A comparison of normative and oral health related quality of life measures to assess the outcomes of orthodontic treatment

by

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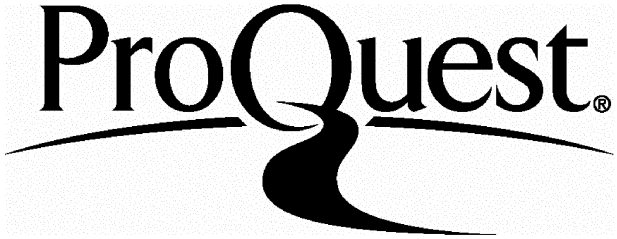

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To my parents, my brother, my sister Claudia, Glauco,

Peter, for their love and support

Abstract

Despite the fact that demand for orthodontic treatment is mostly related to personal concern about appearance and other psychosocial factors, measures of need assessment and outcomes of orthodontic treatment place little emphasis on patients' perceptions of need and the difference that orthodontic care makes to their daily lives. While quality of life has become a relatively common outcome measure in medical research, similar research in dentistry is in its infancy. Traditionally, dental researchers have focused on hard clinician-driven outcome measures at the expense of more subjective patient-driven measures, such as perceived functional status and psychological well-being. The measurement of treatment need and outcome has been based predominantly upon traditional clinical measures because there has not been a systematic study of the association of quality of life and malocclusion. The aim of this study was therefore to assess how the teeth and mouth impact on the daily lives of adolescents and whether the impacts, as assessed by two well established oral health related quality of life measures, are affected by orthodontic treatment. **Hypothesis**: It was hypothesised that adolescents who had completed orthodontic treatment had less oral health related impacts on their daily life activities and were more satisfied with their dental appearance than those who never had orthodontic treatment. In addition, it was hypothesised that a commonly used orthodontic clinical measure of need is an adequate measure of perceived satisfaction with dental appearance and also how the mouth affects oral health related quality of life. **Methods**: The study was conducted in Bauru-SP, Brazil. A sample of 1675 schoolchildren between 15 to 16 years old, from 21 urban schools, were randomly selected and three groups were identified according to their orthodontic status: treated, currently under treatment and untreated. Adolescents were clinically examined for orthodontic treatment need using the Index of Orthodontic Treatment Need (IOTN). Data on adolescents' self-perceptions were collected through a self-complete questionnaire. A structured interview was used to assess adolescents' oral health related impacts. Two oral health related quality of life measures, which had previously been used on Brazilian schoolchildren, namely the Oral Impacts on Daily Performance (OIDP) and the shortened version of the Oral Health Impacts Profile (OHIP-14)

were used. Bivariate analysis and multiple logistic regression were used in the data analysis. **Findings**: Oral health related impacts were prevalent in the adolescents studied. Adolescents who had completed orthodontic treatment were significantly more satisfied with their dental appearance than those who were currently under treatment or who never had treatment. There were also significantly less oral health impacts on daily life activities in adolescents who had completed orthodontic treatment compared to the other two groups. Another finding was that the clinical measure of orthodontic treatment need, the IOTN index, did not adequately measure adolescents' satisfaction with dental appearance and overall oral health impacts as measured by two oral health related quality of life measures. Also, there was discordance between IOTN need and overall oral health impacts. Many adolescents who had no othodontic treatment need had impacts and vice versa. **In conclusion**, adolescents who had completed orthodontic treatment were more satisfied with their dental appearance and had fewer oral health impacts than those who never had orthodontic treatment and those who were currently having treatment. Combining the dental health component of IOTN with either of the two oral health related quality of life measures (OIDP and OHIP-14) used in this study provided more information about adolescents' perceived satisfaction with their appearance than the IOTN alone. Therefore current methods of orthodontic need should be complemented by oral health related quality of life measures with valid psychometric properties, and measures of perceived need.

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Chapter 1

Introduction and Literature review

1.1 Introduction

While quality of life has become a relatively common outcome measure in medical research, similar research in dentistry has begun to develop only recently (Hatch et al., 1998). Traditionally, dental researchers have focused on "hard" clinician-driven outcome measures at the expense of more subjective patient-driven measures, such as perceived functional status and psychological well-being. Quality of life, as usually applied in health outcomes research, is a multidimensional concept that presumes to include subjectively perceived physical, psychological, and social function as well as a sense of subjective well-being.

The extension of people's life spans and the enhancement of their quality-of-life are two central goals of health care systems, as reflected in policies developed by the United States Government (US Department of Health and Human Services, 1992) and the World Health Organization (Mahler, 1981). Health outcomes research plays a valuable role in the achievement of these goals by identifying treatments that produce the best outcomes for patients, evaluating ways in which health care can be organised to optimise benefits for communities, and through informed development of health care policy at the local and national level (Hatch et al., 1998).

The imperative for outcomes research within medical settings has been matched recently in dentistry. Dentistry was urged by the US Institute of Medicine (IOM) to "improve our knowledge of what works and what does not work" in the advancement of national oral health objectives (Institute of Medicine, 1995). The IOM report noted: "A focus on health outcomes is essential for dental professionals and dental services in achieving desired health outcomes for individuals and communities and cannot simply be assumed, but must be demonstrated to patients, other purchasers of dental services, and policymakers." However, as Bader (1992) has observed "... for the established and more commonly performed dental treatments and diagnostic procedures and skills, data needed for use in evaluations of appropriateness of care are not available."

Since the majority of dental care is directed towards diseases that are seldom life threatening, there has been long-standing recognition of the need to evaluate the impact of dental care on quality of life. In the two decades since Cohen and Jago (1976) advocated the development of 'sociodental' indicators, there has been considerable methodological research leading to the development of questionnaire instruments to measure dimensions of quality of life that relates to oral health (Gift, 1996).

During the same period, theoretical models have been developed to link concepts of disease, dysfunction and disability to health, oral health and quality of life (Sheiham and Croog, 1981; Reisine, 1984; Davis, 1987; Locker, 1988; Gift and Atchison, 1995; Slade et al., 1998). By 1995, there were a number of instruments

measuring oral health related quality of life. However, it was apparent that those instruments had been used primarily within oral health surveys, and relatively few had been utilised to evaluate outcomes of dental care. Reports from conferences (Miller, 1987; Kressin, 1996) and editorials (Heath, 1996) have emphasised the need to incorporate concepts of quality of life into methods for evaluating dental care. Their conclusions have suggested the existence of a more fundamental methodological problem whereby oral health outcomes researchers have had little involvement in the development or use of instruments to assess oral health related quality of life.

This also applies to research into the association of quality of life and malocclusion where research has not made a major contribution. In fact, the measurement of status at treatment entry and outcome has largely been based upon traditional clinical measures. Of these, the most commonly used are calculation of cephalometric measurement of dental occlusal features together with occlusal indices, or imprecise categorisations such as Angle's classification (Angle, 1899).

More recently, a number of orthodontic indices have been developed (Brook and Shaw, 1989; Cons et al., 1986). However, when the relationship between orthodontic indices and patients' perception of their oral health status is examined, it seems doubtful that these two parameters are strongly associated (Shaw, 1981). Since the subject's perception is central to the assessment of overall need, knowledge about patients' perceptions is very important to establish. A number of sociodental indicators have been developed in adults to assess the impact of the

mouth on daily living and the quality of life. These indicators have been applied mainly to adults. The Department of Epidemiology and Public Health at University College London has developed a number of sociodental indicators. The Dental Impacts on Daily Living (DIDL) (Leao and Sheiham, 1995) was developed on a Brazilian adult population. More recently the Department has developed the Oral Impacts on Daily Performances (OIDP) (Adulyanon, 1996) as a component of a treatment need system. The overall need system has the following dimensions:

- A clinical dimension based upon sound concepts of the life history of the disease.
- A measure of impairment, which incorporates functional measures to assess the impacts of the impairment.
- Measures of social dysfunction.
- The wants of the individual. Wants are the individuals' perceptions of their own dental needs and depend on the individuals' oral health, their perceptions of what is normal and what the possible benefits of treatment are and factors such as social class and education (Cooper, 1975).
- Assessment of the propensity of the individual to take preventive action and the perceived barriers to prevention. This includes the promotion of general health maintenance, health education and attitudes about health matters.
- A prescription of effective and acceptable treatments or cures (Matthew, 1971) and the skills required to carrying out the care (division of labour) (Adulyanon and Sheiham, 1996).

Some of the above mentioned dimensions are important both for needs assessment and for measuring outcome of treatment. Obviously, the clinical dimension is important. However, dimensions of dental impact and social function are as important as clinical measures, if not more so. In an attempt to redress the paucity of research into psychosocial aspects of the mouth and teeth, this thesis will investigate the importance of the psychosocial outcomes of orthodontic treatment and compare them with the assessments of clinicians and with the expressed levels of satisfaction of the patients.

In order to provide a clear overview, the literature review will first deal with concepts of need, focusing on orthodontic treatment need. The review will highlight the shortcomings of the current approaches of assessing outcomes of orthodontic treatment. The main shortcoming is that they pay little attention to the perceptions of the patients.

1.2 Literature review

1.2.1 Introduction

This literature review is divided into five sections and provides evidence on topics related to the present study. Section 1.2.2 outlines the perspectives of concepts of need for health care. Section 1.2.3 presents a brief review on the assessment of orthodontic treatment need. Section 1.2.4 presents an overview on the assessment of outcomes of orthodontic care, particularly the current outcome measures in orthodontics. Section 1.2.5 describes the oral impacts of malocclusion. Finally, Section 1.2.6 presents a general review about the oral health related quality of life measures used in the present study. In addition, a general summary of the review is presented.

1.2.2 Perspectives of concepts of need for health care

Assessments of health needs have long been considered useful in planning oral health care. While the debate about oral health care has emphasized the limitations of a single normative perspective of health needs, the increasing range of indices that are combining a clinical assessment with social and psychological factors within sociodental indicators, will enhance the appropriate application of health needs assessments to planning (Sheiham and Spencer, 1997).

1.2.2.1 Definitions of impairment, disability and handicap

The indices of orthodontic treatment need have developed in relative isolation from the concepts of need for health and health care. Orthodontics is trailing behind other disciplines in dentistry in this regard. This is surprising because the features which orthodontists deal with, namely impairment, disability and handicap, fall neatly within the WHO (1980) concepts relating to disability and handicap. The WHO (1980) definition of impairment for dental health, modified by Locker (1988), is that an impairment is defined as a loss or abnormality of mental, physical, or biochemical function either present at birth or arising out of disease or injury, such as tooth loss or malocclusion. All changes are associated with impairment, but not all impairments lead to functional limitations (Figure 1.1).

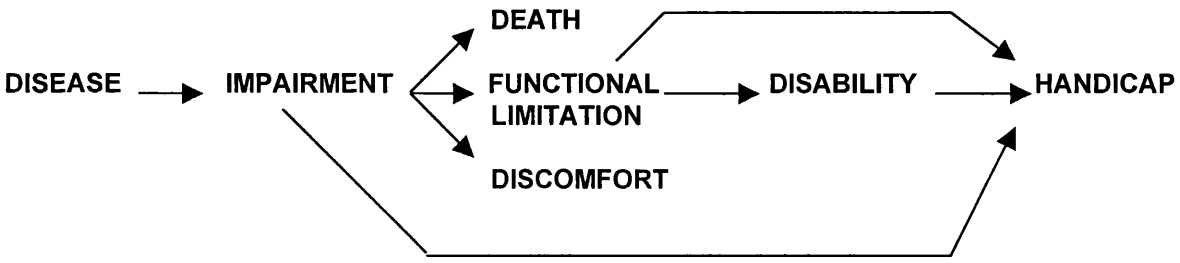


Figure 1.1 The conceptual model. WHO (1980) adapted by Locker (1988).

Functional limitation is a restriction in a function that is normally expected of the body or a component organ or system, such as a limitation of jaw mobility. Discomfort extends biomedical measures to include subjective appraisals of well-being. These appraisals might be in response to disease, such as self-reported pain and discomfort or other physical and psychological symptoms. Social disability is any limitation or a lack of ability to carry out socially defined tasks and roles that individuals generally are expected to do. A disability is as a result of the condition, the loss or reduction of function or activity arising from the impairment. It includes not only restriction in mobility, body movement or self-care, but also other distinct dimensions of physical, psychological and social well-being. Disability is not determined solely by abnormalities of psychological or anatomical structures. The environment and public attitudes may also determine whether functional limitations become disabilities (Pope and Tarlov, 1991).

Handicap is concerned with the broader social effects and is defined as the disadvantage experienced by impaired and disabled people because they do not or cannot, conform to the expectations of society, or the social groups to which they belong (Locker, 1988). It is the disadvantage or restriction experienced by individuals in their personal and social life consequent on disability or impairment. In this sense, a handicap results from interactions between physical impairment, the adjustment to it and the physical and social environment (WHO, 1980). The disadvantage is multidimensional and can involve loss of opportunity, actual material and social deprivation, and dissatisfaction (Nagi, 1976; WHO, 1980; Locker, 1988; Pope and Tarlov, 1991). The WHO (1980) and Locker's (1988)

concepts of impairment, disability and handicap can be applied in order to assess need for treatment and outcome of treatment.

1.2.2.2 Definitions of need

The concept of need is at the core of health planning. A commonly challenged assumption in the organization and provision of health services, including dental health services, is that professionals can objectively determine the need for health care. It is now known however, that health care needs may be defined in broader ways, because the definition of any given state of ill health has become open to much wider interpretation than in the past (Sheiham and Spencer, 1997).

Health care needs now extend beyond a narrow clinical interpretation to issues like the impact of ill health on individuals and on society, the degree of disability and dysfunction that ill health brings, the perceptions and attitudes of patients towards ill health, and the social origins of many common illnesses. All these factors are believed to influence the utilization of health services, the development of health care techniques and, ultimately, the effectiveness of treatment.

According to Acheson (1978), there have been two different approaches to defining need for health care. Firstly, the "humanitarian" view, which was developed by Donabedian (1974), as "some disturbance in health and well-being", is defined in terms of phenomena that require medical care services. It implies that when there is human suffering we must do something about it, but it fails to take

into account the consequence of limited resources for health care. Secondly, the "realistic" approach of need developed by Matthew (1971) and Cochrane (1976). These authors suggested that need should be recognised only when it can be met with some medical intervention that has positive utility and that actually alters the prognosis of the disease in some favourable way at reasonable cost.

There is no general agreement on what constitutes health need. Sometimes need is defined in terms of treatment required. Donabedian (1974) presented "a service equivalent of need" or "need for" concepts which may be deployed to meet that need. This approach is constrained by resource allocation. Cooper (1975) had a homologous definition: "a state of health assessed as in need of treatment by a medical practitioner". Matthew (1971) extended this service-related definition to effectiveness of treatment by stating that "a need for medical care exists when an individual has an illness or disability for which there is an effective and acceptable treatment or cure."

However, the definition, which has been generally used, is the taxonomy suggested by Bradshaw (1972). "Normative" need is that which the expert or professional, administrator or social scientist defines as need in a given situation. "Felt" need is equated with "want", expressed as the individual's own assessment of his or her requirements for health care. "Expressed" need or "demand" is felt need turned into action by seeking assistance. "Comparative" need is obtained by comparing the health care received by different people with similar characteristics. "Unmet" need is the differences, if any, between services judged to be necessary to

appropriately deal with defined health problems and services actually being received (Carr and Wolfe, 1979). Magi and Allander (1981) concluded that need is relative to time, place and assessor.

Assessment of need is used to set priorities, to establish services and resources and to evaluate health care systems (Magi and Allander, 1981). The most commonly used needs assessment in dental health planning is normative need. In recent years the shortcoming of this approach has been increasingly recognized as being disease-oriented or biomedical, identifying disease without recognising the subjective perception of the patient.

Further shortcomings have been identified. Firstly, professional judgments in normative need are neither value-free nor objective. The whole concept of objectivity is much less clear-cut than is suggested in this approach (Teeling-Smith, 1973; Harman, 1974) because its methods often depend on the agreement of a number of subjective approaches. Even within these agreements, there are intra-examiner and inter-examiner variability between different judgments. Secondly, the standard way to measure dental disease, may lead to a perception of treatment need that gives an incomplete picture because it excludes the functional and social dimensions. This problem occurs particularly in conditions that lack easy definition such as occlusal disharmonies (Sheiham et al., 1982). Giddon (1978) indicated that oral health problems probably have much more to do with an individual's quality of life and personal comfort than people's ability to carry out usual daily activities. This is corroborated by evidence that people's dental

satisfaction bears little relation to the clinical assessment of oral conditions (Barenthin, 1977; Davis, 1980).

Thirdly, dental need justified by the professional alone was questioned in terms of human rights or consumer rights. Campbell (1977) asserts that the rationale behind discrimination between people with the same needs cannot be morally justified. Decisions of priority in medicine must be transparent and should not be the sole prerogative of a single professional group or a single agency of government. In addition, recent developments in consumerism and marketing have highlighted the important role of 'patient satisfaction'. Patient satisfaction was considered as an important outcome measure of health care, not only in terms of consumer's rights or taxpayer's rights, but research suggests that patient satisfaction makes a direct contribution to other outcomes of medical care (Fitzpatrick, 1990). This particularly applies to oral problems that have no serious consequences for an individual's ability to live a normal life. In other words, for people who do not regard themselves as sick. So the basis for the relationship with the practitioner is not one of patient-healer, which tends to favour the authority of the practitioner, but client-consultant, which introduces a degree of equality and mutual respect and co-operation into the relationship (Bloom and Wilson, 1972).

Lastly, normative need was criticized for its paradoxical approach. Although, need is based on the belief that all the sick should be helped, this is not achieved in the reality of limited health care resources. As Acheson (1978) stated, "If some of the needy received complete care, nothing may be left for others. We cannot be

endlessly generous and continue to be fair". This is why Fuchs (1974), an economist, described this kind of need as "romantic" rather than "humanitarian". Glass (1976) even considered normative need as a useless concept in planning health services.

More useful concepts of need have been suggested by Donabedian, 1974; Campbell, 1977; Acheson, 1978; Cohen and Jago, 1976; Shaw et al., 1979; Reisine, 1981; Sheiham et al., 1982; Patrick and Bergner, 1990; Maizels et al., 1993; Sheiham and Spencer, 1997. Their comments are not mutually exclusive. The key elements of suggested improvements were:

- Consideration should be given to meeting people's needs in relation to the procedures available and resources that permit those procedures. There has to be a good probability that the use of the proposed services and measures will lead to an acceptable outcome and that the resources are available to provide it. Therefore, both effectiveness and cost of health care have to be included in considerations of need (Sheiham and Spencer, 1997).

- Measuring need should include the outcome that underlies need. Outcomes comprise risk of morbidity and impairment, pain and discomfort, disability and dysfunction, handicap, and mortality. Attempts to meet each kind of need should lead to an acceptable overall outcome.

- Assessment of need should be supplemented by measures of the social perception of health from lay people and the public. Therefore, definitions of need should be a joint responsibility of the health profession and the community.

- More realistic assessment of needs should comprise the individual's potential or propensity for responding to health care. These aspects of need should inform the different planning strategies needed for different groups in the population, according to their potential benefit.

1.2.3 Assessing orthodontic treatment need

One of the major problems in orthodontic diagnosis and assessment of orthodontic treatment need, is that orthodontic anomaly is not a disease with a series of well-recognised symptoms. It is a variation from the norm in which treatment is based upon the evaluation of certain dental characteristics in an otherwise healthy person. Orthodontic treatment need is difficult to define precisely because of the uncertainty of the functional and psychological benefits of orthodontic treatment (Shaw et al., 1980a). It is often the perception of the professional that is used to define the dental treatment. Orthodontics is the field of dentistry with the most contested concepts because deviations from the 'normal' occlusion are not clear-cut unless one adopts a very strict normative approach, where any misalignment should be treated.

Classic orthodontic teaching has emphasized that the major benefits of orthodontic treatment are the improvement of physical function, the prevention of tissue destruction and the correction of aesthetic impairment (Graber, 1972). A re-evaluation of the benefits of orthodontic treatment is currently taking place as a result of recent research findings (Sadowsky and BeGole, 1980; Sadowsky and BeGole, 1981; Ramfjord and Ash, 1981; Bell et al., 1985). Contemporary orthodontic opinion is beginning to doubt the importance of orthodontic care for prevention of caries, periodontal disease and temporo-mandibular disorders (Shaw, 1980a). According to orthodontist Isaacson (1985), "... orthodontic care appears to be unjustifiable on the basis that without it negative sequelae will occur." Prahl-Andersen (1978) questions the traditional assumptions underlying the need for orthodontic treatment. She claims that the belief that individuals with 'ideal' occlusion have significantly fewer caries, less periodontal disease and function better than individuals with malocclusion, has not been clearly demonstrated.

In his thesis, 'Reappraisal of the criteria for orthodontic treatment', Helm (1990) stated that "the assessment of need or indication for treatment can indeed be the orthodontist's most difficult task". On the basis of the research findings he concluded that most malocclusions have a smaller impact on oral health (e.g. caries, periodontal disease) than previously anticipated. On the other hand the hypothesis that "malocclusions did create psychosocial problems, which are not necessarily easier to cope with than somatic problems", was confirmed. Current research provides less support than previously believed for the physical benefits derived from the provision of orthodontic treatment of malocclusion (Sadowsky

and BeGole, 1980; Sadowsky and BeGole, 1981; Ramfjord and Ash, 1981; Bell et al., 1985). Although severe malocclusion may compromise some aspects of oral function, Proffit (1986) believes that less severe malocclusion will not compromise function, but may still require some physiological compensation.

This review of need for orthodontic treatment will not deal with all the assumptions of orthodontists of what comprise a malocclusion. Instead, the main indications for treatment will be discussed. Two diverse viewpoints by influential professors of orthodontics illustrate the range of indications. On the one hand, Shaw et al. (1980a) states that there is evidence that more severe dental features such as traumatic deep overbite, unprotected incisors and impacted teeth adversely affect the longevity of the dentition. He also stated that the relationship of dental irregularity to periodontal disease, caries and mandibular dysfunction is less certain. At the other extreme, Solow (1995) developed a list of indications for intervention for orthodontic treatment, which is not evidence based (Table 1.1).

Table 1.1 Health risks related to malocclusion (Solow, 1995).

Risk	Malocclusion
I Risk of damage to the teeth and surrounding tissue	
1. Caries	Rarely justifies orthodontic treatment
2. Periodontal lesions	Extreme deep bite Pronounced anterior cross-bite or reverse overjet Pronounced crowding
3. Traumatic dental injuries	Extreme overjet, particularly when the teeth are not protected by the lips
4. Extreme wear of the teeth	Forced bite Deep bite with retroclined upper incisors
5. Root resorption of the upper incisors	Unerupted ectopic upper canines
II Risk of functional disorders	
1. Craino-mandibular disoders	Forced bite (forwards, backwards, laterally) Lack of occlusal stability
2. Chewing and/or incising difficulties	Pronounced anterior or lateral open bite Pronounced reverse overjet Locking of the bite due to extensive lingual or buccal crossbite Pronounced anterior cross-bite
3. Speech disorders	Rarely justify orthodontic treatment
III Risk of psychosocial stress	
Teasing, harassment, low self-esteem	Facial deformities, cleft lip Extreme overjet Reverse overjet Pronounced crowding, particularly of the upper incisors and canines Pronounced spacing of the upper incisors
IV Risk of late sequelae	
1. Forward migration of the upper incisors	Extreme overjet with lip trapping incisors
2. Late development of extreme deep bite	Extreme jaw growth in connection with lack of incisal contact
3. Asymmetric facial development	Pronounced lateral lingual or buccal cross-bite with forced bite

Solow's indications for orthodontic treatment are currently used in Denmark. The difference in approach between Shaw and Solow demonstrates why the prevalence of children needing orthodontic treatment varies so greatly, both within countries and between examiners. In 10 industrialized countries a range of between 21% and 64% of 13 to 14 year olds were reported to 'need' orthodontic treatment (WHO, 1985). Although some differences are to be expected in the prevalence of orthodontic treatment need, it is likely that this large variation in need reflects the inherent subjectivity of the evaluation systems used (Downer, 1987) and their questionable validity and reliability (Foster, 1980).

In some Scandinavian countries the percentage of children having orthodontic treatment is about 35%. However, because of cost pressures, orthodontists in Denmark are expected to reduce the percentage of children having orthodontics to 25% (Solow, 1995). As a consequence decisions will have to be made on who will benefit most and indications for intervention will have to change. Perhaps the indications for intervention outlined by Salzmann (1968), who defined a handicapping malocclusion as one that adversely affects aesthetics, function or speech, is more relevant than the predominantly clinical indications recommended by Solow (1995). The definition of the aims of the orthodontic treatment of the British Dental Association (Memorandum on Orthodontic Services, 1954) captures some of the emphasis of psychosocial aspects of teeth: "to produce improved function by the correction of irregularities and to create not only greater resistance to disease, but also to improve personal appearance, which later will contribute to the mental as well as to the physical well-being of the individual". A similar

emphasis was expressed by the World Health Organisation (1985). Malocclusion is considered a handicapping dentofacial anomaly and defined as an anomaly which causes disfigurement or impedes function, and requires treatment "if the disfigurement or functional defect is, or is likely to be, an obstacle to the patient's physical or emotional well-being".

Prahl-Andersen (1978) discussed the concept of treatment need from the point of view of three types of information collected in the practice of medicine. These were objective signs, subjective symptoms, and social sufficiency. Objective signs involve those anomalies that deviate sufficiently from the recognized norm, while subjective symptoms refer to self-perception of the presence of an anomaly that is in need of treatment. Social sufficiency considers the recognition by society that the individual's malocclusion is in need of treatment, and this is related to current sociocultural norms for appearance.

Shaw et al. (1991a,b) showed that the criteria used by dentists to judge need for orthodontic treatment are not clear and there is ample scope for subjective assessment. Accordingly, it is difficult to see how the assessment of treatment need, and by inference, outcomes of treatment, could be completely objective. Nevertheless, the overemphasis on clinical measures and the imprecise and often casual assessment of the psychosocial aspects needs readdressing.

The issue of how orthodontic diagnostic and treatment decisions are made and outcomes of treatment are measured, has considerable interest in a future of

technology transfer where medical algorithms have been devised for the diagnosis and treatment of disease. The shifting paradigm in orthodontics will not be centred on growth prediction, with orthodontists' intent on modifying and redirect craniofacial growth, but will focus future efforts on those aspects of treatment where the orthodontist has some direct control by making evidence-based diagnostic and treatment decisions (Relman, 1988).

It is not merely the elective nature of orthodontic treatment that makes it unique. It is also the way in which it differs from medicine by virtue of the outcome measures on which assessments of costs, risks and benefits of treatment are based. An important but undressed question for orthodontists is whether society or the individual should pay for orthodontic care. Clinical trials in medicine can, and usually do, estimate outcomes of tangible benefit to patients (Vig et al., 1994).

The range of concepts relating to estimating needs for orthodontic treatment also applies to the assessment of the outcomes of orthodontic care.

1.2.3.1 Occlusal indices

Occlusal indices may be defined as methods of determining the level of treatment need or the amount of deviation from a normal occlusion. They can be used both for the evaluation of individual patients and populations and as indicators of the clinical outcome of orthodontic treatment. Economic restraints in recent years have resulted in an increasing interest in the evaluation of orthodontic treatment outcome. Occlusal indices have been used to assess outcome for orthodontic treatment and need, the following is a critical review of the literature.

It is a basic requirement of any index or system of measurement, that it should be valid and reproducible. Validity is the ability of an index to measure that which it purports to measure, whereas reproducibility is the ability to reproduce the original ratings or scores when the subject is re-examined by the same or a different examiner. A good index should be easy to learn, ideally allowing rapid recording of relevant features by both trained dental and non-dental personnel (Richmond et al., 1995).

For most of this century, the dental profession has directed considerable attention to methods of description and measurement of malocclusion. The apparent lack of universally accepted measuring techniques for assessing need and outcomes for orthodontic treatment derives to a large extent from the inherent complexities of the underlying basic science of craniofacial growth and development. In addition, aetiology of malocclusion, orthodontic diagnosis, and effects of malocclusion are

by nature multi-factorial (Stenvik, 1997). Orthodontic patients have different growth patterns, psychological and cultural needs. Below, some general trends in which the orthodontic profession has described and measured malocclusion during the last century will be briefly reviewed.

Although some classification systems for systematic description of observations were suggested in the 19th century, none were generally accepted until Edward Angle (1899) introduced the concept 'malocclusion' and established a simple system by dividing malocclusions into three main types. Despite criticism and many shortcomings, Angle's typological classification has so far become the only universally acknowledged method still in regular use. The method was devised as an attempt to systematize treatment planning, and has served as a tool for professional communication. However, the method has frequently been used for other purposes, and often been applied in epidemiological studies.

One purpose of epidemiological studies of malocclusion is to provide data for organizing care. Analysis of the adverse effects of malocclusion and the identification of etiologic factors depends upon detailed measurements of the various malocclusion traits that are not included in typological classifications. In response to the need for more sophisticated tools, methods for recording all the single traits of a malocclusion were developed. One example of this approach is the method established by Bjork, Krebs and Solow (1964) by which definitions and criteria for all single traits that constitute a person's malocclusion were defined. In addition to studying the prevalence of traits, this methodology is

suitable for analysing associations between malocclusion and dental factors such as caries, periodontal disease and function.

Another approach is to measure deviations from the norm by assigning scores to various occlusal traits that are then added to obtain a total score. Several indices based on a summary score have been devised and used to assess prevalence of malocclusion. The advantage of indices which express malocclusion by a summary score is that a person's occlusal status can be considered as a quantitative variable. A disadvantage is that different malocclusions may result in the same score. A scoring procedure that measures malocclusion quantitatively may be most suitable for the general evaluation of treatment outcome in terms of improvement in occlusion. The PAR-Index recently developed in Great Britain (Richmond et al., 1992) is designed specifically to assess changes in occlusion as a result of treatment.

In response to the development of programs for the organization and funding of orthodontic care, starting in the middle of this century, a number of indices were proposed with the intention of identifying individuals with a need for treatment (Draker, 1960; Grainger, 1967; Salzmann, 1970; Summers, 1971). The recognition that measuring severity of malocclusion in terms of the degree of deviation was not equivalent to determining the need for treatment, lead to the development of indices that apply weightings. Values have been given to scores depending on the location of the deviation in the dental arch, or on the degree of the deviation. It has been recognized that treatment priority indices designed to objectively interpret the

severity of malocclusions, nevertheless commonly use index scores that are based on clinical estimates (Carlos, 1970; Helm, 1977). Even if weighting procedures have been based on multiple regression models, or validated by applying professional assessment panels, clinical judgment remains the underlying principle.

During the 1960's and 1970's it gradually became apparent that the measurement of orthodontic treatment need was compounded by the variation in professional and patient perception of what constitutes a malocclusion (Prahl-Andersen, 1978). Barmes (1973) in a review of attempts made by the WHO (1962, 1971) to define dentofacial anomalies stated that the usefulness of orthodontic indices has been severely limited by a failure to devise a precise definition of an anomaly and of when it requires treatment. The problem can mainly be attributed to the variability in perception, not only by the potential patient, but also by the dental specialist, general practitioner or epidemiologist.

To reconcile professional and patient perceptions, Barmes (1973) recommended to first define several levels of need for various populations. These levels should then be modified in terms of patient perceptions as an essential final step. The clinical definitions of the level of need should be re-evaluated by an assessment of the number of people at various levels who, on the basis of individual perception, would be placed in a different category. It would take adequate samples at each level of clinical definition of need to quantify the differences between patient and professional assessments.

In conclusion, the indices of orthodontic treatment need consist of a metric specification of how irregular the malocclusion is or how great the deviation is from the 'ideal' occlusion. In other words, they are based on an idea that the greater the deviation from the 'ideal' occlusion is, the greater the risks of oral health problems are. Such indices of orthodontic treatment need do not take into account the psychosocial aspects of malocclusion.

1.2.3.2 Recent developments of indices of orthodontic treatment need

Presently, there is no comprehensive measure of outcome for orthodontic treatment. Assuming that treatment reduces need and consequently contributes to health gain, it would be prudent to review recent developments of assessing orthodontic need. The recent indices of orthodontic treatment need will be considered using the criteria outlined by Sheiham and Spencer (1997) namely that there should be a) a clinical dimension based upon sound concepts of the life history of the condition, in this case growth and development; b) a measure which incorporates functional measures of the impacts of impairment; c) measures of social dysfunction; d) a measure to evaluate the wants of the individual; e) a measure of the propensity of the individual to adhere to the treatment regimen and the perceived barriers and f) a prescription of effective and acceptable treatments and the professional skills required to carry them out.

Over the past two decades an increasing number of studies on lay persons' attitudes to dentofacial anomalies have been published (Shaw, 1981; Helm et al.,

1985; Helm, 1990; Espeland et al., 1993). Concurrently, indices establishing categories of orthodontic treatment need have been in operation in the Scandinavian countries whilst indices defining levels of treatment need have been utilized in the UK (e.g. Brook and Shaw, 1989). Surprisingly, few orthodontic treatment need indices have attempted to measure or record the perceptions of the child or parent in relation to psychosocial aspects of malocclusion. One index, the Index of Orthodontic Treatment Need (IOTN), was developed in the United Kingdom and ranks malocclusion in terms of the significance of various occlusal traits for the individual's dental health and perceived aesthetic impairment. The intention of identifying those individuals is to establish who would be most likely to benefit from orthodontic treatment. The index incorporates a dental health and an aesthetic component (Brook and Shaw, 1989).

The dental health component of the IOTN represents an attempt at synthesis of the current evidence for the deleterious effects of malocclusion and the potential benefits of orthodontic treatment, loosely based upon the Index of the Swedish Medical Board. Each occlusal trait thought to contribute to the longevity and satisfactory functioning of the dentition is defined and placed into five grades, with clear cut-off points between the grades. Grade 1 represents a negligible need for treatment while grade 5 indicates an urgent or high priority for treatment. Ten features or traits of malocclusion are used to establish the grade level. These are overjet, overbite, openbite, crossbite, displacement of teeth, impeded eruption of teeth, defects of cleft lip and palate, class II and class II buccal occlusions, and hypodontia. These various features of the malocclusion are noted and measured,

with a specially designed ruler. A fundamental premise of the index is the recognition that dental conditions are site-specific (for example, severe displacement of a particular tooth represents a particular disadvantage for that site). The most severe trait identified is the basis for grading the individual's need for orthodontic treatment on dental health grounds. Summing scores for a series of individual traits is not performed. Thus, multiple minor variations, which are unimportant with respect to dental health, cannot be added together to place an individual in a higher grade.

