist hurting you	-0.91	-1.08	-1.31	-0.51	-0.31	-0.25
Noise at the dentist	-0.17	-0.32	-0.57	0.11	0.27	0.26
Injections in the gum	-0.62	-0.89	-0.85	-0.44	-0.26	-0.10
Fillings	-0.32	-0.38	-0.20	0.24	0.22	0.11
Extractions	-0.58	-0.83	-0.84	-0.77	-0.70	-0.64
Orthodontic braces	-0.44	-0.85	-0.75	-0.48	-0.57	-0.64
Being bored	-0.61	-0.92	-0.95	-0.08	0.37	0.38
Being frightened	-0.25	-0.39	-0.56	-0.86	-0.84	-0.62

Table 18. Chi square and level of significance (with 8 degrees of freedom) for the evaluation and the probability of each outcome crosstabulated by attendance pattern.

	Evaluations		Probabilities	
	Chi square	p	Chi square	p
Getting dental advice	12	.14	15	.05
Preventing decay	12	.15	6	.69
Preventing pain	15	.05	19	.01 *
Having teeth checked	33	.00 *	13	.11
Teeth looking good	16	.04	13	.12
Healthy teeth	8	.46	11	.21
Keeping teeth	22	.01 *	20	.01 *
Time at the dentist	24	.00 *	15	.05
Money on teeth	13	.13	12	.17
Dentist hurting you	17	.03	7	.49
Noise at the dentist	11	.20	3	.92
Injections in the gum	9	.33	11	.22
Fillings	12	.15	11	.19
Extractions	14	.08	11	.18
Orthodontic braces	15	.06	13	.12
Being bored	15	.07	23	.00 *
Being frightened	15	.05	12	.15

* Difference between the regular, the occasional and the trouble-only attenders is significant at $p<0.01$

Mean values in excess of 1.0 in Table 17 indicated that most youngsters wanted to prevent decay, prevent pain, have teeth checked, have attractive teeth, have healthy teeth and keep their teeth; furthermore, many respondents believed that regular dental visiting would help them to achieve these ends. However, the current trend for dental health education to emphasize personal rather than professional control (for example, dietary measures and oral hygiene at home as opposed to dental visits) may reduce the perceived role of regular dental visits and hence reduce visiting. As one youngster wrote: "If you brush your teeth 3 times a day, you don't need to go to the dentist".

The regular, the occasional and the trouble-only attenders all had similar beliefs about many of the variables. However, certain significant differences emerged in Table 18: the regular attenders tended to believe that regular dental visits would prevent pain from teeth and ensure keeping teeth till old age; they considered it important to keep their teeth till old age and to have their teeth checked for holes; moreover, they found time at the dentist pleasant and not boring. Conversely, the trouble-only attenders tended to believe that regular dental visits would be less effective in preventing pain from teeth and ensuring keeping teeth till old age; they considered it less important to keep their teeth till old age and to have their teeth checked for holes; they found time at the dentist unpleasant and boring. These areas of discrepancy between regular and trouble-only attenders indicate where dental health educators should concentrate their effort.

Normative beliefs underlying intention to visit the dentist regularly

The normative belief of (question 77 to 82) and motivation to comply with (question 83 to 88) each salient referent were broken down by attendance pattern (question 2) to give the mean values of belief and motivation for regular, occasional and trouble-only attenders (Table 19). Also the beliefs and motivations were crosstabulated by attendance pattern so that chi square tests could be applied (Table 20).

Table 19. Normative belief of and motivation to comply with each referent, broken down by attendance pattern. Each belief is on a scale from -2 to +2; each motivation is on a scale from 1 to 5.

	Normative beliefs			Motivation to comply		
	Regular check-up	Occasional check-up	Trouble only	Regular check-up	Occasional check-up	Trouble only
Family	1.29	0.85	0.48	3.70	3.48	3.31
Mother	1.51	1.16	0.72	3.99	3.74	3.74
Father	1.09	0.77	0.32	3.73	3.46	3.63
Close friends	0.45	0.03	0.03	2.98	2.89	2.77
Dentists	1.54	1.34	0.95	3.91	3.58	3.54
Doctors	1.07	0.84	0.73	3.76	3.41	3.46

Table 20. Chi square and level of significance (with 8 degrees of freedom) for the normative belief of and the motivation to comply with each referent crosstabulated by attendance pattern.

	Normative beliefs		Motivation to comply	
	Chi square	p	Chi square	p
Family	54	.00 *	17	.03
Mother	55	.00 *	7	.56
Father	43	.00 *	13	.11
Close friends	29	.00 *	13	.11
Dentists	32	.00 *	21	.01 *
Doctors	13	.11	22	.00 *

* Difference between regular, occasional and trouble-only attenders is significant at $p<0.01$

Table 19 shows marked variation in the means of different attendance groups and these are discussed later with the benefit of the statistics in Table 20. The motivations to comply with family and parents in Table 19 are modest in magnitude (ranging from 3.31 to 3.99); this suggests that the respondents were, even in their mid-teens, starting to take their own decisions regarding dental visits, independent of family pressures. This suggestion is supported by the observation that many 14 year old children attend the Lister Health Centre in London for dental treatment without their parents. Motivations to comply with dentists were similar to those for family members (ranging from 3.54 to 3.91) and provide an opportunity for dental health educators.

Compared with the trouble-only attenders, the regular attenders tended to believe that their family, friends and dentists thought that they should visit the dentist regularly; the regular attenders tended to do what dentists and doctors thought they should do. Conversely, the trouble-only attenders thought that their family, friends and dentists did not fully endorse regular dental visits; the trouble-only attenders did not do what dentists and doctors recommended. Clearly, normative differences are important and so individual dental health education (for example, in the surgery) may fail; family or community based education programmes are more likely to be successful.

2.61 Increasing uptake of recall appointments: introduction

Failed appointments in Lambeth, Lewisham and Southwark present a formidable challenge to the Community Dental Service. Analysis of Community records revealed that of 123,593 appointments issued for school children in these boroughs during 1984, 24,711 (20%) were not kept; of the 36,475 courses of treatment started, only 27,373 (75%) could be completed. Clearly, this alarming rate of failed appointments must not only reduce the regularity of patients' attendance but must also reduce the efficiency of dental services.

Sections 2.4 and 2.5 have demonstrated that, for many young people in Lambeth, Lewisham and Southwark, dental anxiety was a major deterrent to dental visits. The study also revealed the impersonal nature of treatment for these youngsters; many children in these areas did not know the name of their dentist: when asked to give the name of their dentist, less than a quarter (23%) could do so.

Concern over the problem of failed appointments in Wessex (where the problem costs the NHS over £500,000 per year) prompted a survey to discover the reasons for missing appointments (Draycott, 1986). A questionnaire was sent to 1871 people who had failed to attend for hospital out-patient appointments. Perhaps not surprisingly the response rate was poor. Only 734 questionnaires were returned - this represented a response rate of 39% and so the results must be interpreted with caution.

The commonest reason offered for out-patients missing hospital appointments was forgetting the appointment, as shown in Table 21. The percentage of respondents who claimed to forget their appointment varied from 17 in one district to 28 in another. Interestingly, the district with the lowest rate of forgotten appointments used very bright and eye-catching pink appointment cards in contrast to the other districts which used plain white cards. Draycott concluded that a bright colour should be used for appointment cards in all clinics. She also suggested the use of an answering machine to record cancellations and a reminder system.

Table 21. Reasons for non-attendance for out-patient appointments (Draycott, 1986)

Reason	%
Forgot	22
Felt too ill to attend	10
Claimed to have cancelled	9
On holiday	8
Difficulty getting time off work	7
Lost appointment card	5
Received treatment elsewhere	5
Felt treatment unnecessary	5
Problems arranging transport	4
Problems with dependents	3
Other	22

The use of reminder material that would reduce forgotten appointments and additionally help to reduce anxiety seemed appropriate for the Community Dental Service in Lambeth, Lewisham and Southwark. Consultation with staff from the district health education department, the district dental health education team and local schools highlighted a number of problems with written educational material. Most interviewees felt that the local area had a considerable number of people with very limited reading skills who would not be able to understand anything but the simplest literature. The area included large numbers of people for whom English was a second language; many of these people would find it impossible to read the literature unless it were translated into their first language or was extremely easy to read. Additionally, many local people, faced with the problems of living in a deprived inner city area, seemed to give health communications a low priority and so would be unlikely to spend more than a few seconds reading unsolicited health leaflets. Furthermore, even the people who did read any literature would be likely to forget the messages between reading the leaflet and the appointment time. Hence it was essential that the literature produced should require a minimum of reading. Although interviewees offered a pessimistic and rather unflattering view of the population, action research sharing this pessimism might encourage more effective solutions.

It was concluded that three major problems should be addressed. Firstly, many people avoid dental treatment because of anxiety - they regard the dentist as the perpetrator of unpleasant treatment rather than a friendly ally against disease. Secondly, a significant

minority of people forget their appointments. Thirdly, local people would ignore any material that used more than a few simple words. Hence, the requirements for the project were:

1 to include a personal element to enhance rapport and reduce anxiety,

2 to act as a reminder to reduce forgotten appointments,

3 to use only simple written material.

2.62 Increasing uptake of recall appointments: method

Material

A personalised calendar sheet was constructed as shown in appendix 4. The simple message "See you at (appointment time), (patient's name)" was written on each sheet in a bright colour. The message was hand written and included the patient's name in order to increase the personal element of the communication. Space was available for other appointments or events to be added by the recipient to make it more useful. A bright colour was used for the sheets, as recommended by Draycott (1986). In addition, an eye-catching "Percy Plaque" sticker was put on the calendar to increase its appeal to children. The character Percy Plaque was selected because he had been used in many local schools to give dental health messages (Munday and Gelbier, 1987) and a familiar symbol would be more likely to evoke positive affect than an unfamiliar symbol (e. g. Matlin, 1971; Moreland and Zajonc, 1979).

Initial evaluation was performed by showing 20 patients (one at a time) the personalised calendar sheet and a standard appointment card; patients were asked which they would prefer to receive and why. All but one of the subjects chose the calendar sheet. Subjects appeared to find it difficult to articulate the reasons for their choice, but mention was made of sticking the sheet on a wall at home, seeing one's own name written in bold bright letters and the Percy Plaque sticker.

Sample

938 patients for recall at the community dental clinic at Lister Health Centre were used for the study.

Administration

The addresses of patients for recall at the Lister clinic were stored on computer as described by Woolgrove and Gelbier (1986). Patients at alternate addresses in the computer files were allocated to the experimental group and the other patients served as controls. Each patient in the experimental group was sent a personalised calendar sheet with the standard appointment card. Members of the control group were sent standard appointment cards in the usual way. The number of recall appointments kept, the number failed and the number cancelled were recorded.

2.63 Increasing uptake of recall appointments: results and discussion

The outcome of the recall appointments is shown in Table 22. The results show that 30% of appointments were missed without notification. The study was conducted during the autumn and winter and so seasonal factors - for example, bad weather and Christmas - may have contributed towards this high level of missed appointments. Nevertheless this level of missed appointments obviously made it difficult to run an efficient service and highlighted one of the problems faced by community dental services working in inner city areas. It should be noted that seasonal factors operated equally on the control and the experimental group and thus would not affect the validity of the experimental manipulation.

Table 22. The numbers and percentages of appointments kept, failed and cancelled

	Experimental group		Control group		Total	
Appointment	n	%	n	%	n	%
Kept	281	60	235	50	516	55
Failed	128	27	152	33	280	30
Cancelled	62	13	80	17	142	15
Total	471	100	467	100	938	100

Chi-square with 2 degrees of freedom = 8.4 $p<0.02$

The percentage of cancellations was high (15%). This might be reduced if the service could be tailored more closely to patients' needs. However, this might require some reorganisation of staff - for example, opening clinics in the evenings or at weekends.

The personalised calendar sheets produced an increase in the number of appointments kept (from 50% to 60%) and a decrease in failed appointments (from 33% to 27%). The success of the calendar sheets should encourage other dentists to test similar methods for increasing attendance.