The aesthetic component of the IOTN consists of a 10-point scale, illustrated by a series of numbered photographs which were rated for attractiveness by lay individuals and selected as being equidistantly spaced through the range of scores (Figure 1.2). This aesthetic component can be ranked by both patient and professional.

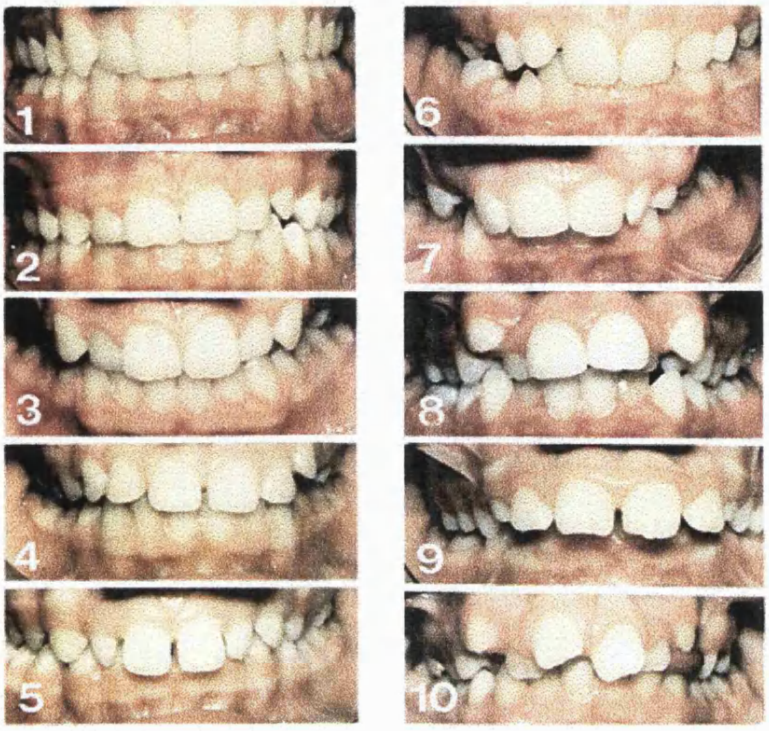


Figure 1.2 The Aesthetic Component of the IOTN index.

A rating is allocated by overall dental attractiveness rather than specific morphological similarity to the photographs. The value arrived at gives an indication of the patient's treatment need on the grounds of aesthetic impairment, and by inference reflects the psychosocial need for orthodontic treatment.

According to Lunn et al. (1993), basic data of potential treatment need and demand is required when considering the use of the IOTN index as a public health tool and not details of the type of treatment. In this respect, scores of 4 and 5 in the dental health component clearly indicate a need for orthodontic treatment independent of the aesthetic judgment by the patient. Conversely, scores of 1 and 2 do not

constitute treatment need. The difficulty arises for those children with a dental health component score of 3. In this situation, the use of the aesthetic component comes into play, more especially for children with a low awareness of their own dental appearance. The authors reported that the IOTN was easy to calibrate experienced dental epidemiologists (Lunn et al., 1993). The epidemiologists found it a quick, easy and enjoyable index to use (more so than DMF) and the index was readily accepted by children. There was a high level of agreement between examiners on the dental health component. The agreement for the aesthetic component with 10 choices was lower, although 96 % fell into the moderate agreement category. The recalibration exercise showed that the examiners had remained stable after work in the field which is an important element in the use of any proposed epidemiological index.

In a comparative study Tang and So (1993) used the Occlusal Index (OI) (Summer, 1971) and the Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw, 1989) to assess orthodontic treatment needs in a local population of Hong Kong. They concluded that both indices were highly reproducible but significant differences in the treatment need as assessed by these two indices did occur. For instance, the OI method suggested 60% of the subjects had either "good occlusions" or "no treatment need", whilst only 2% of the subjects were shown by the IOTN to have no need for treatment. This difference may have resulted through differences in weighting missing teeth. The IOTN puts a heavy weight on missing teeth in any quadrant. For example, when more than one tooth is missing in any quadrant, the treatment need is "very great". When the absence of one tooth in any

quadrant results in tilting of adjacent teeth, the treatment need is also "great". The heavy weighting for missing teeth in posterior quadrants is questionable since it has an insignificant impact on dental functioning (Elias and Sheiham, 1998). The OI, on the other hand, does not take into account missing teeth except in cases of missing upper incisors where no prosthesis is present. In addition, the OI does not score mesio-distal or bucco-lingual tipping of teeth that may occur subsequent to tooth loss.

Further differences occurred between OI and IOTN when weighting crossbites. For example, when using the IOTN on dental casts, posterior lingual crossbites and unilateral posterior buccal crossbites, even those involving only a single tooth, are assumed to be associated with mandibular displacement. Therefore, these features are weighted heavily and fall into grade 4, which means, "great treatment need". The OI does not make a similar assumption. Differences in weighting and measuring tooth displacement were also noted between the indices. According to the authors, both indices were highly reproducible. However, the OI was much more time-consuming to use than the IOTN. The simplicity of the IOTN gives it an advantage over the OI because it enables one to study a large population group without spending a lot of time.

A postal survey using a structured questionnaire was administered to all Consultants in Dental Public Health in the United Kingdom to ascertain the use of the Index of Orthodontic Treatment Need (IOTN) as an instrument for planning, contracting and monitoring orthodontic services (de Oliveira, 1997). Twenty five

percent of the Consultants who answered reported that one of the strengths of the IOTN index is that it allows prioritisation. In this respect, IOTN scores of 4 and 5 in the dental health component clearly indicate a need for treatment independent of the aesthetics of the case. However, 70.5% of the Consultants mentioned that one of the weaknesses of the IOTN was the fact that such an index does not measure the complexity of treatment needed. Ideally, Consultants should treat only those with malocclusions requiring the most complex and difficult treatment. The remainder could be treated within the General Dental Service and the Community Dental Service by practitioners qualified in Orthodontics. The IOTN does not consider the complexity of treatment needed and is therefore not an ideal method of directing referrals to an appropriate specialist level of provider.

One obvious shortcoming of the aesthetic component of the IOTN index is its poor ability to represent dentofacial imbalance in the anteroposterior plane, which is a feature often associated with malocclusion. Another shortcoming may be the use of photographs from an older sample, as it does not represent dentitions that are still transitional. On the other hand, the IOTN's simplicity and apparent ease of conceptualisation may commend its use in everyday practice as well as in epidemiological studies.

Otuyemi et al. (1997) studied unmet orthodontic treatment need in rural Nigerian adolescents using the IOTN index, and concluded that, in general, assessment of aesthetic impairment is complex and difficult to measure. This was demonstrated by the low correlation between orthodontic judgment and the rating of Nigerian

adolescents in this study. A number of reasons were proposed for this low correlation. Firstly, the subjects tended to rate their dental appearance higher on the aesthetic scale compared with the professional orthodontic rating. Secondly, the selective conditioning of orthodontists may have affected their assessment leading them to become less critical of dental attractiveness because of the frequency with which they see patients with extreme facial handicaps. These observations were also reported by Shaw et al. (1975) and Holmes (1992b) who found that the dental aesthetic ratings of orthodontists were less favourable than those of children. There is also a tendency for orthodontists to be more critical in the assessment of treatment need on dental health grounds because of their greater knowledge of occlusion and experience with likely outcome.

The results of the Otuyemi et al. (1997) study showed that some Nigerian adolescents encountered difficulty in matching their overall dental appearance, with specific reference to the morphological similarity on the aesthetic scale. For instance, a child with anterior openbite found it difficult to match their overall dental appearance, as this trait is not presented on the aesthetic scale. Phillips et al. (1992) had earlier warned about the use of clinical photographs in determining the perception of dental attractiveness. The aesthetic component of the IOTN index may be criticized for its two-dimensional nature and its insufficiently wide range of dental appearances. Despite their criticism, Phillips et al. (1992) reported a high correlation between the aesthetic and dental health components of the IOTN index.

The aesthetic component of the IOTN index may not be sensitive enough to provide valid information on the psychosocial effects related to dental aesthetics. Firstly, there are only a few types of malocclusion represented in this scale of 10 photographs and usually people present with a larger range of occlusal conditions. Thus, it would be difficult to comprehensively rank the aesthetics of people with a wide range of different occlusal conditions from the information obtained from such a scale. The second limitation of this method is that it does not allow a view of the anteroposterior plane of the malocclusion (e.g. overjet), which is important for the assessment. Finally, it does not take into account issues such as the colour and shape of the teeth and missing teeth.

In Norway, a new orthodontic treatment need index was introduced by the National Health Insurance System (Espeland et al., 1992). As national subsidies for orthodontic care are limited, the government reimburses the treatment costs according to the severity of malocclusion. The Need for Orthodontic Treatment Index (NOTI) (Espeland et al., 1992) defines four groups or grades, denoting "very great need", "great need", "obvious need", and "little/no need". Occlusal traits presumed to be associated with concern for dental appearance and psychosocial problems were incorporated in the index, but this was based solely on professional estimates. Selection of traits and definitions of cut-off points are based on present scientific evidence and empirical orthodontic norms about the risks for detrimental effects of dentofacial anomalies on dental health, function and psychosocial well-being.

Another recent development in assessing orthodontic treatment need is the Dental Aesthetic Index (DAI), which is an orthodontic index grounded in socially defined aesthetic norms (Cons et al., 1986). It responds to the call for the inclusion of psychosocial factors in the assessment of malocclusion. The DAI allows the estimation of potential social handicaps if occlusal status deviates significantly from society's aesthetic norms. In contrast to other attempts to include aesthetic factors in assessment of malocclusion where separate assessments are made for the aesthetic and clinical components, the DAI links the aesthetic and clinical aspects of malocclusion into a single score. The DAI recognises that socially derived norms for acceptable dental appearance sets the standard for evaluation of acceptable levels of dental aesthetics. It also recognises that the condition of malocclusion is socially defined by the deviation of occlusal configurations from social norms. Extreme deviations from acceptable dental appearance should have a negative impact on social, psychological and physical function. The DAI is an orthodontic index in the form of a regression equation that links the public's rating of the social acceptability of occlusal conditions with their clinically measured orthodontic traits. It was developed through the use of specially prepared photographs of 200 occlusal patterns that represented the wide range of untreated occlusal conditions found in a population of half a million adolescents (Ast et al., 1965; Cons et al., 1986). The stimuli were completely neutral with regard to sex, race or ethnic origin. There were no confounding facial features that could influence subjects' assessment of facial acceptability of the stimuli. Stimuli were rated for social acceptability using a semantic differential instrument. Sixteen hundred students and adults in the USA participated in rating these stimuli. The

resulting regression equation consisted of ten components of intraoral measurements of the morphological traits associated with dental aesthetics and their appropriate regression coefficients (weights). This regression equation is called the Standard DAI.

Table 1.2 represents the components of the Standard DAI regression equation, the actual and rounded regression coefficients (weights) for each component and the constant. The Standard DAI loses relatively little precision when regression weights are rounded. The higher the score on the DAI scale the more likely the untreated malocclusion will contribute to psychological, social or physical dysfunction. Depending on the DAI score an individual's occlusal status can then be classified into the following categories: normal occlusion or minor malocclusion, definite malocclusion with treatment elective, severe malocclusion with treatment highly desirable or handicapping malocclusion (Table 1.2).

Table 1.2 Components and weights of the Dental Aesthetic Index.

Component	Weight
Constant	13
Missing incisor, canine and premolar teeth - (number)	6
Crowding in incisal segments - number of segments crowded	1
Spacing in incisal segments - number of segments crowded	1
Diastema - (mm)	3
Largest anterior irregularity, maxilla - (mm)	1
Largest anterior irregularity, mandible - (mm)	1
Anterior maxillary overjet - (mm)	2
Anterior mandible overjet - (mm)	4
Vertical anterior openbite - (mm)	4
Antero-posterior molar relation - largest deviation from normal either left or right, 0= normal, 1= 1/2 cusp either mesial or distal, 2= 1 full cusp or more either mesial or distal	3
Total	**DAI score**

The Peer Assessment Rating (PAR) Index developed by Richmond (1990) and Richmond et al. (1992) to measure treatment outcome takes into consideration occlusal changes, and has been found to be as reliable and valid as most other occlusal indices (Richmond et al., 1992; Buchanan et al., 1993). The PAR index is based on models of subjects and has no patient assessment of outcome. There are basically two methods of assessing improvement using the PAR Index: (1) reduction in the weighted PAR score and (2) percentage reduction in the weighted PAR score. This approach to evaluate orthodontic treatment outcome parallels the view of Berg (1991), who compared quantification of occlusion to general orthopaedics in medicine, where the degree of restitution of a handicap is frequently expressed as a percentage of the ideal. The PAR Index does not

measure iatrogenic effects such as enamel lesions, marginal bone loss and apical root resorption as discussed by Kvam (1985) and Linge and Linge (1991).

The concept of PAR is to assign a score to various occlusal traits that make up a malocclusion. The individual scores are summed to obtain an overall total, representing the degree to which a case deviates from normal alignment and occlusion. The score of zero indicates good alignment and higher scores (rarely beyond 50) indicate increased levels of irregularity. There are 11 components of the PAR Index (Table 1.3).

Table 1.3 Components of the PAR Index.

	Component
1	Upper right segment
2	Upper anterior segment
3	Upper left segment
4	Lower right segment
5	Lower anterior segment
6	Lower left segment
7	Right buccal occlusion
8	Overjet
9	Overbite
10	Centreline
11	Left buccal occlusion

A new orthodontic index, the Index of Complexity Outcome and Need (ICON index), was developed by Daniels and Richmond (2000) to assess treatment need, complexity, and outcome. The ICON index was designed for an ease and rapid application both clinically and on study models. It was validated using an

international panel of orthodontists, who were asked to express their subjective opinion on the need for treatment, treatment complexity, the degree of occlusal improvement and the acceptability of a number of untreated and treated cases. It is valid in as much as it broadly represents the prevailing expert approach to treatment entry and exit thresholds. The ICON index contains 5 components: dental aesthetics, crossbite, anterior vertical relationship, upper arch crowding/spacing and buccal segment sagital relationship.

From the review so far it is reasonable to conclude that the development of an index to assess 'handicapping' malocclusion will not be possible until more objective methods of measuring the effect of a malocclusion on the individual's psychological and social need, are included. Furthermore, any evaluation of the effectiveness of health services should reveal to what extent the goals of providing care have been reached. Moreover, when evaluating orthodontic services one has to decide whose viewpoints are primarily considered, because the patient, provider, and purchaser may have different expectations concerning orthodontic treatment (Howatt, 1993). In addition, when orthodontic resources are limited, any evaluation must take into account the resources available to the service.

1.2.4 Assessing outcomes of orthodontic care

Research assessing patients' opinions of orthodontic treatment have measured their concern about dental or facial appearance (Helm et al., 1985; Helm et al., 1986; Espeland et al., 1993). It appears that laypersons associate orthodontic treatment

predominantly with these factors, and a patient's concern does not always coincide with professional evaluation of treatment need or treatment results (Lewit and Virolainen, 1968; Shaw, 1981). Especially in orthodontics, the term 'health' should be recognised on a broad scale, including the psychological, social and cultural well-being of the individual, because orthodontic treatment affects a patient's facial appearance, thereby affecting self-image.

Thus, it seems important to assess the outcome of orthodontic treatment by using the opinions of the patients themselves in addition to a professional evaluation. Furthermore, if an orthodontic assessment is confined solely to those with treatment experience, a large amount of relevant information will be lost (Pietila and Pietila, 1994). Assessment of the patient's satisfaction with the outcome of orthodontic treatment should include perceived improvement in appearance, function and well-being.

The public's perceived outcome of orthodontic services will probably affect the demand for treatment and also the expectations of treatment. During the last decade cross-sectional studies in different countries have evaluated the need and outcome of treatment both from a patient and a professional point of view. The results of such studies may be utilized both to establish premises for organizing and funding orthodontic services (macro-level), and to make decisions about treatment for the individual (micro-level). An ongoing project in orthodontic research to accumulate information could inform the development of systems that address the salient factors both at macro- and micro-levels (Stenvik, 1997).

The results from studies that include patients' perception of outcome are of particular interest in the discussion of need for orthodontic treatment. In cross-sectional and longitudinal studies, perceived need for treatment of malocclusions in untreated individuals as well as a demand for treatment of residual malocclusion in those who have had orthodontic treatment, provide valuable information for planning of services and advice to patient's as to whether treatment should be initiated. Furthermore, such information could assist in establishing treatment goals and for treatment planning. Some studies addressing treatment outcomes will be briefly reviewed.

1.2.4.1 Evaluation of individual clinics

Numerous retrospectives reports are available in which clinicians have assessed the effects of specific treatment methods. Few, however, have made systematic evaluations of overall outcome of treatment. There are even fewer reports on patient attitudes to treatment as an outcome measurement. Studies combining patient and professional evaluations have shown satisfactory results both from specialist practice (Berg, 1979; Axelsson and Zachrisson, 1992) and university specialist clinics (Myrberg and Thilander, 1973).

1.2.4.2 Care based on removable appliances

Some studies measured occlusal improvement resulting from treatment by examining population groups. A distinction may be made between studies

according to the predominant treatment modality such as removable or fixed appliance therapy, as they have different indications. Elderton and Clark (1983), in a study of 256 patients treated within the Scottish Dental Service, found that 30 percent were minimally improved or made worse. Only one third of those starting with a marked malocclusion ended up with a significant improvement. Similar results were obtained in an evaluation of the orthodontic services in the general dental services in England and Wales where malocclusions, on average, were improved by only 50 percent (Richmond and Andrews, 1993). In a study of 18-24 year old German males, Pancherz and Hahn (1992) concluded that there was unequivocal need for treatment in 50 percent, and that the results of treatment were generally unsatisfactory. Of the sample of 370 individuals, 85 percent of the 135 being treated had been provided with removable appliances.

The outcome of removable appliance therapy has also been assessed by recording patient attitudes. Gravely (1990) observed that among 319 patients, of whom 97 percent had removable appliances, 23 percent were dissatisfied with the result. Studies that recorded both occlusion and patient attitudes present similar results. Mohlin (1982) observed that in a group of 205 Swedish adult women of whom 25 percent had treatment, 34 percent were still in clinical need and 9 percent still had a desire for treatment. The author suggested that the residual need was due to sub-optimal treatment, which was a compromise for limited resources and led to removable appliances being used in two thirds of the treatments.

1.2.4.3 Care based on fixed appliances

There is consistent evidence that the success of orthodontic treatment is higher when fixed appliances are used (Pickering and Vig, 1975; Tang and Wei, 1990). Tang and Wei (1990) compared the effectiveness of fixed and removable appliances in 67 patients treated with fixed appliances. The average reduction in the scores of the Occlusal Index (Summers, 1971) was significantly higher with the fixed appliances than with removable appliances.

In a British study using mailed questionnaires to previous patients, only 1 percent of those having received fixed appliances were dissatisfied compared to the 26 percent among those with removable appliances (Gravely, 1989). The standard of treatment in orthodontic care systems based on the use of upper and lower fixed appliances has been studied in England and Wales (Richmond et al., 1993). The results showed a reduction of malocclusions by 71 and 78 percent, respectively. Two arch fixed appliance treatment improved outcomes compared to single arch treatment (76 and 59 percent, respectively) (O'Brien et al., 1993).

It appears that better results are obtained overall by fixed appliances than with removable appliances (Power et al., 1996). This may be due to the professional's inappropriate choice of a removable appliance for a given malocclusion as these appliances have a limited potential for tooth movement. Frequently attempts are made to treat malocclusions with removable appliances that require fixed

appliances for successful outcome due to ineffective educational dental programmes or lack of competence in the clinician.

The assessment of outcomes of orthodontic treatment has been, mainly, based on normative methods without taking into account important concepts such as patient's self-perceptions and quality of life.

1.2.4.4 Current outcome measures in orthodontics

The assessment of treatment outcome is less predictable than treatment need and is based on a different set of criteria. The objective assessment of treatment results is of basic importance in many branches of the health services. For example, the evaluation of treatment results in various fields of medicine is frequently based on the consideration of the following: a) success or failure rates; b) degree of improvement or aggravation; c) result as related to the time factor; d) result as related to the cost factor. In orthodontic treatment, the study of these aspects has received little attention (Proffit and Ackerman, 1985). Furthermore, in orthodontics, the morphological, biological, psychological, sociological and functional implications complicate the evaluation of treatment results (Berg and Fredlund, 1981). The most important features of assessment of orthodontic treatment outcome appear to be the aesthetics, overjet incisor inclination interaction, transverse discrepancy, lower incisor inclination, buccal segment sagital relation and upper incisor alignment.

Although the use of occlusal indices is a quick, valid, and accurate method of assessing the dento-occlusal aspects of orthodontic treatment results, there are admittedly some limitations. Importantly, changes in facial profile, or cephalometric parameters that reflect the skeletal component of malocclusion are not considered in the quantitative evaluation. Unfortunately, measurement of these variables by valid and reliable methods has not been achieved for the following reasons. Firstly, individual biologic variation requires discrimination between changes attributable to orthodontic intervention and those due to the growth and development of the facial complex. Secondly, the ideal cephalometric analysis or cephalometric goals of orthodontic treatment are controversial with no consensus throughout the profession. Finally, no universally accepted methods currently exist to assess change in facial profile as an outcome measure. For the time being, the optimal feasible method for assessing the attainment of desired occlusal outcomes is by the use of occlusal indices. This procedure enables an accurate evaluation of many of the effects of treatment (DeGuzman et al., 1995).

It is clear from the orthodontic literature that no appreciable oral health benefits can be directly attributable to teeth that are straighter (Vig et al., 1994). The most plausible justification for orthodontics as a component of health services is the contention that it improves the quality of life by addressing some elements of self-perception. Parenthetically, orthodontists make this assumption of quality of life principally based on empirical knowledge. They believe that improving dental appearance is necessarily linked to quality of life. Ideas such as the degree to which quality of life is enhanced by orthodontic treatment, how long life is

perceived as being better for having had treatment, or whether the same amount of morphological change has different "tangible" benefit for different people at different stages of their life, is certainly a matter for conjecture.

The assessment of outcome is a great deal more complicated than orthodontic treatment need. Judgment of outcome may consider the final alignment of the teeth, the difficulty of treatment, the initial clinical need for treatment, the appropriateness of the treatment mechanics, the extent of any iatrogenic damage, and whether the final tooth positions are stable (Richmond and Daniels, 1998). A consideration of facial aesthetics and the patient's satisfaction are also important.

Research evaluating immediate treatment outcomes of what is considered to be successes or failures in orthodontics, is very limited. However, before such research is carried out, there are many issues that need to be considered. There are few agreed upon criteria of how clinical successes and failures of treatment are measured. Also, appropriate scientific designs for evaluating treatment outcomes in orthodontics have not been thoroughly investigated.

Estimates of treatment success are varied but confounded by different assessment criteria used by different researchers. In Sweden, 54% of children treated in an university clinic obtained a good outcome by subjective assessment (Myrberg and Thilander, 1973). In the Netherlands, 44% of adults who had received orthodontic treatment had a residual need of treatment (Burgersdijk et al., 1991). The use of the Index of Orthodontic Treatment Need (IOTN) and Peer Assessing Rating

(PAR) occlusal indices (Shaw et al., 1995) show that general practice orthodontic treatment in England and Wales left approximately 60% of patients with a degree of residual malocclusion (Richmond et al., 1993), whereas a better standard of care was found in the hospital service (Richmond and Andrews, 1993) and specialist service of Norway (O'Brien et al., 1993).

The opinions of 97 orthodontists from 9 countries have been surveyed with respect to their judgment of treatment outcome. Ninety-eight pre-treatment and post-treatment study casts were examined by each orthodontist who gave a judgment of the degree of improvement and whether they thought the result was acceptable. It was found that there was at least 80% agreement on the acceptability of the outcome for only 45.5% of the sample (Richmond and Daniels, 1998). Logistic regression was used to identify predictive indicators for the judgment of acceptable outcome. Post-treatment scores for dental aesthetics, crossbite, buccal segment sagital relation, lower arch crowding, centreline, and left and right buccal segment vertical relationship were most important predictor variables. These six traits correctly assigned the decision with 70% accuracy.

Shaw et al. (1991c) in a study involving a comparison of pre-treatment and post-treatment casts for 100 orthodontic patients found that 4% had worse or no change in tooth alignment and 7% had worse or no change in aesthetic appearance, which was subjectively evaluated. No change, or worsening in tooth alignment, was more common in patients treated with removable appliances as well as in those who had teeth extracted before treatment. Patients with minor crowding were also less

likely to improve with treatment than those with more severe crowding. Elderton and Clark (1983) reported a comparable treatment failure of 12%. An even higher proportion of failure was reported by Berg (1979) who found that, after the completion of treatment and retention, 43% of 264 treated patients achieved successful results. Success was determined primarily by the achievement of specific occlusal and alignment related goals. In a review, Riedel (1987) concluded that the success in maintaining post-retention alignment of mandibular anterior teeth is less than 30% with nearly 20% showing marked crowding. It is clear from these findings that treatment results in some patients are subject to changes throughout life, and a stable treatment result may not be possible without ongoing clinical intervention.

Richmond and Andrews (1993) found that specialist orthodontic treatment on average reduced the malocclusion (PAR Index) by 78%. Richmond et al. (1992) proposed criteria for high standards of orthodontic treatment. He suggested that the mean PAR reduction should be greater than 70%, the number of cases allocated to the "worse-no different" category should be negligible, and the number allocated to "greatly improved" larger than 40%.

The success or failure of orthodontic treatment is generally judged by criteria related to occlusal function and stability, as well as aesthetics. The successful outcome of orthodontic treatment determined by both the clinician and the patient is most often attributed to the dental and facial aspects that "look good" on completion of the treatment, hence improved aesthetics is considered to be the a

very important criterion of treatment success for orthodontic patients. Of equal importance as criteria for determining treatment success, but less obvious to the patient, are the requirements of a well functioning and stable occlusion at the end of the treatment (Lobb et al., 1994).

1.2.5 Oral impacts of malocclusion

The shift in emphasis from the clinical measures to the behavioural domain of oral health and to the development of sociodental indicators highlights a broader scope for oral health. The functional, social, psychological, cultural and economic effects of oral conditions, and not only the presence or absence of oral pathology, should be considered (Reisine and Locker, 1995). The shift in emphasis should be reflected in assessment of outcomes of orthodontic treatment.

In an early critical review of the impacts of oral conditions, Sheiham and Croog (1981) acknowledged the importance of the oral region for physical health and social, psychological and economic well-being of individuals. They called for the comprehensive assessment of the impact of oral impacts on individuals and its complex implications for society. Clearly, the impacts of oral conditions and diseases cover wide domains of life, such as functional limitation, disability, interpersonal relations, social interaction, economic situation, work, family life and leisure activities, thus highlighting the influence of oral health on quality of life (Nikias, 1985; Miller, 1987).

Much research has been directed towards the assessment of impacts from malocclusion and more severe dentofacial anomalies. These conditions are not usually associated with limitation in the physical ability of the individual, unless there is a functional problem. Nevertheless, the social and psychological impacts are considerable. In the early 1970s, the need to explore these dimensions in defining and describing malocclusion became apparent (Cohen and Horowitz, 1970). At the same time, McGregor (1970) raised the issue of stereotyping and potential handicap of dentofacial deformities in relation to self-image and social interaction, while Stricker (1970), in evaluating the psychological aspects of malocclusion, showed that the level of satisfaction with appearance was related to the self-esteem of the individual.

Current research indicates that unacceptable subjective dental appearance, including visible dental characteristics that deviate greatly from the norm, may stigmatise, impede career advancement and peer group acceptance, encourage negative stereotyping and have a negative effect on self concept (Cons et al., 1986). Dental appearance that deviates from acceptable norms might indeed reduce opportunities. For prestigious occupations, where dental appearance is important, and in which the person is visible to the public, an individual's dentofacial disorders may come between career aspirations and career opportunities (Cons et al., 1986). Rosenberg (1974) argued that social standards of appearance determine self-concept by affecting how people perceive themselves.

In a classic early study, individuals with cleft lip or palate were compared to their healthy siblings in relation to family life. Subjects with cleft lip or palate were less likely to marry. Furthermore, when they married, they did so at a later age, and were less likely to have children (Peter and Chinsky, 1974). Apart from that, teachers rated less accurately the intellectual ability of children with facial deformities, in comparison to those without (Richman, 1978), while there was evidence that lower academic expectations and more negative opinion about the behaviour and personality are attributes associated with children considered to be unattractive (Baldwin, 1980).

Conversely, in a review of the literature on the social effects of malocclusion, Shaw et al. (1980a) failed to identify conclusive evidence regarding the assessment of dentofacial anomalies on daily life. However, they acknowledged the fact that unattractive physical appearance may be related to unfavourable social interaction. Although they suspected important handicapping effects in extreme cases of malocclusion, they concluded, "there is no specific, direct evidence that unfavourable stereotyping operates against individuals with visible dental irregularities or that it interferes with personal development" (Shaw et al., 1980b). A longitudinal study of children aged 11-12 years old also failed to demonstrate strong associations between measures of dental status, attractiveness and psychosocial well-being (Kenealy et al., 1989). However, the authors accepted that the results might have been influenced by the choice of measures of psychological impact. In addition, the results may have been influenced by a relatively small sample of school children with severe forms of malocclusion as opposed to those

attending orthodontic treatment. They further explained the lack of evidence linking malocclusion with social and psychological impacts, by suggesting that physical attractiveness may be less crucial to young children. The effects of malocclusion on psychological well-being may however become more obvious in later adolescence.

In another study of children aged 9-13 years, which assessed the extent of teasing and harassment caused by deviant dental characteristics, poor appearance of teeth and mouth was related to significant social handicap (Shaw et al., 1980b). Teeth represented the fourth most frequent feature that related to teasing, followed by height, weight and hair. Children teased about their teeth were twice more likely to suffer general harassment and over 60% of them admitted that they disliked or were upset by it. The prevalence of teasing, combined with dissatisfaction about appearance, was reported to be significantly higher among Danish adolescents with malocclusion traits, mainly extreme maxillary overjet, extreme deep bite and space anomalies, in comparison to those who were not diagnosed for malocclusion (Helm et al., 1985). In a methodologically challenging 15-year follow-up study of 30-year-olds Danes, that focused on specific conditions related to malocclusion both retrospectively and presently, the results showed that conspicuous occlusal anomalies and maxillary crowding adversely affected body image and self-concept in both adolescence and adulthood (Helm et al., 1985).

A more detailed longitudinal study used various measurements in a two-year follow-up with the aim to evaluate the psychological changes related to

orthognathic surgery in 46 patients, aged between 12 and 47 years (Kiyak et al., 1984). They found that although oral function, pain and paresthesia decreased over time, self-esteem of patients fluctuated considerably. Self-esteem was higher before the operation, possibly due to an anticipation of desirable outcomes, but significantly lower nine months after the operation. Self-esteem increased again by the two-year follow-up but failed to reach pre-operative values. Nevertheless, overall and profile body images improved significantly and all patients reported high levels of satisfaction with the surgery. Satisfaction was related to their perception of aesthetic improvements, irrespective of the presence of functional problems.

The finding that some occlusal traits can create psychosocial problems suggests the desirability of incorporating psychosocial aspects into the professional reappraisal of criteria for treatment particularly when new indices are being developed. Even though indices are necessary instruments from an administrative point of view, they fail to indicate whether the malocclusion traits presented will have an adverse effect on the individual child. To resolve this dilemma, Helm (1990) stated, "that profound psychological insight is required" as decisions "must be based on impressions of the child's personality and its personal resources in coping with a deviating dentofacial appearance".

It seems reasonable to postulate that the concept of "handicapping" malocclusions, although yet undefined, in some way involves the interrelations of the psychological effects on the child and the aesthetic impact of his appearance on

his/her peers. If so, there may be no numerical index based on occlusal morphology alone that will be an effective substitute for the personal evaluation of each applicant by the clinician (Helm, 1990). Indeed, there is now general agreement within the orthodontic profession that a clinical determination of "need for treatment" should include consideration of the psychosocial, as well as the physical, effects of malocclusion (Helm, 1990). However, neither psychosocial effects of malocclusion nor psychosocial responses to orthodontic treatment have been demonstrated in systematic research. Moreover, in recent years, the use of public funds to provide orthodontic treatment has emphasized the need to verify the deleterious psychological and social effects of malocclusion and determine the degree to which they are alleviated by orthodontic treatment.

Oral conditions affect many areas of life, including work, family life, economics and social interactions, but the larger implications of these social and psychological effects on society have rarely been examined (Sheiham and Croog, 1981). The impact of oral health problems on society is usually measured by outcomes related to limitations in role performance and functional capabilities. Such broadly based indicators are multidimensional measures that assess the social, psychological and economic impacts of oral disorders on society (Reisine and Locker, 1995).

1.2.6 Oral health related quality of life measures

From their investigations of the impact of oral conditions on daily life, Nikias et al. (1978) recommended that sociodental indicators should be developed. They defined sociodental indicators as a "measure of the extent to which oral conditions disrupt normal role functioning". This definition was expanded by Locker (1989, p. 77) to include "measures of the extent to which dental and oral disorders disrupt normal social role functioning and bring about major changes in behaviour such as an inability to work or attend school, or undertake parental or household duties".

Contemporary definitions of health involve both clinical and subjective aspects. They stress that illness can be a result of pathological abnormality and that a person can also feel ill without detectable disease (Bowling, 1995). Thus, a measure for orthodontic treatment need and outcome of treatment should incorporate not only clinical assessment, but also psychological and social dimensions because these measures will contribute qualitatively to the overall picture. Presently many clinical measures of active dental disease are available but only a small number of subjective measures of the psychosocial aspects of mouth and teeth have been developed.

Studies have been conducted to develop measures that highlight subjective and behavioural impacts related to the oral status (Cushing et al., 1986; Rosenberg et al., 1988; Gooch et al., 1989; Reisine et al., 1989; Atchison and Dolan, 1990; Locker, 1988; Slade and Spencer, 1994; Leao and Sheiham, 1995). Although these

studies made a contribution to the development of oral health related quality of life measures, they do present with some disadvantages. For example, the Geriatric Oral Health Assessment Index (GOHAI, Rosenberg et al., 1988) is designed specifically for oral health problems of the elderly. The Dental Impact on Daily Living (DIDL) (Leao and Sheiham, 1995), which provides a more flexible weighting score, has some disadvantages because of its 36-item length and its weaker theoretical support.

The original Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994) has the advantage of permitting statistical scores and in addition demonstrates strong theoretical consequence support. It has disadvantages too because of the long 49-item questionnaire and its use of standard panel weighting in different groups of population. However, a short version of the OHIP has been developed.