Dentists in other locations may need to modify the material - the "Percy Plaque" sticker used on the sheet was chosen because Percy Plaque has been promoted in local dental health education programmes (Munday and Gelbier, 1987). Percy Plaque may have less influence in other districts. Furthermore, it must be remembered that the present study was conducted over a short period (data were collected over 6 months). A longer trial is needed to see if the effect of the calendar sheets fades with repeated use.

The personalised calendar sheets reduced the number of cancelled appointments (from 17% to 13%); this reduction is difficult to explain - a study to explore reasons for cancelling appointments might throw some light on this change.

As the personalised calendar sheets succeeded in increasing the attendance rate, similar sheets - suitably adapted for local factors - should be tested in other areas which suffer from high failure

rates. Thus similar sheets should be developed and used to increase uptake of dental services in other areas.

Chapter 3 : INCREASING SUPPLY

3.1 Overview

Some of the material in this chapter must be declared as previously published: Woolgrove and Boyles (1984), Woolgrove and Gelbier (1984, 1986), Woolgrove and Harris (1982), Woolgrove, Harris and Boyles (1984).

Dental treatment may only be performed by appropriately qualified personnel - the Dentists Act (1983) makes it illegal for anybody other than a registered dentist to practise dentistry (except in certain limited circumstances discussed later). Therefore at first sight, an increase in supply can only be achieved by either increasing the number of dentists or by increasing their productivity.

The training of a dentist takes 4 or 5 years and so any need to change the number of dentists qualifying is subject to a long time lag. Long term manpower planning is notoriously difficult in dentistry: in 1981 the Dental Strategy Review Group recommended a 10% reduction in training of dentists; less than 6 months later a report of the British Dental Association (1982b) argued dental training should be maintained at its present level. It is not even certain that dental training will be tailored to the projected demand: since the training and salaries of dentists are largely paid by government, the number of dentists may be determined by economic restraints. Therefore, any increased demand (see chapter 2) may need to be met

not by more dentists but by greater productivity per dentist. Productivity could be increased if dentists could delegate more of their work to auxiliary staff or to machines.

More dental auxiliaries were requested back in 1976 by the Committee on Child Health Services to improve child dental health. Since then the Royal Commission on the National Health Service (1979), The Nuffield Foundation (1980) and the Dental Strategy Review Group (1981) have all advocated more auxiliaries to improve dental health. More auxiliaries would permit dentists to delegate more tasks and hence increase productivity per dentist.

While the 1950's saw great advances in dentist's hardware - for example, fundamental changes in design increased the angular speed of dental drills by a factor of 10 - the 1980's are marked by developments in information technology. Microcomputers are now within the grasp of virtually all small businesses and a report commisioned by the British Dental Association has claimed that computerisation of dental practices would enable dentists to treat more patients (Palmer, 1981). Recent experience in general dental practices appears to confirm this (Turner, 1985; Hitchcock, 1986), but evaluations have been made more on the potential than actual achievements.

The present study examined the opportunities for increasing productivity of dentists by delegation to auxiliaries (section 3.2) and by computerisation (section 3.3).

3.2 Delegation

3.21 Background

Although the review below is focussed on the implications for future dental services, it is presented in a little more detail than is necessary for present concerns since psychologists may well be interested in the experience of a profession which predated psychology in its establishment as a registered profession with clearly defined powers of delegation. However no attempt will be made to comment on parallels.

The Dentists Act (1983) permits dentists to delegate items of dental treatment to only two types of auxiliary: hygienists and therapists. The development, duties, employment, training and value of these 2 types of auxiliary are reviewed below.

Historical development of hygienists

Dental assistants have been employed for clerical duties since the middle of the nineteenth century when fixed dental surgeries began replacing itinerant dental practice (Dunning, 1970). The earliest proposals to extend the dental assistant's duties from clerical to operating are to be found in the American literature. In 1884 it was proposed that women should progress by apprenticeship training from chairside assistance to an operating role in order to "turn a tedious operating procedure into a valuable source of income for the dentist" (Kingsley, 1884).

In 1902 Wright suggested formal training for "women of education and refinement" to become dental hygienists (Wright, 1902). In 1905 Fones trained the first hygienist and the following year she was actually working in Fones's surgery in Connecticut (Dunning, 1970). In 1913 Fones enrolled 33 women (mainly dental surgery assistants and school teachers) to train as hygienists.

Hygienist training in the United Kingdom was started much later by the Royal Air Force in 1943. Sir William Kelsey Fry was largely responsible for setting up training, to ensure that those on active service were dentally fit. The other Armed services soon followed suit. Civilian training schools were established in the 1950's. Hygienists are currently trained in 17 schools in the United Kingdom: 14 are linked to dental schools and three are run by the Armed services.

Historical development of therapists

Therapists were employed as early as 1916 in the School Dental Service in the United Kingdom. These therapists, known at this time as "dental dressers", were employed to clean, and even fill and extract teeth for school children because of a shortage of dentists in the Service.

The Dentists Act of 1921 registered many previously unrecognised dentists who were consequently eligible for employment as School Dental Officers. Many gained such employment and so the shortage was solved (Pitts, 1924). Dressers were phased out during the 1920's.

While the use of operating auxiliaries in the British School Dental Service was being abandoned, a similar scheme of auxiliary utilisation was being introduced in New Zealand. The New Zealand dental nurse scheme was established in 1921, and subsequently expanded to graduate over 200 dental nurses per year. New Zealand has been the source of inspiration for many other countries wishing to use operating auxiliaries, including the United Kingdom, Malaya and Sri Lanka. However, recent fears of excess dental manpower have led to a great reduction in training of New Zealand dental nurses.

At its inception in 1948 the National Health Service offered generous payments to general dental practitioners and consequently caused a shortage of school dental officers. Auxiliary help was invoked and, in 1960, a training school for dental therapists (then called dental auxiliaries) was opened on an experimental basis. The final report on the experimental scheme concluded that therapists could be successfully trained and employed to do work of great value (General Dental Council, 1966) and so in 1968 therapists were formally established as a class of auxiliary dental worker (Ancillary Dental Worker Regulations, 1968). Subsequently proposals were made to increase the number of training schools (Committeee on Child Health Services, 1976).

In 1981 the Dental Strategy Review Group suggested that changes in dental manpower and caries (tooth decay) rate had resulted in some health authorities being disinclined to employ dental therapists and therefore recommended the closure of the New Cross School. Following the closure of the School in 1983, a scheme for training small

numbers of therapists was started at the London Hospital Dental School.

Duties and employment of auxiliaries

The Ancillary Dental Worker Regulations of 1968, amended in 1974 and 1986, limit the work performed by hygienists and therapists. Hygienists are permitted to scale and polish teeth, apply prophylactic materials approved by the General Dental Council, and give advice on matters relating to oral hygiene. Therapists are allowed to carry out the same tasks but, in addition, are allowed to undertake simple fillings and extract deciduous (first) teeth.

Hygienists may work in any of the dental services although most work in the general dental service, where they are usually paid on a sessional or a piece work basis. Hygienists in the general dental service work under the direct personal supervision of a dentist - hence a dentist must be on the premises while the hygienist is working.

Therapists are restricted to working in the hospital and community dental services, where they are salaried. They are not allowed to work in the general dental sevice. Therapists work to the direction of a dentist who gives a written prescription - it is not essential for the dentist to be on the premises while the therapist is working.

It is noteworthy that the Dentists Act (1983) empowers Her Majesty, by Order in Council (that is, Privy Council), to allow therapists to

work in the general dental service and for hygienists to work under the direction of a dentist. However, both Houses of Parliament would have to approve the Order before the power could be exercised.

Training of auxiliaries

The General Dental Council issues recommendations concerning courses of instruction for hygienists and therapists (General Dental Council, 1970, 1980). These recommendations indicate the minimum course necessary for satisfactory training. The course of instruction must be designed specifically for the student hygienist or student therapist and the course should extend over not less than 9 months for the hygienist and not less than 2 years for the therapist. It is considered desirable that hygienists treat children as well as adults, and patients who are geriatric, handicapped, receiving oral surgery or in long stay hospitals.

Prospective student hygienists and therapists should be at least 17 years of age and should show evidence of having received a satisfactory standard of education (4 'O' levels are specified for student therapists). In practice, preference is often shown to applicants who are older and have a higher level of education, and who have dental surgery assistant experience or certification.

The recommended courses of instruction for hygienists and therapists include subjects related to basic clinical sciences and those related to operative and preventive dentistry. Major differences in the minimum course recommendations are shown in Table 23.

Table 23. Major differences between the recommendations for the minimum course for hygienists and those for therapists

Subject	Hygienist Hours	Therapist Hours
Operative dentistry/techniques (pre-clinical)	8	400
Dental health education	22	120
Oral hygiene and prevention	16	80
Radiography	5	50

Value of auxiliaries

The concept of the team approach to the provision of dental care has met with a mixed response from the dental profession. While the reports of the Dental Strategy Review Group (1981), the Nuffield Foundation (1980) and the Royal Commission on the National Health Service (1979) have all favoured using auxiliary workers in a team approach, opponents of such schemes have expressed concern over what they see as a reduction in the status of the profession and its earning power (Edwards,1981).

One frequently heard argument in the debate is that the published views and recommendations, be they for or against the concept, do not represent the wishes of the majority of dental practitioners. Yet when an editorial in the British Dental Journal (Anonymous, 1980) invited its readers to specify those tasks which they considered suitable for delegation, only 5 letters were published in response.

As the planning of dental treatment and the delegation of care can only be performed by dentists, and as the use of auxiliaries can only be expanded if the profession agrees to it, it is somewhat surprising that so few attempts have been made to seek the views of practitioners in this country on this issue. Therefore, a survey was planned to determine the attitudes of a random sample of dentists to the delegation of clinical tasks and the employment of therapists.

3.22 Survey of dentists: method

The names of 992 dentists were selected by taking every 22nd name from the 1981 Dentists Register (General Dental Council, 1981) after a random start. Of these 24 were subsequently rejected as they were living abroad, leaving a working sample of 968.

A questionnaire designed to assess attitudes concerning the delegation of clinical tasks was piloted. After minor adjustments the questionnaire (as shown in appendix 5) was sent to each member of the sample. In order to achieve a high response rate the questionnaire was kept as short as possible, with most answers calling for simple yes/no responses. However, comments were invited in a space at the end of the questionnaire. The only personal details sought were the date of qualification and the branch of dentistry in which the dentist worked. Confidentiality was promised.

The questionnaire was followed up with 2 reminders in order to ensure a maximum response and a total of 716 questionnaires were returned, representing 74% of the working sample. The response rate was greater from those who qualified more recently: the response rate from those who qualified before 1960 was 67% whereas the response rate for those who qualified more recently was 77%. A further 19 uncompleted forms were also returned; of these 12 were from dentists (mainly retired) who felt unable to offer an opinion, 5 were returned by the Post Office as untraceable, and the other 2 had been sent to dentists who had died since the Register was published.

The quantitative analysis of the questionnaire data was achieved with the aid of computer using the Statistical Package for the Social Sciences (Nie J H et al, 1975, Hull and Nie, 1981). In addition the numerous comments were subject to a qualitative analysis.

3.23 Survey of dentists: results

Quantitative results

The dates of qualification of the sample ranged from 1914 to 1980, with a median in 1968. Over two thirds (68%=487) were full-time general practitioners and 11% (77) were full-time community dental officers; the remaining 21% (152) of respondents worked in some other branch of dentistry (mainly hospital or university) or in some combination of part-time jobs.

Table 24 shows that whereas only just under two-thirds (63%) of the general practitioners could see themselves as head of a dental team delegating simple tasks, nine out of ten (90%) community dental officers felt happy in the role. It is also significant that although over three-quarters of those who qualified in the past decade favoured the team approach, the proportion fell to only just over a half in those who qualified before 1950. Thus type of practice and age, as indicated by qualification date, are clearly significant factors in determining attitudes to the use of auxiliaries. Moreover, the data clearly indicate an increasing demand for auxiliaries as more newly qualified dentists who favour delegation emerge from dental school.

To examine the possibility of employment being related to year of qualification, these variables were crosstabulated (Table 25). There appeared a significant relationship - three quarters of new dentists work in general practice compared with only slightly over half of dentists qualified before 1950.

Table 24. Responses to the question "Could you see yourself as the head of a dental health team delegating simple tasks?" broken down by employment and year of qualification.

	YES		NO		TOTAL
	%	n	%	n	
All	69.8	489	30.2	212	701
General practice	63.5	304	36.5	175	479
Community dental service	89.6	69	10.4	8	77
Other	80.0	116	20.0	29	145
Chi square with 2 degrees of freedom = 29.2			p<0.01		
Qualified before 1950	53.3	46	46.5	40	86
" 1950 - 1959	59.8	70	40.2	47	117
" 1960 - 1969	71.5	128	28.5	51	179
" 1970 - 1980	76.8	245	23.2	74	319
Chi square with 3 degrees of freedom = 24.0			p<0.01		

Table 25. Employment broken down by year of qualification.

	General practice		Community service		Other		Total
	%	n	%	n	%	n	
Qualified before 1950	55.7	49	15.9	14	28.4	25	88
" 1950 - 1959	60.8	73	11.7	14	27.5	33	120
" 1960 - 1969	68.5	126	10.3	19	21.2	39	184
" 1970 - 1980	74.2	239	9.3	30	16.5	53	322
Chi square with 6 degrees of freedom = 16.8			p<0.05				

Table 26. Responses to the question "Which tasks do you consider you should be able to delegate?" broken down by employment and year of qualification. * denotes chi square significant at $p<0.01$

	D. H. E.		SCALING		FLUORIDE		BITE-WINGS	
	%	n	%	n	%	n	%	n
All	86.3	615	83.2	594	81.1	579	69.3	494
General practice	84.4	410	80.2	390	77.8	378	67.5	328
Community dental service	94.8	73	94.8	73	94.8	73	70.1	54
Other	86.8	132	86.2	131	84.2	128	73.7	112
Qualified before 1950	76.1	67	73.9	65	67.0	59	55.7	49
" 1950 - 1959	80.0	96	75.8	91	77.5	93	64.7	77
" 1960 - 1969	88.6	164	84.9	157	82.7	153	74.1	137
" 1970 - 1980	90.0	288*	87.5	281*	85.4	274*	72.0	231*

	SEALANTS		FILLINGS		DEC. EXT.	
	%	n	%	n	%	n
All	63.5	453	37.3	266	27.1	193
General practice	58.8	286	31.1	151	21.0	102
Community dental service	76.6	59	58.4	45	46.8	36
Other	71.1	108	46.1	70*	36.2	55*
Qualified before 1950	53.4	47	26.1	23	21.6	19
" 1950 - 1959	53.8	64	33.3	40	26.7	32
" 1960 - 1969	67.0	124	38.9	72	31.9	59
" 1970 - 1980	67.9	218*	40.9	131	25.9	83

D. H. E. = dental health education

DEC. EXT. = deciduous extractions

Table 26 shows that four out of five respondents were in favour of delegating such items as dental health education, scaling, and fluoride applications. Roughly two-thirds also favoured delegation of fissure sealing and the taking of bite-wing radiographs; over one third wanted to delegate simple restorations, and over one quarter, deciduous extractions. Community dental officers were again more prepared to delegate as were recently qualified dentists.

Table 27. Responses to the question "Would you employ a dental therapist in a practice?" broken down by employment and year of qualification.

	YES		NO		TOTAL
	%	n	%	n	
All	41.0	286	59.0	411	697
General practice	38.5	185	61.5	295	480
Community dental service	42.3	30	57.7	41	71
Other	48.6	71	51.4	75	146

Chi square with 2 degrees of freedom = 4.70 Not significant

Qualified before 1950	29.1	25	70.9	61	86
" 1950 - 1959	35.9	42	64.1	75	117
" 1960 - 1969	40.1	71	59.9	106	177
" 1970 - 1980	46.7	148	53.3	169	317

Chi square with 3 degrees of freedom = 10.61 $p<0.05$

Tables 27 and 28 indicate that over two in every five of the sample said they would be willing to employ a dental therapist in a practice, and only just over one in four said they would object to other dentists employing therapists. Again, recently qualified dentists were more in favour of employing therapists themselves and less likely to object to their employment. Indeed, nearly half the dentists qualifying in the past decade said they would employ a therapist, and only one in five said they would object to the employment of therapists.

Table 28. Responses to the question "Would you object to other dentists employing dental therapists?" broken down by employment and year of qualification.

	YES		NO		TOTAL
	%	n	%	n	
All	26.6	186	73.4	512	698
General practice	27.4	130	72.6	345	475
Community dental service	21.3	16	78.7	59	75
Other	27.0	40	73.0	108	148

Chi square with 2 degrees of freedom = 1.22 Not significant

Qualified before 1950	32.6	28	67.4	58	86
" 1950 - 1959	37.3	44	62.7	74	118
" 1960 - 1969	27.7	49	72.3	128	177
" 1970 - 1980	20.5	65	79.5	252	317

Chi square with 3 degrees of freedom = 14.59 $p<0.01$

Table 29 shows that roughly half of the sample said they would like to see therapists working in general practice. Again the recent graduates were most in favour of this extension to the work of therapists.

Table 29. Responses to the question "Would you like to see dental therapists working in general practice?" broken down by employment and year of qualification.

	YES		NO		TOTAL
	%	n	%	n	
All	46.5	325	52.2	374	699
General practice	44.4	212	55.6	265	477
Community dental service	48.6	35	51.4	37	72
Other	52.0	78	48.0	72	150
Chi square with 2 degrees of freedom = 2.78			Not significant		
Qualified before 1950	37.6	32	62.4	53	85
" 1950 - 1959	40.2	47	59.8	70	117
" 1960 - 1969	43.9	79	56.1	101	180
" 1970 - 1980	52.7	167	47.3	150	317
Chi square with 3 degrees of freedom = 9.92			$p<0.05$		

Qualitative results

The questionnaire invited dentists to make comments upon the use of auxiliaries. Comments were received from 379 dentists and were classified according to attitude towards delegation by 3 "expert judges", that is, dentists with considerable experience of auxiliary training. Comments were fairly evenly divided into those mentioning problems and those favouring delegation: 165 comments favoured delegation, 178 mentioned problems, 21 acknowledged both an advantage and a disadvantage of delegation and 15 of the dentists comments could not be classified. The problems fell into one of six categories:

1 Manpower

2 Quality control

3 Continuity of treatment

4 Cost-effectiveness

5 Facilities

6 Supervision

The validity of each objection was evaluated against the available evidence.

1 Manpower

The falling caries rate coupled with the increasing number of dentists has produced fears of unemployment amongst dentists. These fears have led some dentists to reject auxiliaries. Comments included:

"The only problem I see is .... over-manning of dental services."

"If the Dental Strategy Review Group proposes that the intake of dental students should be reduced, I can see no sense in training a group of ancillary workers."

It appears therefore that some dentists consider themselves to be in competition with auxiliaries. However, this view is not shared by a series of important reports: the Dental Strategy Review Group (1981) asked for more hygienists to increase the emphasis on prevention; the Committee on Child Health Services (1976) wanted more therapists to improve child dental health; the Nuffield Foundation (1980) backed a team approach in order to increase efficiency; and the Royal Commission on the National Health Service (1979) demanded more auxiliaries to achieve greater flexibility in meeting demands.

As the roles of auxiliaries are complementary to those of dentists, then the manpower requirements for auxiliaries and for dentists are largely independent. Hence it is possible to recognise overproduction of dentists but still recognise the need for more auxiliaries as did the Dental Strategy Review Group (1981).

2 Quality control

Dentists expressed concern over the training and ability of auxiliaries with such comments as:

"Standards should be raised, not lowered."

"I do not believe that the dental profession should be diluted with ancillaries whose only qualification is a short course in practical dentistry."

The training of both hygienists and therapists is overseen by the General Dental Council - the same body that oversees the training of dentists. The General Dental Council designs the curricula for operating auxiliaries (General Dental Council, 1970, 1980) and performs regular inspections of training schools to ensure a high standard of teaching. Auxiliaries must pass a final examination with external examiners.

Many comments suggest that auxiliaries are viewed as only partly trained dentists. The General Dental Council ensures that the opposite is true: auxiliaries perform a limited range of duties and are fully trained for the execution of these duties.

Furthermore the system of delegation in the United Kingdom contains an inherent safeguard: the delegating dentist has "vicarious liability" for the auxiliary's actions. The dentist must therefore supervise an auxiliary to "whatever degree is necessary in order to ensure adequate quality of work" (British Dental Association, 1978, 1982a).

The quality of work performed by hygienists has stimulated little research, but the work of therapists has been scrutinised in several studies. Both hospital research (Allred, 1977) and field research (Jones et al, 1981) have revealed that therapists work to a standard

similar to that of dental surgeons. These results are echoed by American studies (Lobene, 1979; Mullins et al, 1979; Nixon, 1980; Kaplan, 1980) and are summarised in an extensive review by Sisty et al (1979):

> "Results of all studies indicated that dental auxiliaries can be taught to perform, with no reduction in quality, selected reversible and irreversible procedures traditionally performed by dentists."

3 Continuity of treatment

Some dentists believed that patients preferred to receive all treatment from one operator:

> "Patients like continuity of treatment with one person, and object to changing ....."

> "I have always been of the opinion that the whole of treatment within the mouth should be carried out by one operator."

> "Patients prefer to see the same person for all their treatment."

Fears of patient dissatisfaction with operating dental auxiliaries have lead to questionnaire studies of patients. Results of such studies in the United Kingdom (Allred, 1977) and in the United States of America (Lobene, 1979) have demonstrated a high level of confidence and satisfaction with the treatment provided by auxiliaries.

4 Cost effectivenes

Dentists questioned the cost effectiveness of utilising auxiliaries, particularly under the present National Health Service payment system. Typical comments were:

> "In practice found them (auxiliaries) uneconomical in NHS framework, too slow, low productivity."

> "I feel that (the NHS payment system) needs to be altered before the time 'team' concept can be brought in."

> "In a practice situation the principal may as well employ .... an associate - who may well earn more money."

Auxiliaries earn much less than dentists (Table 30) and therefore appear good value - a hygienist or therapist receives approximately half of the salary of a dentist.

Table 30. Annual pay scales for dental personnel effective 1986

	Dentist	Hygienist	Therapist
Community dental service	£11,570-16,970	£5,855-7,599	£6,068-8,823
General practice	£21,700*	£6,110**	

* Target average net income from July, 1986

** British Dental Hygienist Assocciation recommendation for minimum rates of pay from August, 1986

However, while the British Dental Association has stated that the value of hygienists has been well demonstrated, the Association has suggested that the economic case for therapists ought not to be taken for granted and it has called for detailed study of the costs and returns of employing therapists (Ancillary Personnel Committee, 1976).

Holt and Murray (1980) subsequently conducted an extensive evaluation of therapists and concluded that the cost benefit of therapists was comparable to that of hygienists. A subsequent study highlighted the fact that, with incentives and organisation, dental therapists are capable of high productivity (Jones et al, 1981).

Those American studies which reported on the economic aspects of expanded duty dental auxiliaries (EDDA's) generally gave a guarded approval to their use on an economic basis (Lobene, 1979; Mullins at al, 1979; Redig et al, 1974). Unlike EDDA's, British therapists do not require the direct personal supervision of a dentist. This factor is likely to make British therapists more cost-effective than their American counterparts (Scarrott, 1973).

5 Facilities

Comments indicated that dentists were restricted by surgery arrangements and that general dental practitioners were unable or unwilling to change:

> "In my practice we have no surgery space for ancillary staff and have no immediate plans to alter our premises."

"(I) would be unable to contemplate full time employment of an ancillary under the existing arrangement ....."

Operating auxiliaries can only be employed if surgery space is available. Dental practices have traditionally been single-handed but - because of economies of scale (British Dental Association, 1976) - there is now a tendency towards the establishment of group practices. The percentage of British Dentists working single-handed decreased from 59% in 1955 (Royal Commission on Doctors' and Dentists' Remuneration, 1960) to 22% in 1975 (British Dental Association, 1976). This trend towards group practice is likely to increase the facilities available for operating auxiliaries.