The two oral health related quality of life measures used in this study will now be discussed.

1.2.6.1 The Oral Health Impact Profile (OHIP)

The Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994) was developed with the aim of providing a comprehensive measure of self-reported dysfunction, discomfort and disability attributed to oral conditions. These dimensions were intended to complement traditional oral epidemiological indicators of clinical disease, thereby providing information about the "burden of illness" within

populations and the effectiveness of health services in reducing that burden of illness (Tugwell et al., 1985). These aspects of the OHIP made it particular suitable to be used in this study.

The OHIP measures people's perception of the social impact of oral disorders on their well-being. The development, reliability and validity of the OHIP have been tested and described as good (Slade and Spencer, 1994). The questions in the OHIP capture seven conceptually formulated dimensions that are based on Locker's theoretical model of oral health (Locker, 1988). The seven dimensions are: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap. The hierarchy captures outcomes that have an increasingly disruptive impact on people's lives. A short version of the OHIP sociodental indicator containing 14 questions was developed and tested by Slade in 1997.

1.2.6.2 The Oral Impact on Daily Performances (OIDP)

Another good development of an assessment of oral health related quality of life is the Oral Impacts on Daily Performances (OIDP) (Adulyanon and Sheiham, 1996).

The OIDP aims to provide an alternative sociodental indicator that focuses on measuring the serious oral impacts on the person's ability to perform daily activities. The advantages of this approach are that it makes easier to measure the

behavioural impacts on performances and the consequence of outcomes. The theoretical framework of OIDP is presented in Figure 1.3.

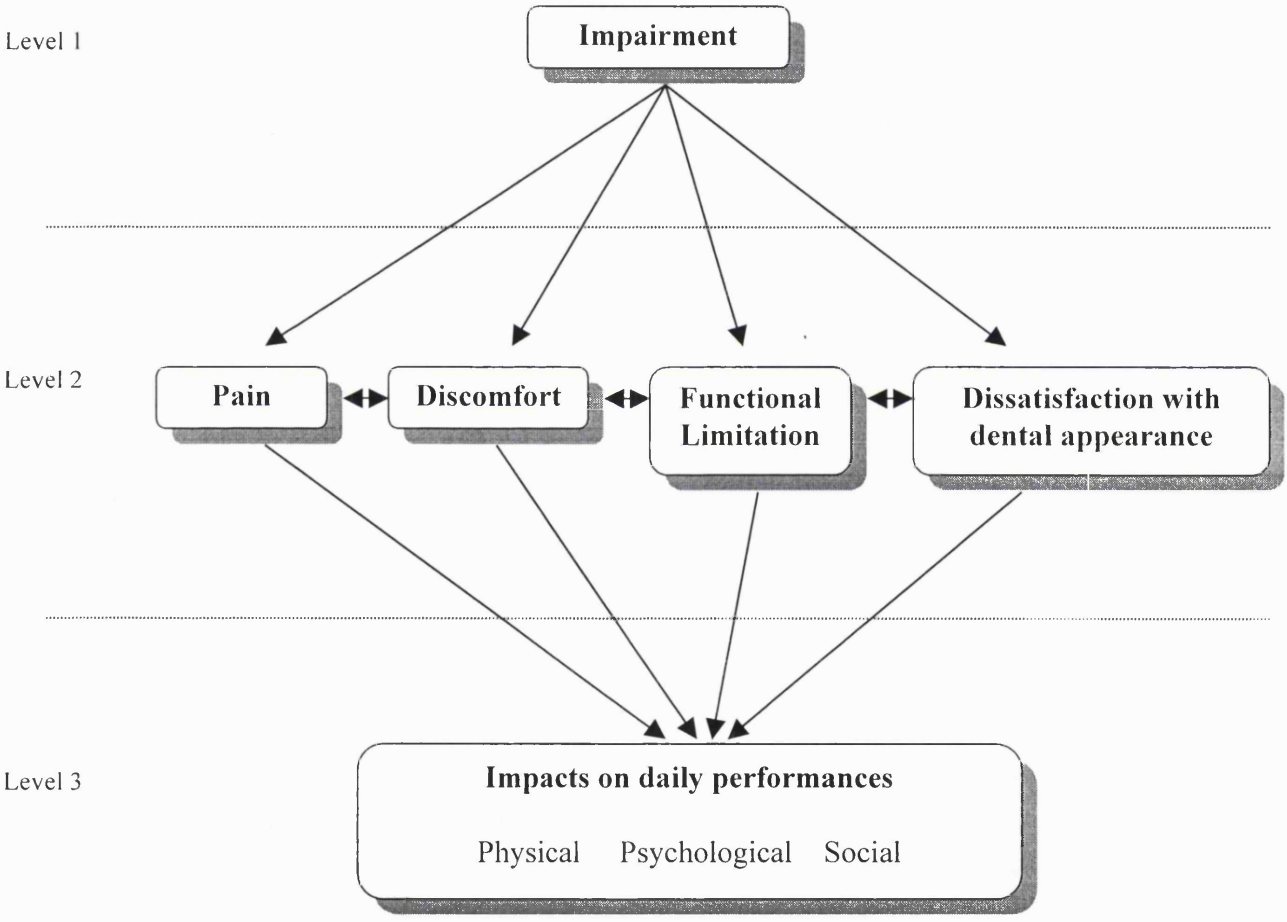


Fig.1.3 Theoretical framework of consequences of oral impacts (Modified from the WHO's International classification of Impairment, Disability and Handicap) (Adulyanon, 1996)

The theoretical framework of OIDP was modified from the WHO's International Classification of Impairments, Disabilities and Handicaps (1980) amended for dentistry by Locker (1988).

The main modification was that different levels of consequence variables were established. The first level refers to the oral status, including oral impairments, which most clinical indices attempt to measure. The second level, "the intermediate impacts", includes the possible earliest negative impacts caused by oral health status namely pain, discomfort or functional limitation. Dissatisfaction with appearance was added in this level since studies indicated that it was a major dimension of oral health outcomes (Linn, 1966; Cushing et al., 1986; Leao and Sheiham, 1995). In addition, functional limitation may cause pain, discomfort or dissatisfaction with appearance and vice versa. The third level, or "ultimate impacts" represents impacts on ability to perform daily activities, which consists of physical, psychological and social performances. The dimensions in the second level may impact on the performance ability of the third level. The third level is equivalent to the disability and handicap dimensions in the WHO (1980) model.

The OIDP focuses on measuring the level three consequences, which provides four advantages. Firstly, this approach is concise and yet covers all the main consequences. On the other hand, other concise oral health related quality of life measures concentrate on the intermediate impacts in level two such as pain or chewing ability. Secondly, it helps to avoid, or at least reduce, over scoring from repeat scoring of the same impacts at each of the three levels. Thirdly, only the

significant impacts are recorded, by eliminating minor conditions which do not lead to impacts on daily performances. Lastly, it is easier to measure the behavioural impacts such as the performance of daily activities (e.g., eating, speaking) than the feeling-state dimension (e.g., discomfort, worry). The reliability and validity of behaviourally based measures are easier to establish (Hall et al., 1984).

The OIDP was applied successfully in the integration of perceived impact into normative (professional judged) dental treatment need in a group of Thais (Adulyanon, 1996). By adjusting different cut-off points, the OIDP demonstrated its usefulness as an indicator of dental treatment need in populations. The OIDP was used to assess treatment needs in a study in England (Robinson et al., 1996). Furthermore, the OIDP has acceptable psychometric properties, as well as a sound theoretical basis. A distinguishing feature is that it provides a significant endpoint outcomes scale for oral conditions within a concise, reliable and valid measurement.

1.2.7 Summary

This review has highlighted the strengths and weaknesses of current concepts related to assessing orthodontic treatment need and outcomes of orthodontic care. It is apparent that despite some important recent developments in assessing orthodontic needs, there have been few developments in assessing outcomes of orthodontic care.

Psychosocial factors are very important when assessing the need for, and outcome of orthodontic care. The development of oral health related quality of life measures such as the OHIP and the OIDP offer an opportunity to apply these measures to assessing outcomes of care. These two oral health related quality of life measures have been applied to adolescents (Cortes, 2000; Soe, 2000; Goes, 2001). They have validated dimensions that apply to children and adults. Used in combination with a widely used measure of orthodontic need, such as the Index of Orthodontic Treatment Need (IOTN), the system could provide important insights for the development of an objective outcome measure of orthodontic treatment.

1.3 Aims, objectives and hypotheses of the study

1.3.1 Aims

- To assess how the teeth and mouth impact on the daily lives of adolescents and whether the impacts, as assessed by oral health related quality of life measures, are affected by orthodontic treatment.

1.3.2 Objectives

- To assess the oral health related impacts using two oral health related quality of life measures in three groups of schoolchildren who: 1) had orthodontic treatment, 2) were still under treatment and, 3) never had orthodontic treatment.

- To compare the "impact related orthodontic treatment need" to the "normative orthodontic treatment need".

1.3.3 Hypotheses

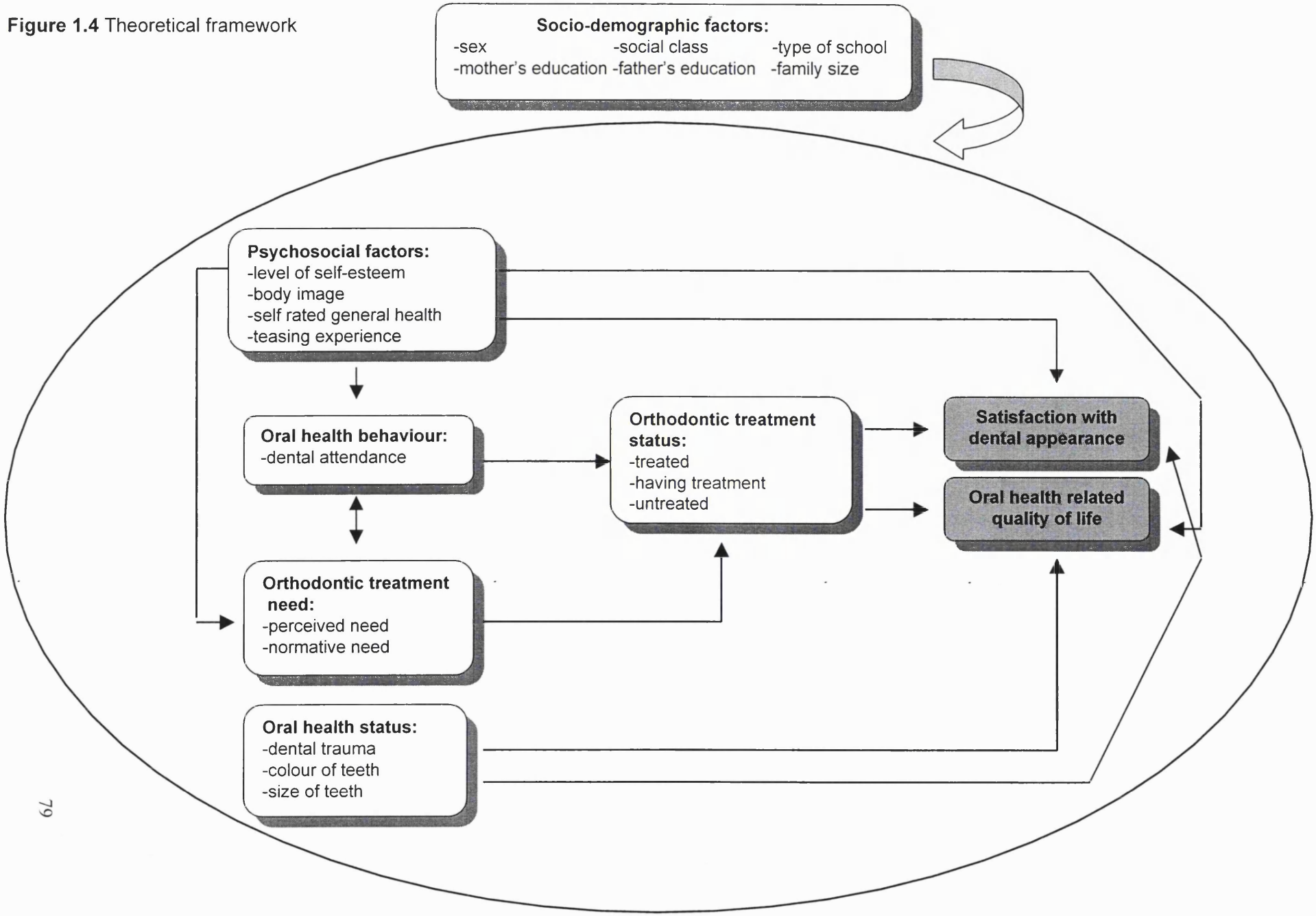
- Adolescents who have had orthodontic treatment had less oral health related impacts on their daily life activities and were more satisfied with their dental appearance than those who never had orthodontic treatment.

- An orthodontic clinical measure of orthodontic need is an adequate measure of perceived satisfaction with dental appearance and how the mouth affects oral health related quality of life.

Figure 1.4 presents a tentative framework to explain the relationship between the variables studied in the present project.

The methods and approaches utilized to collect and analyse the data are presented in the following chapter.

Figure 1.4 Theoretical framework



Chapter 2

Methodology

2.1 Introduction

This chapter describes the methodological procedures applied in the present study, focusing on details about the sampling design, the data collection methods and strategies, and analytical procedures.

2.2 Study design

The present research project is a cross-sectional study. This type of design does not establish temporal causal relationships. However, information can be derived through correlations by going beyond the descriptive characteristics of the survey to the interpretative. Interpretation depends on incorporating information on a substantial number of variables and then analysing the pattern of correlation to establish where relationships are strong, weak or non-existent (Robson, 1997).

2.3 Pilot study

The pilot study was carried out to establish the feasibility of the methods used in the main study, namely the process of approaching education authorities, school staff, parents/guardians and students. It also aimed at testing the research instruments (self-

complete questionnaire and structured interview), procedures and measurements for the dental clinical examination, the design of the data collection form and letters to be sent to the people involved in the study.

One hundred and sixty students, 15 to 16 years old, representing all socio-economic groups, were included in the pilot study. Permission to carry out the pilot study was obtained from the local education authorities. Because in Brazil students from public schools are more likely to be members of low socio-economic status families than those from private schools (Witt, 1992), it was decided to randomly select one secondary private and one public school, using a sampling frame of all the secondary schools in Bauru. All students aged 15 to 16 years from both schools were included. One meeting was organised with the head teachers and teachers from the school classes selected. The meeting's aims were to obtain permission and to inform them about the design and objectives of the study.

The parents/guardians of the students were sent a standard letter signed by the head teacher, written according to the instructions given by the researcher. The purpose of the letter was to introduce the researcher, to explain the objectives of the study and to ask for consent for the adolescents to participate in the survey. Parents/guardians were asked to sign and return the letter if they consented to their child's participation. The letter should be signed up and sent back to school to demonstrate parents/guardians approval (Appendix 5).

The students were contacted in the classroom, where a brief explanation of the activities was given and the purposes of the study were outlined. Next, they were examined and interviewed.

Two meetings were organised to evaluate the outcomes of the pilot study, the first with the head teachers and teachers and the second with a group of students. The research design proved to be feasible and minor changes had to be made, in accordance with the outcome of the discussions from the meetings and the researcher's observations during the pilot study.

The education authorities of Bauru approved the research. The letters to obtain permission to carry out the survey were considered satisfactory once they were comprehensible presenting the topics included in the appointments such as the objectives and design of the study (Appendices 3,4 and 5).

The head teacher and teachers from both schools involved were enthusiastic and collaborated with the project. They also agreed that the importance of the study justified the procedures to be conducted during school hours.

After completion of the pilot study, the examination procedures considered pertinent to the purpose of the study were adopted and the wording and order of the questions on the structured interview and self-complete questionnaire were maintained since no problem was detected regarding its clarity and sequence. Therefore, the design of the data collection forms remained the same.

When evaluated by the examiner and staff of both pilot schools, using the classroom for the examination was found to be unacceptable as it disturbed the usual classroom activities. There was general agreement that a special room should be used, and the examination should be carried out in small groups of 15 students. It was decided that an examination room would be booked in each school. The standard characteristics mainly related to light source and working space would be maintained. A standard letter signed by the researcher was sent to the parents/guardians informing them that the school was chosen for the project and their child was selected to participate at random (Appendix 5). Information was given about the use of sterile equipment, disposable plastic rulers, disposable surgical gloves and the simple and non-invasive dental clinical examination. They were told that the students were free not to take part in the study.

2.4 Geographic location of the study

The main study was conducted in Bauru, a middle city in the state of São Paulo, in the South Eastern part of Brazil, with a population of about 320,000 inhabitants (IBGE, 1996) from a wide range of socio-economic backgrounds (Figure 2.1).

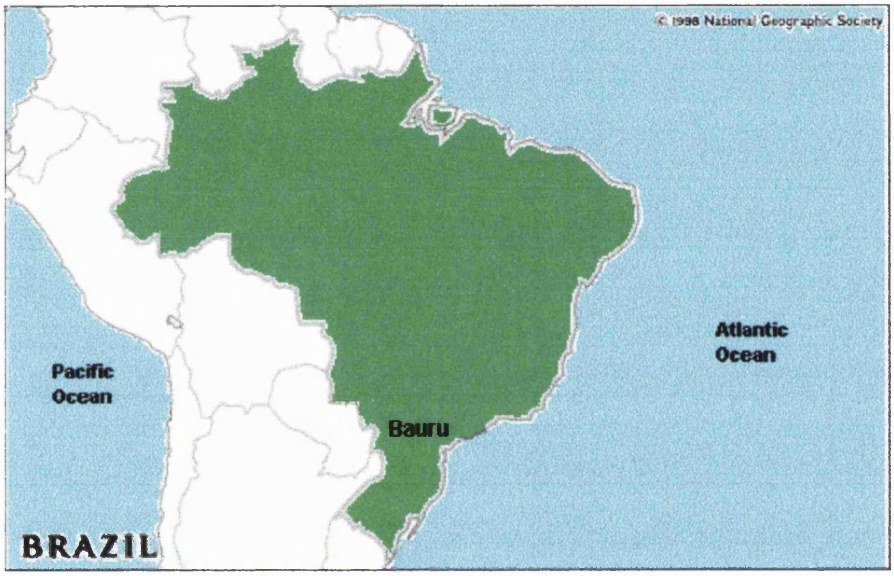


Figure 2.1 Geographic location of the study.

2.5 Study population

The study population consisted of adolescents of both sexes who were between 15 and 16 years old on the day of examination. This age group was chosen because it represents part of the population for whom the perceived impact of malocclusion is an important factor on psychosocial well-being. At the age of 15 to 16 years concern about appearance and facial attractiveness reaches a peak (Hurrelmann, 1989). It also represents an age when individuals are likely to have an increased awareness of their

own physical appearance, of which dental appearance is a central part. The age group of 15 to 16 years old was chosen for examination in this study because their orthodontic treatments are usually complete (Hurrelmann, 1989). Additionally, they are in the highest school grade where children could be reached together and at the same time. Finally, children of this age are capable of expressing their opinions on issues relating to this thesis.

2.6 Sample size calculation

Sample size depends on the aims, nature and scope of a study. In the present study the ultimate objective was to test the hypothesis, namely "adolescents who have had orthodontic treatment had less oral health related impacts on their daily life activities and were more satisfied with their dental appearance than those who never had orthodontic treatment".

The minimum required sample size was estimated to be 1,397 adolescents. Sample size calculation was based on the outcome the prevalence of oral health impact in the daily performances. Calculation was carried out using the EPI INFO 6 computer package, and the method for comparing two proportions described by Fleiss (1981) was applied. This sample size was calculated to have 90% power of demonstrating a statistically significant difference in the prevalence of oral health impact in the daily performances between two groups of adolescents at the 5% level, if an odds ratio of 1.5 or more was observed. For the purpose of the calculation of the sample size the overall oral health impact was estimated to be 30%.

In surveys, two problems may arise that lead to a loss of participants from the planned sample, namely districts with a mobile population and participants who are absent on the day of the examination. To minimise the problem of absentees, a number bigger than requested for the initial sample calculation was selected (Pine et al., 1997). Thus, in spite of the fact that a high response rate was expected, the study was over-sampled by 20% in order to avoid a sample smaller than the minimum required. Thus, the final number of adolescents invited to participate in the study was 1,675.

2.7 Sampling method

There are several sampling methods that are appropriate for a cross-sectional survey. The method selected should provide adequate accuracy and precision, be easy to understand and allow the steps performed to be audited (Pine et al., 1997).

The multi-stage sampling technique was adopted in the present study (Kirkwood, 1988). The sampling method used was two-stage sampling. Two-stage sampling consists of first taking a random sample of first-stage units (schools) and then taking a random sample of second-stage units (students) from each selected school.

The first-stage units in the present study consisted of all the private and public secondary schools in Bauru. A list of the schools with the respective number of students enrolled in each was composed. The researcher used data from the State and Local Secretary for Education. A list of all public and private secondary schools was

obtained from the local education authorities (Appendix 1). In each school, a list of all 15 to 16 years old, with their full names, date of birth, class and period of attending school (morning, afternoon and evening) was requested. Only the schools having 15 to 16 year olds enrolled in any grade of high school were included. In the present study, no replacement of absentees was made and special schools were excluded from the selection. Twenty two secondary schools (11 public and 10 private) in Bauru were eligible and selected to participate in the study.

The next step was the selection of adolescents. As the schools had different numbers of adolescents, in order to assure the random process, an equal probability scheme was used (Kirkwood, 1988). The number of adolescents from each school was proportional to the number of adolescents on the age group required by the study in each school. A list of 15 to 16 year olds students attending the schools was compiled from the 21 schools selected and the adolescents selected at random.

2.8 Conduct of the study

2.8.1 Approaching health and education authorities

Initially, permission to carry out the study in Bauru was obtained from the Ethics Committee of the Bauru Dental School of the University of Sao Paulo (Appendix 2a, 2b).

Next, contact was made with the local and state education authorities in Bauru-SP to inform them of the research plans and to ask consent to carry out the study in the schools. The researcher was introduced to the authorities by a letter signed by the Dean of the Bauru Dental School of the University of São Paulo (Appendix 3).

Consent to contact the students in the private schools was obtained through a letter signed by the Dean of the Dental School of the University of São Paulo, which was handed to the head masters of each school (head teacher, principal) (Appendix 3). The heads of the public schools were informed about the present study by the local and state education authorities (Appendix 4).

2.8.2 Approaching schools staff and parents

One week after sending the letter to the schools selected, a meeting was organised with the head teachers either by telephone or by visiting the schools. It aimed at presenting the research design and objectives, obtain collaboration and get permission to conduct the study. Information on the total number of classes with

children aged 15 to16 years old was obtained. A room for the examination to be carried out was allocated and people to help the researcher organising the activities on the day of the examination were named.

A meeting was arranged with the teachers of the selected classes to explain their participation, which mainly related to the collection of the questionnaires. A date for the researcher to visit the school was established. The teacher sent a note to parents/guardians to limit participants' absence from school on that day and also letters signed by the researcher and endorsed by the Dean of the Dental School (Appendix 5). The purpose was to inform them about the research and to stress the implications of the survey for planning education and preventive programs in the future. Parents/guardians were encouraged to contact the school if they did not want their child to participate.

2.8.3 Approaching the participants

The researcher gave a detailed explanation to the participating students about the procedures they were involved in. The students were encouraged to ask questions and discuss their points of view to ensure a good comprehension of the procedures. After the discussion in the classroom the students were guided, in groups of 10, to a room previously organised for the examination. Following the examination, they were interviewed.

2.8.4 Consent and confidentiality

Before data collection commenced, a letter was sent to the parents/guardians of the participants to seek consent for their participation in the study (Appendix 5). This letter also served to inform parents/guardians about the examination procedures and to assure them of the confidentiality of any information collected. Only positive consent was accepted. In addition, each student was asked for consent before starting the activities and reassured of the full confidentiality of the data collected. All data collected were coded and the original files containing the identification of the participants were kept by the researcher in a secure locked filing system.

2.9 Response rate

Of the 21 schools selected all agreed to participate. A total of 1675 adolescents were invited to take part in the main study and the response rate was 100%.

2.10 Assuring validity and reliability

This subsection will describe the steps carried out in the present study to assure the reliability and validity of the data collected. The different steps carried out to assure validity as well as the result of the test applied to each of the outcome measures, will be presented.

The main study took place when the adaptation of the study measures was completed. All subjects were examined by one examiner (C.M.O.) and interviewed by one interviewer (C.M.O.). Intra-examiner consistency was monitored by re-examining 10 percent of the sample, selected randomly.

In order to assess the external reliability of the self-complete questionnaire, 168 adolescents (10% of the sample) answered the self-complete questionnaire twice on two consecutive days. Test-retest reliability was carried out on all questions of both oral health related quality of life measures and on all questions of the self-complete questionnaire. The correlation between the two sets of observations was calculated using Spearman's rank correlation coefficient. The correlation coefficients were high in both oral health related quality of life measures, 0.65 for the OIDP and 0.70 for the OHIP-14. It was also high for the self-complete questionnaire ($r = 0.82$).

Internal consistency is particularly important in multiple-item scales. Internal consistency refers to all items measuring the same underlying latent variable or trait, being consequently related to one another. The concept of internal consistency or homogeneity implies that the instrument should measure different aspects of the same attribute. The statistics most frequently used to test the homogeneity of a new instrument, the Cronbach's alpha (α) coefficient, was adopted in this study. Based on all possible correlations between the items in a scale, the Cronbach's alpha (α) coefficient produces the estimate of reliability. According to Bowling (1997) there is no agreement over the minimum acceptable standards for scale of reliability. Some regard 0.70 as the minimally acceptable level of internal consistency reliability

(Nunnally and Bernstein, 1994), whereas others accept above 0.50 as an indicator of good internal consistency (Cronbach, 1951). In the present study, Cronbach's alpha was 0.84 for the OIDP and 0.85 for the OHIP-14, which falls well within these parameters. The standardised item alpha, where all items' variances were standardised, was 0.88 for the OIDP and 0.86 for the OHIP-14.

Face validity is often confused with content validity, being closely related concepts that assess the appropriateness of an instrument to a certain population. Face validity refers to the subjective assessments of the presentation and relevance of the instrument. It indicates whether the instrument is assessing the desired qualities. This is an empirical finding, but its importance should not be underestimated. Streiner and Norman (1995) refer to face validity as a way of increasing acceptance of the instrument by those who will ultimately use it. If the item appears irrelevant, then the respondent may very well object to it, irrespective of its possibly good psychometric properties. Content validity refers to judgements of whether the instrument appears logically to examine and comprehensively includes all the relevant or important domains it is intended to measure (Streiner and Norman, 1995). Again, this is an empirical finding.

In the present study, the assessment of face validity of both the OIDP and the OHIP-14 was gained through a panel of Brazilian postgraduate dental students living in London. This exercise took place before the pilot study. During the pilot study, the comprehensiveness of both oral health related quality of life measures was also checked. All necessary changes were made after the pilot, but before the main study.

The same panel that assessed face validity assessed the content validity of the Portuguese version of both measures. Face and content validity were also assured in the pilot study by asking the participants whether there were issues related to problems with their mouth that they had not been asked during the administration of the questionnaire. Through the previously mentioned procedures, face and content validity of the Portuguese version of both OIDP and OHIP-14 were considered satisfactory.

Cohen's Kappa Coefficient of Agreement (Cohen, 1960) was chosen to measure the intra-examiner reliability for orthodontic treatment need. The Kappa statistic is a measure of agreement. It considers the overall agreement achieved by the researcher compared to a baseline that is established according to decisions that could have been made at random. In effect, this statistic deducts the proportion of agreement that might be expected by chance, from the actual agreement achieved. Kappa is recommended by the BASCD (Pine et al., 1997) as a measure of overall agreement. The six-point scale adapted by Altman (1996) from Landis and Koch (1977) was used for interpreting the Kappa values:

1. Kappa < 0: poor agreement
2. Kappa between 0.0 – 0.20: slight agreement
3. Kappa between 0.21 - 0.40: fair agreement
4. Kappa between 0.41 – 0.60: moderate agreement
5. Kappa between 0.61 – 0.80: substantial agreement
6. Kappa of 0.81 and above: almost perfect agreement

In the present study, overall Kappa of the clinical data was 0.95 for the Aesthetic Component of the IOTN index and 0.91 for the Dental Health Component.

2.11 Data collection

Data collection was carried out during a period of six months, from February to August 1999. The data collected in this study involved the following types of information: clinical, socio-demographic, psychosocial, oral health behaviour, satisfaction with dental appearance, orthodontic treatment need and the overall oral health impact of malocclusion on daily life. These were collected through a dental clinical examination, self-complete questionnaire and a structured interview.

Data obtained from each participant were collected in the schools during one visit. The location in the school where data collection was undertaken varied according to the facilities available at the school. Most of the time classrooms and libraries were used. The research instruments and techniques used for the data collection will be described in the following two sub-sections.

2.12 Clinical data

2.12.1 Dental clinical examination

The dental clinical examination was carried out by the researcher alone (C.M.O.). The following clinical data were collected in this phase:

- normative orthodontic treatment need
- perceived orthodontic treatment need
- orthodontic treatment status
- oral health status

During the dental clinical examination, subjects were seated on an ordinary chair with straight backs in a well-lit room. The examiner used the conventional position used in dental clinics (8 o'clock position) and the lighting was from a hand-operated headlamp. All universal precautions for infection control were taken such as disposable orthodontic plastic rulers, disposable wooden spatulas and disposable surgical gloves were used in order to make the orthodontic measurements.

2.12.2 Examiner training and calibration

In order to obtain accuracy in the use of the IOTN index, the researcher underwent training and a calibration exercise. The calibration exercise took place in the Department of Orthodontics at University of Cardiff in July 1998. The calibration was divided in two stages.

In the first stage, some instructions were provided to the researcher by the head of the Department of Orthodontics about the components of the IOTN index and how to use them. After that, slides of some occlusal traits were shown and after which the researcher was asked to score each slide according the Aesthetic component of the IOTN index. Additionally, the examiner was asked to score dental casts according to

the Dental Health Component of the IOTN.

In the second part of the calibration exercise the researcher was asked to score 30 standardised dental casts representing a full range of malocclusion conditions in both aesthetic and dental health components of the IOTN index.

The outcome of the calibration exercise showed that the researcher was calibrated in the use of the Aesthetic Component of the IOTN index. This was illustrated by the weighted Kappa obtained by the researcher, which was 0.77. The required lower 95% confidence limit of 0.6 was exceeded by the researcher, who obtained 0.69. The specificity and sensitivity obtained were also exceeded and were, respectively, 94.5% and 90.9%, whereas both are required to be above 70%.

The researcher was also calibrated with regard to the Dental Health Component of the IOTN index. The weighted Kappa obtained by the researcher was 0.77. The lower 95% confidence limit required needs to be above 0.6 and the confidence limit obtained by the researcher was 0.656. The specificity and sensitivity obtained were, respectively, 84.6% and 100%, whereas both need to be above 70%.

2.12.3 Research Instruments

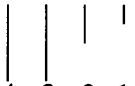
2.12.3.1 Normative orthodontic treatment need

The normative orthodontic treatment need was examined by using the Dental Health Component of the Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw, 1989). A ruler, which contains all the information necessary to record the Dental Health Component (DHC), was used. The ruler (Figure 2.2) was developed for clinical setting in which information is collected regarding competence of the lips, displacement on closure and masticatory/speech problems. Only the worst occlusal feature is recorded. When recording overjet, the ruler is held parallel to the occlusal plane and radial to the line of the arch. The most prominent aspect of the upper incisors is recorded.

There are two ways of recording the DHC of the IOTN index. The first is to record the grade only: in the second, the initiating feature would be recorded, for example, an overjet greater than 9 mm would be 5a, the grade being 5 and the overjet signified by the letter. The second method provides more information regarding the prevalence of the specific occlusal traits and it was used in the present study.

Figure 2.2 The Dental Health Component Ruler.

This section provides a brief description of occlusal anomalies. The majority are qualitative measurements.

	3			5 Defect of CLP	3 O.B. with NO G+ P trauma	
0	i	4	5	5 Non eruption of teeth	3 Crossbite 1-2 mm discrepancy	**DISPLACEMENT**
	2			5 Extensive hypodontia	2 O.B. >	**OPEN BITE**
2	c			4 Less extensive hypodontia	2 Dev. from full interdig	
3			4	4 Crossbite > 2mm discrepancy	2 Crossbite < 1mm discrepancy	
				4 Scissors bite		
4	m	s	5	4 O.B. with G+P trauma		**4 3 2 1**

OVERJET
This section is split into two, the upper half records postive overjet, the lower half reverse overjet.

CONTACT POINT, DISPLACEMENT AND OPENBITE
This section consists of four lines. Each line is assigned a grade. The greater the contact point, displacement or openbite the greater the grade.

ABBREVIATIONS

i	- incompetent lips
c	- competent lips
O.B.	- overbite
G+P	- gingival and palatal trauma
DEV	- deviation
Interdig	- interdigitation

2.12.3.2 Perceived orthodontic treatment need

The perceived orthodontic treatment need was assessed by both researcher and adolescent using the Aesthetic Component of the IOTN index. The Index of Orthodontic Treatment Need (IOTN) is used to rank malocclusion in terms of significance of the occlusal traits for an individual's dental health and the perceived

aesthetic impairment. It incorporates an Aesthetic and Dental Health Component (Brook and Shaw, 1989). The Aesthetic Component (AC) records the dental aesthetic impairment and consists of a scale of ten colour photographs that shows different levels of dental attractiveness (Evans and Shaw, 1987). Grade 1 represents the most and Grade 10 the least attractive arrangements of teeth. Both patient and professional can rank the aesthetic component. In this study, the AC-IOTN was ranked by the adolescent with the objective of assessing his/her own perception of their dental appearance.

The participants were posed the following standard explanation and question: - "Here is a set of 10 photographs showing a range of dental attractiveness. Number 1 is the most, and number 10 is the least attractive arrangement of teeth. Where would you put your teeth on this scale?"

2.12.3.3 Oral health status

This dental clinical information was collected to make sure that adolescent's satisfaction or dissatisfaction with dental appearance was only due to the position of their teeth and not to dental trauma, colour of teeth and size of teeth.

2.12.3.3.1 Dental trauma

The classification of dental trauma was based on clinical, non-radiographic evidence of dental trauma. All the incisors were examined using artificial light. As dry teeth

increases the accuracy of diagnosis, cotton was used to dry the teeth before examination. The dental trauma was recorded as 'dental trauma present' or 'no dental trauma'.