6 Supervision

Some dentists were worried by the responsibility of delegation:

"I would be frightened of delegating the responsibility of treating nervous children ....."

"Though I have no objection to carrying my own can should my negligence result in injury to a patient, I should be most reluctant to carry the responsiblity for an ancillary ....."

Auxiliaries in the United Kingdom work under the direction or supervision of a dentist who assumes responsibility for the treatment they deliver. However, auxiliaries are still personally responsible, and so the dentist is unlikely to become involved in legal

proceedings provided he delegates correctly (British Dental Association, 1978, 1982a).

Of course, working in a team inevitably changes a dentist's work. Delegation of preventive and routine conservative procedures enables the dentist to carry out more complex tasks and to see more patients.

Working with auxiliaries confers a management role upon a dentist, yet dentists receive very little training in leadership and management. This may partly explain why a significant proportion - 30% in Table 24 - could not see themselves as head of a dental health team.

3.24 Conclusions

The large sample size and the high response rate justify the assumption that these results are a reasonable reflection of the views held by British dentists in general.

It is therefore noteworthy that the majority of dentists were in favour of delegating even though, in fact, few were able to do so; for example, one survey showed that only one third of N. H. S. dental practitioners employed a hygienist (National Dental Health Action Campaign, 1981). Another disturbing finding was that although over two-thirds of dentists wished to delegate the taking of bite-wing radiographs, this was strongly opposed by the Council of the College of radiographers (Jordan, 1981).

The fact that recently qualified practitioners were more in favour of both the delegation to and the employment of auxiliaries, a finding supported by Davey in 1973, suggests that support for both these measures will grow in the future, unless other factors intervene. Possible negative factors were explored by considering dentists' objections to delegation.

Most of the objections were not supported by published data. Objectors failed to recognise that the training of auxiliaries is controlled by dentists collectively, that the work of auxiliaries is regulated by dentists individually, and that the role of auxiliaries should be complementary to the role of dentists. Contrary to the expectations of some dentists, it appears that the treatment

delivered by auxiliaries is cost effective and is readiy accepted by patients.

Some of the objections were valid - some dentists do not have the facilities to employ an auxiliary and some do not have the ability to manage an auxiliary. However, these constraints affect only a limited number of dentists, and this number is likely to decrease with the trend towards group practice and with the increasing emphasis upon continuing education.

This study has demonstrated that many dental practitioners wish to increase the delegation of simple clinical duties, and that the views of this sample are generally in accord with those recommendations in recent reports which favour an increased commitment to the team approach in the provision of dental care. Thus auxiliary help will offer a viable option to meet increased demand in the future.

3.3 Computerisation

3.31 Background

In 1981 the British Dental Association followed the British Medical Association's lead and commissioned Scicon Consultancy International to assess the feasibility of computers in general dental practice with particular reference to the use of computers for preparing and transmitting claims for NHS payment.

Scicon's report (Palmer, 1981) recommended that dental computer systems should comprise facilities for handling appointments, storing clinical records, and practice management including the preparation of the NHS claims form FP17. Only radiographic films and correspondence would need to be stored in the conventional way.

Dentists in England and Wales claim payment from the NHS by submitting to the Dental Estimates Board a claims form for each course of treatment - form FP17 for routine treatment and form FP17a for emergency treatment. Each dentist submits an average of 2300 claims forms per year to the Board, where 1500 staff and an ICL 1904 computer process the claims. Scicon's report included technical details of various options for incorporating new technology to the mechanism for processing dentists' payments - using optical character recognition readers to read the claims forms, replacing the forms with floppy disks, and transmission of claims by direct link between the dentist's computer system and the Board's system.

The report emphasized that dentists should formulate clear objectives before deciding to computerise. These objectives might include: treat more patients, improve access to records, decrease clerical and administrative effort and costs, be less tired at the end of the day, improve recall systems, and study disease and treatment patterns.

Following Scicon's report, a tripartite working party was established between the British Dental Association, the Dental Estimates Board and the Health Departments. The working party decided that its primary concerns should be the use of computers for the preparation and processing of claims forms and for the keeping of clinical records (Tripartite Workng Party, 1983). It suggested that computerisation of appointments and practice management could and would proceed without any central guidance. However, the statutory and other requirements of handling claims forms and maintaining clinical records required collaboration between the Health Departments, the Dental Estimates Board and the profession to facilitate computerisation. The working party estimated that between 2,500 and 15,000 patient records are maintained in each practice and that an average of 20 working days per year are used to transcribe information on to NHS claims forms for each dentist. It believed that introducing computers into dental practice could improve the efficiency of both individual practices and the payment system. The working party's report recommended a two to three year pilot study to establish the cost effectiveness of computers in general dental practice and to identify any problem areas.

On 7 October 1983 Mr John Patten, Junior Health Minister, announced the pilot study at the annual conference of the Society of Family Practitioner Committees (Anonymous, 1983). The Department of Trade and Industry agreed to give Information Technology funds of £1.9 million towards the study.

A steering committee (made up of the British Dental Association, the Dental Estimates Board, the Health Departments and the Department of Trade and Industry) set to work on a software specification that would go to open tender. The steering committee hoped to install the system in 60 selected practices in the following areas: East Sussex, Essex, Greenwich and Bexley, Hereford and Worcester, Liverpool, North Tyneside, Scotland and Wales.

Unfortunately the Department of Trade and Industry subsequently withdrew their offer and so a more modest pilot project is now planned with a grant of £120,000 from the Department of Health and Social Security. The main objective is to provide a system to transmit FP17 data from practices to the Dental Estimates Board via ordinary telephone lines. The operational requirements for such a system (currently being devised by CAP limited) will be made available to any company that wishes to write the software. The software will then be subject to a pilot study in 20 volunteer practices that already have suitable hardware. A nominal payment (about £450) will be made to each practice.

The early 1980's witnessed gradual development of the dental computer market (Benn, 1983a) and some dentists, impatient to obtain the

benefits of computerisation, will wish to computerise before the pilot scheme is completed. It is unfortunate, therefore, that little information on dental computer systems is readily available: the few limited reviews of dental computer systems published in the dental press contained minimal information on what each system could achieve and did not supply even the addresses or phone numbers of suppliers (Benn, 1982a, 1982b, 1983b, 1984, 1985, 1986). Therefore a survey was planned to provide more comprehensive information for dentists.

3.32 Survey of dental computer suppliers: method

A comprehensive list of suppliers of dental computer systems was compiled. This list included all computer companies mentioned (in articles or advertisements) in the main dental press, namely, the British Dental Journal, Dental Update and Dental Practice, at any time during 1983. In addition the names of the dental computer companies in the listings of the December 1983 issue of Microdecision were used. The final list of 46 companies is shown in appendix 6.

These companies were contacted and information regarding their dental computer systems was requested. Of the 46 companies, only 19 still produced dental systems for dentists; the remainder had either ceased to supply dental systems, ceased to trade altogether or had moved leaving no forwarding address.

A questionnaire was designed to discover what tasks a computer system could perform with respect to the 3 areas - appointments, records and management - specified by the Scicon report (Palmer, 1981). Questions were added regarding the companies themselves and the cost of their computers. The final questionnaire, modified in the light of a pilot study involving both dentists and computer experts, is shown in appendix 7.

In February 1984 a copy of the questionnaire was sent to each supplier with a stamped addressed envelope and a covering letter explaining the purpose of the survey. A reminder was sent to each non-respondent after one month to produce replies from all 19 suppliers.

3.33 Survey of dental computer suppliers: results and discussion

Only 8 of the 19 suppliers offered a comprehensive system for recording appointments, clinical records and practice management as recommended by the Scicon report (Palmer, 1981). These suppliers, listed in Table 31, all offered multi-user multi-tasking systems with hard disks for memory storage.

Table 31. Suppliers of comprehensive dental computer systems.

British Medical Data Systems	(BMS)
Business Information Systems	(BIS)
Claudius Ash	(ClA)
Dentron Computers	(DeC)
Protechnic Computers	(PrC)
Radius	(Rad)
Specialist Dental Services	(SDS)
Stroud Microcomputers	(StM)

Initials in brackets indicate abbreviations used in Tables 32 to 34.

Claudius Ash, a large dental supplier established over a century ago, have linked with Attar Computers to market a system based on the Apple IIe; they had installed 27 systems, which probably made them the biggest supplier. The other companies were all formed in the late seventies or early eighties and most employed only a handful of staff. Dentron has a user base in excess of 20 (Benn, 1983b) but most of the other suppliers had installed only one or two complete systems. Many customers may prefer a large well-established company because small computer companies seem to disappear quite often, leaving no support for ther customers.

Table 32 compares the functions of the comprehensive dental computer systems available. All the companies offer good facilities on their appointment systems - most will cross book two diaries (so that a patient can arrange to see a dentist and a hygienist on the same visit), print day lists, and issue recalls. The 15 minute minimum apointment length of the Dentron system will soon be reduced to one minute. Although it does not print lists of failed apointments, the Dentron system does produce "failed to attend" letters.

Table 32. Comparison of comprehensive dental computer systems - appointment facilites.

	BMD	BIS	ClA	DeC	PrC	Rad	SDS	StM
Number appointment systems installed	0	1	27	?	2	?	?	6
Minimum appointment length (minutes)	2	5	1	15	2.5	1	5	?
Can the system								
double book?.....	Y	Y	Y	Y	N	Y	Y	Y
cross book two diaries?.....	Y	Y	Y	Y	Y	N	?	Y
make appointments 6 months ahead?.	Y	Y	Y	Y	Y	Y	Y	Y
print day lists?.....	Y	Y	Y	Y	Y	Y	Y	Y
list failed appointments?.....	Y	Y	Y	N	Y	Y	Y	Y
issue recalls?.....	Y	Y	Y	Y	Y	Y	Y	Y
accept variable recall periods?...	Y	Y	Y	Y	Y	Y	N	Y

Y=Yes N=No ?=Information not available

Key for initials of computer companies shown in Table 31

The clinical records systems shown in Table 33 vary in facilities. Only half the systems can reproduce the standard tooth charting (a graphic representation of dental health): although the Scicon Report (Palmer, 1981) suggested that this was not essential, many dentists may be reluctant to learn a new charting system. All the systems except Protechnic's will over-print the FP17 forms; however the Dentron system requires the tooth charting to be completed manually. The FP17a claims form accounts for about three per cent of claims; it can be completed by around half of the systems.

Table 33. Comparison of comprehensive dental computer systems - clinical records facilites.

	BMD	BIS	ClA	DeC	PrC	Rad	SDS	StM
Number of records systems installed.	0	1	27	?	2	?	0	0
Can the system								
use high resolution graphics to reproduce standard tooth charting?	Y	Y	Y	N	N	N	Y	N
complete form FP17?.....	Y	Y	Y	Y	N	Y	Y	Y
complete charting on form FP17?...	Y	Y	Y	N	N	Y	Y	N
complete form FP17a?.....	Y	Y	N	N	N	Y	N	Y

Y=Yes N=No ?=Information not available

Key for initials of computer companies shown in Table 31

All the systems offer good practice management facilites (see Table 34) but often as extra cost options.

Table 34. Comparison of comprehensive dental computer systems - practice management facilites.

	BMD	BIS	ClA	DeC	PrC	Rad	SDS	StM
Number management systems installed.	1	?	27	?	2	?	?	7
Can the system								
calculate fees due from the DEB?..	Y	Y	Y	Y	Y	Y	Y	Y
calculate fees due from patients?.	Y	Y	Y	Y	Y	Y	Y	Y
calculate wages and PAYE tax?.....	N	Y	Y	Y	Y	Y	Y	Y
perform stock control?.....	Y	Y	Y	Y	Y	Y	Y	Y
act as a word processor?.....	Y	Y	Y	Y	Y	Y	Y	Y

Y=Yes N=No ?=Information not available

Key for initials of computer companies shown in Table 31

The prices in table 35 must be taken only as a rough guide - all the systems have various options that make major differences to cost.

Table 35. Cost in pounds of comprehensive dental computer systems.