2.12.3.3.2 Satisfaction with colour of teeth

An acceptable dental status in terms of colour of teeth was considered if the participant presented a uniform colouration of his/her teeth. Discoloured teeth by dental trauma, endodontic treatment, enamel defects, prothesis or aesthetic filling of poor quality, were considered an unacceptable dental status. The adolescent was asked if he/she was satisfied with the colour of his/her teeth.

2.12.3.3.3 Satisfaction with size of teeth

The adolescent was asked if he/she was satisfied with the size of his/her teeth.

2.13 Non-clinical data

This data was collected through a self-complete questionnaire (Appendix 6a,b) and structured interview (Appendix 7a,b). The following types of data were collected: socio-demographic, psychosocial factors, oral health behaviour, satisfaction with dental appearance and psychosocial impact of malocclusion on daily activities. Every 10^{th} subject was re-interviewed in order to assess the reliability of the questionnaires.

2.13.1 Socio-demographic data

2.13.1.1 Demographic data

The demographic information was obtained from each sample based on the date of examination time frame. The following information was collected: gender, family size, type of school, father's and mother's level of education.

2.13.1.2 Socio-economic status

Information was collected in order to determine the social class of the participants, using the Marxist concept (Lombardi et al., 1988). The classification based on the Marxist concept of social class was adapted for Latin America by Bronfman and Tuiran (1984), then for Brazil by Lombardi et al. (1988). Social class of the family is defined by the participation of the head of the family in the production or distribution processes. The head of the family was considered the member of the household in the highest social position. The indicators used to classify the families are: occupational position (employer, employee, self-employed), sector of activity (production, construction, trading of goods or services), education and training for work and ownership of the means of production. Within this classification system, six social classes were distinguished: bourgeoisie, traditional petit bourgeoisie, typical proletariat, non-typical proletariat, and sub-proletariat. These classifications are defined as follows:

a) **Bourgeoisie**: employers (with 5 or more employees).

b) **Traditional petit bourgeoisie**: self-employed without university education or specialised training but with ownership of means of production (with less than 5 employees).

c) **New petit bourgeoisie**: paid workers with managerial posts and/or university education required for the job; self-employed with university education (with or without ownership of means of production, but with less than 5 employees).

d) **Typical proletariat**: self-employed in the construction sector; aid workers in the construction sector without managerial posts or university education but with specialised training; paid workers without university education or managerial posts in the production sector (manual workers).

e) **Non-typical proletariat**: paid workers without university education or managerial posts in the trading or services sectors; paid workers without university education or managerial posts working with the production sector (non-manual workers).

f) **Sub-proletariat**: self-employed in the production, trading or services sectors without university education, specialised training and ownership of means of production; paid workers in the construction sector without managerial posts, university education and specialised training; paid workers performing domestic services.

2.13.2 Psychosocial data

The self-esteem scale was validated by Factor Analysis of elements of the question performed in the English evaluation (Jamison et al., 1998). Three people translated the English version of the self-complete questionnaire (Appendix 6b) into Portuguese and an agreed version was then used (Appendix 6a). Data on participants' concern about body image and satisfaction with general appearance were also collected (Appendix 6a, b). Participants' experience of teasing was collected through the self-complete questionnaire adapted from the Dutch Study on Pàtient Centred Evaluation (ter Heege, 1998) about satisfaction with dental appearance. The self-complete questionnaire presented statements which dealt with participants' opinion about teeth.

2.13.3 Oral health behaviour

This information was obtained through a question regarding the participant's pattern of dental attendance (Appendix 6a).

2.13.4 Satisfaction with dental appearance

The participant was asked if he/she was satisfied with the appearance of his/her teeth (Appendix 6a).

2.13.5 Oral health related quality of life data

2.13.5.1 Oral Impact on Daily Performances (OIDP)

The Oral Impact on Daily Performances (OIDP) (Adulyanon and Sheiham, 1996) was used to measure the dental impact (Appendix 7a,b). Sheiham and Spencer (1997) suggested that the minimum qualification for an oral health related quality of life should be brief and easy-to-use, have an appropriate scoring system, and should be supported by a relevant theoretical model. The OIDP was selected since it is a concise interviewer-administered questionnaire and seemed applicable to the age group selected for this study. Furthermore, the index attempts to use the logical approach of impact quantification by assessing both frequency and severity. A complementary objective is that the severity score weights the relative importance of individuals' perceived impacts within different performances (Adulyanon and Sheiham, 1996).

The OIDP is an indicator with a final single score and focuses on measuring the oral impacts on the person's ability to perform daily activities. The 9 original physical, psychological and social performances assessed by the OIDP are eating and enjoying food, speaking and pronouncing clearly, cleaning teeth, sleeping and relaxing, smiling, laughing and showing teeth without embarrassment, maintain usual emotional state without being irritable, carrying major work or social role, enjoying contact with people and doing other light physical activities.

2.13.5.1.1 Criteria used to assess perceived Oral Impacts on Daily Performances

The OIDP was used to interview the participants with the aim of comparing effects of anterior teeth condition on their ability to perform routine activities of everyday life. As the theoretical framework, content and scoring system of this index was presented elsewhere (Adulyanon and Sheiham, 1996), only the modifications for this study are presented here. The modifications relates to the clarification of the content throughout a variety of examples given for each daily activity performed as well as changes in the wording. It was considered necessary after the pilot study to improve the acceptability of the indicator. Some of the examples are given below:

a) for the item "eating and enjoying food", the examples were "bite an apple or carrot, drink cold drinks and eat hot food";
b) for "speaking and pronouncing clearly", "... mainly words beginning with an S" were emphasised;
c) "cleaning teeth" was changed to "cleaning your mouth" and the child had to answer about "brushing and flossing teeth, as well as rinsing mouth";
d) "doing light physical activities such as sports or walk" was changed to "doing physical activities" and the example was "sports";
e) the item "sleeping and relaxing" did not need any clarification;
f) "smiling, laughing and showing teeth without embarrassment" was changed to "showing your teeth without embarrassment" with the explanation "smiling, laughing, showing your teeth and opening your mouth"
g) "maintain usual emotional state without being irritable", was changed to "maintain usual emotional state" and "crying easily, being sad, being more

irritable" were the examples given;

h) the wording for "carry out major work or social role" was changed to "carry out your schoolwork" and the examples were "lack of concentration in class and absence from school";

i) "enjoying contact with people" was changed to "going out with friends" with activities such as "parties and meetings" being given as examples.

The researcher asked those participants who reported a positive impact on the OIDP oral health related quality of life measure, whether his/her impact on any of the performances above was due to the position of his/her teeth or due to his/her dental status (dental trauma, size of teeth, or colour of teeth).

2.13.5.2 Oral Health Impact Profile (OHIP-14)

The Oral Health Impact Profile (OHIP) measures perception of the social impact of oral disorders on well-being. The development, reliability and validity of the OHIP have previously been described (Slade and Spencer, 1994).

The short version of the Oral Health Impact Profile (OHIP-14) (Slade, 1997) (Appendix 6a,b) was used in the present study to assess the perceived psychosocial impacts of malocclusion on the following seven dimensions:

a. Functional limitation
b. Physical pain
c. Psychological discomfort

d. Physical disability

e. Psychological disability

f. Social disability

g. Handicap

2.14 Data processing and construction of the variables

All sections of the self-complete questionnaire, structured interview and dental clinical examination form were pre-coded. A data entry system was set up so that raw data could be entered on to a PC. The researcher did the data entry continuously during the six months of data collection.

Data were entered on to an IBM computer for analysis using the Statistical Package for Social Sciences (SPSS for Windows, version 10.0). Only variables related to the hypotheses of this study were selected for entry into data analysis. Variables with a high number of missing cases were excluded from the analysis. This procedure provided 1 main explanatory variable, 2 outcome variables and 19 potential confounding variables.

The nature of the observations is of major importance in determining appropriate statistical methods of analysis. In the present study data were categorical (nominal or ordinal).

For categorical data, as well as discrete numerical data, the allocation of the subjects to one of only two categories (dichotomous data) was carried out and logistic

regression was selected as the appropriate method of analysis. The statistical methods used in the data analysis are discussed in more detail in Section 2.15.

Collapsing the data into categories may imply some decision-making. While the process can be straightforward for nominal variables, for continuous variables the researcher has to decide on the number of categories and where the boundaries of these categories should be. There is no generally accepted method in deciding the boundary between categories.

The next section describes the types of outcome and explanatory variables measured, as well as data reduction and transformations carried out. A description of the potential confounding variables is also presented.

2.14.1 Outcome variables

Two outcome variables were selected to investigate the association between orthodontic treatment status and satisfaction with dental appearance and dental impact. The variables and the respective categories are given in Table 2.1 and a construction of these measurements is given below.

Satisfaction with dental appearance

A rating scale was used to measure satisfaction with dental appearance. The question was: " How satisfied are you with the appearance of your teeth?"

Each category was given a numerical code, representing the intensity of the response category:

0- very satisfied
1- satisfied
2- rather dissatisfied
3- very dissatisfied

For the purpose of logistic regression the variable satisfaction with dental appearance was dichotomised and coded:

0- dissatisfied (codes 2 and 3)
1- satisfied (codes 0 and 1)

Overall oral health impact

The OIDP and the OHIP-14 short version oral health related quality of life measures were used in order to assess the overall oral health impact of the malocclusion on participants' daily life activities. According to the answers provided during the interview, adolescents were divided into two groups.

0- no dental impact
1- dental impact

Table 2.1 Outcome variables used in the statistical analysis.

Outcome variables	Categories
Satisfaction with dental appearance	Satisfied Dissatisfied
Dental impact	Impact No impact

2.14.2 Explanatory variables

Explanatory variables are those variables of central interest, whose effect on the outcomes are examined and estimated. In the present study, orthodontic treatment status was the main explanatory variable investigated.

Orthodontic treatment status was measured using a single question. The participants were divided into three groups:

0- untreated
1- undergoing treatment
2- treated

2.14.3 Confounding variables

One of the explanations of an observed relationship of an exposure to a disease (or outcome) is that the observed association (or lack of one) is in fact due to a mixing of effects between the exposure, the disease, and a third factor. This third factor is associated with the exposure and independently affects the risk of developing the outcome of interest. This is referred to as confounding, and the extraneous factor is called a confounding variable or confounder. A confounder must be associated with both the exposure and, independent of that exposure, be a risk factor for the disease. Furthermore, it cannot merely be an intermediate link in the causal chain between the exposure and outcome under study. Confounding can lead to an overestimate or underestimate of the truth association between the exposure and the disease and can even change the direction of the observed effect (Hennekens and Buring, 1987).

The variables selected as potential confounders for the relationship between satisfaction with dental appearance and overall oral health impact and orthodontic treatment status in the present study are presented in Table 2.2.

Socio-demographic variables

Social class

The classification system used in the present study distinguishes the following socio-economic groups:

0- bourgeoisie
1- traditional petit bourgeoisie
2- new petit bourgeoisie
3- typical proletariat
4- non- typical proletariat
5- sub- proletariat

For the purpose of the statistical analysis, social class was reduced to two categories:

0- high social class (Codes 0 to 2, corresponding to the bourgeoisie)
1- low social class (Codes 3 to 5, corresponding to the proletariat)

Social class was expected to be a strong confounder for orthodontic treatment status in the present study. In order to increase the power of social class, this variable was dichotomised, since there was little data in some of the groups.

Family size

This variable was constructed from the question regarding how many people lived in each participant's home.

0- 4 people and less

1- more than 4 people

Type of school

This information was collected on the day of examination.

0- public

1- private

Mother's level of education

The question on the level of education of the mother was in the following categories:

0- Illiterate (cannot read or write)

1- First phase of primary school not completed (less than 4 years)

2- First phase of primary school completed (4 years)

3- Second phase of the primary school not completed (less than 8 years)

4- Second phase of the primary school not completed (8 years)

5- Secondary school not completed (less than 11 years)

6- Secondary school completed (11 years)

7- University not completed

8- University completed

9- Post- graduation

Later, this variable was reduced to four categories, according to the classification used in Brazil:

0- University or post-graduate (codes 8 and 9)

1- Secondary (codes 6 and 7)

2- Primary (2^{nd} phase) (codes 4 and 5)

3- Illiterate and primary (1^{st} phase) (codes 0 to 3)

Father's level of education

The question on the level of education of the father was in the following categories:

0- Illiterate (cannot read or write)

1- First phase of primary school not completed (less than 4 years)

2- First phase of primary school completed (4 years)

3- Second phase of the primary school not completed (less than 8 years)

4- Second phase of the primary school not completed (8 years)

5- Secondary school not completed (less than 11 years)

6- Secondary school completed (11 years)

7- University not completed

8- University completed

9- Post- graduation

Later, this variable was reduced to four categories, according to the classification used in Brazil:

0- University or post-graduate (codes 8 and 9)

1- Secondary (codes 6 and 7)

2- Primary (2^{nd} phase) (codes 4 and 5)

3- Illiterate and primary (1^{st} phase) (codes 0 to 3)

Psychosocial factors

The 6 variables related to adolescents' self- concepts were extracted from the answers of questions 1, 2 and 42 of the self-completed questionnaire (Appendix 6a,b).

Level of self- esteem

First, a self- esteem score, derived from the answers to the 16 items included in question 2, was constructed by given a score of +1 for responses implying good self-

esteem and –1 for the opposite (good items = 1, 3, 4, 10, 11, 12 and 16). A total score with median 6 (minimum = -10 and maximum = 16) was obtained. Using the median as cut-off point, a dichotomous variable was defined and coded as:

0- low level of self- esteem

1- high level of self- esteem

Adolescents' satisfaction with weight

This variable was derived from adolescents' answers to question 1 (Appendix 6a,b).

0- good

1- fair

2- poor

Adolescents' satisfaction with height

This variable was derived from adolescents' answers to question 1 (Appendix 6a,b).

0- good

1- fair

2- poor

Adolescents' satisfaction with looks

This variable was derived from adolescents' answers to question 1 (Appendix 6a,b).

0- good

1- fair

2- poor

Adolescents' self-rated general health

This variable was derived from adolescents' answers to question 1 (Appendix 6a,b).

0- good

1- fair

2- poor

Adolescent's experience of teasing

This variable was derived from adolescents' answer to question 42 (Appendix 6a,b).

0- no
1- yes

Oral health behaviour

The information regarding participants' s pattern of dental attendance was obtained through the self-completed questionnaire (Appendix 6a,b). Adolescents were asked if they already went to the dentist and the main reason for going to the dentist. The variable was coded as:

0- Check ups mainly
1- In trouble mainly
2- Orthodontic visits
3- Other

Orthodontic treatment need

The 3 confounding variables related to participants' orthodontic treatment need were collected through the dental clinical examination (Appendix 8a,b).

Normative orthodontic treatment need

This variable was obtained using the Dental Health Component of the IOTN index.

The variable was coded as:

0- No/ slight need (grades 1 and 2)
1- Moderate need (grade 3)
2- Need (grades 4 and 5)

Examiner's perceived orthodontic treatment need assessment

This variable was obtained using the Aesthetic Component of the IOTN index. The variable was coded as:

0- No/ slight need (scores 1, 2, 3 and 4)

1- Moderate need (scores 5, 6 and 7)

2- Need (scores 8, 9 and 10)

Adolescents' perceived orthodontic treatment need

This variable was obtained using the Aesthetic Component of the IOTN index. The variable was coded as:

0- No/ slight need (scores 1, 2, 3 and 4)

1- Moderate need (scores 5, 6 and 7)

2- Need (scores 8, 9 and 10)

Oral health status

Three confounding variables related to participants' oral health status were collected in the present study.

Dental trauma

This variable was coded as:

0- No (no dental trauma)

1- Yes (dental trauma)

Adolescents' satisfaction with size of teeth

This variable was coded as:

0- Dissatisfied

1- Satisfied

Adolescents' satisfaction with colour of teeth

This variable was coded as:

0- Dissatisfied

1- Satisfied

Table 2.2 Covariates selected for statistical analysis.

Covariates	Categories
Demographic factors	
Gender	Female Male
Type of school	Public Private
Family size	Up to 4 people More than 4 people
Level of education of the mother	University or post-graduate Secondary Primary (2nd phase) Illiterate and primary (1st phase)
Level of education of the father	University or post-graduate Secondary Primary (2nd phase) Illiterate and primary (1st phase)
Socio economic status	
Social class	High Low
Psychosocial factors	
Level of self-esteem	High Low
Satisfaction with weight	Good Fair Poor
Satisfaction with height	Good Fair Poor
Satisfaction with looks	Good Fair Poor
Self rated general health	Good Fair Poor
Teasing experience	No Yes
Oral health behaviour	
Pattern of dental attendance	Check ups mainly In trouble mainly Orthodontic visits Other
Orthodontic treatment need	
Normative need/ IOTN	No/slight need Moderate need Need
Perceived need/ IOTN/ examiner	No/slight need Moderate need Need
Perceived need/ IOTN/ adolescent	No/slight need Moderate need Need

Table 2.2 (continued).

Covariates	Categories
Oral health status	
Satisfaction with colour of teeth	Satisfied Dissatisfied
Satisfaction with size of teeth	Satisfied Dissatisfied
Dental trauma	No Yes

2.15 Data analysis

Data analysis was carried out in three stages. Initially, an exploratory data analysis was conducted in order to identify the main patterns of the data. This included information about average values, dispersion, distribution shape, and the presence of outliers. An initial exploration of the data is considered necessary before performing statistical tests for the following reasons: Firstly, the immediate performance of various statistical tests by the researcher without an initial exploration of the data may lead to a loss of the most illuminating features of the data. Secondly, the performance of a statistical test always presupposes that certain assumptions about the data are correct. Should these assumptions be false, the results of statistical tests may be misleading (Kinnear and Gray, 1997).

In the next stage, bivariate analysis was carried out before performing a Logistic Regression since it is important to explore patterns of associations between the variables that would be included in the regression models. Therefore, initial results regarding the analysis of associations between satisfaction with dental appearance

and dental impact and each of nineteen covariates was obtained using Chi squared test.

Finally, the association between orthodontic treatment status and satisfaction with dental appearance and overall oral health impact was examined using multiple regression analysis. For all statistical tests, significance was considered when P <0.05. For the regression models, P-values were obtained from the Wald test, and estimated odds ratios and their 95% confidence limits were determined. A description of the steps carried out in the regression modelling is presented below.

2.15.1 Steps in the regression modelling

Multiple regression analysis is a mathematical technique used to describe the relation between two or more variables, by predicting one variable from other variables. The concept of regression does not imply any casual relationship between the outcome and the explanatory variables. It investigates the joint influence of the explanatory variables or predictors, taking account of possible correlations among them (Kirkwood, 1988; Altman, 1996).

As OIDP and OHIP-14 scores were not normally distributed, the investigation of the ways that these measures were associated with several other variables was performed using the logistic and not the linear regression. The choice of the cut-off points for the categorisation of both oral health related quality of life measures was determined through a conceptual approach. The distribution of the scores of the index was used.

The conceptual approach implied that the basic categorisation would be between the participants who experienced oral impacts that affected their daily living and those that did not experience it. This point was also reinforced by the distribution of the scores from both measures, since the majority of participants had an OIDP and an OHIP-14 score equal to zero. Consequently, the value of "zero" for both measures should be used as a cut-off point for the categorisation of the variable.

The next issue referred to the decision whether there should be another cut-off point. This implied determining whether the new variable should be dichotomous or categorical with more than two categories. Conceptually, there was no justification for choosing a second cut-off point. Besides, the frequency distribution of the scores showed that there were very few subjects with an OIDP and an OHIP-14 score above zero. In short, a second cut-off point could not be justified, neither conceptually nor statistically. Thus, the OIDP and the OHIP-14 scores were dichotomised into "zero" and any value larger than zero.

Multiple regression encompasses a vast array of techniques. In the present study regression model used for the data analysis was logistic regression. Logistic regression is used when the outcome is dichotomous. It predicts a transformation of the outcome variable, or the probability of an outcome to occur for any combination of the explanatory variables in the model (Altman, 1996). Adjusted estimates of odds ratios of the factors of interest are obtained, which are adjusted for confounders. This method has been widely used in general health as well as oral health research. It is also easy to interpret, although the grouping in only two categories may result in the

loss of some important information. Logistic regression was used for the 2 dichotomous outcome variables investigated in the present study, namely satisfaction with dental appearance and overall oral health impact. Since the outcome variables included in this study may be affected by different factors, different models were built for each of the outcomes.

2.15.2 Simple regression analysis

The starting point for each model was to examine the simple relationship between each potential explanatory variable and the outcome of the interest. For this unadjusted regression analyses, the explanatory variable and each of the outcome variables were performed.

The inclusion of the potential confounding variables in the regression models was based on the strengths of their associations with the outcome variables. Therefore, the next stage of the data analysis was a simple (unadjusted) regression analysis with the explanatory variable and each one of the confounders in turn. Multiple regression was performed to examine the relative importance of the significant explanatory and potential confounding variables for each of the outcome variables.

The log odds ratio is interpreted as the estimated additive changes (increases and decreases) in the outcome variable for an increase of one unit in the predictor or explanatory variable on the log odds scale (Altman, 1996).

Before constructing the models, correlation between some of the independent variables was tested. When two variables are highly correlated, there is no advantage in adding the two variables in the model at the same time, as they explain much the same variability of the outcome variable. As a result, the effect of one variable may obscure the effect of the other one, which leads to misleading findings (Altman, 1996). In the present study, correlations were found between the following variables: orthodontic treatment status and pattern of dental attendance ($r = 0.79$; $P < 0.001$), weight and looks ($r = 0.41$; $P < 0.001$), mother's level of education and social class ($r = 0.50$; $P < 0.001$), type of school and social class ($r = 0.43$; $P < 0.001$), aesthetic component of the IOTN assessed by the adolescent and the dental health component of the IOTN ($r = 0.43$; $P < 0.001$), aesthetic component of IOTN assessed by the examiner and the dental health component of the IOTN index ($r = 0.75$; $P < 0.001$) and aesthetic component of the IOTN index assessed by the adolescent and the aesthetic component of the IOTN index assessed by the examiner ($r = 0.58$; $P < 0.001$). Therefore, when the correlated variables above mentioned had a significant relationship with the outcome as well as the explanatory variable, only one was entered in the model.

2.15.3 Multiple regression analysis

In the following step, multiple regression was used to adjust the relationship between orthodontic treatment status and satisfaction with dental appearance and overall oral health impact.

All potential confounders, which had an association with the outcome variables in the simple regression at the 5% level, were included in the model. The inclusion of potential confounding variables in the model was done in separate stages. In each stage, a set of variables was entered simultaneously.

In the analysis of the relationship between participants' orthodontic treatment status and satisfaction with dental appearance, multiple regression was performed in four stages:

Stage 1 - Adjusted for sex, social class and family size;

Stage 2 - Adjusted for sex, social class, family size, health, height, looks, level of self-esteem and teasing experience;

Stage 3 - Adjusted for sex, social class, family size, health, height, looks, level of self-esteem, teasing experience and normative orthodontic treatment need;

Stage 4 - Adjusted for sex, social class, family size, health, height, looks, level of self-esteem, teasing experience, normative orthodontic treatment need, satisfaction with colour of teeth and satisfaction with size of teeth.

In the analysis of the relationship between participants' orthodontic treatment status and overall oral health impact according to the OIDP, multiple regression was performed in four stages:

Stage 1 - Adjusted for age, sex and social class;

Stage 2 - Adjusted for age, sex, social class, health, looks, level of self-esteem and teasing experience;

Stage 3 - Adjusted for age, sex, social class, health, looks, level of self-esteem, teasing experience and normative orthodontic treatment need;

Stage 4 - Adjusted for age, sex, social class, health, looks, level of self-esteem, teasing experience, normative orthodontic treatment need, dental trauma, satisfaction with colour of teeth and satisfaction with size of teeth.

In the analysis of the relationship between participants' orthodontic treatment status and overall oral health impact according to the OHIP-14, multiple regression was performed in four stages:

Stage 1 - Adjusted for sex, type of school, family size, and mother's level of education;

Stage 2 - Adjusted for sex, type of school, family size, mother's level of education, height, looks, level of self-esteem and teasing experience;

Stage 3 - Adjusted for sex, type of school, family size, mother's level of education, height, looks, level of self-esteem, teasing experience and normative orthodontic treatment need;

Stage 4 - Adjusted for sex, type of school, family size, mother's level of education, height, looks, level of self-esteem, teasing experience, normative orthodontic treatment need, satisfaction with colour of teeth

and satisfaction with size of teeth.

Finally, multiple regression analysis for the combined use of a measure of oral health related quality of life with a normative orthodontic treatment need measure was performed in two stages:

Stage 1 - Adjusted for overall oral health impact;

Stage 2 - Adjusted for overall oral health impact, orthodontic treatment status, sex, social class, family size, health, height, looks, level of self-esteem, teasing experience, satisfaction with colour of teeth and satisfaction with size of teeth.

2.15.4 Checking for interactions between variables

One of the assumptions of the regression model is that the effects of each variable are independent, so that the effect of one variable is the same regardless of the values of the other variables in the model (Altman, 1996). Therefore, the final step in the data analysis was to check for interaction between some of the variables that could distort the results. The interaction between two variables is examined by creating a new variable that is their product and adding this to the model (Altman, 1996). In the present study, no interactions between the variables investigated were found.

The findings based on the data analysis described will be presented in the next chapter.

Chapter 3

Results

3.1 Introduction

This chapter presents the findings of the study. Initially, a descriptive presentation of the survey results is displayed in Section 3.2. This includes details about the sample and general frequency distribution of the variables studied. Then, Sections 3.3 to Section 3.5 present the results of bivariate analyses. Finally, the results regarding the multiple regression analyses looking at the relationship between the outcome variables and covariates are presented in Sections 3.6 to Section 3.9.

3.2 Descriptive data

General socio-demographic features of the study population are shown in Table 3.1. A group of 1675 adolescents from 21 secondary schools participated in the study. The sample consisted of 951 females (56.8%) and 724 males (43.2%). Among the sample, 940 adolescents (56.1%) were from public secondary schools and 735 (43.9%) were from private secondary schools. The high social class group was composed of 875 subjects (52.2%), and low social class of 800 (47.8%). More than half (52.5%) of the mothers and 49.0% of the fathers have completed secondary school or a university degree. 933 (55.7%) of the adolescents came from families with up to four people and 742 (44.3%) were from families with five or more people (Table 3.1).

Table 3.1 Frequency distribution of the Brazilian adolescents according to socio-demographic features.

Socio-demographic variables	Frequency	Relative frequency (%)
Gender		
Female	951	56.8
Male	724	43.2
Age		
15 years old	1110	66.3
16 years old	565	33.7
Type of school		
Public	940	56.1
Private	735	43.9
Family size		
Up to 4 people	933	55.7
5 or more people	742	44.3
Level of education of the mother		
University and post-graduate	438	26.1
Secondary	442	26.4
Primary (2nd phase)	287	17.1
Illiterate and primary (1st phase)	508	30.3
Level of education of the father		
University and post-graduate	415	24.8
Secondary	406	24.2
Primary (2nd phase)	314	18.7
Illiterate and primary (1st phase)	540	32.2
Social class		
High social class	875	52.2
Low social class	800	47.8

A high level of self-esteem was found in 890 adolescents, 53.1% of the sample. On the other hand, 785 of them (46.9%) reported a low level of self-esteem (Table 3.2). Regarding adolescent's teasing experience, only 10.3% reported a teasing experience (Table 3.2). When asked to rate themselves according to their health in general, 96.0% of the adolescents considered having good general health, 3.5% of them classified themselves as having fair general health and only 0.5% as having poor general health (Table 3.3).

Table 3.2 Frequency distribution of the adolescents according to their reported level of self-esteem and teasing experience.

Variable	Frequency	Relative frequency (%)
Level of self-esteem		
Low	785	46.9
High	890	53.1
Teasing experience		
Yes	173	10.3
No	1502	89.7

Table 3.3 Frequency distribution of the adolescents according to their self-rated general health.

Variable	Frequency	Relative frequency (%)
Health		
Good	1608	96.0
Fair	59	3.5
Poor	8	0.5

The frequency distributions of the adolescents according to their satisfaction with body image are presented in Table 3.4.

Table 3.4 Frequency distribution of the adolescents according to their satisfaction with body image.

Variable	Frequency	Relative frequency (%)
Height		
Good	1409	84.1
Fair	180	10.7
Poor	86	5.1
Weight		
Good	1178	70.3
Fair	298	17.4
Poor	205	12.2
Looks		
Good	1430	85.4
Fair	188	11.2
Poor	57	3.4

Regarding the pattern of dental attendance, 34.8% of the sample visited the dentist when they were in trouble mainly, 44.1% for check ups mainly, 16.4% for orthodontic visits, and only 4.7% for other reasons (Table 3.5). In terms of orthodontic treatment status, 15.8% of the adolescents had orthodontic treatment, 63.3% never had orthodontic treatment and 21.3% were having orthodontic treatment (Table 3.5). Table 3.6 and Table 3.7 display the frequency distribution of the adolescents who were treated and those who were undergoing treatment regarding their orthodontic treatment.

Table 3.5 Frequency distribution of the adolescents according to stated pattern of dental attendance and orthodontic treatment status.

Variable	Frequency	Relative frequency (%)
Pattern of dental attendance		
Check ups mainly	738	44.1
In trouble mainly	583	34.8
Orthodontic visits	275	16.4
Other	79	4.7
Orthodontic treatment status		
Treated	258	15.4
Having treatment	357	21.3
Untreated	1060	63.3

Table 3.6 Frequency distribution of the treated adolescents (n=258) and those who were undergoing orthodontic treatment (n=357) according to their orthodontic treatment status.

Variable	Frequency	Relative frequency (%)
Finished treatment		
No, still in treatment	357	58.0
Yes, less than 1 year ago	99	16.1
Yes, between 1 and 2 years ago	50	8.2
Yes, between 2 and 4 years ago	54	8.8
Yes, more than 4 years ago	55	8.9

Table 3.7 Frequency distribution of the treated adolescents and those who were undergoing orthodontic treatment according to their orthodontic treatment status (n=615).

Variable	Frequency	Relative frequency (%)
Why have you been treated		
Front teeth crooked	204	33.2
Teeth did not come together properly	133	21.6
Front teeth sticking out	109	17.7
Too much space between teeth	72	11.7
Bite was no good	15	2.4
Improve speech	6	1.0
I do not remember	48	7.8
Other	28	4.6
Who said first you needed orthodontic treatment		
Parents	220	35.8
Dentist no specialist	180	29.3
Orthodontist	106	17.2
I did myself	64	10.4
Speech therapist	10	1.6
Friends/ peers	3	0.5
I do not know	19	3.1
Other	13	2.1
Treated by whom		
Private orthodontist	311	50.6
Orthodontist at university	189	30.7
Dentist no specialist	78	12.7
Orthodontist at hospital	20	3.3
School dentist	3	0.5
I do not remember	14	2.3
Kind of braces		
Removable+fixed+extra	223	36.3
Removable+fixed	167	27.2
Only fixed	117	19.0
Only removable	48	7.8
Other	60	9.8

The majority of the adolescents in the present study were satisfied with their dental appearance (77.6%), and only 22.4% of the sample was dissatisfied. Information on adolescents' oral health status is presented in Table 3.8. Dental trauma was observed in only 6.7% of the studied population. 65.9% of the participants were satisfied with the colour of their teeth, and the majority (87.5%) was satisfied with

the size of their teeth.

Table 3.8 Frequency distribution of the adolescents according to adolescents' oral health status.

Variable	Frequency	Relative frequency (%)
Dental trauma		
Yes	112	6.7
No	1563	93.3
Satisfaction with colour of teeth		
Satisfied	1104	65.9
Dissatisfied	571	34.1
Satisfaction with size of teeth		
Satisfied	1465	87.5
Dissatisfied	210	12.5

Orthodontic treatment need

Frequency distribution of the adolescents according to their orthodontic treatment need is displayed in Table 3.9. Among the subjects examined, 77.1% presented no/slight need for orthodontic treatment, 8.0% moderate need, and 14.9% were in need of orthodontic treatment according to the aesthetic component of the IOTN index assessed by the examiner (Table 3.9).

The orthodontic treatment need perceived by the adolescent was assessed using the aesthetic component of the IOTN index. Most of the subjects (93.3%) said they had no/slight need for orthodontic treatment, 3.8% moderate need, and only 2.9% were in need of orthodontic treatment (Table 3.9).

The normative orthodontic treatment need of the studied population according to the dental health component of the IOTN index indicated that 61.5% of the sample presented no/slight need for orthodontic treatment, 21.0% moderate need, and 17.5% were in need for orthodontic treatment (Table 3.9).

Table 3.9 Frequency distribution of the adolescents according to orthodontic treatment need using the Index of Orthodontic Treatment Need (IOTN).

Variable	Frequency	Relative frequency (%)
IOTN - Aesthetic component - examiner		
No/slight need for orthodontic treatment	1292	77.1
Moderate need for orthodontic treatment	134	8.0
Need for orthodontic treatment	249	14.9
IOTN - Aesthetic component - adolescent		
No/slight need for orthodontic treatment	1563	93.3
Moderate need for orthodontic treatment	64	3.8
Need for orthodontic treatment	48	2.9
IOTN - Dental health component		
No/slight need for orthodontic treatment	1031	61.5
Moderate need for orthodontic treatment	351	21.0
Need for orthodontic treatment	293	17.5

Figures 3.1, 3.2 and 3.3 show the frequency distribution of the adolescents according to the grades of the IOTN index.

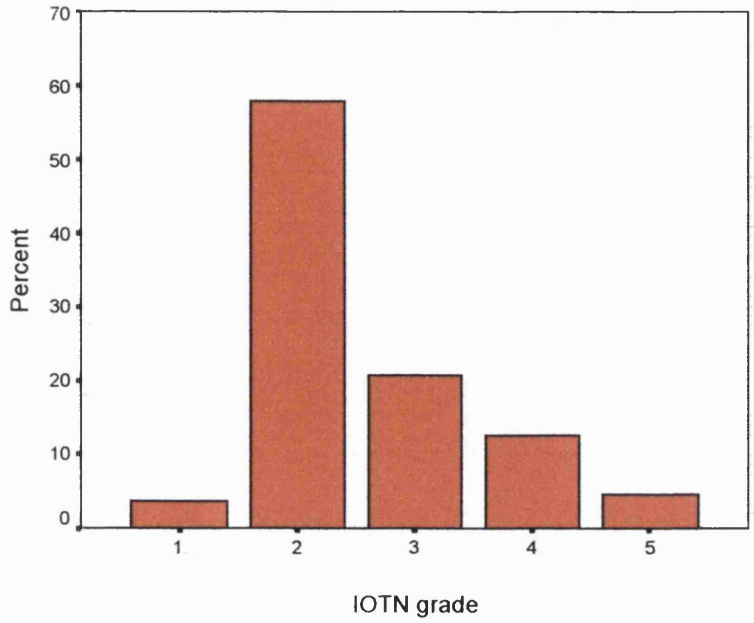


Fig. 3.1 Frequency distribution of grades of the Dental Health Component of the IOTN index assessed by the dentist.

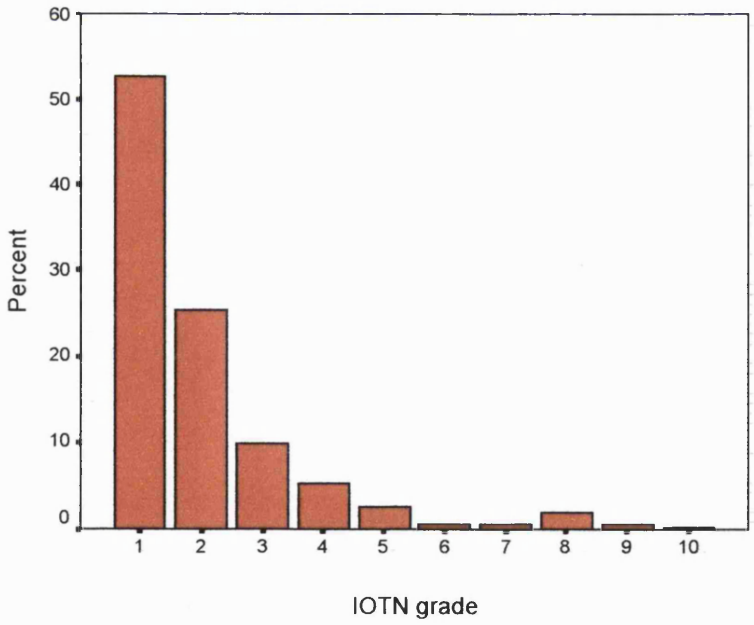


Fig. 3.2 Frequency distribution of grades of the Aesthetic Component of the IOTN index assessed by the adolescent.

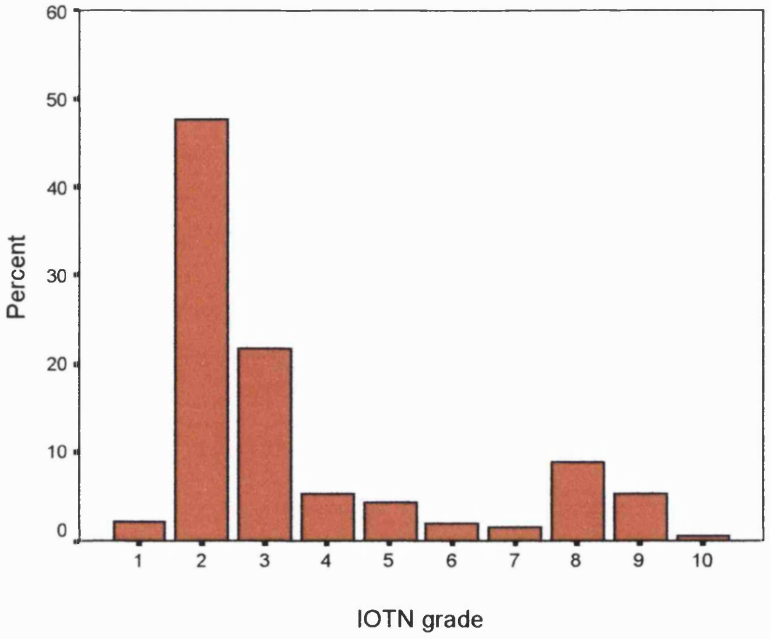


Fig. 3.3 Frequency distribution of grades of the Aesthetic Component of the IOTN index assessed by the dentist.

549 (32.8%) adolescents reported having experienced one or more dental impacts on their daily life activities according to the OIDP oral health related quality of life measure (Table 3.10).

Table 3.10 Frequency distribution of the adolescents according to the Oral Impact on Daily Performances oral health related quality of life measure (OIDP).

Variable	Frequency	Relative frequency (%)
OIDP		
No dental impact	1126	67.2
Dental impact	549	32.8

Table 3.11 displays frequency distribution of the adolescents according to the 9 activities of the Oral Impact on Daily Performances oral health related quality of life measure (OIDP).

Table 3.11 Frequency distribution of the adolescents according to the 9 activities of the Oral Impact on Daily Performances oral health related quality of life measure (OIDP).

Daily activity		Frequency	Relative frequency (%)
Eating	No impact	1407	84.0
	Impact	268	16.0
Speaking	No impact	1537	91.8
	Impact	138	8.2
Cleaning teeth	No impact	1626	97.1
	Impact	49	2.9
Sleeping	No impact	1670	99.7
	Impact	5	0.3
Smiling	No impact	1448	86.4
	Impact	227	13.6
Emotional stability	No impact	1652	98.6
	Impact	23	1.4
School activities	No impact	1672	99.8
	Impact	3	0.2
Contact with people	No impact	1666	99.8
	Impact	9	0.5
Sport	No impact	1672	99.8
	Impact	3	0.2

Adolescents who reported an oral health related impact were asked what they perceived as the specific cause of the problem with their mouth and teeth. The specific causes were reported for each of the nine activities mentioned in Table 3.11. Position of teeth was reported as the most frequent specific cause for 8 of the

9 activities assessed. The only activity in which position of teeth was not reported as the main cause of the impact was eating. Dental pain was most frequently (51%) reported as a specific cause related to eating, followed by the position of the teeth (36%) and braces (13%).

According to the OHIP-14 oral health related quality of life measure, 721 (43.0%) subjects reported having experienced one or more dental impacts on their daily life activities (Table 3.12). In Table 3.13, the frequency distribution of the adolescents according to the 14 activities assessed by the Oral Health Impact Profile oral health related quality of life measure (OHIP-14) is presented. The frequency distribution of the participants regarding the 7 dimensions of the Oral Health Impact Profile oral health related quality of life measure (OHIP-14) is shown in Table 3.14.

Table 3.12 Frequency distribution of the adolescents according to the Oral Health Impact Profile oral health related quality of life measure (OHIP-14).

Variable	Frequency	Relative frequency (%)
OHIP-14		
No dental impact	954	57.0
Dental impact	721	43.0

Table 3.13 Frequency distribution of the adolescents according to the 14 activities of the Oral Health Impact Profile oral health related quality of life measure (OHIP).

Daily activity	Impact	Frequency	Relative frequency (%)
Had problem pronouncing words	No	1563	93.3
	Yes	112	6.7
Felt their sense of taste has worsened	No	1635	97.6
	Yes	40	2.4
Had a painful aching in the mouth	No	1299	77.6
	Yes	376	22.4
Found it uncomfortable to eat any food	No	1425	85.1
	Yes	250	14.9
Have been self-conscious	No	1445	86.3
	Yes	230	13.7
Felt tense	No	1512	90.3
	Yes	163	9.7
Had an unsatisfactory diet	No	1551	92.6
	Yes	124	7.4
Had to interrupt meals	No	1593	95.1
	Yes	82	4.9
Found it difficult to relax	No	1579	94.3
	Yes	96	5.7
Have been a bit embarrassed	No	1509	90.1
	Yes	166	9.9
Have been irritable with other people	No	1577	94.1
	Yes	98	5.9
Had difficulty doing usual jobs	No	1607	95.9
	Yes	68	4.1
Felt life in general less satisfying	No	1620	96.7
	Yes	55	3.3
Have been totally unable to function	No	1642	98.0
	Yes	33	2.0

Table 3.14 Frequency distribution of the adolescents according to the 7 dimensions of the Oral Health Impact Profile oral health related quality of life measure (OHIP-14).

Dimension	Impact	Frequency	Relative frequency (%)
Functional limitation	No impact	1532	91.5
	Impact	143	8.5
Physical pain	No impact	1186	70.8
	Impact	489	29.2
Psychological discomfort	No impact	1371	81.9
	Impact	304	18.1
Physical disability	No impact	1513	90.3
	Impact	162	9.7
Psychological disability	No impact	1451	86.6
	Impact	224	13.4
Social disability	No impact	1537	91.8
	Impact	138	8.2
Handicap	No impact	1605	95.8
	Impact	70	4.2

The frequency histograms of the scores of both oral health related quality of life measures used in the present study were not compatible with a normal distribution, showing a highly positive skewed distribution (Figures 3.4 and 3.5).

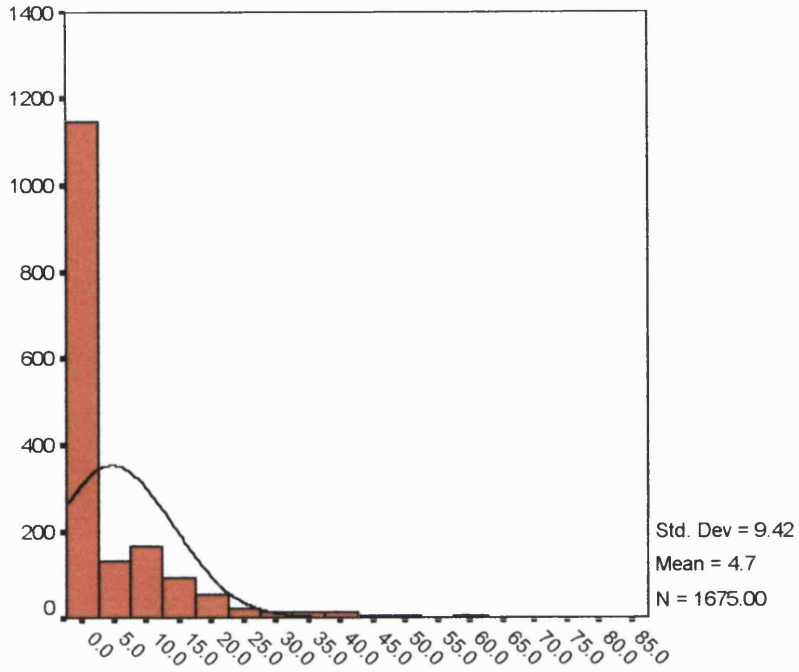


Fig. 3.4 Distribution of scores for the OIDP oral health related quality of life measure.

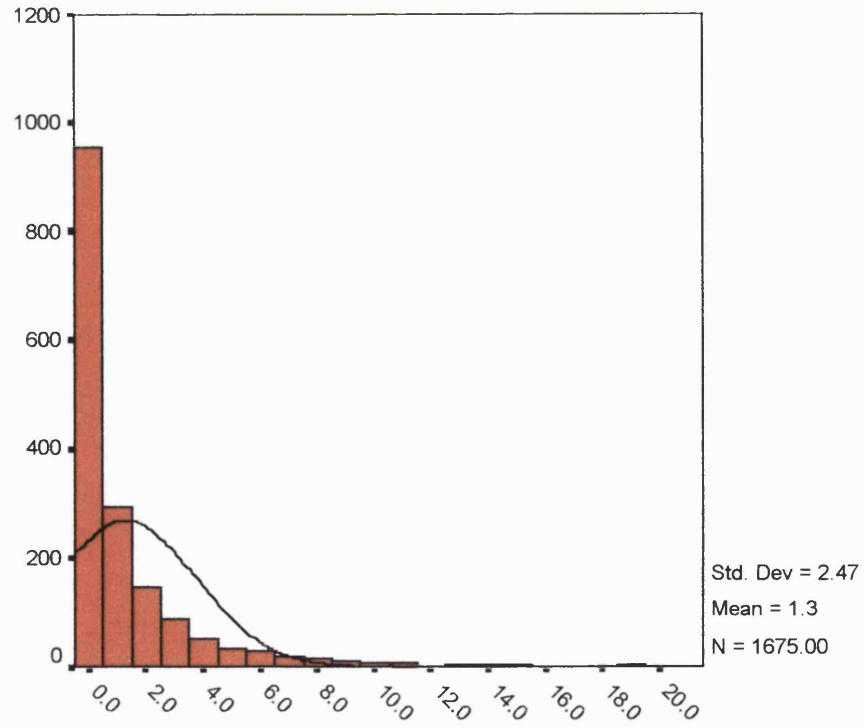


Fig. 3.5 Distribution of scores for the OHIP-14 oral health related quality of life measure.

3.3 The relationship between the explanatory variables and adolescents' satisfaction with dental appearance

An investigation of the influence of the explanatory variables (defined as covariates) on the outcome under study was conducted. Initially, the association between outcome and defined covariates was explored using the Chi-squared test. Tables 3.15 to Table 3.24 summarise the results of these investigations.

An association was found between adolescent's satisfaction with dental appearance and most of the socio-demographic variables investigated (Table 3.15). Adolescents who were more satisfied with their dental appearance were male ($P < 0.001$), from private school ($P < 0.001$), from family with up to 4 people ($P < 0.001$), from high social class and parents' whose level of education was university or post-graduate ($P < 0.001$), compared with those adolescents who were dissatisfied with their dental appearance. No statistically significant difference was found in relation to age ($P < 0.821$).

Results regarding self-rated general health, satisfaction with body image, level of self-esteem and teasing experience are shown in Table 3.16 to Table 3.19. Adolescents who were satisfied with their dental appearance reported a better general health ($P < 0.020$), were more satisfied with their body image ($P < 0.001$), had a higher level of self-esteem ($P < 0.001$) and reported no teasing experience ($P < 0.001$).

As shown in Table 3.20 and Table 3.21, adolescents satisfied with their dental appearance had less normative and perceived need for orthodontic treatment ($P < 0.001$), they had orthodontic treatment ($P < 0.001$) and they attended the dentist, mainly, for check ups ($P < 0.001$).

Regarding the oral health status, adolescents who were satisfied with their dental appearance were also more satisfied with the colour ($P < 0.001$) and size ($P < 0.001$) of their teeth (Table 3.22). No statistically significant difference was found in relation to dental trauma ($P < 0.150$).

Both OIDP and OHIP-14 oral health related quality of life measures used in the present study were associated with satisfaction with dental appearance (Table 3.23 and Table 3.24). Adolescents satisfied with their dental appearance reported less dental impacts ($P < 0.001$) in their daily lives compared with those adolescents who were dissatisfied with their dental appearance.

Table 3.15 Bivariate analysis of the relationship between satisfaction with dental appearance and socio-demographic variables using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Age			
15 years old	859 (77.4)	251 (22.6)	$X^2 = 0.51$
16 years old	440 (77.9)	125 (22.1)	$P < 0.821$
Gender			
Male	589 (81.4)	135 (18.6)	$X^2 = 10.59$
Female	710 (74.7)	241 (25.3)	$P < 0.001$
Type of school			
Public	680 (72.3)	260 (27.7)	$X^2 = 33.43$
Private	619 (84.2)	116 (15.8)	$P < 0.001$
Family size			
Up to 4 people	751 (80.5)	182 (19.5)	$X^2 = 10.46$
5 or more people	548 (73.9)	194 (26.1)	$P < 0.001$
Social class			
High	719 (82.2)	156 (17.8)	$X^2 = 22.45$
Low	580 (72.5)	220 (27.5)	$P < 0.001$
Level of education of the mother			
University and post-graduate	365 (83.3)	73 (16.7)	$X^2 = 44.56$
Secondary	371 (83.9)	71 (16.1)	$P < 0.001$
Primary (2^{nd} phase)	216 (75.3)	71 (24.7)	
Illiterate and primary (1^{st} phase)	347 (68.3)	161 (31.7)	
Level of education of the father			
University and post-graduate	344 (82.9)	71 (17.1)	$X^2 = 21.84$
Secondary	330 (81.3)	76 (18.7)	$P < 0.001$
Primary (2^{nd} phase)	239 (76.1)	75 (23.9)	
Illiterate and primary (1^{st} phase)	386 (71.5)	154 (28.5)	

Table 3.16 Bivariate analysis of the relationship between satisfaction with dental appearance and self-rated general health using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Health			
Good	1256 (78.1)	352 (21.9)	$X^2 = 7.78$
Fair	37 (62.7)	22 (37.3)	$P < 0.020$
Poor	6 (75.0)	2 (25.0)	

Table 3.17 Bivariate analysis of the relationship between satisfaction with dental appearance and satisfaction with body image using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Height			
Good	1110 (78.8)	299 (21.2)	X^2= 15.86
Fair	137 (76.1)	43 (23.9)	P < 0.001
Poor	52 (60.5)	34 (39.5)	
Weight			
Good	951 (80.7)	227 (19.3)	X^2= 29.38
Fair	216 (74.0)	76 (26.0)	P < 0.001
Poor	132 (64.4)	73 (35.6)	
Looks			
Good	1148 (80.3)	282 (19.7)	X^2= 50.46
Fair	124 (66.0)	64 (34.0)	P < 0.001
Poor	27 (47.4)	30 (52.6)	

Table 3.18 Bivariate analysis of the relationship between satisfaction with dental appearance and adolescent's level of self-esteem using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Level of self-esteem			
High	738 (82.9)	152 (17.1)	X^2= 31.45
Low	561 (71.5)	224 (28.5)	P < 0.001

Table 3.19 Bivariate analysis of the relationship between satisfaction with dental appearance and adolescent's teasing experience using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Teasing experience			
Yes	95 (54.9)	78 (45.1)	X^2= 56.79
No	1204 (80.2)	298 (19.8)	P < 0.001

Table 3.20 Bivariate analysis of the relationship between satisfaction with dental appearance and orthodontic treatment need using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
IOTN– Aesthetic component - examiner			
No/slight need for orthodontic treatment	1096 (84.8)	196 (15.2)	X^2= 184.78
Moderate need for orthodontic treatment	85 (63.4)	49 (36.6)	P < 0.001
Need for orthodontic treatment	118 (47.4)	131 (52.6)	
IOTN– Aesthetic component - adolescent			
No/slight need for orthodontic treatment	1250 (80.0)	313 (20.0)	X^2= 79.61
Moderate need for orthodontic treatment	26 (40.6)	38 (59.4)	P < 0.001
Need for orthodontic treatment	23 (47.9)	25 (52.1)	
IOTN– Dental health component			
No/slight need for orthodontic treatment	901 (87.4)	130 (12.6)	X^2= 190.88
Moderate need for orthodontic treatment	251 (71.5)	100 (28.5)	P < 0.001
Need for orthodontic treatment	147 (50.2)	146 (49.8)	

Table 3.21 Bivariate analysis of the relationship between satisfaction with dental appearance and pattern of dental attendance and orthodontic treatment status using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Pattern of dental attendance			
Check ups mainly	613 (83.1)	125 (16.9)	
In trouble mainly	405 (69.5)	178 (30.5)	X^2= 41.00
Orthodontic visits	226 (82.2)	49 (17.8)	P < 0.001
Other	55 (69.6)	24 (30.4)	
Orthodontic treatment status			
Treated	236 (91.5)	22 (8.5)	X^2= 51.04
Having treatment	296 (82.9)	61 (17.1)	P < 0.001
Untreated	767 (72.4)	293 (27.6)	

Table 3.22 Bivariate analysis of the relationship between satisfaction with dental appearance and adolescents' oral health status using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
Dental trauma			
Yes	93 (83.0)	19 (17.0)	X^2= 2.07
No	1206 (77.2)	357 (22.8)	P < 0.150
Satisfaction with colour of teeth			
Satisfied	959 (86.9)	145 (13.1)	X^2= 161.37
Dissatisfied	340 (59.5)	231 (40.5)	P < 0.001
Satisfaction with size of teeth			
Satisfied	1179 (80.5)	286 (19.5)	X^2= 57.45
Dissatisfied	120 (57.1)	90 (42.9)	P < 0.001

Table 3.23 Bivariate analysis of the relationship between satisfaction with dental appearance and the OIDP oral health related quality of life measure using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
OIDP			
No impact	982 (87.2)	144 (12.8)	X^2= 184.12
Impact	317 (57.7)	232 (42.3)	P < 0.001

Table 3.24 Bivariate analysis of the relationship between satisfaction with dental appearance and the OHIP-14 oral health related quality of life measure using the Chi squared test.

Variable	Satisfied n (%)	Dissatisfied n (%)	Test statistic (x^2) Significance level (P)
OHIP-14			
No impact	835 (87.5)	119 (12.5)	X^2= 126.65
Impact	464 (64.4)	257 (35.6)	P < 0.001

3.4 The relationship between the explanatory variables and adolescents' overall oral health impact according to the OIDP oral health related quality of life measure

The association between overall oral health impact as assessed by the OIDP oral health related quality of life measure and defined covariates was explored using the Chi-squared test. Tables 3.25 to Table 3.32 summarise the results of these investigations.

An association was found between adolescent's overall oral health impact and most of the socio-demographic variables investigated (Table 3.25). Compared with those adolescents who reported no dental impact, adolescents who reported having experienced one or more dental impacts on their daily life activities were 15 years old ($P < 0.020$), female ($P < 0.014$), attended public school ($P < 0.001$), were from a low social class ($P < 0.004$) and had mothers' whose level of education was illiterate or primary ($P < 0.004$). No statistically significant difference was found in relation to the size of family ($P < 0.414$) and the level of education of the father ($P < 0.146$).

Results regarding self-rated general health, satisfaction with body image, level of self-esteem and teasing experience are shown in Table 3.26 to Table 3.29. Adolescents who reported having experienced one or more dental impacts on their daily life activities also reported a poor general health ($P < 0.022$). They were less satisfied with their height ($P < 0.060$), weight ($P < 0.046$), looks ($P < 0.001$), had a

lower level of self-esteem ($P < 0.001$) and reported a teasing experience ($P < 0.001$).

As shown in Table 3.30 and Table 3.31, adolescents who reported having experienced one or more dental impacts on their daily life activities had more normative and perceived need for orthodontic treatment ($P < 0.001$), they never had orthodontic treatment ($P < 0.001$) and they attended the dentist mainly when they were in trouble ($P < 0.001$).

Regarding the oral health status, adolescents who reported having experienced one or more dental impacts on their daily life activities were less satisfied with the colour ($P < 0.001$) and size ($P < 0.001$) of their teeth (Table 3.32) and they reported more dental trauma ($P < 0.001$).

Table 3.25 Bivariate analysis of the relationship between overall oral health impact (OIDP) and socio-demographic variables using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Age			
15 years old	385 (34.7)	725 (65.3)	X^2= 5.44
16 years old	164 (29.0)	401 (71.0)	P < 0.020
Gender			
Male	214 (29.6)	510 (70.4)	X^2= 5.99
Female	335 (35.2)	616 (64.8)	P < 0.014
Type of school			
Public	364 (38.7)	576 (61.3)	X^2= 34.38
Private	185 (25.2)	550 (74.8)	P < 0.001
Family size			
Up to 4 people	298 (31.9)	635 (68.1)	X^2= 0.66
5 or more people	251 (33.8)	491 (66.2)	P < 0.414
Social class			
High	259 (29.6)	616 (70.4)	X^2= 8.38
Low	290 (36.3)	510 (63.8)	P < 0.004
Level of education of the mother			
University and post-graduate	134 (30.6)	304 (69.4)	X^2= 13.30
Secondary	121 (27.4)	321 (72.6)	P < 0.004
Primary (2^{nd} phase)	104 (36.2)	183 (63.8)	
Illiterate and primary (1^{st} phase)	190 (37.4)	318 (62.6)	
Level of education of the father			
University and post-graduate	117 (28.2)	298 (71.8)	X^2= 5.38
Secondary	138 (34.0)	268 (66.0)	P < 0.146
Primary (2^{nd} phase)	106 (33.8)	208 (66.2)	
Illiterate and primary (1^{st} phase)	188 (34.8)	352 (65.2)	

Table 3.26 Bivariate analysis of the relationship between overall oral health impact (OIDP) and self-rated general health using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Health			
Good	520 (32.3)	1088 (67.7)	X^2= 7.64
Fair	23 (39.0)	36 (61.0)	P < 0.022
Poor	6 (75.0)	2 (25.0)	

Table 3.27 Bivariate analysis of the relationship between overall oral health impact (OIDP) and satisfaction with body image using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Height			
Good	446 (31.7)	963 (68.3)	X^2= 5.64
Fair	67 (37.2)	113 (62.8)	P < 0.060
Poor	36 (41.9)	50 (58.1)	
Weight			
Good	365 (31.0)	813 (69.0)	X^2= 6.14
Fair	105 (36.0)	187 (64.0)	P < 0.046
Poor	79 (38.5)	126 (61.5)	
Looks			
Good	442 (30.9)	988 (69.1)	X^2= 15.92
Fair	80 (42.6)	108 (57.4)	P < 0.001
Poor	27 (47.4)	30 (52.6)	

Table 3.28 Bivariate analysis of the relationship between overall oral health impact (OIDP) and adolescent's level of self-esteem using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Level of self-esteem			
High	243 (27.3)	647 (72.7)	X^2= 25.81
Low	306 (39.0)	479 (61.0)	P < 0.001

Table 3.29 Bivariate analysis of the relationship between overall oral health impact (OIDP) and adolescent's teasing experience using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Teasing experience			
Yes	90 (52.0)	83 (48.0)	X^2= 32.40
No	459 (30.6)	1043 (69.4)	P < 0.001

Table 3.30 Bivariate analysis of the relationship between overall oral health impact (OIDP) and orthodontic treatment need using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
IOTN– Aesthetic component - examiner			
No/slight need for orthodontic treatment	348 (26.9)	944 (73.1)	X^2= 93.05
Moderate need for orthodontic treatment	60 (44.8)	74 (55.2)	P < 0.001
Need for orthodontic treatment	141 (56.6)	108 (43.4)	
IOTN– Aesthetic component - adolescent			
No/slight need for orthodontic treatment	487 (31.2)	1076 (68.8)	X^2= 32.91
Moderate need for orthodontic treatment	41 (64.1)	23 (35.9)	P < 0.001
Need for orthodontic treatment	21 (43.8)	27 (56.3)	
IOTN– Dental health component			
No/slight need for orthodontic treatment	276 (26.8)	755 (73.2)	X^2= 74.47
Moderate need for orthodontic treatment	116 (33.0)	235 (67.0)	P < 0.001
Need for orthodontic treatment	157 (53.6)	136 (46.4)	

Table 3.31 Bivariate analysis of the relationship between overall oral health impact (OIDP) and pattern of dental attendance and orthodontic treatment status using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Pattern of dental attendance			
Check ups mainly	198 (26.8)	540 (73.2)	
In trouble mainly	222 (38.1)	361 (61.9)	X^2= 21.55
Orthodontic visits	99 (36.0)	176 (64.0)	P < 0.001
Other	30 (38.0)	49 (62.0)	
Orthodontic treatment status			
Treated	58 (22.5)	200 (77.5)	X^2= 14.98
Having treatment	128 (35.9)	229 (64.1)	P < 0.001
Untreated	363 (34.2)	697 (65.8)	

Table 3.32 Bivariate analysis of the relationship between overall oral health impact (OIDP) and adolescents' oral health status using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Dental trauma			
Yes	52 (46.4)	60 (53.6)	X^2= 10.15
No	497 (31.8)	1066 (68.2)	P < 0.001
Satisfaction with colour of teeth			
Satisfied	276 (25.0)	828 (75.0)	X^2= 88.87
Dissatisfied	273 (47.8)	298 (52.2)	P < 0.001
Satisfaction with size of teeth			
Satisfied	436 (29.8)	1029 (70.2)	X^2= 48.21
Dissatisfied	113 (53.8)	97 (46.2)	P < 0.001

3.5 The relationship between the explanatory variables and adolescents' overall oral health impact according to the OHIP-14 oral health related quality of life measure

The association between dental impact as assessed by the OHIP-14 oral health related quality of life measure and defined covariates was explored using the Chi-squared test. Tables 3.33 to Table 3.40 summarise the results of these investigations.

An association was found between adolescent's overall oral health impact and most of the socio-demographic variables investigated (Table 3.33). Adolescents who reported having experienced one or more dental impacts on their daily life activities were female (P < 0.019), from public school (P < 0.001), from a family with 5 or more people (P < 0.008) and mothers' whose level of education was illiterate or primary (P < 0.002), compared with those adolescents who reported no overall oral health impact. No statistically significant difference was found in

relation to age ($P < 0.450$), social class ($P < 0.178$) and the level of education of the father ($P < 0.188$).

Results regarding self-rated general health, satisfaction with body image, level of self-esteem and teasing experience are shown in Table 3.34 to Table 3.37. Adolescents who reported having experienced one or more dental impacts on their daily life activities also reported a poor general health ($P < 0.059$). They were less satisfied with their height ($P < 0.001$), weight ($P < 0.001$), looks ($P < 0.001$), had a lower level of self-esteem ($P < 0.001$) and reported a teasing experience ($P < 0.001$).

As shown in Table 3.38 and Table 3.39, adolescents who reported having experienced one or more dental impacts on their daily life activities had more normative and perceived need for orthodontic treatment ($P < 0.001$), they were having or never had orthodontic treatment ($P < 0.001$) and they attended the dentist for orthodontic visits ($P < 0.001$).

Regarding the oral health status, adolescents who reported having experienced one or more dental impacts on their daily life activities were less satisfied with the colour ($P < 0.001$) and size ($P < 0.001$) of their teeth (Table 3.40). No statistically significant difference was found in relation to dental trauma ($P < 0.303$).

Table 3.33 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and socio-demographic variables using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Age			
15 years old	485 (43.7)	625 (56.3)	X^2= 0.57
16 years old	236 (41.8)	329 (58.2)	P < 0.45
Gender			
Male	288 (39.8)	436 (60.2)	X^2= 5.55
Female	433 (45.5)	518 (54.5)	P < 0.019
Type of school			
Public	441 (46.9)	499 (53.1)	X^2= 13.09
Private	280 (38.1)	455 (61.9)	P < 0.001
Family size			
Up to 4 people	375 (40.2)	558 (59.8)	X^2= 6.98
5 or more people	346 (46.6)	396 (53.4)	P < 0.008
Social class			
High	363 (41.5)	512 (58.5)	X^2= 1.82
Low	358 (44.8)	442 (55.3)	P < 0.178
Level of education of the mother			
University and post-graduate	167 (38.1)	271 (61.9)	X^2= 14.45
Secondary	175 (39.6)	267 (60.4)	P < 0.002
Primary (2^{nd} phase)	130 (45.3)	157 (54.7)	
Illiterate and primary (1^{st} phase)	249 (49.0)	259 (51.0)	
Level of education of the father			
University and post-graduate	170 (41.0)	245 (59.0)	X^2= 4.79
Secondary	164 (40.4)	242 (59.6)	P < 0.188
Primary (2^{nd} phase)	135 (43.0)	179 (57.0)	
Illiterate and primary (1^{st} phase)	252 (46.7)	288 (53.3)	

Table 3.34 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and self-rated general health using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Health			
Good	684 (42.5)	924 (57.5)	X^2= 5.67
Fair	31 (52.5)	28 (47.5)	P < 0.059
Poor	6 (75.0)	2 (25.0)	

Table 3.35 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and Satisfaction with body image using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Height			
Good	584 (41.4)	825 (58.6)	X^2= 15.84
Fair	83 (46.1)	97 (53.9)	P < 0.001
Poor	54 (62.8)	32 (37.2)	
Weight			
Good	464 (39.4)	714 (60.6)	X^2= 26.52
Fair	139 (47.6)	153 (52.4)	P < 0.001
Poor	118 (57.6)	87 (42.4)	
Looks			
Good	574 (40.1)	856 (59.9)	X^2= 35.80
Fair	108 (57.4)	80 (42.6)	P < 0.001
Poor	39 (68.4)	18 (31.6)	

Table 3.36 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and adolescent's level of self-esteem using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Level of self-esteem			
High	315 (35.4)	575 (64.6)	X^2= 45.35
Low	406 (51.7)	379 (48.3)	P < 0.001

Table 3.37 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and adolescent's teasing experience using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Teasing experience			
Yes	136 (78.6)	37 (21.4)	X^2= 99.55
No	585 (38.9)	917 (61.1)	P < 0.001

Table 3.38 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and orthodontic treatment need using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
IOTN– Aesthetic component - examiner			
No/slight need for orthodontic treatment	501 (38.8)	791 (61.2)	X^2= 42.72
Moderate need for orthodontic treatment	73 (54.5)	61 (45.5)	P < 0.001
Need for orthodontic treatment	147 (59.0)	102 (41.0)	
IOTN– Aesthetic component - adolescent			
No/slight need for orthodontic treatment	651 (41.7)	912 (58.3)	X^2= 19.13
Moderate need for orthodontic treatment	38 (59.4)	26 (40.6)	P < 0.001
Need for orthodontic treatment	32 (66.7)	16 (33.3)	
IOTN– Dental health component			
No/slight need for orthodontic treatment	397 (38.5)	634 (61.5)	X^2= 39.26
Moderate need for orthodontic treatment	151 (43.0)	200 (57.0)	P < 0.001
Need for orthodontic treatment	173 (59.0)	120 (41.0)	

Table 3.39 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and pattern of dental attendance and orthodontic treatment status using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Pattern of dental attendance			
Check ups mainly	249 (33.7)	489 (66.3)	
In trouble mainly	273 (46.8)	310 (53.2)	X^2= 47.87
Orthodontic visits	158 (57.5)	117 (42.5)	P < 0.001
Other	41 (51.9)	38 (48.1)	
Orthodontic treatment status			
Treated	78 (30.2)	180 (69.8)	X^2= 20.80
Having treatment	167 (46.8)	190 (53.2)	P < 0.001
Untreated	476 (44.9)	584 (55.1)	

Table 3.40 Bivariate analysis of the relationship between overall oral health impact (OHIP-14) and adolescents' oral health status using the Chi squared test.

Variable	Impact n (%)	No impact n (%)	Test statistic (x^2) Significance level (P)
Dental trauma			
Yes	43 (38.4)	69 (61.6)	X^2= 1.06
No	678 (43.4)	885 (56.6)	P < 0.303
Satisfaction with colour of teeth			
Satisfied	410 (37.1)	694 (62.9)	X^2= 46.09
Dissatisfied	311 (54.5)	260 (45.5)	P < 0.001
Satisfaction with size of teeth			
Satisfied	593 (40.5)	872 (59.5)	X^2= 31.41
Dissatisfied	128 (61.0)	82 (39.0)	P < 0.001

3.6 The relationship between satisfaction with dental appearance and adolescents' orthodontic treatment status

The results of the simple and the multiple regression analyses in the study of the relationship between adolescent's satisfaction with dental appearance and orthodontic treatment status are summarised in Tables 3.41 and 3.42.