	BMD	BIS	ClA	DeC	PrC	Rad	SDS	StM
SYSTEM FOR								
1 dentist	7,400	9,000	7,000	5,000	15,000	?	5,000	?
2 dentists	9.850	12,000	9,500	6,500	?	?	7,000	?
3 dentists	10,866	13,000	12,000	8,000	?	?	7,500	?
4 dentists	12,376	14,000	13,500	10,000	?	?	10,000	?
5 dentists	15,545	20,000	15,000	11,000	?	?	12,000	?

?=Information not available

Key for initials of computer companies shown in Table 31

Table 36 lists companies which supply small systems to assist with some aspects of running a dental practice. Most of these systems aid practice management; some store clinical records or appointments. Prices vary from a few hundred pounds for software only to a few thousand pounds for a complete turnkey system. Two suppliers offer software for patient education in dentists' waiting rooms. The programmes currently available cost around £15 and run on a Sinclair Spectrum. They present a sequence of pages offering information on dental treatment, NHS charges, oral hygiene and dietary suggestions. The programmes can be edited so that the messages are customised to suit the individual dentist's requirements.

Table 36. Suppliers of limited dental systems.

Aztech	A,M
BBS	M
Business House	M
Dental Office Systems	M
Dental Software Products	E
Graham-Dorian Software Systems	A,M
Microsave	R
Missing Link Computers	R
Printivity	M
W H Roberts	E
Vixon Comuter Systems	A

A=Appointment system M=Practice management system

R=Clinical records system E=Patient education system

3.34 A computerised recall system

Value of recall systems

Recall systems are widely used to increase patient flow. One British dentist reported that his number of recalls for one month increased from 353 to 520 (Willmott, 1986), a 47% increase. An American dentist claimed a 23% increase in his gross income by using an efficient recall system (Ault, 1980). Apart from anything else, such systems may also convey to patients that their dentist cares about them. However no studies are well documented and no independent evaluation has been reported to date.

At the Lister Dental Clinic the card recall system was fairly typical of dental practice and - like most manual systems - exhibited a number of flaws: it was difficult to retrieve a record to update it (because records for each month were not stored in any particular order), some records got "lost" (posssibly because the record was never inserted), some patients would attend for their recall prematurely (possibly because these patients had two cards in the system and duplicate entries were difficult to detect) and difficulties sometimes arose because the handwriting on the cards was illegible. It was therefore decided to develop a computer system which would overcome these problems.

Hardware and software

The computer chosen was a Sinclair QL. Now that Amstrad has taken

over Sinclair computers the QL can be purchased for the bargain price of £150. The future of the QL itself is uncertain but several upgrades have recently been developed: Cambridge Systems Technology has started marketing the Thor computer and Care Electronics, with the help of Tony Tebby the author of the QL operating system, is now selling the Sandy QLT computer and the Q-XT640 QL computer. These products are claimed to be fully compatible with the existing QL and so should run this program. A Brother M-1109 printer (cost about £200) and a Philips BM 7502 monitor (about £80) were added to make up the complete system.

The QL is supplied with a general database program called Archive. A program was devised to adapt Archive to provide an address list for recalling patients (see recalls program 3.0 in appendix 8). This program was further developed to permit the printing of addresses for the 3 different dentists at Lister Dental Clinic. Table 37 shows the information stored for each patient. The program is menu driven, the main menu being shown in table 38.

Table 37. Data stored on each record

Surname

Forename

Address (3 lines)

Recall month

Recall interval

Dentist

Preferred appointment time

Miscellaneous information

Table 38. Main menu

Would you like to:	
ADD a record?	(type A)
CHANGE (or look at) a record?	(type C)
DELETE a record?	(type D)
PRINT recalls?	(type P)
FINISH?	(type F)

The system in use

This system has been in use the Lister Dental Clinic for several months. The instructions in Table 39 are displayed on a notice by the computer to remind staff how to start the system running. Thereafter the program displays prompts on the screen to direct the operator.

Table 39. Instructions

1. Insert microdrives
2. Press key marked F1 - wait a minute
3. Press key marked CAPS LOCK
4. Press key marked F2
5. Type RUN "RECALLS"
6. Press key marked ENTER

Data are stored on microdrive cartridges. However, as with any computer data, data can become corrupted. Hence it is essential to make backup copies of the data. We have five backup cartridges

labelled Monday, Tuesday, Wednesday, Thursday and Friday. Each day a backup is made on the appropriate cartridge. This does not require the use of Archive or the recall program, but can be done by inserting a blank cartridge in place of the Archive cartridge and instructing the computer to make a copy. If a complete list of patients is required in a particular order, this can be achieved by using the "dump" command in Archive.

The computer has provided an efficient and accurate recall system. However it suffers from the limitations of the microdrives: access to information is slower than we would like (it can take a minute to find a record) and the quantity of data stored is modest (about 1000 records per microdrive cartridge). A range of peripherals are available to improve data storage: extra RAM, floppy discs and hard discs can be purchased.

The QL system can, of course, be used for other functions, as well as the database. It is supplied with software for word processing, spreadsheets and graphics. A range of games is available (Psion Chess is excellent) and the Consumer Association markets Taxcalc to help both employed and self-employed people work out their tax liability.

3.25 Conclusions

The survey of 46 suppliers has shown that comprehensive computer systems perform the repetitive administrative tasks in a dental practice. In most dental practices these tasks are done, not by the dentist, but by auxiliary staff. Therefore, computers are likely to have more effect on the administration of a practice (possibly reducing the number of auxiliary staff needed) than on the supply of dental treatment. However, dental practices exhibit tremendous variation and so the benefits of a comprehensive computer system will vary greatly from one practice to another; some practices can supply more dental treatment as a result of computerisation (Turner, 1985; Hitchcock, 1986).

The survey revealed that only 19 of the 46 original suppliers still offered dental computer systems. Clearly prospective buyers must assess the company as well as the product to ensure that they will receive long-term support.

An accurate recall system can increase patient flow (Ault, 1980; Willmott, 1986) and is therefore likely to increase demand. The survey revealed that all the comprehensive systems were able to issue recalls but the cost of the computers was so great as to deter most dentists from computerisation (Benn, 1986). On the other hand the computerised recall system developed at the Lister Dental Clinic has shown that an accurate and efficient recall system need only cost a few hundred pounds.

Chapter 4 : CONCLUSIONS AND RECOMMENDATIONS

The major government surveys discussed in chapter 1 have clearly demonstrated that many people fail to make regular dental visits (Todd and Dodd, 1985; Todd Walker and Dodd, 1982; Office of Population and Census Surveys, 1986). A number of questionnaire surveys indicated that for many people fear of pain was the major deterrent to regular dental care (Lidell and May, 1984; Green and Green, 1985; Woolgrove and Cumberbatch, 1986), yet numerous publications claim that fear and pain can be successfully treated by simple behavioural strategies such as providing security, imparting information, giving control, distraction, modelling, relaxation training, desensitisation and suggestion (see section 2.2). Thus the literature contains a conundrum: why does fear of pain from dentists persist if it can be readily treated?

Close scrutiny of the literature revealed the possibility that the association of fear of pain with dentistry could be an artefact. As discussed in section 2.23 the questions used to assess this association, including the popular Corah Dental Anxiety Scale (Corah, 1969), imply that anxiety is usually associated with dentistry and hence may bias the responses. Is fear of pain really a major problem for dental patients? What methodology can be employed that would eliminate this possibility of bias?

Past research has indicated a gradual but encouraging trend towards increasing dental attendance, as one would expect with increasing health promotion in society to-day (Todd and Walker, 1980). However,

Elderton and Eddie (1986) revealed that dental attendance was actually decreasing amongst youngsters in their late teens. Why is this age group making this retrograde step against the trend? What can be done to promote dental attendance?

The repertory grid technique was used for the purpose of "gaining access to private worlds" as to how people might perceive visiting dentists (Kelly, 1955). This technique enabled personal constructs to be elicited from each subject while minimising any implications that could bias the results. These constructs confirmed that fear and pain, along with cost, pleasantness and frequency were frequently associated with dental visits. Attempts to match routine dental visits with other elements (such as visits to the doctor, the hospital, the hairdresser and the optician) produced wide variations between subjects. It seemed that different people tended to use similar constructs for these elements but evaluated the elements at different points on the constructs. To draw such conclusions may seem controversial to those writers who emphasize that subjects do not articulate an actual construct, but merely a verbal label: "a construct is not a verbal label" (Fransella and Bannister, 1977). The present author acknowledges this distinction between verbal labels and constructs but feels that consideration of the possible meaning of the verbal labels can provide insights into the way people think. Indeed, the value of eliciting these verbal labels would seem to be questionable if they were not subject to any interpretation.

The themes derived from the repertory grid study, along with other topics, were investigated in a questionnaire study of 524

adolescents. As expected, the dental attendance of respondents was variable: just one half (50%) claimed to go to the dentist for regular check-ups, 28% for occasional check-ups and 22% only when getting trouble with their teeth.

Over two-thirds (68%) of the youngsters reported that their dental treatment had been painful and over half (57%) of these stated that their pain had been moderate or severe, confirming the high prevalence of this association. It was not surprising therefore that the mean score on the Corah Dental Anxiety Scale was 8.8, similar to the value reported for American students when this scale was first published nearly 20 years ago (Corah, 1969). Under a quarter (23%) actually seemed to know the name of their dentist, indicating a lamentable lack of rapport between the youngsters and their dentists.

Few respondents seemed to know that dental charges start at 18 years of age for most treatment and 16 years of age for dentures. Less than 1 in 5 (18%) knew that dental charges for routine dental treatment started at 18 years of age, but nearly half (41%) thought these charges started at 16 years of age. Hence it could be concern over charges that causes the decline in dental attendance in mid-teens. Youngsters should be informed of dental charges so that they are not deterred by the erroneous assumption that charges are normally payable from age 16.

It is interesting to note that there appears to be no justification for charges for dentures to start at 16 years of age when other charges are deferred until 18 years of age. It would therefore seem

sensible to bring denture charges into line with other charges, so making the message simpler for youngsters.

Trouble-only attenders reported that they needed a lot of treatment and that they expected their next treatment would be unpleasant. It was not surprising, therefore, that they had high dental anxiety scores. High anxiety scores were associated with painful treatment in the past, expectations of a lot of treatment in the future and expectations of unpleasant treatment in the future. This evidence suggests that dental anxiety may be maintained by partial reinforcement: people with high levels of dental anxiety may delay dental visits until extensive treatment is needed. When treatment is eventually performed it is likely to be painful because of the extent of the treatment and the expectation of the patients. Pain during treatment then reinforces the view that dental treatment justifies anxiety.

It is interesting that anxious patients seem to expect more pain than they actually experience (Kent, 1984, Wardle, 1984; Lindsay, 1984): this suggests that cognitive factors are influential. However, only one study has been found that attempts to explore cognitive factors in dental anxiety: Kent (1985) found that anxious patients reconstruct their memories of dental treatment to justify their anxiety. The cognitive model of dental anxiety outlined in section 2.21 (developed from Neisser, 1976) generates readily testable hypotheses. Do anxious patients selectively attend to the most anxiety provoking stimuli? Do they adopt heuristic rules to justify their anxiety? The field of cognitive factors in dental anxiety

would appear ripe for exploration, but was beyond the remit of the present research.

The persistent problem of fear of pain from dentistry and the apparent absence of rapport between dentists and their patients should be overcome by dentists using behavioural strategies. The failure of dentists to implement successful behavioural strategies is not surprising when one realises the inadequate training given in this field. Kent (1987) is about to publish the results of a survey of the 16 dental schools in the United Kingdom revealing that although behavioural science teaching has increased markedly in the last few years, still only 8 schools provide formal teaching in psychology and only 7 in sociology; moreover, some respondents expressed concern over excessive reliance on the lecture method of teaching (Kent, 1987).

To equip dentists with the social skills necessary to overcome fear of pain it is essential for the relevant training to be given. Dr Guy Cumberbatch and the author pioneered one of the first behavioural science courses for dentists in 1981 (appendix 9 shows the programme for the original course) and have gradually developed interactive teaching methods to supersede the traditional lecture teaching so beloved by dental schools. Group exercises based on case histories and discussions triggered by videotapes have proved especially popular with participants.

The attempts of Dr Cumberbatch and the author to teach behavioural sciences can only satisfy a tiny part of the need for such teaching.

The author was therefore pleased to have been able to participate in the setting up of an organisation which aims to increase such teaching to dentists - The Behavioural Sciences and Dentistry Group (Woolgrove and Feinman, 1987). The conclusions of the present study indicate that the Group should promote behavioural science teaching as vigorously as possible. To this end the Group is organising postgraduate courses for dentists and is involving dentists, psychologists and psychiatrists in the development of a curriculum of behavioural sciences for undergraduate dental students.

The theory of reasoned action was validated in the context of dental attendance behaviour (section 2.5). Compared with regular attenders the trouble-only attenders tended to believe that regular dental visits would not be effective either in preventing pain from their teeth or in ensuring keeping their teeth till old age; they did not consider it important to keep their teeth till old age and to have their teeth checked for holes; they found time at the dentist unpleasant and boring. These areas are likely to be fruitful for dental health educators; research is now needed to exploit these areas fully. Normative influences (e. g. from family members) were found to be significant and so family and community-based education programmes are recommended in preference to individual surgery-based programmes. Current dental health education which emphasizes personal rather than professional control (such as dietary measures and oral hygiene at home) is likely to reduce the perceived role of regular dental visits and hence may reduce visiting. Hence educators need to balance the message that home care is important with stress on the need for regular dental visits. Further research is needed to

guide dental health educators to use the most effective methods to change attitudes and behaviour.

The problem of failed appointments is one manifestation of the low uptake of dental services. Failed appointments cause not only the dental health of the community but also the efficiency of dental services to suffer. Funding from the Health Education Council, together with collaboration with staff from local schools, the local health education department and the local dental health education departments, and consideration of the elements of research described above, enabled a personalised calendar sheet to be developed. The calendar used only simple written material to act as a reminder to reduce forgotten appointments and included a personal element to enhance rapport and reduce anxiety. The calendar was evaluated in a controlled study of 938 appointments, demonstrating an increased uptake of dental services (section 2.6).

The personalised calendar sheets should be tested in other areas and modified to produce best results with local conditions. The calendars should then be used as extensively as possible.

Any attempts to increase dental attendance would be futile unless the supply of treatment could be expanded to a corresponding degree. The dental profession has operated a closed shop for over half a century, and it takes a minimum of 4 years to train a dentist. How, then, can supply of dental treatment be increased?

More auxiliary staff, as requested by various authoritative reports, could increase productivity of dentists (see section 3.1). Such requests have provoked some controversy amongst dentists, and could not succeed without the participation of the dental profession (Edwards, 1981). Would the dental profession be prepared to delegate more freely to auxiliaries?

The survey of 716 dentists showed that most were in favour of delegating even though few were able to do so. Recently qualified practitioners were more in favour of both delegation to and employment of auxiliaries, suggesting that the support for these measures will grow in the future. A number of objections to delegation were raised, but most were not supported by published data. The objections that were valid (lack of facilities to employ an auxiliary and lack of ability to manage an auxiliary) affect only a limited number of dentists and are likely to affect fewer dentists in the future. Thus auxiliary help was shown to be a viable option to meet increased demand in the future.

Recent advances in information technology bring computers within the reach of most dental practices and a report commissioned by the British Dental Association claimed that computers would enable dentists to treat more patients (Palmer, 1981). Are current computer systems suitable for dentists? Can computers really increase productivity?

Dental journals devote considerable space to reviewing equipment and materials, but the new field of computers for dentists has received

scant attention from the dental press. In order to remedy this, a list of 46 suppliers of dental computer systems was compiled. A survey of these companies revealed that only 19 still offered dental systems: clearly prospective buyers must assess the company as well as the product in order to ensure that they will receive long-term support. The facilities of many of the systems were impressive, but their emphasis was upon administrative tasks. These tasks would often be performed not by the dentist, but by auxiliary staff, and hence the dentist would not be able to see more patients.

Of the many activities that computer systems can perform, the recall function seems to have most potential for increasing patient flow (Willmott, 1986; Ault, 1980). The commercial systems only offer a recall system as part of an expensive package. Can a basic computer recall system be developed at a reasonable cost?

A low cost recall system was developed at the Lister dental clinic and the details publicised to dentists (section 3.34). A computerised recall system such as this is recommended for use in conjunction with the calendar. Such computer recall systems offer the opportunity of follow-up on those people who fail appointments. Such research could eventually produce further increases in uptake of dental services.

Marteau and Johnston (1987) recently asserted that health psychologists neglected psychological paradigms and that their contribution to health care suffered as a result. Within the eclectic approach adopted for the present research, personal

construct theory and the theory of reasoned action were applied fruitfully to uptake of dental services. This leads the present author to suggest that not only health psychologists but also other health workers might usefully apply psychological paradigms to dentistry. The Behavioural Sciences and Dentistry Group will attempt to provide the encouragement and support to achieve this (Woolgrove and Feinman, 1987).

Appendix 1. Constructs elicited from repertory grid analysis

Subject	Constructs
1	ordinary - unusual
	unworrying - worrying
	medical - leisure
	casual - urgency
2	fear - no fear
	treatment - no treatment
	non cosmetic - cosmetic
	painful - not painful
3	normal - abnormal
	non medical - medical
	no medical problem - problem
	normal - fear
4	painful - not painful
	pleasant - tiresome
	pleasant - chore
	can be painful - enjoyable
5	nervous - not nervous
	being ill - not being ill
	medical - cosmetic
	emergency - not emergency
6	routine - not routine
	like going - do not like going
	appointments acceptable - hate appointments
	accessible - inaccessibility
7	don't like - don't mind
	more serious - every day
	don't like - like
	bother me - don't bother me
8	high discomfort - low discomfort
	low cost - high cost
	high periodicity - low periodicity
	low immediacy of need - high immediacy of need
9	expensive - free
	normal - emergency
	O.K. - frightening
	no pain - in pain
10	dental - medical
	cosmetic - essential
	regular - rare
	painless - pain

11 health/screening checks - pain/symptoms
health - cosmetic
apprehensive/discomfort - less apprehensive/discomfort
for opinion - for treatment

12 no pain/anxiety - more pain/anxiety
unnecessary - necessary
routine - when required
appt./no time wasted - no appt./time wasted

13 not regular - regular
no expense - expense involved
formal - casual
highly professional - less professional

14 not regular - regular
medical - non medical
apprehensive - not apprehensive
serious - not serious

15 need - routine
painful - painless
embarrassing - not embarrassing
urgent - non urgent

16 illness - health
irregular - regular
attend - not attend
neutral - unpleasant

17 frequent - not frequent
like - dislike
interesting - boring
painful - harmless

18 dental - not dental
healthy - unhealthy
regular - occasional
painful - painless

19 symptoms - no symptoms
health - appearance
free - costs
frightening - not frightening

Appendix 2. Questionnaire used for attitude survey and the theory of reasoned action

Camberwell
HEALTH AUTHORITY · LONDON

GIVE PERCY PLAQUE THE BRUSH OFF

DEPARTMENT OF COMMUNITY DENTAL HEALTH

ST GILES HOSPITAL
ST GILES ROAD LONDON SE5 7RN
Telephone 01-703 0898 ext

Head of Department
Dr S Gelbier PhD LDSRCS DDPH DHMSA

Your ref

Our ref

DENTAL SURVEY

INTRODUCTION

May we ask for your help in a survey which Mr John Woolgrove is conducting for the department? We are trying to find out what people think of visiting the dentist.

We are trying to talk to as many people as possible but questionnaires like this one help us get information from a much larger number of people. This questionnaire is a very important part of our study so we should be grateful if you could fill it in carefully and honestly. Your own personal views are important. Your replies will be treated in strictest confidence and will be used only for statistical purposes to show how a cross-section of people feel.

INSTRUCTIONS

1. Most questions have several answers provided. There is a number by each answer. You should ring the number by the answer that is most true for you. Here is an example:

   What do you think of dentists?
   Nice people 1
   Neither nice nor nasty 2
   Nasty people 3

   If you think dentists are neither nice nor nasty then you would ring number 2 like this:

   What do you think of dentists?
   Nice people 1
   Neither nice nor nasty (2)
   Nasty people 3

2. Some questions do not have answers provided. You should write your answer in the space provided.

Please fill in the questionnaire and return it to the teacher.
Thank you very much.

Appendix 2 (continued)

OFFICIAL USE ONLY.

		1
1 2 3 4		

1. Have you ever been to a dentist?
   YES 1
   NO 2 — 5

2. Do you usually go to the dentist for...
   a regular check up 1
   an occasional check up 2
   or only when you're having trouble from your teeth 3 — 6

3. Does your father visit a dentist for regular check-ups?
   YES 1
   NO 2
   Don't know 3 — 7

4. Does your mother visit a dentist for regular check-ups?
   YES 1
   NO 2
   Don't know 3 — 8

5. How old do you think you were when you were first treated by a dentist?
   0-3 years of age 1
   4-5 years of age 2
   6-9 years of age 3
   9-12 years of age 4
   Over 12 years of age 5 — 9

6. Have you ever had any teeth taken out by a dentist?
   YES 1
   NO 2 — 10

   If YES, how many teeth do you think you have had taken out? Write the number of teeth here:

   [ ][ ] 11,12

7. Have you ever had any teeth filled by a dentist?
   YES 1
   NO 2 — 13

   If YES, how many of your teeth do you think have fillings at the moment? Write the number of teeth here:

   [ ][ ] 14,15

8. Has any of your dental treatment ever been painful?
   YES 1
   NO 2 — 16

   If YES, HOW OFTEN has your dental treatment been painful?
   On most of your dental visits 1
   On about half your dental visits 2
   On a few of your dental visits 3 — 17

   and HOW MUCH pain have you felt with your dental treatment?
   Slight pain 1
   Moderate pain 2
   Severe pain 3 — 18

9. How long is it since the last time you went to a dentist?
   6 months or less 1
   6-12 months 2
   1-2 years 3
   2-3 years 4
   More than 3 years 5 — 19

			col.
10. The last time you went to the dentist why did you go? Was it because you were having trouble with your teeth or for a check up?	Trouble with teeth	1	
	Check up	2	
	Other reason	3	20
11. When people go to the dentist, they sometimes have to make more than one visit for the dentist to carry out any treatment they might need. When you last went to the dentist how many visits did you have to make?	One visit	1	
	Two visits	2	
	Three visits	3	
	Four visits or more	4	21
12. During the visits you made to the dentist for your last course of treatment did you have your teeth polished?	YES	1	
	NO	2	22
13. During the visits you made to the dentist for your last course of treatment did you have any treatment to straighten your teeth (for example, with a brace)?	YES	1	
	NO	2	23
14. During the visits you made to the dentist for your last course of treatment how many fillings did you have?	None	0	
	One	1	
	Two	2	
	Three	3	
	Four or more	4	24
15. During the visits you made to the dentist for your last course of treatment how many teeth did you have taken out?	None	0	
	One	1	
	Two	2	
	Three	3	
	Four or more	4	25
16. During the visits you made to the dentist for your last course of treatment how many X rays did you have?	None	0	
	One	1	
	Two	2	
	Three	3	
	Four or more	4	26
17. What type of dentist did your last treatment?	National Health Service dentist	1	
	Private dentist	2	
	School (or Community) dentist	3	
	Hospital dentist	4	
	Don't know	5	27
18. Do you know the name of this dentist?	YES	1	
	NO	2	28

If YES, please write the name of this dentist here:

---

19. What is the address of this dentist (just name the road if you cannot remember the whole address)?

---

			29 30 31

20. Was this dentist (the one you visited last time) the dentist you usually visit? YES 1, NO 2 — col. 32

If NO, please write the name and address of your usual dentist here:

---

33 3435

21. If a dentist looked in your mouth now, do you think you would need any treatment? YES 1, NO 2 — 36

If YES, do you think you would need any fillings? YES 1, NO 2 — 37

and do you think you would need any teeth taken out? YES 1, NO 2 — 38

22. Do you think that your next dental treatment will be unpleasant?

Not at all unpleasant 1
Slightly unpleasant 2
Fairly unpleasant 3
Very unpleasant 4 — 39

23. If you had to go to the dentist tomorrow, how would you feel about it?

I would look forward to it as a reasonably enjoyable experience 1
I wouldn't care about it one way or another 2
I would be a little uneasy about it 3
I would be afraid it would be unpleasant and painful 4
I would be very frightened of what the dentist might do 5 — 40

24. When you are in the dentist's waiting room, how do you feel?

Relaxed 1
A little uneasy 2
Tense 3
Anxious 4
So anxious that I sometimes break out in a sweat or almost feel physically sick 5 — 41

25. When you are in the dentist's chair waiting while he gets his drill ready to begin working on your teeth, how do you feel?