The primary purpose of using multiple regression in the statistical analysis of data was to study the effect of orthodontic treatment, the main explanatory variable, on adolescent's satisfaction with dental appearance. Because satisfaction with dental appearance is also related to other variables, it was necessary to adjust for the effect of these variables (confounding variables). Although the interest was focused on adolescent's orthodontic treatment status, the fact that some potential confounder variables may turn out to be important exposures was also taken into consideration.

The first stage in the assessment of the relationship between the explanatory variables against the outcome measure was to perform a simple logistic regression. The results showed a highly significant association between the outcome variable, satisfaction with dental appearance, and all explanatory variables (Tables 3.41 and 3.42).

The next step was to carry out a multiple regression analysis including orthodontic treatment status and the significant confounding variables for satisfaction with dental appearance in the model in four stages. The results showed that orthodontic treatment status remained significant after adjusting for all variables ($P < 0.001$) (Table 3.42, Stage 4). Adolescents who had orthodontic treatment were 2.95 times (95% CI = 1.77 - 4.90) more likely to be satisfied with their dental appearance than those adolescents who never had orthodontic treatment. Gender also remained statistically significant associated with satisfaction with dental appearance ($P < 0.003$). Adolescents who were male were 1.52 times (95% CI = 1.14 - 2.01) more satisfied with their dental appearance than females (Table 3.42, Stage 4).

Adolescents who reported a high level of self-esteem (OR = 1.51, 95% CI = 1.14 - 2.00), those who were satisfied with their height (OR = 2.28, 95% CI = 1.16 - 4.46), those who were satisfied with their looks (OR = 2.50, 95% CI = 1.27 - 4.91), those who reported no teasing experience (OR = 2.14, 95% CI = 1.42 - 3.20) were more satisfied with the appearance of their teeth (Table 3.42, Stage 4).

The probability of being more satisfied with dental appearance was higher among

adolescents with no need for orthodontic treatment according to the dental health component of the IOTN index (OR = 5.43, 95% CI = 3.87 - 7.62). Adolescents who were satisfied with the colour of their teeth (OR = 3.63, 95% CI = 2.76 - 4.76) and also with the size of their teeth (OR = 1.88, 95% CI = 1.30 - 2.73) had a higher level of satisfaction with their dental appearance (Table 3.42, Stage 4). The model including all the confounder variables explained 23% of the variation in satisfaction with dental appearance.

3.7 The relationship between overall oral health impact (OIDP) and adolescents' orthodontic treatment status

The results of the simple and the multiple regression analysis in the study of the relationship between adolescent's overall oral health impact, assessed by the OIDP oral health related quality of life measure, and orthodontic treatment status are summarised in Tables 3.43 and 3.44.

The primary purpose of using multiple regression in the statistical analysis of data was to study the effect of orthodontic treatment, the main explanatory variable, on adolescent's overall oral health impact. Because dental impact is also related to other variables, it was necessary to adjust for the effect of these variables (confounding variables). Although the interest was focused on adolescent's orthodontic treatment status, the fact that some potential confounding variables may turn out to be important exposures was also taken into consideration.

The first stage in the assessment of the relationship between the explanatory

variables against the outcome measure was to perform a simple logistic regression. The results showed a highly significant association between the outcome variable, overall oral health impact, and all explanatory variables (Tables 3.43 and 3.44).

The next step was to carry out a multiple regression analysis including orthodontic treatment status and the significant confounding variables for overall oral health impact in the model in four stages. The results showed that orthodontic treatment status remained significant after adjusting for all variables ($P < 0.008$) (Table 3.44, Stage 4). Adolescents who never had orthodontic treatment were 1.43 times (95% CI = 1.01 - 2.02) more likely to report having experienced one or more dental impacts on their daily lives than those adolescents who had orthodontic treatment. The association between age and adolescent's overall oral health impact was of borderline significance ($P < 0.048$). Adolescents who were 15 years old had 1.27 times (95% CI = 1.00 - 1.61) more dental impacts than those aged 16 years (Table 3.44, Stage 4).

Adolescents who reported a low level of self-esteem (OR = 1.45, 95% CI = 1.15 - 1.82) and those who have reported a teasing experience (OR = 1.57, 95% CI = 1.10 - 2.24) also reported more overall oral health impacts on their daily life activities (Table 3.44, Stage 4).

The probability of reporting more dental impact was higher among adolescents with need for orthodontic treatment according to the dental health component of the IOTN index (OR = 2.65, 95% CI = 1.97 - 3.56). Adolescents who were

dissatisfied with the colour of their teeth (OR = 2.32, 95% CI = 1.84 - 2.92) and also with the size of their teeth (OR = 1.97, 95% CI = 1.43 - 2.72) had a higher level of dental impact. Adolescents with dental trauma were 2.23 times (95% CI = 1.47 - 3.40) more likely to report dental impact than those with no dental trauma. The model including all confounder variables explained 13% of the variation in adolescent's overall oral health impact. All other variables were not significant (Table 3.44, Stage 4).

3.8 The relationship between overall oral health impact (OHIP-14) and adolescents' orthodontic treatment status

The results of the simple and the multiple regression analysis in the study of the relationship between adolescent's overall oral health impact, assessed by the OIHP-14 oral health related quality of life measure, and orthodontic treatment status are summarised in Tables 3.45 and 3.46.

The primary purpose of using multiple regression in the statistical analysis of data was to study the effect of orthodontic treatment, the main explanatory variable, on adolescent's overall oral health impact. Because overall oral health impact is also related to other variables, it was necessary to adjust for the effect of these variables (confounding variables). Although the interest was focused on adolescent's orthodontic treatment status, the fact that some potential confounding variables may turn out to be important exposures was also taken into consideration.

The first stage in the assessment of the relationship between the explanatory

variables against the outcome measure was to perform a simple logistic regression. The results showed a highly significant association between the outcome variable, overall oral health impact, and all explanatory variables (Tables 3.45 and 3.46).

The next step was to carry out a multiple regression analysis including orthodontic treatment status and the significant confounding variables for overall oral health impact in the model in four stages. The results showed that orthodontic treatment status remained significant after adjusting for all variables ($P < 0.002$) (Table 3.46, Stage 4). Adolescents who never had orthodontic treatment (OR = 1.39, 95% CI = 1.01 – 1.90) and those who were having treatment (OR = 1.85, 95% CI = 1.30 - 2.62) were more likely to report having experienced one or more dental impacts on their daily lives than those adolescents who had orthodontic treatment. Adolescents from public schools reported 1.38 times (95% CI = 1.08 - 1.76) more dental impacts than those adolescents from private schools (Table 3.46, Stage 4).

Adolescents who reported a low level of self-esteem (OR = 1.42, 95% CI = 1.15 - 1.75) and those who have reported a teasing experience (OR = 1.69, 95% CI = 1.20 – 2.38) also reported more overall oral health impacts on their daily life activities (Table 3.46, Stage 4).

The probability of reporting more overall oral health impact was higher among adolescents with need for orthodontic treatment according to the dental health component of the IOTN index (OR = 1.46, 95% CI = 1.09 – 1.94). Adolescents who were dissatisfied with the colour of their teeth (OR = 1.36, 95% CI = 1.09 –

1.69) had a higher level of overall oral health impact. The model including all confounder variables explained 10% of the variation in adolescent's overall oral health impact. All other variables were not significant (Table 3.46, Stage 4).

3.9 The relationship between normative orthodontic treatment need and a measure of oral health related quality of life

Multiple regression was performed in the statistical analysis of data in order to study the effect of using a measure of oral health related quality of life in conjunction with a normative orthodontic treatment need measure on adolescent's satisfaction with dental appearance. Because satisfaction with dental appearance is also related to other variables, it was necessary to adjust for the effect of these variables (confounding variables). Although the interest was focused on the relationship between normative orthodontic treatment need and a measure of oral health related quality of life, the fact that some potential confounding variables may turn out to be important exposures was also taken into consideration.

The first step in the assessment of the relationship between the explanatory variables against the outcome measure was to perform a simple logistic regression. The results showed a highly significant association between the outcome variable, satisfaction with dental appearance, and all explanatory variables (Table 3.47 and Table 3.48, Stage 2).

The next step in the data analysis was to carry out a multiple regression analysis including a normative orthodontic treatment need measure, an oral health related quality of life measure and the significant confounding variables for satisfaction with dental appearance in the model in two stages. Because the two oral health related quality of life measures (OIDP and OHIP-14) were studied in the present study, two different models were built up.

The results showed that both oral health related quality of life measures used in the present study remained significant after adjusting for all variables ($P < 0.001$) (Table 3.47 and Table 3.48, Stage 2). Adolescents who reported no overall oral health impact on their daily lives were 2.98 times (95% CI = 2.25 - 3.96), according to the OIDP (Table 3.47, Stage 2), and 2.46 times (95% CI = 1.85 - 3.29), according to the OHIP-14 (Table 3.48, Stage 2), more likely to be satisfied with their dental appearance than those adolescents who had a overall oral health impact.

Because there was no interaction between the normative measure and both oral health related quality of life measures, the final models presented in Tables 3.47 and 3.48 (Stage 2) were considered the best models. Thus, each variable is independent and adding them together into the models resulted in an additional improvement in the fitting of the models. In other words, the use of a normative measure in conjunction with an oral health related quality of life measure provides a clearer indication of adolescent's satisfaction with appearance than a normative measure alone.

The final model (Stage 2, Table 3.47 and 3.48) explained 25% of the variation of adolescents' satisfaction with dental appearance.

3.10 Summary

1. Oral health related impacts were reasonably prevalent among the adolescents studied.

2. Adolescents who had orthodontic treatment were more satisfied with their dental appearance than those who were currently in treatment or those who never had orthodontic treatment.

3. Adolescents who had orthodontic treatment reported less overall oral health impacts on their daily lives than those who were currently under treatment and those who never had orthodontic treatment.

4. No significant association was found between adolescents' satisfaction with dental appearance and social class.

5. No significant association was found between adolescents' overall oral health impact and social class.

6. Adolescents who were considered to be in no need for orthodontic treatment according to the dental health component of the IOTN index were satisfied with the appearance of their teeth.

7. Adolescents who were considered to be in need for orthodontic treatment according to the dental health component of the IOTN index were dissatisfied with the appearance of their teeth.

8. The use of the dental health component of the IOTN index in conjunction with the OIDP oral health related quality of life measure is strongly associated with adolescents' satisfaction with dental appearance than the IOTN index being used alone.

9. The use of the dental health component of the IOTN index in conjunction with the OHIP-14 oral health related quality of life measure is strongly associated with adolescents' satisfaction with dental appearance than the IOTN index being used alone.

The following chapter will present the discussion of the main results and concluding remarks, including implications for public health policy and suggestions for future research.

Table 3.41 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' satisfaction with dental appearance (n= 1675) – Stages 1 and 2.

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Untreated	767 (72.4)	293 (27.6)	1	0.001	1	0.001	1	0.001
Treated	236 (91.5)	22 (8.5)	4.10 (2.60- 6.47)	0.001	3.82 (2.40- 6.08)	0.001	4.03 (2.50- 6.53)	0.001
Having treatment	296 (82.9)	61 (17.1)	1.85 (1.36- 2.52)	0.001	1.71 (1.24- 2.35)	0.001	2.06 (1.47- 2.89)	0.001
Sex								
Female	710 (74.7)	241 (25.3)	1		1		1	
Male	589 (81.4)	135 (18.6)	1.48 (1.17- 1.88)	0.001	1.60 (1.25- 2.04)	0.001	1.66 (1.28- 2.15)	0.001
Social class								
Low	580 (72.5)	220 (27.5)	1		1		1	
High	719 (82.2)	156 (17.8)	1.75 (1.39- 2.21)	0.001	1.41 (1.10- 1.80)	0.006	1.27 (0.98- 1.64)	0.062
Family size								
5 or more people	548 (73.9)	194 (26.1)	1		1		1	
Up to 4 people	751 (80.5)	182 (19.5)	1.46 (1.16- 1.84)	0.001	1.39 (1.10- 1.76)	0.006	1.38 (1.08- 1.77)	0.010
Health								
Poor	6 (75.0)	2 (25.0)	1	0.024			1	0.169
Good	1256 (78.1)	352 (21.9)	1.19 (0.24- 5.92)	0.832			0.54 (0.09- 3.10)	0.492
Fair	37 (62.7)	22 (37.3)	0.56 (0.10- 3.02)	0.501			0.31 (0.05- 1.96)	0.217
Height								
Poor	52 (60.5)	34 (39.5)	1	0.001			1	0.081
Good	1110 (78.8)	299 (21.2)	2.42 (1.54- 3.81)	0.001			1.72 (1.04- 2.82)	0.033
Fair	137 (76.1)	43 (23.9)	2.08 (1.20- 3.61)	0.009			1.88 (1.02- 3.45)	0.041
Looks								
Poor	27 (47.4)	30 (52.6)	1	0.001			1	0.001
Good	1148 (80.3)	282 (19.7)	4.52 (2.65- 7.73)	0.001			3.32 (1.83- 6.05)	0.001
Fair	124 (66.0)	64 (34.0)	2.15 (1.18- 3.92)	0.012			1.77 (0.91- 3.44)	0.092

***Stage 1** - Adjusted for sex, social class and family size.

****Stage 2** - Adjusted for sex, social class, family size, health, height, looks, level of self- esteem and teasing experience.

Table 3.41 (continued).

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Level of self-esteem								
Low	561 (71.5)	224 (28.5)	1				1	
High	738 (82.9)	152 (17.1)	1.94 (1.54- 2.45)	0.001			1.53 (1.19- 1.98)	0.001
Teasing experience								
Yes	95 (54.9)	78 (45.1)	1				1	
No	1204 (80.2)	298 (19.8)	3.31 (2.40- 4.59)	0.001			3.29 (2.31- 4.70)	0.001
IOTN/ Dental health component								
Need	147 (50.2)	146 (49.8)	1	0.001				
No/slight need	901 (87.4)	130 (12.6)	6.88 (5.13- 9.23)	0.001				
Moderate need	251 (71.5)	100 (28.5)	2.50 (1.80- 3.45)	0.001				
Satisfaction with colour of teeth								
Dissatisfied	340 (59.5)	231 (40.5)	1					
Satisfied	959 (86.9)	145 (13.1)	4.49 (3.53- 5.72)	0.001				
Satisfaction with size of teeth								
Dissatisfied	120 (57.1)	90 (42.9)	1					
Satisfied	1179 (80.5)	286 (19.5)	3.09 (2.28- 4.18)	0.001				

***Stage 1** - Adjusted for sex, social class and family size.
****Stage 2** - Adjusted for sex, social class, family size, health, height, looks, level of self- esteem and teasing experience.

Table 3.42 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' satisfaction with dental appearance (n= 1675) – Stages 3 and 4.

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Untreated	767 (72.4)	293 (27.6)	1	0.001	1	0.001	1	0.001
Treated	236 (91.5)	22 (8.5)	4.10 (2.60- 6.47)	0.001	2.81 (1.72- 4.61)	0.001	2.95 (1.77- 4.90)	0.001
Having treatment	296 (82.9)	61 (17.1)	1.85 (1.36- 2.52)	0.001	1.62 (1.13- 2.30)	0.008	1.45 (1.00- 2.09)	0.049
Sex								
Female	710 (74.7)	241 (25.3)	1		1		1	
Male	589 (81.4)	135 (18.6)	1.48 (1.17- 1.88)	0.001	1.70 (1.29- 2.22)	0.001	1.52 (1.14- 2.01)	0.003
Social class								
Low	580 (72.5)	220 (27.5)	1		1		1	
High	719 (82.2)	156 (17.8)	1.75 (1.39- 2.21)	0.001	1.16 (0.89- 1.52)	0.266	1.15 (0.87- 1.53)	0.315
Family size								
5 or more people	548 (73.9)	194 (26.1)	1		1		1	
Up to 4 people	751 (80.5)	182 (19.5)	1.46 (1.16- 1.84)	0.001	1.36 (1.05- 1.76)	0.020	1.27 (0.97- 1.66)	0.083
Health								
Poor	6 (75.0)	2 (25.0)	1	0.024	1	0.400	1	0.642
Good	1256 (78.1)	352 (21.9)	1.19 (0.24- 5.92)	0.832	0.83 (0.15- 4.61)	0.834	0.87 (0.13- 5.63)	0.888
Fair	37 (62.7)	22 (37.3)	0.56 (0.10- 3.02)	0.501	0.53 (0.08- 3.27)	0.536	0.64 (0.09- 4.54)	0.653
Height								
Poor	52 (60.5)	34 (39.5)	1	0.001	1	0.049	1	0.039
Good	1110 (78.8)	299 (21.2)	2.42 (1.54- 3.81)	0.001	1.87 (1.11- 3.16)	0.018	1.94 (1.11- 3.36)	0.019
Fair	137 (76.1)	43 (23.9)	2.08 (1.20- 3.61)	0.009	2.04 (1.08- 3.86)	0.028	2.28 (1.16- 4.46)	0.016
Looks								
Poor	27 (47.4)	30 (52.6)	1	0.001	1	0.001	1	0.001
Good	1148 (80.3)	282 (19.7)	4.52 (2.65- 7.73)	0.001	3.47 (1.84- 6.55)	0.001	2.50 (1.27- 4.91)	0.008
Fair	124 (66.0)	64 (34.0)	2.15 (1.18- 3.92)	0.012	1.59 (0.79- 3.21)	0.192	1.19 (0.56- 2.52)	0.641

***Stage 3** - Adjusted for sex, social class, family size, health, height, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.
****Stage 4** - Adjusted for all variables listed above.

Table 3.42 (continued).

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Level of self-esteem								
Low	561 (71.5)	224 (28.5)	1		1		1	
High	738 (82.9)	152 (17.1)	1.94 (1.54- 2.45)	0.001	1.67 (1.28- 2.19)	0.001	1.51 (1.14- 2.00)	0.004
Teasing experience								
Yes	95 (54.9)	78 (45.1)	1		1		1	
No	1204 (80.2)	298 (19.8)	3.31 (2.40- 4.59)	0.001	2.54 (1.74- 3.71)	0.001	2.14 (1.42- 3.20)	0.001
IOTN/ Dental health component								
Need	147 (50.2)	146 (49.8)	1	0.001	1	0.001	1	0.001
No/slight need	901 (87.4)	130 (12.6)	6.88 (5.13- 9.23)	0.001	6.04 (4.37- 8.35)	0.001	5.43 (3.87- 7.62)	0.001
Moderate need	251 (71.5)	100 (28.5)	2.50 (1.80- 3.45)	0.001	2.32 (1.63- 3.29)	0.001	1.97 (1.36- 2.85)	0.001
Satisfaction with colour of teeth								
Dissatisfied	340 (59.5)	231 (40.5)	1				1	
Satisfied	959 (86.9)	145 (13.1)	4.49 (3.53- 5.72)	0.001			3.63 (2.76- 4.76)	0.001
Satisfaction with size of teeth								
Dissatisfied	120 (57.1)	90 (42.9)	1				1	
Satisfied	1179 (80.5)	286 (19.5)	3.09 (2.28- 4.18)	0.001			1.88 (1.30- 2.73)	0.001

*Stage 3 - Adjusted for sex, social class, family size, health, height, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.
**Stage 4 - Adjusted for all variables listed above.

Table 3.43 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' overall oral health impact according to the OIDP oral health related quality of life measure (n=1675) – Stages 1 and 2.

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Treated	58 (22.5)	200 (77.5)	1	0.001	1	0.001	1	0.005
Having treatment	128 (35.9)	229 (64.1)	1.93 (1.34- 2.77)	0.001	1.92 (1.33- 2.77)	0.001	1.73 (1.19- 2.51)	0.004
Untreated	363 (34.2)	697 (65.8)	1.80 (1.31- 2.47)	0.001	1.72 (1.24- 2.38)	0.001	1.70 (1.21- 2.37)	0.002
Age								
16 years old	164 (29.0)	401 (71.0)	1		1		1	
15 years old	385 (34.7)	725 (65.3)	1.30 (1.04- 1.62)	0.020	1.28 (1.03- 1.61)	0.025	1.28 (1.02- 1.60)	0.033
Sex								
Male	214 (29.6)	510 (70.4)	1		1		1	
Female	335 (35.2)	616 (64.8)	1.30 (1.05- 1.60)	0.014	1.29 (1.04- 1.59)	0.017	1.32 (1.06- 1.63)	0.013
Social class								
High	259 (29.6)	616 (70.4)	1		1		1	
Low	290 (36.3)	510 (63.8)	1.35 (1.10- 1.66)	0.004	1.28 (1.03- 1.60)	0.022	1.22 (0.98- 1.52)	0.078
Health								
Good	520 (32.3)	1088 (67.7)	1	0.047			1	0.213
Fair	23 (39.0)	36 (61.0)	1.34 (0.78- 2.28)	0.286			1.14 (0.65- 1.99)	0.646
Poor	6 (75.0)	2 (25.0)	6.27 (1.26- 30.0)	0.025			4.16 (0.81- 21.38)	0.088
Looks								
Good	442 (30.9)	988 (69.1)	1	0.001			1	0.062
Fair	80 (42.6)	108 (57.4)	1.66 (1.21- 2.26)	0.001			1.39 (1.00- 1.94)	0.048
Poor	27 (47.4)	30 (52.6)	2.01 (1.18- 3.42)	0.010			1.53 (0.88- 2.68)	0.136
Level of self-esteem								
High	243 (27.3)	647 (72.7)	1				1	
Low	306 (39.0)	479 (61.0)	1.70 (1.39- 2.09)	0.001			1.50 (1.21- 1.87)	0.001

***Stage 1** - Adjusted for age, sex and social class.

****Stage 2** - Adjusted for age, sex, social class, health, looks, level of self- esteem and teasing experience.

Table 3.43 (continued).

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Teasing experience								
No	459 (30.6)	1043 (69.4)	1				1	
Yes	90 (52.0)	83 (48.0)	2.46 (1.80- 3.39)	0.001			2.21 (1.60- 3.08)	0.001
IOTN/ Dental health component								
No/slight need	276 (26.8)	755 (73.2)	1	0.001				
Moderate need	116 (33.0)	235 (67.0)	1.35 (1.04- 1.75)	0.024				
Need	157 (53.6)	136 (46.4)	3.16 (2.42- 4.13)	0.001				
Dental trauma								
No	497 (31.8)	1066 (68.2)	1					
Yes	52 (46.4)	60 (53.6)	1.86 (1.26- 2.74)	0.002				
Satisfaction with colour of teeth								
Satisfied	276 (25.0)	828 (75.0)	1					
Dissatisfied	273 (47.8)	298 (52.2)	2.75 (2.22- 3.40)	0.001				
Satisfaction with size of teeth								
Satisfied	436 (29.8)	1029 (70.2)	1					
Dissatisfied	113 (53.8)	97 (46.2)	2.75 (2.05- 6.68)	0.001				

***Stage 1** - Adjusted for age, sex and social class.
****Stage 2** - Adjusted for age, sex, social class, health, looks, level of self- esteem and teasing experience.

Table 3.44 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' overall oral health impact according to the OIDP oral health related quality of life measure (n=1675) – Stages 3 and 4.

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Treated	58 (22.5)	200 (77.5)	1	0.001	1	0.039	1	0.008
Having treatment	128 (35.9)	229 (64.1)	1.93 (1.34- 2.77)	0.001	1.63 (1.12- 2.38)	0.011	1.84 (1.25- 2.72)	0.002
Untreated	363 (34.2)	697 (65.8)	1.80 (1.31- 2.47)	0.001	1.39 (0.99- 1.96)	0.058	1.43 (1.01- 2.02)	0.045
Age								
16 years old	164 (29.0)	401 (71.0)	1		1		1	
15 years old	385 (34.7)	725 (65.3)	1.30 (1.04- 1.62)	0.020	1.26 (1.01- 1.60)	0.045	1.27 (1.00- 1.61)	0.048
Sex								
Male	214 (29.6)	510 (70.4)	1		1		1	
Female	335 (35.2)	616 (64.8)	1.30 (1.05- 1.60)	0.014	1.33 (1.06- 1.65)	0.012	1.25 (0.99- 1.57)	0.054
Social class								
High	259 (29.6)	616 (70.4)	1		1		1	
Low	290 (36.3)	510 (63.8)	1.35 (1.10- 1.66)	0.004	1.16 (0.93- 1.45)	0.198	1.14 (0.91- 1.45)	0.244
Health								
Good	520 (32.3)	1088 (67.7)	1	0.047	1	0.163	1	0.115
Fair	23 (39.0)	36 (61.0)	1.34 (0.78- 2.28)	0.286	1.05 (0.59- 1.86)	0.875	0.97 (0.54- 1.75)	0.923
Poor	6 (75.0)	2 (25.0)	6.27 (1.26- 30.0)	0.025	4.84 (0.95- 24.55)	0.057	5.79 (1.10- 30-43)	0.038
Looks								
Good	442 (30.9)	988 (69.1)	1	0.001	1	0.049	1	0.126
Fair	80 (42.6)	108 (57.4)	1.66 (1.21- 2.26)	0.001	1.46 (1.04- 2.04)	0.027	1.43 (1.01- 2.02)	0.042
Poor	27 (47.4)	30 (52.6)	2.01 (1.18- 3.42)	0.010	1.47 (0.83- 2.60)	0.190	1.09 (0.60- 1.98)	0.786
Level of self-esteem								
High	243 (27.3)	647 (72.7)	1		1		1	
Low	306 (39.0)	479 (61.0)	1.70 (1.39- 2.09)	0.001	1.57 (1.26- 1.95)	0.001	1.45 (1.15- 1.82)	0.001

***Stage 3** - Adjusted for age, sex, social class, health, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.
****Stage 4** - Adjusted for all variables listed above.

Table 3.44 (continued).

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Teasing experience								
No	459 (30.6)	1043 (69.4)	1		1		1	
Yes	90 (52.0)	83 (48.0)	2.46 (1.80- 3.39)	0.001	1.85 (1.31- 2.59)	0.001	1.57 (1.10- 2.24)	0.013
IOTN/ Dental health component								
No/slight need	276 (26.8)	755 (73.2)	1	0.001	1	0.001	1	0.001
Moderate need	116 (33.0)	235 (67.0)	1.35 (1.04- 1.75)	0.024	1.35 (1.03- 1.77)	0.031	1.38 (1.04- 1.82)	0.026
Need	157 (53.6)	136 (46.4)	3.16 (2.42- 4.13)	0.001	2.95 (2.22- 3.93)	0.001	2.65 (1.97- 3.56)	0.001
Dental trauma								
No	497 (31.8)	1066 (68.2)	1				1	
Yes	52 (46.4)	60 (53.6)	1.86 (1.26- 2.74)	0.002			2.23 (1.47- 3.40)	0.001
Satisfaction with colour of teeth								
Satisfied	276 (25.0)	828 (75.0)	1				1	
Dissatisfied	273 (47.8)	298 (52.2)	2.75 (2.22- 3.40)	0.001			2.32 (1.84- 2.92)	0.001
Satisfaction with size of teeth								
Satisfied	436 (29.8)	1029 (70.2)	1				1	
Dissatisfied	113 (53.8)	97 (46.2)	2.75 (2.05- 6.68)	0.001			1.97 (1.43- 2.72)	0.001

***Stage 3** - Adjusted for age, sex, social class, health, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.
****Stage 4** - Adjusted for all variables listed above.

Table 3.45 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' overall oral health impact according to the OHIP-14 oral health related quality of life measure (n= 1675) – Stages 1 and 2.

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Treated	78 (30.2)	180 (69.8)	1	0.001	1	0.001	1	0.003
Having treatment	167 (46.8)	190 (53.2)	2.02 (1.44- 2.84)	0.001	1.98 (1.41- 2.79)	0.001	1.83 (1.29- 2.59)	0.001
Untreated	476 (44.9)	584 (55.1)	1.88 (1.40- 2.51)	0.001	1.48 (1.09- 2.01)	0.012	1.47 (1.07- 2.01)	0.015
Sex								
Male	288 (39.8)	436 (60.2)	1		1		1	
Female	433 (45.5)	518 (54.5)	1.27 (1.04- 1.54)	0.019	1.08 (0.88- 1.32)	0.444	1.07 (0.87- 1.31)	0.448
Type of school								
Private	280 (38.1)	455 (61.9)	1		1		1	
Public	441 (46.9)	499 (53.1)	1.44 (1.18- 1.75)	0.001	1.49 (1.18- 1.89)	0.001	1.47 (1.16- 1.87)	0.002
Family size								
Up to 4 people	375 (40.2)	558 (59.8)	1		1		1	
5 or more people	346 (46.6)	396 (53.4)	1.30 (1.07- 1.58)	0.008	1.18 (0.96- 1.43)	0.103	1.16 (0.95- 1.42)	0.143
Level of education of the mother								
University and post-graduate	167 (38.1)	271 (61.9)	1	0.002	1	0.179	1	0.313
Secondary	175 (39.6)	267 (60.4)	1.06 (0.81- 1.39)	0.656	1.12 (0.84- 1.49)	0.411	1.03 (0.86- 1.54)	0.327
Primary (2nd phase)	130 (45.3)	157 (54.7)	1.34 (0.99- 1.81)	0.055	1.21 (0.86- 1.69)	0.267	1.26 (0.84- 1.68)	0.315
Illiterate and primary (1st phase)	249 (49.0)	259 (51.0)	1.57 (1.20- 2.02)	0.001	1.40 (1.03- 1.91)	0.031	1.47 (0.98- 1.85)	0.060
Height								
Good	584 (41.4)	825 (58.6)	1	0.001			1	0.057
Fair	83 (46.1)	97 (53.9)	1.21 (0.88- 1.65)	0.233			1.03 (0.74- 1.44)	0.828
Poor	54 (62.8)	32 (37.2)	2.38 (1.52- 3.73)	0.001			1.76 (1.11- 2.80)	0.017
Looks								
Good	574 (40.1)	856 (59.9)	1	0.001			1	0.207
Fair	108 (57.4)	80 (42.6)	2.01 (1.48- 2.74)	0.001			1.25 (0.90- 1.74)	0.173
Poor	39 (68.4)	18 (31.6)	3.23 (1.83- 5.70)	0.001			1.43 (0.81- 2.54)	0.209

*Stage 1 - Adjusted for sex, type of school, family size and level of education of the mother.

**Stage 2 - Adjusted for sex, type of school, family size, level of education of the mother, height, looks, level of self- esteem and teasing experience.

Table 3.45 (continued).

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Level of self-esteem								
High	315 (35.4)	575 (64.6)	1				1	
Low	406 (51.7)	379 (48.3)	1.95 (1.61- 2.38)	0.001			1.44 (1.17- 1.77)	0.001
Teasing experience								
No	585 (38.9)	917 (61.1)	1				1	
Yes	136 (78.6)	37 (21.4)	5.76 (3.95- 8.41)	0.001			2.01 (1.37- 2.68)	0.001
IOTN/ Dental health component								
No/slight need	397 (38.5)	634 (61.5)	1	0.001				
Moderate need	151 (43.0)	200 (57.0)	1.20 (0.94- 1.54)	0.136				
Need	173 (59.0)	120 (41.0)	2.30 (1.77- 2.99)	0.001				
Satisfaction with colour of teeth								
Satisfied	410 (37.1)	694 (62.9)	1					
Dissatisfied	311 (54.5)	260 (45.5)	2.03 (1.65- 2.49)	0.001				
Satisfaction with size of teeth								
Satisfied	593 (40.5)	872 (59.5)	1					
Dissatisfied	128 (61.0)	82 (39.0)	2.30 (1.70- 3.08)	0.001				

*__Stage 1__ - Adjusted for sex, type of school, family size and level of education of the mother.

**__Stage 2__ - Adjusted for sex, type of school, family size, level of education of the mother, height, looks, level of self- esteem and teasing experience.

Table 3.46 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' overall oral health impact according to the OHIP-14 oral health related quality of life measure (n= 1675) – Stages 3 and 4.

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Orthodontic treatment status								
Treated	78 (30.2)	180 (69.8)	1	0.001	1	0.004	1	0.002
Having treatment	167 (46.8)	190 (53.2)	2.02 (1.44- 2.84)	0.001	1.79 (1.26- 2.54)	0.001	1.85 (1.30- 2.62)	0.001
Untreated	476 (44.9)	584 (55.1)	1.88 (1.40- 2.51)	0.001	1.38 (1.01- 1.90)	0.045	1.39 (1.01- 1.90)	0.043
Sex								
Male	288 (39.8)	436 (60.2)	1		1		1	
Female	433 (45.5)	518 (54.5)	1.27 (1.04- 1.54)	0.019	1.07 (0.88- 1.31)	0.490	1.03 (0.84- 1.27)	0.725
Type of school								
Private	280 (38.1)	455 (61.9)	1		1		1	
Public	441 (46.9)	499 (53.1)	1.44 (1.18- 1.75)	0.001	1.41 (1.11- 1.80)	0.005	1.38 (1.08- 1.76)	0.010
Family size								
Up to 4 people	375 (40.2)	558 (59.8)	1		1		1	
5 or more people	346 (46.6)	396 (53.4)	1.30 (1.07- 1.58)	0.008	1.15 (0.94- 1.41)	0.160	1.14 (0.94- 1.39)	0.207
Level of education of the mother								
University and post-graduate	167 (38.1)	271 (61.9)	1	0.002	1	0.367	1	0.392
Secondary	175 (39.6)	267 (60.4)	1.06 (0.81- 1.39)	0.656	1.16 (0.87- 1.55)	0.302	1.15 (0.86- 1.54)	0.334
Primary (2^{nd} phase)	130 (45.3)	157 (54.7)	1.34 (0.99- 1.81)	0.055	1.16 (0.82- 1.64)	0.387	1.16 (0.82- 1.64)	0.391
Illiterate and primary (1^{st} phase)	249 (49.0)	259 (51.0)	1.57 (1.20- 2.02)	0.001	1.32 (0.96- 1.82)	0.078	1.32 (0.96- 1.81)	0.085
Height								
Good	584 (41.4)	825 (58.6)	1	0.001	1	0.052	1	0.058
Fair	83 (46.1)	97 (53.9)	1.21 (0.88- 1.65)	0.233	1.03 (0.74- 1.44)	0.841	1.01 (0.72- 1.41)	0.934
Poor	54 (62.8)	32 (37.2)	2.38 (1.52- 3.73)	0.001	1.78 (1.12- 2.84)	0.015	1.77 (1.10- 2.82)	0.017
Looks								
Good	574 (40.1)	856 (59.9)	1	0.001	1	0.210	1	0.385
Fair	108 (57.4)	80 (42.6)	2.01 (1.48- 2.74)	0.001	1.27 (0.91- 1.76)	0.154	1.23 (0.88- 1.71)	0.218
Poor	39 (68.4)	18 (31.6)	3.23 (1.83- 5.70)	0.001	1.40 (0.80- 2.48)	0.242	1.24 (0.69- 2.21)	0.457

*__Stage 3__ - Adjusted for sex, type of school, family size, level of education of the mother, height, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.