Relaxed 1
A little uneasy 2
Tense 3
Anxious 4
So anxious that I sometimes break out in a sweat or almost feel physically sick 5 — 42

26. You are in the dentist's chair to have your teeth cleaned. While you are waiting and the dentist is getting out the instruments which he will use to scrape your teeth around the gums, how do you feel?

Relaxed 1
A little uneasy 2
Tense 3
Anxious 4
So anxious that I sometimes break out in a sweat or almost feel physically sick 5 — 43

27. Children can get free dental treatment from the National Health Service. Do you know at what age you must start to pay for routine dental treatment such as fillings? YES 1, NO 2 — 44

If YES, write the age (in years) here:

---

45 46

28. Do you know at what age you must start to pay for dentures (false teeth)?
YES 1
NO 2
47

If YES, write the age (in years) here:
----
48 49

29. Do you know where you can find out about National Health Service dental charges?
YES 1
NO 2
50

If YES, where can you find out?
----
51 52

30. How sensitive are you to pain?
Much more sensitive than most people 1
Slightly more sensitive than most people 2
Slightly less sensitive than most people 3
Much less sensitive than most people 4
53

31. Have you ever had toothache?
YES 1
NO 2
54

32. If you went to the dentist with an aching BACK tooth, would you want the dentist to take it out or fill it?
Take it out 1
Fill it 2
55

33. If you went to the dentist with an aching FRONT tooth, would you want the dentist to take it out or fill it?
Take it out 1
Fill it 2
56

34. A lot of people eventually have their own teeth out and have false teeth (dentures). Do you find the thought of losing all your own teeth and having false teeth upsetting?
Very upsetting 1
A little upsetting 2
Not at all upsetting 3
57

35. Do you think you will keep your own natural teeth for the rest of your life?
Will definitely keep them 1
Will probably keep them 2
Will probably lose them 3
Will definitely lose them 4
58

36. Which of these phrases best describes your teeth?
Very poor condition 1
Quite poor condition 2
Neither good nor poor 3
Quite good condition 4
Very good condition 5
59

37. How often do you clean your teeth?
Less than once a day 1
Once a day 2
Twice a day 3
More than twice a day 4
60

38. How concerned are you about the appearance of your teeth?
Not at all concerned 1
Slightly concerned 2
Fairly concerned 3
Very concerned 4
61

SOME MORE INSTRUCTIONS TO HELP YOU

Some questions have answers provided with the numbers 1 2 3 4 5. Here is an example of one of these:

What do you think of filling in this questionnaire?

Very boring 1 2 3 4 5 Very interesting

If you think this would be an exciting thing to do you would answer like this:

Very boring 1 2 3 4 (5) Very interesting

If you were fed up with the idea but felt it wasn't really too bad you might put a ring round number 2, like this:

Very boring 1 (2) 3 4 5 Very interesting

If you didn't care or had no idea what you felt you should ring number 3, like this:

Very boring 1 2 (3) 4 5 Very interesting

Now turn over the page and ring the appropriate numbers.

Appendix 2 (continued)

OFFICE USE ONLY
col.

39. Do you intend to visit the dentist regularly?

definitely yes 1 2 3 4 5 definitely no — 62

40. Do you think that visiting the dentist regularly is beneficial or harmful?

beneficial 1 2 3 4 5 harmful — 63

41. Do you think that visiting the dentist regularly is pleasant or unpleasant?

pleasant 1 2 3 4 5 unpleasant — 64

42. How important to you is getting advice about your teeth?

very important 1 2 3 4 5 not important — 65

43. How important to you is preventing decay in your teeth?

very important 1 2 3 4 5 not important — 66

44. How important to you is preventing pain in your teeth?

very important 1 2 3 4 5 not important — 67

45. How important to you is having a dentist check your teeth for holes?

very important 1 2 3 4 5 not important — 68

46. How important to you is having teeth that look good?

very important 1 2 3 4 5 not important — 69

47. How important to you is having teeth that are healthy?

very important 1 2 3 4 5 not important — 70

48. How important to you is keeping your teeth till you are very old?

very important 1 2 3 4 5 not important — 71

49. How much would you mind spending a lot of time visiting the dentist?

mind a lot 1 2 3 4 5 do not mind — 72

50. How much would you mind spending a lot of money on your teeth?

mind a lot 1 2 3 4 5 do not mind — 73

Appendix 2 (continued)

51. How much would you mind if the dentist hurt you?

mind a lot 1 2 3 4 5 do not mind 74

52. How unpleasant is the noise in the dentist's surgery?

very unpleasant 1 2 3 4 5 not unpleasant 75

53. How unpleasant is having injections in the gum?

very unpleasant 1 2 3 4 5 not unpleasant 76

54. How unpleasant is having fillings put in your teeth?

very unpleasant 1 2 3 4 5 not unpleasant 77

55. How unpleasant is having a tooth taken out?

very unpleasant 1 2 3 4 5 not unpleasant 78

56. How unpleasant is wearing a brace to staighten your teeth?

very unpleasant 1 2 3 4 5 not unpleasant 79

57. How much do you mind being bored?

mind a lot 1 2 3 4 5 do not mind 80

			2
1	2	3	4

58. How much do you mind being frightened?

mind a lot 1 2 3 4 5 do not mind 5

Now we would like to know what you think the dentist is likely to do if you visit the dentist regularly.

59. Do you think that the dentist is likely to give you advice about your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 6

60. Do you think the dentist is likely to prevent decay in your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 7

61. Do you think the dentist is likely to prevent pain in your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 8

Appendix 2 (continued)

62. Do you think the dentist is likely to check your teeth for holes if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 9

63. Do you think the dentist is likely to do fillings in your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 10

64. Do you think the dentist is likely to make your teeth look good if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 11

65. Do you think the dentist is likely to make your teeth healthy if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 12

66. Do you think your teeth are more likely to last till you are very old if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 13

67. Do you think it is likely to take a lot of time if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 14

68. Do you think it is likely to cost a lot if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 15

69. Do you think the dentist is likely to hurt you if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 16

70. Do you think you will hear a lot of noise from the dental equipment if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 17

71. Do you think the dentist is likely to give you injections in the gum if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 18

72. Do you think the dentist is likely to take out some of your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 19

73. Do you think the dentist is likely to give you a brace to straighten your teeth if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 20

74. Do you think it is likely you will be bored if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 21

75. Do you think it is likely you will be frightened if you visit the dentist regularly?

likely 1 2 3 4 5 unlikely 22

Now we would like to know how you think other people would like you to act. Remember, you can ring number 3 if the question does not apply to you.

76. Do most people who are important to you think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 23

77. Do most members of your family think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 24

78. Do your close friends think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 25

79. Does your mother think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 26

80. Does your father think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 27

81. Do dentists think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 28

82. Do doctors think you should visit the dentist regularly or not?

should visit regularly 1 2 3 4 5 should not 29

Appendix 2 (continued)

83. Generally speaking, do you want to do what most members of your family think you should do?

definitely yes 1 2 3 4 5 definitely no 30

84. Generally speaking, do you want to do what your close friends think you should do?

definitely yes 1 2 3 4 5 definitely no 31

85. Generally speaking, do you want to do what your mother thinks you should do?

definitely yes 1 2 3 4 5 definitely no 32

86. Generally speaking, do you want to do what your father thinks you should do?

definitely yes 1 2 3 4 5 definitely no 33

87. Generally speaking, do you want to do what dentists think you should do?

definitely yes 1 2 3 4 5 definitely no 34

88. Generally speaking, do you want to do what doctors think you should do?

definitely yes 1 2 3 4 5 definitely no 35

Finally, please write in:

Your school _____ 36 37 38

Your class _____ 39, 40

Your name _____ 41,42,43,44,45

Your sex _____ 46

Your date of birth _____ 47,48,49,50, 51,52

Your father's job (If your father is unemployed, write "unemployed")_____ 53

Your mother's job (If your mother is unemployed, write "unemployed")_____ 54

Thank you very much for your time and help.

Please return the questionnaire to the teacher as quickly as possible.

Appendix 3. Elicitation questionnaire

QUESTIONNAIRE

Please answer the following questions and then return this sheet to the supervisor.

It is important that you give your own ideas so please do not discuss your answers with other people until after you have returned this sheet.

List as many reasons as you can for making a visit to a dentist:

a) List reasons that might apply to you

b) List reasons that would not apply to you but might apply to other people.

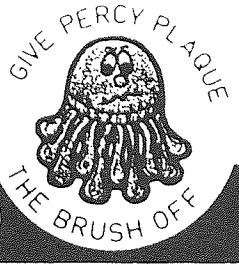
List as many reasons as you can for avoiding a visit to a dentist:

a) List reasons that might apply to you

b) List reasons that would not apply to you but might apply to other people.

Appendix 4. Personalised calendar sheet

Lister Health Centre
Dental Clinic
1 Camden Square
London SE15 3LW
Tele: 701 6291 Ext. 230



SEPTEMBER 1986

1	Mon		17	Wed	
2	Tue		18	Thu	
3	Wed		19	Fri	
4	Thu		20	Sat	
5	Fri		21	Sun	
6	Sat		22	Mon	
7	Sun		23	Tue	
8	Mon		24	Wed	
9	Tue	See you at 10.30, John	25	Thu	
10	Wed		26	Fri	
11	Thu		27	Sat	
12	Fri		28	Sun	
13	Sat		29	Mon	
14	Sun		30	Tue	
15	Mon				

Appendix 5. Delegation questionnaire for dentists

YEAR OF QUALIFICATION _____

PLEASE TICK APPROPRIATE BOXES.

IN WHICH BRANCH OF DENTISTRY DO YOU WORK?

GENERAL PRACTICE ☐ A.H.A. ☐ HOSPITAL ☐ OTHER SPECIFY ☐

1. WOULD YOU LIKE TO SEE DENTAL THERAPISTS WORKING IN GENERAL PRACTICE? YES/NO ☐☐

2. WOULD YOU EMPLOY A DENTAL THERAPIST IN A PRACTICE? YES/NO ☐☐

3. COULD YOU SEE YOURSELF AS THE HEAD OF A DENTAL HEALTH TEAM DELEGATING SIMPLE TASKS? YES/NO ☐☐

4. WHICH TASKS WOULD YOU CONSIDER YOU SHOULD BE ABLE TO DELEGATE?

Scale & Polish ☐ Dental Health Education ☐ Fluoride Applications ☐

Fissure Sealants ☐ Infiltration Anaesthesia ☐ Bite-wing Radiographs ☐

Simple Fillings ☐ Deciduous Extractions ☐

5. WOULD YOU OBJECT TO OTHER DENTISTS EMPLOYING DENTAL THERAPISTS? YES/NO ☐☐

6. COMMENTS.

Appendix 6. Names and addresses of computer companies

Abies Informatics
38 Dover St., London W1X 3RB

Attar Computers
Newlands Rd., Leigh

Aztech
160 Slade Rd., Manchester, M19 2AQ

BBS
Glebe Hse., Alkinson Rd., Urmston, Manchester, M32 1AD

Briers Computer Services
1 King Edward Square, Middlesborough, Cleveland

British Olivetti
PO Box 1AP, 30 Berkeley Square, London W1A 1AP

British Medical Data Systems
Paddington House, Town Centre, Basingstoke, RG21 1LJ

Bucon
18 Mansel St., Swansea

Business House
47 Promenade, Cheltenham, GL50 1PJ

Business Information Systems
107/109 Gloucester Rd., London, SW7 4SS

CAP Ltd
233 High Holborn, London WC1

Chiltern Microcomputers
Finlandia Centre, Oxford Rd., Gerrards Cross

Claudius Ash
Casco House, Moon La., Barnet, EN5 5UA

Commonsense Computing
PO Box 7, Bideford

Computaquest
88 Hassal Rd., Sandbach

Computer Interfacing
19 Roseburn Terrace, Edinburgh

Computers for Business an Industry Ltd.
Wellesbourne House, Lowes Lane, Wellesbourne, Warmick CV35 9RH

Corvus
289 Coronation Rd., Bristol, BS3 1RT

Dental Office Systems
23 Washway Rd., Sale, M33 1AD

Dataforce UK Ltd
68 Alma rd., Clifton, Bristol BS8 2DJ

Dental Software Products
369 Maidstone Rd., Gillingham, ME8 0HX

Dentron Computers
71 Loudoun Rd., London NW8 0DQ

Graham-Dorian Software Systems
68 Dukes Ride, Crowthorne, Berks.