**__Stage 4__ - Adjusted for all variables listed above.

Table 3.46 (continued).

	Impact n (%)	No impact n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Level of self-esteem								
High	315 (35.4)	575 (64.6)	1		1		1	
Low	406 (51.7)	379 (48.3)	1.95 (1.61- 2.38)	0.001	1.46 (1.19- 1.80)	0.001	1.42 (1.15- 1.75)	0.001
Teasing experience								
No	585 (38.9)	917 (61.1)	1		1		1	
Yes	136 (78.6)	37 (21.4)	5.76 (3.95- 8.41)	0.001	1.80 (1.27- 2.51)	0.001	1.70 (1.20- 2.38)	0.001
IOTN/ Dental health component								
No/slight need	397 (38.5)	634 (61.5)	1	0.001	1	0.008	1	0.029
Moderate need	151 (43.0)	200 (57.0)	1.20 (0.94- 1.54)	0.136	1.18 (0.91- 1.52)	0.202	1.17 (0.91- 1.52)	0.211
Need	173 (59.0)	120 (41.0)	2.30 (1.77- 2.99)	0.001	1.55 (1.17- 2.05)	0.002	1.46 (1.09- 1.94)	0.009
Satisfaction with colour of teeth								
Satisfied	410 (37.1)	694 (62.9)	1				1	
Dissatisfied	311 (54.5)	260 (45.5)	2.03 (1.65- 2.49)	0.001			1.36 (1.09- 1.69)	0.006
Satisfaction with size of teeth								
Satisfied	593 (40.5)	872 (59.5)	1				1	
Dissatisfied	128 (61.0)	82 (39.0)	2.30 (1.70- 3.08)	0.001			1.30 (0.95- 1.77)	0.099

*Stage 3 - Adjusted for sex, type of school, family size, level of education of the mother, height, looks, level of self- esteem, teasing experience and normative orthodontic treatment need.

**Stage 4 - Adjusted for all variables listed above.

Table 3.47 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' satisfaction with dental appearance and the combined use of a measure of oral health related quality of life (OIDP) in conjunction with the IOTN index (n= 1675), stages 1 and 2.

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
IOTN/ Dental health component								
Need	147 (50.2)	146 (49.8)	1	0.001	1	0.001	1	0.001
No/slight need	901 (87.4)	130 (12.6)	6.88 (5.13- 9.23)	0.001	5.47 (4.02- 7.46)	0.001	4.66 (3.30- 6.58)	0.001
Moderate need	251 (71.5)	100 (28.5)	2.50 (1.80- 3.45)	0.001	2.02 (1.43- 2.85)	0.001	1.72 (1.17- 2.53)	0.005
OIDP								
Dental impact	317 (57.7)	232 (42.3)	1		1		1	
No dental impact	982 (87.2)	144 (12.8)	4.99 (3.92- 6.37)	0.001	4.23 (3.27- 5.46)	0.001	2.98 (2.25- 3.96)	0.001
Orthodontic treatment status								
Untreated	767 (72.4)	293 (27.6)	1	0.001			1	0.001
Treated	236 (91.5)	22 (8.5)	4.10 (2.60- 6.47)	0.001			2.70 (1.62- 4.49)	0.001
Having treatment	296 (82.9)	61 (17.1)	1.85 (1.36- 2.52)	0.001			1.63 (1.11- 2.39)	0.012
Sex								
Female	710 (74.7)	241 (25.3)	1				1	
Male	589 (81.4)	135 (18.6)	1.48 (1.17- 1.88)	0.001			1.44 (1.08- 1.93)	0.012
Family size								
5 or more people	548 (73.9)	194 (26.1)	1				1	
Up to 4 people	751 (80.5)	182 (19.5)	1.46 (1.16- 1.84)	0.001			1.27 (0.96- 1.68)	0.090
Social class								
Low	580 (72.5)	220 (27.5)	1				1	
High	719 (82.2)	156 (17.8)	1.75 (1.39- 2.21)	0.001			1.14 (0.85- 1.52)	0.392
Health								
Poor	6 (75.0)	2 (25.0)	1	0.024			1	0.568
Good	1256 (78.1)	352 (21.9)	1.19 (0.24- 5.92)	0.832			0.58 (0.08- 3.76)	0.565
Fair	37 (62.7)	22 (37.3)	0.56 (0.10- 3.02)	0.501			0.42 (0.06- 3.06)	0.395

***Stage 1** - Adjusted for overall oral health impact by the OIDP oral health related quality of life measure.

****Stage 2** - Adjusted for all variables listed above.

Table 3.47 (continued).

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Height								
Poor	52 (60.5)	34 (39.5)	1	0.001			1	0.044
Good	1110 (78.8)	299 (21.2)	2.42 (1.54- 3.81)	0.001			1.92 (1.08- 3.37)	0.024
Fair	137 (76.1)	43 (23.9)	2.08 (1.20- 3.61)	0.009			2.33 (1.17- 4.63)	0.016
Looks								
Poor	27 (47.4)	30 (52.6)	1	0.001			1	0.001
Good	1148 (80.3)	282 (19.7)	4.52 (2.65- 7.73)	0.001			2.58 (1.30- 5.15)	0.007
Fair	124 (66.0)	64 (34.0)	2.15 (1.18- 3.92)	0.012			1.30 (0.61- 2.80)	0.497
Level of self-esteem								
Low	561 (71.5)	224 (28.5)	1				1	
High	738 (82.9)	152 (17.1)	1.94 (1.54- 2.45)	0.001			1.40 (1.05- 1.88)	0.022
Teasing experience								
Yes	95 (54.9)	78 (45.1)	1				1	
No	1204 (80.2)	298 (19.8)	3.31 (2.40- 4.59)	0.001			1.94 (1.27- 2.95)	0.002
Satisfaction with colour of teeth								
Dissatisfied	340 (59.5)	231 (40.5)	1				1	
Satisfied	959 (86.9)	145 (13.1)	4.49 (3.53- 5.72)	0.001			3.07 (2.32- 4.07)	0.001
Satisfaction with size of teeth								
Dissatisfied	120 (57.1)	90 (42.9)	1				1	
Satisfied	1179 (80.5)	286 (19.5)	3.09 (2.28- 4.18)	0.001			1.63 (1.11- 2.40)	0.012

*__Stage 1__ - Adjusted for overall oral health impact by the OIDP oral health related quality of life measure.
**__Stage 2__ - Adjusted for all variables listed above.

Table 3.48 Frequency distribution and results of simple and multiple logistic regression of the variables included in the study of adolescents' satisfaction with dental appearance and the combined use of a measure of oral health related quality of life (OHIP-14) in conjunction wit the IOTN index (n= 1675), stages 1 and 2.

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
IOTN/ Dental health component								
Need	147 (50.2)	146 (49.8)	1	0.001	1	0.001	1	0.001
No/slight need	901 (87.4)	130 (12.6)	6.88 (5.13- 9.23)	0.001	6.08 (4.48- 8.25)	0.001	4.95 (3.51- 6.98)	0.001
Moderate need	251 (71.5)	100 (28.5)	2.50 (1.80- 3.45)	0.001	2.20 (1.56- 3.09)	0.001	1.86 (1.28- 2.72)	0.001
OHIP-14								
Dental impact	464 (64.4)	257 (35.6)	1		1		1	
No dental impact	835 (87.5)	119 (12.5)	3.89 (3.04- 4.97)	0.001	3.51 (2.17- 4.54)	0.001	2.46 (1.85- 3.29)	0.001
Orthodontic treatment status								
Untreated	767 (72.4)	293 (27.6)	1	0.001			1	0.001
Treated	236 (91.5)	22 (8.5)	4.10 (2.60- 6.47)	0.001			3.05 (1.83- 5.09)	0.001
Having treatment	296 (82.9)	61 (17.1)	1.85 (1.36- 2.52)	0.001			1.67 (1.15- 2.43)	0.007
Sex								
Female	710 (74.7)	241 (25.3)	1				1	
Male	589 (81.4)	135 (18.6)	1.48 (1.17- 1.88)	0.001			1.48 (1.12- 1.98)	0.007
Family size								
5 or more people	548 (73.9)	194 (26.1)	1				1	
Up to 4 people	751 (80.5)	182 (19.5)	1.46 (1.16- 1.84)	0.001			1.20 (0.91- 1.59)	0.192
Social class								
Low	580 (72.5)	220 (27.5)	1				1	
High	719 (82.2)	156 (17.8)	1.75 (1.39- 2.21)	0.001			1.13 (0.84- 1.50)	0.423
Health								
Poor	6 (75.0)	2 (25.0)	1	0.024			1	0.605
Good	1256 (78.1)	352 (21.9)	1.19 (0.24- 5.92)	0.832			0.83 (0.14- 5.03)	0.837
Fair	37 (62.7)	22 (37.3)	0.56 (0.10- 3.02)	0.501			0.59 (0.08- 3.99)	0.591

***Stage 1** - Adjusted for overall oral health impact by the OHIP-14 oral health related quality of life measure.

****Stage 2** - Adjusted for all variables listed above.

Table 3.48 (continued).

	Satisfied n (%)	Dissatisfied n (%)	Unadjusted OR (95% C.I.)	P	Adjusted OR* (95% C.I)	P	Adjusted OR** (95% C.I)	P
Height								
Poor	52 (60.5)	34 (39.5)	1	0.001			1	0.102
Good	1110 (78.8)	299 (21.2)	2.42 (1.54- 3.81)	0.001			1.75 (0.99- 3.08)	0.052
Fair	137 (76.1)	43 (23.9)	2.08 (1.20- 3.61)	0.009			2.05 (1.03- 4.05)	0.040
Looks								
Poor	27 (47.4)	30 (52.6)	1	0.001			1	0.001
Good	1148 (80.3)	282 (19.7)	4.52 (2.65- 7.73)	0.001			2.33 (1.17- 4.63)	0.016
Fair	124 (66.0)	64 (34.0)	2.15 (1.18- 3.92)	0.012			1.23 (0.57- 2.63)	0.593
Level of self-esteem								
Low	561 (71.5)	224 (28.5)	1				1	
High	738 (82.9)	152 (17.1)	1.94 (1.54- 2.45)	0.001			1.39 (1.04- 1.85)	0.027
Teasing experience								
Yes	95 (54.9)	78 (45.1)	1				1	
No	1204 (80.2)	298 (19.8)	3.31 (2.40- 4.59)	0.001			1.67 (1.09- 2.53)	0.017
Satisfaction with colour of teeth								
Dissatisfied	340 (59.5)	231 (40.5)	1				1	
Satisfied	959 (86.9)	145 (13.1)	4.49 (3.53- 5.72)	0.001			3.34 (2.53- 4.41)	0.001
Satisfaction with size of teeth								
Dissatisfied	120 (57.1)	90 (42.9)	1				1	
Satisfied	1179 (80.5)	286 (19.5)	3.09 (2.28- 4.18)	0.001			1.77 (1.21- 2.59)	0.003

*__Stage 1__ - Adjusted for overall oral health impact by the OHIP-14 oral health related quality of life measure.
**__Stage 2__ - Adjusted for all variables listed above.

Chapter 4

Discussion and Conclusions

4.1 Introduction

This chapter is divided into three sections. Section 4.2 presents the discussion of the most important results of the study, key findings compared to other relevant research, and important methodological issues. Conclusions and recommendations are presented in Sections 4.3 and 4.4.

4.2.1 Discussion of the main findings

The main finding of this research was that adolescents who had orthodontic treatment in the past were significantly more satisfied with their dental appearance than those who were currently under treatment or never had treatment. There were also significantly less oral health impacts on daily life activities in adolescents who had orthodontic treatment in the past compared to the other two groups. These results support the first hypothesis of the thesis.

In addition, a clinical measure of orthodontic treatment need, the IOTN index, which was not designed to measure satisfaction with dental appearance, did not adequately measure adolescents' satisfaction with dental appearance. More importantly, the IOTN index was not clearly related to overall oral health impacts as measured by two oral health related quality of life measures, the OIDP and OHIP-14.

Adolescents' oral health impacts and orthodontic treatment status

It is increasingly accepted that the measurement of oral health related quality of life is an essential component of oral health surveys, clinical trials and other studies evaluating the outcomes of preventive and therapeutic programs intended to improve oral health. The assessment of oral health related quality of life also has an important role to play in clinical practice (Locker et al., 2001). Of all the dental treatments that require the use of oral health related quality of life measures, the treatment of malocclusion, which has such a large psychosocial component, call out for the use of oral health related quality of life measures. Oral health related quality of life measures can and should be used in the assessment of need and the outcomes of dental care. That was the basis for this research. To assess whether orthodontic treatment affected the quality of life of Brazilian adolescents.

In the present study, adolescents who had completed orthodontic treatment reported significantly fewer oral health impacts on their daily life activities than those who were undergoing treatment or those who never had orthodontic treatment. The odds of having an OIDP or OHIP-14 assessed impact was almost one and a half times (1.43 and 1.39 respectively) greater for the untreated compared to the treated group. Interestingly, the adolescents undergoing orthodontic treatment were more likely than those from the untreated group to report either on OIDP or OHIP-14 impact. That may suggest that the process of treatment may contribute to oral health impacts.

It is generally considered that the patient benefits psychologically from orthodontic treatment with improved facial and dental appearance and the associated increased

self-confidence that accompanies those changes. These findings were corroborated in a study that investigated the pre- and post-operative psychological characteristics of patients undergoing orthognathic treatment by Kiyak et al. (1984). They found high levels of satisfaction following orthognathic surgery and patients reported considerable improvements in their facial appearance and body image. The authors concluded that satisfaction following treatment was generally high, with patients viewing themselves more positively. Flanary et al. (1990) also found high levels of post-operative satisfaction and a healthy psychological adjustment that led them to conclude that orthognathic treatment appeared to have a positive impact on quality of life. The present study indicates that the same may be true for orthodontic treatment.

The appearance of the human body, especially the appearance of the face, plays an important psychosocial role in human life and interpersonal relationships (Vallittu et al., 1996, Etcoff 1999). Furthermore, the features most commonly associated with facial attraction are the eyes and the mouth (Baldwin, 1980, Etcoff 1999). They are key elements in social interactions and social and interpersonal success in mating. Research on appearance and beauty suggest that the assumption that beauty is an arbitrary cultural convention is being challenged (Etcoff 1999 p.22). Ekman (1998) has shown that many expressions of emotion are expressed by the same facial expressions and movements across cultures. Similarly, aspects of judging human beauty, such as general geometric features of a face that are considered attractive and beautiful may be universal. Even very young infants stare longer at faces which adults consider attractive suggesting that there is an evolutionary basis for what we consider beautiful (Langlois et al., 1991). Thus, it is not surprising that those adolescents, who never had orthodontic treatment and were more dissatisfied with

their appearance and had clinically assessed orthodontic needs assessed by IOTN, reported more oral health impacts on their daily activities than those who have had orthodontic treatment.

The main hypothesis of this thesis was that adolescents who had completed orthodontic treatment would have less oral health related quality of life impacts on their daily life activities. Two oral health related quality of life measures were used to assess adolescents' overall oral health impacts. The measures where developed on adults and adapted and validated for teenagers in a number of studies. Three recent studies have tested the use of the OIDP and the OHIP in younger populations, to assess the perceived impact of oral conditions on oral health related quality of life. Cortes (2000) studied the impact of dental trauma in a sample of 3702 schoolchildren aged 9 to 14 years living in Belo Horizonte, Brazil, using the OIDP oral health related quality of life measure. The results showed that children with fractured incisors involving dentine were more likely to report an impact on their daily living than children without any traumatic injury to the incisors. Using the OIDP, Goes (2001) studied the impact of dental pain on schoolchildren and on their families in Recife, Brazil, in a sample of 14-15 years old. His results showed that those adolescents who reported dental pain also reported more oral health impacts on their daily lives than those who had no dental pain. Both Cortes (2000) and Goes (2001) demonstrated that the OIDP was a valid reliable method when used on Brazilian populations similar to those studied in the present Bauru study. Soe (2000) carried out a randomised controlled trial to assess whether simple amalgam restorations affected the oral health related quality of life in Myanmar adolescents aged 14 years. Using the OIDP oral health related quality of life measure, Soe (2000) concluded that

having simple dental restorations provided benefits by preventing a deterioration of oral health related quality of life.

The findings from the present study suggest that orthodontic treatment does affect adolescents' daily life activities such as eating, speaking and smiling. Subjective aspects such as dentofacial aesthetics and self-perception of occlusal appearance as well as attitudes toward malocclusion and orthodontic treatment are important factors in deciding to seek orthodontic treatment (Albino et al., 1981; Albino et al., 1984; Soderfelt et al., 1993; Tuominen and Tuominen, 1994; Tuominen et al., 1994; Burden and Pine, 1995; Pietila and Pietila, 1994). More technical aspects of malocclusion, such as dissatisfaction with ability to chew, were less often a reason for seeking treatment because problems with chewing may be less common among young adults than problems with dental appearance (Tuominen and Tuominen, 1994). More adolescents who never had orthodontic treatment than those who had completed orthodontic treatment experienced difficulties with 'eating and enjoying food'. Adolescents who never had orthodontic treatment were more concerned with aesthetics than with function (Tuominen and Tuominen, 1994).

Satisfaction with dental appearance and orthodontic treatment status

The present study provides evidence that orthodontic treatment was related to adolescents' satisfaction with their dental appearance. Adolescents who had completed orthodontic treatment were almost three times more likely to be satisfied with their dental appearance than those who never had orthodontic treatment. This finding supports the main hypothesis.

The findings also corroborated the results of previous researchers who have reported that the benefit perceived by patients' post orthodontic treatment is related to aesthetics (Schroeder, 1972; Albino et al., 1994). An interesting finding was the large decrease in the odds of being satisfied with dental appearance in the treated group of adolescents, after adjusting for confounding variables such as sex, social class, self-esteem, teasing experience, body image, satisfaction with colour of teeth and satisfaction with size of teeth.

Gender and socio-economic background are thought to play a role in the self-perception of malocclusion (Burden and Pine, 1995). In the present study, however, there was no significant association between socio-economic status and the adolescents' satisfaction with their dental appearance. The fact that no social class differences were detected in this study supports the findings of Mandall et al. (1999) who found that social deprivation was not an important variable in the perceived aesthetic impact of malocclusion. The present research indicates that satisfaction with dental appearance is independent of social class.

Regarding gender, males were more satisfied with their dental appearance than females. This finding supports previous studies that indicated that females were more concerned about their appearance than males and consequently, the uptake of orthodontic treatment is greater among females (Banks et al., 1988; Roberts et al., 1989).

During adolescence, profound social and psychological changes occur that can affect an individual's self-perception (Brown et al., 1987). Psychological aspects have been

cited as a justification for orthodontic treatment, but patients' perceptions of their malocclusion are frequently disproportionate to the objective signs of the malocclusion (Howitt et al., 1967; Lewit and Virolainen, 1968; Shaw et al., 1975, 1991a; Graber and Lucker, 1980; Lindsay and Hodgkins, 1983; Evans and Shaw, 1987; Holmes, 1992a, b). This may lead one to expect an impact on the self-perception of adolescents who have severe malocclusions. Other studies also show that there are differences in individuals' responses to dental irregularities. The perception of malocclusion does not necessarily lead to dissatisfaction, or a perceived need for orthodontic treatment (Shaw, 1981; Solomon et al., 1968; Tuominen and Tuominen, 1994).

The four measures of self-perception that were used in the present study were 'teasing experience', 'level of self-esteem', 'satisfaction with body image' and 'self rated satisfaction with general health'. These measures were used to investigate psychosocial factors.

A teasing experience was a very significant experience for some adolescents in this study. In fact, it was associated with both the adolescents' overall oral health impact and their satisfaction with dental appearance. These findings corroborated those of Shaw et al. (1980b) who found that dental deviations appeared to be a justification for teasing in a sample of British schoolchildren. Another study showed that teasing occurred seven times more often in those with malocclusion (Helm et al., 1985). Subjects with an extreme maxillary overjet, extreme deep bite and crowding expressed unfavourable perceptions of their teeth more often than those with a normal occlusion. Although teasing is a common behaviour among children, it does

not occur without consequences. In particular, it can have deleterious effects on the psychological well-being of those children with different beliefs and feelings, distinctive personality traits, or obvious physical differences from the group norm (Vessey et al., 1995).

Stricker (1970) stated that social and emotional development could be enhanced by an attractive dental appearance. In this respect, the contribution of orthodontic treatment is of great value and should not be underestimated. The perception of dentofacial appearance is individual and therefore permits one person to tolerate a rather obvious defect while another is disturbed by a minor deviation (Baldwin, 1980). These different perceptions of appearance could also explain the different impact on daily living experienced by adolescents who never had orthodontic treatment.

Satisfaction with different parts and aspects of the body seems to influence satisfaction with dental appearance. For example, in the present study, body image as measured by height and looks, was associated with adolescents' satisfaction with dental appearance. This finding was corroborated by Varela et al. (1995) who reported that there was an improvement in patients' body image after orthodontic treatment. Some caution should be exercised in assessing satisfaction with dental appearance in isolation, as aspects of body image may unduly influence a person's own assessment of his/her dental appearance.

Interestingly, an aspect of body image that relates more closely to dental appearance, namely colour and size of teeth, also influenced the adolescents' satisfaction with dental appearance in this study.

Self-esteem had a possible relationship with adolescents' satisfaction with dental appearance. Adolescents who reported having a low level of self-esteem were less satisfied with their dental appearance than those with a higher level of self-esteem. This supports the findings of Evans and Shaw (1987) that adolescents with low levels of self-esteem were more critical of their dental appearance. As with body image, self-esteem appears to be an important aspect in the perception of dental appearance.

In conclusion, these findings reinforced the importance of assessing multiple factors related to patients' perception of their malocclusion prior to embarking on a course of orthodontic treatment. It again pointed to the need for a comprehensive dental, as well as a sociodental assessment to be done before orthodontic treatment. Whereas orthodontic treatment may in some cases address dissatisfaction with dental appearance, it cannot be concluded that it would necessarily address psychosocial concerns. One may therefore find that individuals with more severe psychosocial concerns remain dissatisfied after orthodontic treatment.

One of the objectives of the present study was to assess the oral health related impacts using two oral health related quality of life measures in three groups of schoolchildren who: 1) had orthodontic treatment, 2) were still under treatment and, 3) never had orthodontic treatment. The findings, using the two oral health related quality of life measures, the OIDP and the OHIP-14, showed that overall oral health

impacts were common in the population studied. Thirty three percent of the participants had one or more dental impacts as assessed by the OIDP and 43%, by the OHIP-14. One out of five adolescents who have had orthodontic treatment reported a dental impact according to the OIDP measure and 30.2% according to the OHIP-14 measure. The percentage with a dental impact was higher in the untreated group compared to the treated group, as assessed by the OIDP (34.2% versus 22.5%) and the OHIP-14 (44.9% versus 30.2%). The 'having treatment' group had intermediate prevalence levels of dental impacts (35.9% for the OIDP and 46.8% for the OHIP-14) (Tables 3.44 and 3.46).

Normative orthodontic treatment need and oral health related quality of life

The basis for developing consumer measures of need arose from the concept that demand for services occurs because of a desire by the public to have their perceived needs recognised (Jeffers et al., 1971). This is particularly relevant to orthodontic treatment because it is influenced by self perceived needs and demand as well as normative need. Consequently, simply measuring normative need may not be enough to assess perceived need or predict demand or plan manpower. A normative measure of orthodontic treatment need does not capture feelings of well-being and other psychosocial dimensions relating to satisfaction with dental appearance. On the other hand, there may be supplier-induced demand and as most orthodontics is still done on children, need-based treatment is likely to predominate and distort the levels of need.

In the present study, both the oral health related quality of life measures used were significantly associated with the normative orthodontic treatment need measure, namely the dental health component of the IOTN index. This association remained significant after all confounder variables were taken into account. For example, adolescents assessed as being in need by the IOTN index were more than two and a half (2.65) times more likely to have an OIDP impact than those not in need. The association between both the oral health related quality of life measures and the dental health component of the IOTN index is supported by the findings of Mandall et al. (1999) where children with higher IOTN grades perceived a more negative psychosocial impact of their malocclusion.

Another important finding is that relatively high percentages of adolescents who were assessed to have orthodontic treatment need by the IOTN index, did not have any overall oral health impact. For example, 46% of adolescents with an orthodontic need (grades 4 and 5 of the IOTN) and 67% of those with moderate need (grade 3 of the IOTN) had no dental impacts (Table 3.43). On the other hand, a sizeable percentage (26.8%) of the adolescents that were assessed to have an impact were not considered to have an orthodontic need.

Further evidence of the gap between normative need and psychosocial quality of life related dental impacts is the finding that there were many adolescents without a dental impact in both the aesthetic component of the IOTN-AC index groups (56% in the need (AC = 8 to 10) and 35% in the moderate need (AC = 5 to 7) groups) (Table 3.30). This applied even though there were significant differences in the numbers of

dental impacts in the three orthodontic need groups assessed by the aesthetic component of the IOTN index.

As with satisfaction with appearance, half of the adolescents who had a normative need for orthodontic treatment were satisfied with the appearance of their teeth according to the dental health component of the IOTN index. Moreover, the study found that 12.6% of adolescents who had no or only a slight need for orthodontic treatment were still dissatisfied with the appearance of their teeth.

One of the motivations for this thesis was to see whether the current popular orthodontic need system in Britain, the IOTN index, captured the perceived needs of subjects. The Aesthetic Component of IOTN was included in the IOTN system by its developers to give the patient's perspective. However, this component was excluded during the data analysis of the present study for the following reasons: 1. During the data collection it was observed that the adolescents had difficulty in classifying their own dental appearance on the Aesthetic Component of the IOTN index particularly relating to its poor ability to represent some occlusal traits such as an openbite and the antero-posterior component of the malocclusion. This led to the conclusion that the measure was not sufficiently reliable to be included in the data analysis. 2. Mandall et al. (2001) also found in their study with children that the reliability of the IOTN AC scores was questionable. The authors concluded "the usefulness of child perceived IOTN AC grade as a consumer measure could therefore be questioned because their opinion does not seem to be reliable". 3. Logistic regression, like all varieties of multiple regression, is sensitive to high correlations among predictor variables. In order to avoid two highly correlated variables obscuring each other, as

this may lead to misleading findings (Altman, 1996), only the Dental Health Component of the IOTN index was used in the logistic regression.

The AC of the IOTN index only assesses the aesthetic component of the malocclusion, and not any other aspect of the psychosocial self-perception. It is evident that children's views on appearance are not adequately captured by an epidemiological index of need such as the IOTN (Mandall et al., 1999). There is a strong case to suggest the need for an additional social viewpoint (Sheiham et al., 1982). Generally, such information confers advantages in terms of understanding oral-related behaviour and widening dental evaluation outside the limits of epidemiological indices (Slade and Spencer, 1994).

The findings from this study provide unequivocal evidence that either of the two sociodental indicators when used in combination with the dental component of the IOTN, explain significantly more of adolescents' satisfaction with their dental appearance (Tables 3.47 and 3.48). This illustrates a quantitative value of combining a normative with an oral health related quality of life measure. This finding was not unexpected because appearance is an important part of people's psychological makeup and plays an important role in all aspects of life (Etcoff 1999). Concern about appearance is the main factor motivating people to seek orthodontic treatment and is recognised as such by orthodontists. It has been estimated that 80% of orthodontic patients seek their services out of a concern for aesthetics, rather than health or function (Rosenberg, 1974). Indeed psychological factors, rather than the severity of the actual occlusal condition, determine demand for orthodontic treatment (Albino, 1980; Albino et al., 1981). These finding suggests that additional qualitative

information acquired from the subject would enhance IOTN normative orthodontic treatment need assessments.

Accepting that psychological factors and aesthetics play a part in the subjective need for orthodontic treatment, a problem arises in balancing the needs of the patient, the normative values of dentists and the availability of resources. Therefore, a more comprehensive method for measuring the acceptability of the teeth and occlusal condition as well as facial appearance is needed rather than relying predominately on professional criteria of aesthetically pleasing and clinical measures.

The present study has contributed to the challenge to find a way to incorporate patient-based measures of perception and impact into the assessment of orthodontic treatment need, by demonstrating that normatively assessed need, using the IOTN system, does not capture important psychosocial dimensions related to oral health and oral health related quality of life. Adding a sociodental indicator to IOTN captured aspects of adolescents' perceptions.

This study has highlighted some inconsistencies between normative orthodontic need as assessed by IOTN and psychosocial and sociodental measures. These could be addressed by developing a more comprehensive measure of orthodontic need.

4.2.2 Methodological considerations

The findings of the present study should be considered in relation to its methodological strengths and weaknesses.

The present study attempted to contribute to the development of an improved measure for the assessment of both orthodontic treatment need and orthodontic treatment outcome by comparing a well-known orthodontic need system with two oral health related quality of life measures. It comprised a population-based study with a randomised sample that included all socio-economic groups. In addition, multivariate statistical methods were used in the data analysis, which consider the simultaneous effects of several variables.

Although this study has clearly identified strengths, there are also some weaknesses. Many younger patients are brought for treatment by parents who may be seeking the treatment for reasons other than the child's malocclusion (Baldwin and Barnes, 1965, 1967; Baldwin, 1980; Pratelli et al., 1998) and the children may well reflect their parents perceived concerns (Lewit and Virolainen, 1968). Thus, the assessment of parents' opinions regarding their child's need for orthodontic treatment and also the possible impact of adolescents' malocclusion on their families would help to establish a more complete picture.

The relationship between adolescents' orthodontic treatment status and the overall oral health impact, as assessed by both oral health related quality of life measures, was demonstrated in this study. However, no causal inferences should be made. The

results of cross-sectional studies cannot demonstrate whether fewer oral health impacts are causally predictive of orthodontic treatment. Ideally, this question should be addressed by means of a prospective study, in which adolescent's level of oral health impact could be measured before and after orthodontic treatment. In a longitudinal study individuals would be followed over time, which makes it possible to measure the change of oral health impacts over time (Kirkwood, 1988).

Carrying out a longitudinal study on orthodontic patients would require at least three to four years and was beyond the scope of a doctoral thesis. On the other hand, cross-sectional studies are relatively quick, inexpensive and less complicated to carry out. However, cross-sectional studies provide data at just one point in time and therefore the value of the findings, whilst being indicative, should be interpreted with their limitations in mind.

Longitudinal studies and clinical trials are needed to assess the sensitivity of both oral health related quality of life measures used in the present study by studying the oral health impacts of changes brought about by orthodontic treatment over time. This will give more insights into the psychometric properties of the oral health related quality of life measures (Locker et al., 2001). Additionally, Locker et al. (2001) highlighted the importance of deciding on the most appropriate method of generating scores for oral health related quality of life measures. Therefore, further work on ways of scoring oral health related quality of life measures is warranted to identify those most suitable for use by clinicians in patient assessment.

Another consideration is that a larger sample size would have enabled further analysis of subgroups such as gender as well as increased the power to detect any differences in statistical tests.

This study nevertheless provided important insights about the associations between adolescents' satisfaction with dental appearance and overall oral health impact and normative orthodontic treatment need.

4.3 Conclusions

A broader effect of orthodontic treatment emerges when the findings from this research are considered. Both need for and treatment of malocclusion have strong social and psychological aspects. By assessing psychosocial components in addition to normative orthodontic treatment need, need is considered more holistically for orthodontic treatment planning. Orthodontic treatment has a more holistic impact, as it addresses more than the technical aspects of occlusion. It seems logical therefore to incorporate sociodental measures and measures of perceived need and satisfaction into the assessment of need as well as into outcome measures which assess the success of treatment.

The main conclusions of the present study were:

1. Oral health related impacts were reasonably prevalent in the adolescents studied.

2. Adolescents who had completed orthodontic treatment were more satisfied with their dental appearance and had significantly fewer oral health impacts than those who never had orthodontic treatment and those who were currently having treatment.

3. The IOTN orthodontic need assessment method did not adequately assess adolescents' satisfaction with dental appearance. Also, there was discordance between IOTN need and overall oral health impacts. Many adolescents who had no need had impacts and vice versa.

4. Combining the dental health component of IOTN with either of the two sociodental indicators used in this study, OIDP and OHIP-14, explained more of the children' perceived satisfaction with their appearance than the IOTN alone.

5. Current methods of orthodontic treatment need should be complemented by oral health related quality of life measures with valid psychometric properties and measures of perceived need.

4.4 Recommendations

4.4.1 Recommendations for future research

This study enhances understanding of the relationship between a commonly used normative orthodontic treatment need measure and an oral health related quality of life measure. Further research should be conducted to develop a new measure of orthodontic treatment need, which could also be used as an outcome measure. Such a measure may consist of a normative component, such as the IOTN and an oral health related quality of life measure. Research will be needed to assess the relative weightings for the two components in order to give an overall combined score and thereby enable prioritising need for orthodontic treatment.

Longitudinal studies should elucidate which orthodontic treatments affect both adolescent's satisfaction with dental appearance and oral health impact on daily life using a sociodental measure of oral health status.

Research of a qualitative and explorative nature would increase the understanding particularly of the psychological and social components of orthodontic care. Although the oral health related quality of life measures used in this study contribute to a holistic view of the orthodontic patient, explorative research may identify additional components to the established psychosocial view of orthodontics. Qualitative research is likely to point orthodontic research to new areas to be explored and may complete some of the gaps in the present knowledge base of orthodontics. Such research may include an investigation on parents' perceptions of

orthodontic treatment and the influence of those perceptions on their adolescent's own perception of their teeth would be useful. The impact of adolescent's malocclusion on their families would be equally useful.

The present study stressed the shortcoming of using only universal normative judgements to estimate orthodontic treatment need and also orthodontic treatment outcome. The findings of this thesis might differ between geographical areas of Brazil and other countries. However, the findings certainly provide a basis for further work in other parts of Brazil and the world. Thus, cross-cultural studies of oral health impacts and the integration of subjective measures into orthodontic treatment need and outcome estimation, are required to broaden our concepts of oral health.

Although the OIDP and the OHIP-14 oral health related quality of life measures have been applied cross-culturally and successfully tested for reliability and validity, the validation of an instrument is an on-going process that by no means should be considered complete by the tests carried out in this study. These tests may well cover the minimum requirements for the psychometric properties of a new instrument, but future research should be directed towards the examination of its stability over time (test- retest reliability) and its sensitivity to change, through the adoption of a longitudinal study design.