Health Computing Ltd
7 St Cross St., Wincester SO23 9JA

Intac Data Systems
Frost House, Woodhouse Green, Thurcroft, Rotherham

Interactive Computing
46 Kingsway, London WC2

Lawson Computers
19 Walters Rd., Swansea

LSA Systems
30/32 Markey St. Marple, Stockport

Match Technologies
12 Christchurch Rd., Bournemouth

Microcom (UK)
226 Oxford St., Swansea

Micro Forth
34 Dickson St., Dunfermline

Microsave
289 Coronation Rd., Bristol, BS3 1RT

Missing Link Computers
53-55 Ballards La., London, N3

Pearl Software Ltd
Teachers Hse, Christchurch Rd., Bournemouth BH1 3TF

Protechnic Computers
264 Newmarket Rd., Cambridge, CB5 8JR

Printivity
Ellwood, Deanway, Chalfont St. Giles, HP8 4JR

Racal Hyperon Ltd
Peacock Industrial Est., 125/127 Davigdon Rd., Hove

Radius
47 Queen St., Hull.

Sheffield Computer Centre
227 London Rd., Sheffield

Silicon Centre
21 Comely Bank Rd., Edinburgh

Specialist Dental Services
123 Bath Row, Edgbaston, Birmingham, B15 1LS

Stroud Microcomputers
25 High St., Stroud, GL5 1AJ

Systems Selection
1 Alexandra Rd., Swansea

W. H. Roberts
23 Tan-y-Bryn, Penprisk, Pencoed, Mid Glamorgan, CF35 6RT

Vixon Comuter Systems
49 Grimsby Rd., Cleethorpes, DN35 7AQ

William John and Co
12 High St., Stroud GL5 1AZ

Wordvision
53 Hurstwood South, Ascot

Appendix 7. Questionnaire for computer survey

QUESTIONNAIRE FOR DENTAL COMPUTER COMPANIES

Please complete in the space provided
or delete YES or NO as required.

1. Name

2. Address

3. Telephone number

4. Date company formed

5. Number of full time employees

6. How many dental computer systems have you installed? _____

7. Is yours a multi-user multi-tasking system?
YES-NO

8. Can your dental computer system computerise appointments? YES-NO

IF "NO", PLEASE GO TO QUESTION 9

8a. How many appointment systems have you installed? _____

8b. What is the minimum appointment length? _____

8c. Can the system double book if required? YES-NO

8d. Can two diaries be cross booked? YES-NO

8e. Can appointments be made 6 months ahead? YES-NO

8f. Can day lists be printed? YES-NO

8g. Can lists of failed apointments be printed? YES-NO

8h. Can the system issue recalls? YES-NO

8i. Can the system accept variable recall periods? YES-NO

9. Can your system computerise clinical records? YES-NO

IF "NO", PLEASE GO TO QUESTION 10

9a. How many clinical records systems have you installed? _____

9b. Can the system use high resolution graphics to reproduce the standard tooth charting? YES-NO

9c. Can the system complete form FP17? YES-NO

9d. Can the system complete part 1 (the charting) on form FP17? YES-NO

9e. Can the system complete form FP17a? YES-NO

10. Can the system computerise practice management? YES-NO

IF "NO", PLEASE GO TO QUESTION 11

10a. How many practice management systems have you installed? _____

10b. Can the system calculate fees due from the DEB? YES-NO

10c. Can the system calculate fees due from patients? YES-NO

10d. Can the system calculate wages and PAYE tax? YES-NO

10e. Can the system perform stock control? YES-NO

10f. Can the system act as a word processor? YES-NO

11. What hardware and software would you recommend for a single handed practice with 2000 patients?

12. What is the cost of this system?

13. What arrangements for maintenance would you recommend?

14. What would be the cost of this maintenance?

15. What training would you provide?

16. What is the cost of a system for a 2 dentist practice with 4,000 patients?

17. What is the cost of a system for a 3 dentist practice with 8,000 patients?

18. What is the cost of a system for a 4 dentist practice with 10,000 patients?

19. What is the cost of a system for a 5 dentist practice with 10,000 patients?

20. Do you offer a demonstration to prospective purchasers? YES-NO

21. Would you be prepared to supply the names and addresses of existing users to prospective purchasers? YES-NO

22. Any comments you would like to add?

Appendix 8. Computer program for recalls

```
proc a
 print
 print "    ... [illegible] the patient details ..."
 print "                 and press ENTER after each line"
 print
 print
 let add$="y"
 while add$="y"
   input "surname                   ", surname$
   input "forename                  ", forename$
   input "street                    ", street$
   input "area                      ", area$
   input "postcode                  ", postcode$
   print "recall date "
   input "(as number of months)", recalldate
   print "recall interval"
   input "(number of months)         ", interval
   input "dentist                   ", dentist$
   input "evening appts (EVE)       ", evening$
   input "miscellaneous             ", mis$
   print
   print "Is this OK? (y or n)   ";
   let correct$=lower(getkey())
   if correct$="y"
     append
     print "RECORD ADDED"
     else
     print "RECORD NOT ADDED"
     endif
   print
   print "Add another record? (y or n)   ";
   let add$=lower(getkey())
   endwhile
  cls
  choose
  endproc
proc c
  let n$="x"
  print
  print "... To CHANGE (or look at) a record type in the surname and press ENTER
..."
  if n$<>""
    get
    if ok$="y"
      print at 12,0; "  When you have finished looking, press F5 "
      print at 14,0; "  To CHANGE this record overtype with the correct informat
ion"
      print "          ENTER             moves the cursor to the next line"
      print "           and              move the cursor along the line"
      print "          CTRL and   or     delete along the line"
      print "          F5                enters the record"
      alter
      cls
      endif
    endif
  choose
  endproc
 proc choose
   print
   print
   print
   print "   Would you like to "
   print
   print "   ADD a record?                        Type a"
   print "   DELETE a record?                     Type d"
   print "   CHANGE (or look at) a record?        Type c"
   print "   PRINT addresses?                     Type p"
   print "   FINISH?                              Type f"
   let c$=lower(getkey())
   cls
   if c$="a": a: endif
   if c$="d": d: endif
   if c$="c": c: endif
   if c$="p": p: endif
   if c$="f": f: endif
   endproc
 proc d
   cls
   print
   print "   ... To DELETE a record first type the surname and press enter ..."
   get
   if ok$="y"
     print at 12,0; "DO YOU WISH TO DELETE THIS RECORD? (y or n)     ";
     let ok$=lower(getkey())
     print ok$,
     cls
     print
     print "  ";
     if ok$="y"
       delete
       print n$; "  DELETED"
       else
       print n$; "  NOT DELETED"
       endif
     endif
   choose
   endproc
  proc doline; x$
    print x$
    lprint x$
    endproc
  proc f
    cls
    print
    print
    print "                    Number of records in file:   ";
    print count()
    print
    print
    print "     Please wait - do NOT switch off until this notice disappears"
    quit
    endproc
```

```
proc get
  print "       Look for   "
  let gk$="n"
  input n$
  if n$<>""
    find n$
    while gk$<>"y" and found
      display
      sprint
      print at 1,1;"Is this the right one (y or n) ";
      let gk$=lower$(getkey$)
      print gk$
      if gk$="y"
        print
        print "     ******** SEARCHING FOR NEXT "; n$; " ********"
        continue
        endif
      endwhile
    if not found
      cls
      print
      print "    "; n$; " not found"
      endif
    endif
  endproc
proc label
  doline, ""
  doline, "                                          "+dentist$+" "+evening$
  doline, forename$+" "+surname$
  doline, street$
  doline, area$
  doline, postcode$
  doline, ""
  doline, ""
  doline, ""
  endproc
proc newdate
  first
  while not eof()
    let recalldate=recalldate+interval
    if recalldate>12
      let recalldate=recalldate-12
      endif
    update
    next
    endwhile
  endproc
proc p
  cls
  print
  print "  *** To PRINT recalls type the number of the month and press ENTER ***
  "
  input n
  if n<13
    p
    else
    print "     *** Please wait while "; month$(n); " recalls are selected ***"
    select recalldate=n
    print "    There are "; count(); " recalls for "; month$(n)
    print "      Is printer ready? (y or n)"
    let p$=lower$(getkey$)
    if p$="y"
      all
        label
        endall
      else
      endif
    print "  Would you like to update the "; month$(n); " recalls? (y or n)"
    let u$=lower$(getkey$)
    if u$="y"
      print "     ************* UPDATING RECALL DATES ****************"
      newdate
      reset
      cls
      print "         ******** RECALL DATES FOR "; month$(n); " UPDATED *******
."
      else
      print "              Please wait a moment"
      reset
      cls
      print "       ******* RECALL DATES FOR "; month$(n); " NOT UPDATED ****"
      endif
    choose
    endif
  endproc
proc start
  cls
  print
  print "    THIS IS RECALL PROGRAM VERSION 3.0"
  open "recalls"
  while 1
    error choose
    let n=errnum()
    if n
      if n=27 and c$="a"
        let c$=""
        else
        print
        print "       ***      MISTAKE  -  Press ENTER     ***"
        print "       *** You will return to the main menu ***"
        let w$=getkey$()
        cls
        endif
      endif
    endwhile
  endproc
```

Appendix 9. Programme for the original behavioural science in dentistry course in 1981

DENTISTRY USING THE NEW BEHAVIOURAL SCIENCES

A Postgraduate Course for Dentists

Postgraduate Medical Centre,
Walton Hospital,
Rice Lane,
Liverpool, L9 7AL.
Telephone: 051 525 3611

MONDAY, 6TH JULY, 1981
Registration: 9.20 a.m.

Principal Speakers:-

Mr. John Woolgrove, B.D.S., M.Sc.
Dr. Guy Cumberbatch, Ph.D.

This course provides an overview
of recent developments in the
practical applications of the
behavioural sciences to dentistry,
combining clinical expertise
and applied research.

There will be ample opportunity for discussion.

Appendix 9 (continued)

9.20 REGISTRATION

9.40 John Woolgrove, B.D.S., M.Sc. and
Guy Cumberbatch, Ph.D.

Behavioural Sciences - What can they offer us?

10.20 Elaine Ferry, B.Sc.

Stress in dental practice - Are we equipped for it?

11.00 COFFEE

11.20 Anne Cushing, B.D.S.

Dental disease - What does it mean to our patients?

12.00 John Besford, B.D.S., Ph.D.

Dental fatalism - Can we change it?

12.40 LUNCH

1.40 John Woolgrove, B.D.S., M.Sc. and
Guy Cumberbatch, Ph.D.

Will it hurt? - Pain and fear in the dentist's Chair.

2.20 Stan Lindsay, Ph.D.

Practical procedures in patient management.

3.00 Geoffrey Shanks, L.D.S., R.F.P.S.G.

Hypnotherapy - Its place in dentistry.

3.40 TEA

4.00 John Besford, B.D.S., Ph.D.

Prosthetics - Exploiting the patient.

4.40 Panel Discussion.

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