So far, the OIDP and the OHIP oral health related quality of life measures, like most subjective oral health indicators, have been tested mainly in oral health surveys. They need to be tested for use in clinical settings, so that their usefulness in

individual treatment planning and their appropriateness as an outcome measure to evaluate the effectiveness of orthodontic treatment can be determined.

4.4.2 Recommendations for public health policy

Although this study was cross-sectional and the baseline levels of malocclusion and sociodental impacts were not assessed, the findings have implications for planning of oral health services. In terms of planning with limited resources and in consideration of health gain from treatment, dental health managers and planners could decide to set different cut-off points for orthodontic need using normative and impact indicators. For example, dental health managers might consider the justification of need for orthodontic treatment in patients who have at least a moderate degree of normative need for orthodontic treatment (IOTN index) but who simultaneously have high levels of perceived impacts from their malocclusions on their daily life activities. Where resources are limited, normative impairment with low impact might be considered a much lower priority.

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APPENDICES

Appendix 1: List of Private and Public Schools

School	Address	Telephone
1. Colegio Batista Esc. Educ. Inf. Ens Fund e Medio	Rua Vivaldo Guimaraes, 9-80, J. Estoril CEP 17040-510	234-1622
2. Colegio Adventista de Bauru	Praca Italia, 3-09, Centro CEP 17015-180	223-5921
3. Colegio Fenix Ensino Medio	Rua Araujo Leite, 16-10, Centro CEP 17015-431	223-5070
4. Colegio La Salle	Praca Washington Luiz, 4-73, Centro CEP 17010-210	222-5617
5. Colegio Rogacionista Pe. Paulo Petruzellis	Al. Conego A. Difrancia, 10-04, P.V. Alegre CEP 17020-450	239-2424
6. Colegio Seta	Rua Xingu, 13-70, Jd Brasil CEP 17044-040	223-1999
7. Cursos Preve Escola de 2 grau – Unid. II	Rua Cussy Junior, 3-80 Centro, CEP 17015-020	223-8111
8. EEIEFEM Colegio Atheneu	Av. Nossa Senhora de Fatima, 1-80 Jd Estoril, CEP 17041-160	223-2266
9. EEMF Colegio Interativo-Unid.I	Av. Duque de Caxias, 18-39, Vila Brunhari CEP 17044-140	223-6791
10. Escola de Ensino Medio Colegio Sistema	Rua Araujo Leite, 25-73, Jardim Nasralla CEP 17043-070	223-6679
11. Escola de Segundo grau Colegio Interativo- Unid. II	Rua Treze de Maio, 16-17, Vila Noemy CEP 17040-450	223-4515
12. Escola de Ensino Medio Sagrado Coracao	Rua Maracy, 5-50, Vila Maracy CEP 17044-160	235-7186
13. Liceu Noroeste	Av. Rodrigues Alves, 8-35, Centro CEP 17015-002	224-1800

List of public schools

School	Address	Telephone
1. Azarias Leite - EEPSG	R: Adante Gigo, 5-80, Vila Carolina CEP 17032-490	230-1212
2. Arminda Sbrissia - EEPSG Irma	R: Benedito de Abreu, 2-41, Vila Nova Esperanca, CEP 17065-230	238-1321
3. Carlos Chagas - EEPSG - Dr	R: Benedito Raimundo de Mattos, 3-80, Vila Sao Paulo, CEP 17023- 180	239-1249
4. Carolina Lopes de Almeida EEPSG -	R: Nelson Miranda Silva, 2-68, Pq. Sao Geraldo, CEP 17021- 420	239-8700
5. Christino Cabral - EESG Prof.	R: Gerson Franca, 19-165, Jd. Estoril CEP 17041-000	223-3855
6. Edison Bastos Gasparini EEPSG - Prof.	R: Dos Ferroviarios, 6-50, N.H. Gasparini CEP 17022-240	239-1286
7. Ernesto Monte - EEPSG	Praca das Cerejeiras, 4-44, Altos da Cidade, CEP 17040- 500	223-3856
8. Francisco Alves Brizola EEPG - Prof.	R: Dr Ivo Giunta, 2-45, N.H. Presidente Geisel, CEP 17032-800	230-3233
9. Jao Maringoni - EEPSG	R: Prof. Julieta G. Mendonca, 1-50, N.H. Beija Flor, CEP 17025-500	239-1381
10. Joaquim Rodrgues Madureira - EEPSG	Praca das Orquideas, 1-6, Pq Vista Alegre CEP 17020-390	239-9191
11. Jose Ap. Guedes de Azevedo - EEPSG - Prof.	R: Olavio Bilac, 12-40, Jd Bela Vista CEP 17060-530	222-6212
12. Lourdes de Araujo - CEFAM Profa.	R: Castro Alves, 2-30, Vila Falcao CEP: 17051-060	238-6999
13. Luiz Zuiani - EEPSG - Dr.	R: Aviador Gome Ribeiro, 34-60, Pq. Sao Jorge, CEP 17030- 530	230- 2553
14. Morais Pacheco - EEPSG Prof.	R: 1 de Maio, 16-10, Jd Bela Vista CEP 17160- 650	222-3857
15. Plinio Ferraz - EEPSG	R: Riachuelo, 8-41, Vila Razuk CEP 17054- 240	236- 1366
16. Stela Machado - EEPSG	R: Wenceslau Bras, 15-73, Vila Pacifico CEP 17050- 460	238- 2397
17. Walter Barreto Melchert - EEPSG	R: Jose Fazzio, N.H. Octavio Rasi CEP 17039- 110	230- 3662

Appendix 2a: Ethics Committee Letter (Portuguese)

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU
Al. Dr. Octávio Pinheiro Brisolla, 9-75 - Bauru-SP - Brasil - CEP 17043-101
C.P. 73 - PABX (014) 235-8000 - FAX (014) 223-4679

Comitê de Ética em Pesquisa

Bauru, 26 de fevereiro de 1999

Prezado Doutor

O projeto de pesquisa encaminhado a este Comitê de Ética em fevereiro de 1999 denominado "AVALIAÇÃO DOS RESULTADOS OBTIDOS APÓS A REALIZAÇÃO DA TERAPIA ORTODÔNTICA USANDO-SE UMA MEDIDA DE QUALIDADE DE VIDA" de autoria do Dr. Cesar Messias de Oliveira sob a orientação do Prof. Dr. Aubrey Sheiham, de Londres, foi encaminhado ao Relator para ser avaliado sob o ponto de vista ético.

Na reunião de 25 de fevereiro último, o parecer do relator foi julgado pelo Comitê que o aprovou, considerando que não existem questões éticas pendentes. Entretanto, como se trata de pesquisa com participação estrangeira, o projeto deverá ser encaminhado, por este Comitê, para a COMISSÃO NACIONAL DE ÉTICA EM PESQUISA, de acordo com o item VIII, 4, letra C, número 8 da Resolução 196/96.

Atenciosamente,

Prof. Dr. Roberto Loureiro Maringoni
Coordenador do Comitê de Ética

Ao Exmº Sr.
Dr. César Messias de Oliveira

Appendix 2b: Ethics Committee Letter (English)

UNIVERSIDADE DE SÃO PAULO

FACULDADE DE ODONTOLOGIA DE BAURU

Al. Dr. Octávio Pinheiro Brisolla, 9-75 - Bauru-SP - Brasil - CEP 17043-101
C.P. 73 - PABX (014) 235-8000 - FAX (014) 223-0415

Bauru, 26th February 1999

Dear Professor,

The Research Project entitled "Assessing Oral Health Outcomes for Orthodontic Treatment by Using a Measure of Quality of Life" was submitted to this Ethics Committee on February 1999.
Dr. Cesar Messias de Oliveira is the principal investigator of the research project and he is under the supervision of Professor Aubrey Sheiham from the University College of London.
The Research Project was approved in the committee meeting held on February 25,1999. However, as the project involves international participation it must be sent to the National Ethics Committee in Research according to the item VIII, 4, letter C, number 8 of the resolution 196/96.

Yours sincerely,

Prof. Dr. Roberto Loureiro Maringoni
President of the Ethics Committee

To Dr. Cesar Messias de Oliveira

Appendix 3: Letter from Dental School Dean to Participating School Principals

UNIVERSIDADE DE SÃO PAULO
FACULDADE DE ODONTOLOGIA DE BAURU
Al. Dr. Octávio Pinheiro Brisolla, 9-75 - Bauru-SP - Brasil - CEP 17043-101
C.P. 73 - PABX (014) 235-8000 - FAX (014) 223-4679

Bauru, 26 de fevereiro de 1999.

Vimos através desta comunicar a V.Sª., que a Universidade de Londres estará realizando no corrente ano uma pesquisa sobre a saúde bucal na adolescência, buscando investigar a importância da aparência dos dentes na qualidade de vida e auto-estima da população escolar inserida no Ensino Médio em Bauru, bem como fatores associados a esta faixa etária.

Salientamos que esta pesquisa será de extrema importância, cujos resultados poderão subsidiar o planejamento das ações educativas, preventivas e curativas voltadas para a nossa população.

A pesquisa com início previsto para o mês de março será realizada pelo Dr Cesar Messias de Oliveira cursando pós-graduação na Universidade de Londres e responsável pelo projeto. O Dr. Cesar Messias de Oliveira, responsável pelo referido projeto, é ex-aluno desta Faculdade e conseguiu continuar os seus estudos na Inglaterra por indicação de um dos nossos professores e o seu projeto foi aprovado pelo Comitê de Ética em Pesquisa da Faculdade de Odontologia de Bauru.

Assim sendo, esperamos contar com o apoio de V.Sª. para que a coleta dos dados possa trazer o maior benefício possível para a nossa população.

Atenciosamente,

Prof.Dr. Aymar Pavarini,
Diretor

Appendix 4: Letter from Local Education Authority to Participating Schools Principals

SECRETARIA DE ESTADO DA EDUCAÇÃO
COORDENADORIA DE ENSINO DO INTERIOR
DELEGACIA DE ENSINO DE BAURU
"PROF. WILSON MONTEIRO BONATO"

Bauru, 10 de fevereiro de 1999.

Ofício GDR nº 049/99

Assunto: **Pesquisa sobre a importância da aparência dos dentes na qualidade de vida dos adolescentes.**

Senhor Diretor:

Apresentamos a V. S.ª o **Prof. Cesar Messias de Oliveira**, aluno do Curso de Doutorado da Universidade de Londres, responsável pelo projeto de pesquisa sobre a saúde bucal na adolescência, e que deverá iniciar a coleta de dados nesta Unidade Escolar a partir do mês de março.

Esclarecemos a V. S.ª tratar-se de uma pesquisa, que a Faculdade de Odontologia de Bauru da Universidade de São Paulo estará realizando no corrente ano, na área de Odontologia com o objetivo de comparar adolescentes brasileiros com ingleses com relação a satisfação com a aparência dental, e o impacto dos dentes na qualidade de vida dos mesmos, na idade de 16 anos em Bauru, bem como os fatores associados nesta faixa etária. Além de ser uma pesquisa de extrema importância, trata-se do primeiro levantamento a respeito do impacto da saúde bucal a realizar-se nesta faixa etária em nossa cidade, cujos resultados poderão subsidiar o planejamento de ações cross-cultural comparation, educativas, preventivas e curativas voltadas para a nossa população.

Solicitamos, assim, a valiosa colaboração de V. S.ª para que a coleta de dados, nessa escola, transcorra a contento.

Atenciosamente,

EDINEA SITA CUCCI
Dirigente Regional de Ensino

Appendix 5: Letter from researcher asking parents' consent

Royal Free and University College Medical School

UNIVERSITY COLLEGE LONDON

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Senhores pais,

A escola onde o seu(sua) filho(a) estuda foi selecionada para participar de uma pesquisa à respeito da importância da aparência dos dentes na qualidade de vida e auto-estima dos adolescentes.

Essa pesquisa será conduzida por um aluno do curso de Doutorado em Odontologia da Universidade de Londres (UCL) juntamente com a Faculdade de Odontologia de Bauru da Universidade de São Paulo (USP).

O objetivo desse projeto de pesquisa é investigar o nível de satisfação com a aparência dos dentes e a importância dos dentes na qualidade de vida de escolares na faixa etária de 16 anos em Bauru.

A pesquisa vai ser feita na própria escola através de um exame clínico indolor e um questionário. Toda a informação coletada pelo pesquisador será tratada de forma confidencial.

Sua colaboração será de fundamental importância para o êxito desse estudo de extrema importância pois trata-se do primeiro levantamento à respeito da importância da saúde bucal a realizar-se na faixa etária de 16 anos na nossa cidade.

Atenciosamente,

Prof. CESAR MESSIAS DE OLIVEIRA

Eu concordo que o meu filho(a), ----------
(NOME DO FILHO)

participe da pesquisa sobre o impacto da aparência dos dentes na qualidade de vida, uma vez que fui devidamente informado(a) sobre os objetivos e os procedimentos envolvidos no estudo.

NOME DO PAI OU RESPONSÁVEL: _____

ASSINATURA DO PAI OU RESPONSÁVEL: _____

The Department of Epidemiology and Public Health
The Royal Free and University College London Medical School, London, UK
Faculdade de Odontologia de Bauru, Universidade de São Paulo, Brasil

PROJETO SMILE

QUESTIONÁRIO DO ESTUDANTE

Obrigado por estar participando desta pesquisa.

Leia cada questão cuidadosamente e responda-a sinceramente.
Este questionário não é um teste escolar, portanto não existe resposta "errada" ou "certa". O que nos interessa é a **SUA** opinião.

Suas respostas serão vistas somente pelos pesquisadores e ninguém mais. Seus pais e professores não terão acesso a elas.

DATA : ☐☐ ☐☐ ☐☐
DIA MÊS ANO

NÚMERO DO FORMULÁRIO: ☐☐☐☐

INSTRUÇÕES

EM ALGUMAS QUESTÕES VOCÊ DEVERÁ MARCAR UM **"X"** NO ESPAÇO QUE MELHOR CORRESPONDE À SUA RESPOSTA, POR EXEMPLO:

COMO VOCÊ ESTÁ SE SENTINDO HOJE? MARQUE UM "X" NA SUA RESPOSTA.

BEM [X]

MAL [ ]

EM ALGUMAS QUESTÕES , VOCÊ DEVERÁ RESPONDER CIRCULANDO A SUA OPÇÃO, POR EXEMPLO:

VOCÊ GOSTA DE ACORDAR CEDO?

Sim (Nao) Nao sei

1. Faça um círculo ao redor do número da figura que melhor representa como você se sente a respeito de cada assunto.

Minha saúde

HEALTH

Minha altura

HEIGHT

Meus dentes

TEETH

Meu peso

WEIGHT

Meu visual

LOOKS

2. Leia cada uma das frases abaixo cuidadosamente. Para cada uma delas coloque um "**X**" no quadradinho que melhor descreve você.

	SIM	NÃO	*para uso de pesquisa*
Eu gosto de me envolver em atividades da escola	1 ☐	2 ☐	involv
Eu sou muito preocupado(a)	1 ☐	2 ☐	worry
Eu tenho boas idéias	1 ☐	2 ☐	ideas
Eu gosto de ser do jeito que eu sou	1 ☐	2 ☐	likeself
Eu sempre me meto em encrencas	1 ☐	2 ☐	trouble
Meu visual me aborrece	1 ☐	2 ☐	bother
Eu sou tímido	1 ☐	2 ☐	shy
Meus pais esperam muito de mim (ficam me cobrando)	1 ☐	2 ☐	expect
Eu fico nervoso(a) quando professores me perguntam alguma coisa	1 ☐	2 ☐	nervous
Eu me acho atraente	1 ☐	2 ☐	attrac
Eu gosto da escola	1 ☐	2 ☐	lschool
Eu faço amizade facilmente	1 ☐	2 ☐	friends
As pessoas me perseguem	1 ☐	2 ☐	picked
Sempre que eu tento fazer alguma coisa, parece que tudo dá errado	1 ☐	2 ☐	pessimi
Eu freqüentemente sinto que não sirvo para nada	1 ☐	2 ☐	useless
Eu sempre gosto de fazer as coisas do meu jeito	1 ☐	2 ☐	indept

Nas próximas seis questões, circule apenas uma resposta para cada questão.

3. Você está satisfeito(a) com a aparência geral dos seus dentes? — apteeth
1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

4. Você está satisfeito(a) com a posição dos seus dentes? — arteeth
1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

5. você gostaria de corrigir a posição dos seus dentes? — strteet
1. não
2. talvez
3. sim
4. gostaria muito

6. Você está satisfeito(a) com a aparência do seu sorriso? stsmi

1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

7. Comparando o seu sorriso com o sorriso dos seus colegas da mesma idade, como você classificaria o visual dos seus dentes? tlook

1. entre os mais bonitos
2. acima da média
3. abaixo da média
4. entre os mais feios

8. Comparando com outras partes da sua face como você classificaria os seus dentes? tface

1. eu acho uma das partes mais bonitas da minha face
2. eu acho que os meus dentes são aceitáveis
3. eu acho uma das partes mais feias da minha face

Marque apenas um "X" no espaço que melhor representa a sua resposta .

9. Você já foi alguma vez ao dentista? beendent

❑ sim **(vá para a questão 10)**
❑ não **(vá para a questão 13)**

10. Em geral, você vai ao dentista: whydent

❑ apenas quando você tem algum problema com os seus dentes
(vá para a questão 13)
❑ principalmente para revisões periódicas (check ups)
(vá para a questão 11)
❑ para manutenção do seu aparelho ortodôntico
(vá para a questão 12)
❑ outro motivo, especifique .....
(vá para a questão 13)
❑ não sei/ não me lembro
(vá para a questão 13)

11. Se o principal motivo da sua visita ao dentista é para revisões periódicas (check ups), qual é a freqüência das visitas? oftengo

❑ mais frequente que 2 vezes por ano
❑ 2 vezes por ano
❑ uma vez por ano
❑ uma vez a cada 2 anos
❑ menos frequente do que uma vez a cada 2 anos
❑ não sei/ não me lembro
(vá para a questão 13)

12. Se o principal motivo da sua visita ao dentista é para manutenção do seu aparelho ortodôntico, qual é a freqüência das visitas ? oftenort

❑ em torno de uma vez por mês
❑ menos freqüente que uma vez por mês
❑ não sei/ não me lembro

Responda cada questão marcando um "X" no espaço que melhor representa a sua resposta .

	nunca	poucas vezes	às vezes	Quase Sempre	sempre	
13. Você já teve alguma dificuldade em pronunciar alguma palavra devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	pronounc
14. Você já sentiu que o seu paladar piorou (algum alimento perdeu o sabor) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	taste
15. Você ja teve dor na sua boca?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	pain
16. Você já sentiu desconforto ao comer algum alimento devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	eatprob
17. Você já se sentiu constrangido(a) por causa dos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	selfconc
18. Você já ficou tenso(a) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	tense
19. Alguma vez você já deixou de saborear algum alimento devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	unsadiet
20. Você já teve que interromper alguma refeição devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	meal
21. Você já sentiu alguma vez dificuldade em relaxar devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	relax
22. Você já ficou envergonhado(a) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	embarr
23. Você já ficou irritado(a) com outras pessoas devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	irrita
24. Você já sentiu alguma dificuldade em realizar alguma das suas atividades diárias (escola, passeios, festas, esportes, namorar) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	usualjob
25. Voce já sentiu que a sua vida em geral não estava muito boa devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	satilife
26. Você já se sentiu totalmente incapaz de realizar alguma atividade do seu dia-a-dia devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	unablefu

Você pode circular mais de uma resposta para cada questão abaixo:

27. Você já terminou o seu tratamento ortodôntico? endortho
1 não, ainda estou em tratamento **(vá para a questão 29)**
2 não, eu parei na metade do tratamento ortodôntico **(vá para a questão 28)**
3 sim, eu terminei a 1 ano atrás **(vá para a questão 29)**
4 sim, eu terminei entre 1 a 2 anos atrás **(vá para a questão 29)**
5 sim, eu terminei entre 2 a 4 anos atrás **(vá para a questão 29)**
6 sim, eu terminei a mais de 4 anos atrás **(vá para a questão 29)**

28. Por que você desistiu/interrompeu o seu tratamento ortodôntico? stoporto
1 eu já estava satisfeito(a) com o visual dos meus dentes
2 o tratamento estava ficando muito caro
3 ainda faltava muito para terminar o tratamento
4 o ortodontista/dentista achou que já estava bom
5 outro, especifique.....

29. Por que você foi tratado? whyortho
1 meus dentes da frente eram muito tortos
2 havia muitos espaços entre os meus dentes
3 meus dentes da frente não são bem posicionados
4 meus dentes estavam muito para frente
5 eu não mastigava direito
6 para melhorar a minha fala
7 eu não me lembro
8 outro, especifique.....

30. Quem foi a primeira pessoa a dizer que você precisava usar aparelho ortodôntico? whosaid
1 um dentista clínico geral
2 um ortodontista
3 os meus pais
4 o meu médico
5 meus amigos, colegas
6 uma fonoaudióloga (profissional que cuida de problemas da fala)
7 eu mesmo
8 outro, especifique.....
9 eu não me lembro/ eu não sei

31. O seu tratamento ortodôntico foi feito por quem ? whomtret
1 por um dentista cliníco geral
2 pelo dentista da escola
3 por um ortodontista/ clínica privada
4 por um ortodontista numa faculdade de odontologia
5 por um ortodontista num hospital (ex: centrinho)
6 eu não me lembro/ eu não sei

32. Qual foi o tipo de aparelho ortodôntico que você usou? kindappl
1 removível(placa) + fixo aos dentes + extra-oral (capacete)
2 removível (placa) + fixo aos dentes fixo aos dentes
3 só removível (placa)
4 só fixo aos dentes
5 só extra-oral
6 outro, especifique.....
7 eu não me lembro/ eu não sei

A seguir, você encontrará algumas afirmações que se referemà sua opinião sobre os seus dentes e aparência do seu sorriso, as quais você pode concordar ou discordar.
Dê a sua opinião marcando apenas um "x" em cada afirmação abaixo

	concordo totalmente	concordo parcialmente	discordo parcialmente	discordo totalmente	
33. Eu tenho dentes bem posicionados	1 ❑	2 ❑	3 ❑	4 ❑	strai2
34. Meus dentes da frente são tortos (encavalados)	1 ❑	2 ❑	3 ❑	4 ❑	crook2
35. Existem muitos espaços entre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	space2
36. Meus dentes da frente não são bem posicionados	1 ❑	2 ❑	3 ❑	4 ❑	notog2
37. Meus dentes da frente são muito projetados (para frente)	1 ❑	2 ❑	3 ❑	4 ❑	stick2
38. Minha modida nao é boa	1 ❑	2 ❑	3 ❑	4 ❑	badbite2
39. Eu estou satisfeito(a) com a aparência dos meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	satlook2
40. Eu não tenho dificuldades ao mastigar os alimentos	1 ❑	2 ❑	3 ❑	4 ❑	gchew2
41. Eu sempre quis ter os meus dentes mais alinhados	1 ❑	2 ❑	3 ❑	4 ❑	mstrai2
42. As pessoas faziam/fazem piadas sobre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	tease2
43. Eu me preocupava/preocupo com a opinião das outras pessoas sobre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	pthink2
44. Ter os dentes bem posicionados é muito importante nos dias de hoje	1 ❑	2 ❑	3 ❑	4 ❑	nowaday2
45. Algumas pessoas achavam que eu devia usar aparelho ortodôntico para melhorar a posição dos meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	pstrai2
46. Eu realmente gostaria que o meu tratamento ortodôntico continuasse	1 ❑	2 ❑	3 ❑	4 ❑	likorto2

47. Eu realmente queria fazer o tratamento ortodôntico quando eu comecei o tratmento	1 ❑	2 ❑	3 ❑	4 ❑	wantorth
48. O tratamento ortodôntico realmente mudou a minha aparência	1 ❑	2 ❑	3 ❑	4 ❑	trelook
49. Eu estou muito feliz pois o tratamento ortodôntico melhorou a posição dos meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	gladstr
50. Na minha opinião, o resultado do meu tratamento ortodôntico foi o que eu estava esperando	1 ❑	2 ❑	3 ❑	4 ❑	worth
51. Eu estou satisfeito com o resultado do meu tratamento ortodôntico	1 ❑	2 ❑	3 ❑	4 ❑	satend
52. Lembrando-me da aparência dos meus dentes antes do tratamento, hoje em dia eu tomaria a mesma decisão de fazer o tratamento ortodôntico	1 ❑	2 ❑	3 ❑	4 ❑	noregret
53. Meus dentes estão ficando tortos de novo depois do tratamento	1 ❑	2 ❑	3 ❑	4 ❑	regret

54. nessa questão você encontrará uma escala crescente de importância que vai do número 1(sem importância) até o número 6(extremamente importante). Para cada afirmação abaixo dê a sua opinião marcando um "x" no número que melhor representa o grau de importância para você.

Na sua opinião, o quanto é importante que no final do SEU tratamento ...

	sem importância					**extremamente importante**	
	1	**2**	**3**	**4**	**5**	**6**	
... você se torne mais confiante pelo fato da posição dos seus dentes ter sido melhorada?	❑	❑	❑	❑	❑	❑	esteem
... a aparência dos seus dentes seja melhorada?	❑	❑	❑	❑	❑	❑	betlook
... você se torne mais sociável/extrovertido(a)?	❑	❑	❑	❑	❑	❑	outgoing
... os seus dentes fiquem mais fáceis de serem limpos?	❑	❑	❑	❑	❑	❑	clean
... você ganhe um sorriso mais bonito após ter usado aparelho ortodôntico?	❑	❑	❑	❑	❑	❑	bsmile
... os seus dentes fiquem bem posicionados para sempre?	❑	❑	❑	❑	❑	❑	straight
... você consiga uma face mais atraente/bonita como resultado do tratamento?	❑	❑	❑	❑	❑	❑	profile
...você consiga uma melhora na posição dos seus dentes após ter usado aparelho ortodôntico?	❑	❑	❑	❑	❑	❑	strteeth
... a preocupação com os seus dentes seja menor após ter usado aparelho ortodôntico?	❑	❑	❑	❑	❑	❑	careless

55. Marque com um **"X"** as pessoas que moram na sua casa e responda quantos são: | people

- ❑ pai
- ❑ mãe
- ❑ irmãos (incluindo você). quantos? _____
- ❑ empregados que dormem no emprego. quantos? _____
- ❑ outras pessoas. quantas? _____

56. Até que série da escola o seu **pai** estudou? | faeduc

- ❑ não sabe ler nem escrever
- ❑ 1° grau incompleto
- ❑ 1° grau completo (até a oitava série)
- ❑ 2° grau incompleto
- ❑ 2° grau completo (até o 3° colegial)
- ❑ curso universitário incompleto
- ❑ curso universitário completo
- ❑ pós-graduação
- ❑ não sei

57. Até que série da escola a sua **mãe** estudou? | moeduc

- ❑ não sabe ler nem escrever
- ❑ 1° grau incompleto
- ❑ 1° grau completo (até a oitava série)
- ❑ 2° grau incompleto
- ❑ 2° grau completo (até o 3° colegial)
- ❑ curso universitário incompleto
- ❑ curso universitário completo
- ❑ pós-graduação
- ❑ não sei

☛ as próximas perguntas são a respeito da pessoa que **possue a maior renda** na sua casa (quem ganha mais).

58. A pessoa de maior renda na sua casa está trabalhando no momento? | Dowork

- ❑ sim, em atividade
- ❑ sim, e também é aposentado
- ❑ não, está desempregado
- ❑ não, aposentado
- ❑ não, outra situação. qual? _____
- ❑ não sei

59. A pessoa de maior renda na sua casa **é** ou **era**: | Typejob

- ❑ empregado asssalariado **com** carteira profissional assinada
- ❑ empregado asssalariado **sem** carteira profissional assinada
- ❑ trabalho não remunerado na firma da própria família
- ❑ conta própria ou autônomo **com** estabelecimento
- ❑ conta própria ou autônomo **sem** estabelecimento
- ❑ empregador. quantos funcionários fixos? _____

60. Qual é a profissão da pessoa de maior renda na sua casa e o que ela faz/fazia nesse emprego? (quais as tarefas mais frequentes envolvidas nesse tipo de trabalho)

_____ | dowhat

61. Qual é (ou era) a atividade do estabelecimento em que a pessoa de maior renda renda na sua casa trabalhava/trabalha? (exemplo: comércio, indústria, hospital,clínica, etc.)

_____ | inwhat

Appendix 6a: Self-complete Questionnaire (Portuguese)

The Department of Epidemiology and Public Health
The Royal Free and University College London Medical School, London, UK
Faculdade de Odontologia de Bauru, Universidade de São Paulo, Brasil

PROJETO SMILE

QUESTIONÁRIO DO ESTUDANTE

Obrigado por estar participando desta pesquisa.

Leia cada questão cuidadosamente e responda-a sinceramente.
Este questionário não é um teste escolar, portanto não existe resposta "errada" ou "certa". O que nos interessa é a **SUA** opinião.

Suas respostas serão vistas somente pelos pesquisadores e ninguém mais. Seus pais e professores não terão acesso a elas.

DATA : ☐☐ ☐☐ ☐☐
DIA MÊS ANO

NÚMERO DO FORMULÁRIO: ☐☐☐☐

INSTRUÇÕES

EM ALGUMAS QUESTÕES VOCÊ DEVERÁ MARCAR UM **"X"** NO ESPAÇO QUE MELHOR CORRESPONDE À SUA RESPOSTA, POR EXEMPLO:

COMO VOCÊ ESTÁ SE SENTINDO HOJE? MARQUE UM "X" NA SUA RESPOSTA.

BEM ☐
MAL ☐

EM ALGUMAS QUESTÕES , VOCÊ DEVERÁ RESPONDER CIRCULANDO A SUA OPÇÃO, POR EXEMPLO:

VOCÊ GOSTA DE ACORDAR CEDO?

SIM.....( ).....NÃO SEI

1. Faça um círculo ao redor do número da figura que melhor representa como você se sente a respeito de cada assunto.

Minha saúde		HEALTH
Minha altura		HEIGHT
Meus dentes		TEETH
Meu peso		WEIGHT
Meu visual		LOOKS

2. Leia cada uma das frases abaixo cuidadosamente. Para cada uma delas coloque um "**X**" no quadradinho que melhor descreve você.

	SIM	NÃO	*para uso de pesquisa*
Eu gosto de me envolver em atividades da escola	1 ☐	2 ☐	involv
Eu sou muito preocupado(a)	1 ☐	2 ☐	worry
Eu tenho boas idéias	1 ☐	2 ☐	ideas
Eu gosto de ser do jeito que eu sou	1 ☐	2 ☐	likeself
Eu sempre me meto em encrencas	1 ☐	2 ☐	trouble
Meu visual me aborrece	1 ☐	2 ☐	bother
Eu sou tímido	1 ☐	2 ☐	shy
Meus pais esperam muito de mim (ficam me cobrando)	1 ☐	2 ☐	expect
Eu fico nervoso(a) quando professores me perguntam alguma coisa	1 ☐	2 ☐	nervous
Eu me acho atraente	1 ☐	2 ☐	attrac
Eu gosto da escola	1 ☐	2 ☐	lschool
Eu faço amizade facilmente	1 ☐	2 ☐	friends
As pessoas me perseguem	1 ☐	2 ☐	picked
Sempre que eu tento fazer alguma coisa, parece que tudo dá errado	1 ☐	2 ☐	pessimi
Eu freqüentemente sinto que não sirvo para nada	1 ☐	2 ☐	useless
Eu sempre gosto de fazer as coisas do meu jeito	1 ☐	2 ☐	indept

Nas próximas seis questões, circule apenas uma resposta para cada questão.

3. Você está satisfeito(a) com a aparência geral dos seus dentes?
1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

apteeth

4. Você está satisfeito(a) com a posição dos seus dentes?
1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

arteeth

5. você gostaria de corrigir a posição dos seus dentes?
1. não
2. talvez
3. sim
4. gostaria muito

strteet

6. Você está satisfeito(a) com a aparência do seu sorriso? | stsmi

1. muito satisfeito
2. satisfeito
3. insatisfeito
4. muito insatisfeito

7. Comparando o seu sorriso com o sorriso dos seus colegas da mesma idade, como você classificaria o visual dos seus dentes? | tlook

1. entre os mais bonitos
2. acima da média
3. abaixo da média
4. entre os mais feios

8. Comparando com outras partes da sua face como você classificaria os seus dentes? | tface

1. eu acho uma das partes mais bonitas da minha face
2. eu acho que os meus dentes são aceitáveis
3. eu acho uma das partes mais feias da minha face

Marque apenas um "X" no espaço que melhor representa a sua resposta .

9. Você já foi alguma vez ao dentista? | beendent

❑ sim **(vá para a questão 10)**
❑ não **(vá para a questão 12)**

10. Em geral, você vai ao dentista: | whydent

❑ apenas quando você tem algum problema com os seus dentes
(vá para a questão 12)
❑ principalmente para revisões periódicas (check ups)
(vá para a questão 11)
❑ outro motivo, especifique .....
(vá para a questão 12)
❑ não sei/ não me lembro
(vá para a questão 12)

11. Se o principal motivo da sua visita ao dentista é para revisões periódicas (check ups), qual é a freqüência das visitas? | oftengo

❑ mais frequente que 2 vezes por ano
❑ 2 vezes por ano
❑ uma vez por ano
❑ uma vez a cada 2 anos
❑ menos frequente do que uma vez a cada 2 anos
❑ não sei/ não me lembro

Responda cada questão marcando um "X" no espaço que melhor representa a sua resposta .

	nunca	poucas vezes	às vezes	quase sempre	sempre	
12. Você já teve alguma dificuldade em pronunciar alguma palavra devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	pronounc
13. Você já sentiu que o seu paladar piorou (algum alimento perdeu o sabor) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	taste
14. Você ja teve dor na sua boca?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	pain
15. Você já sentiu desconforto ao comer algum alimento devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	eatprob
16. Você já se sentiu constrangido(a) por causa dos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	selfconc
17. Você já ficou tenso(a) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	tense
18. Alguma vez você já deixou de saborear algum alimento devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	unsadiet
19. Você já teve que interromper alguma refeição devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	meal
20. Você já sentiu alguma vez dificuldade em relaxar devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	relax
21. Você já ficou envergonhado(a) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	embarr
22. Você já ficou irritado(a) com outras pessoas devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	irrita
23. Você já sentiu alguma dificuldade em realizar alguma das suas atividades diárias (escola, passeios, festas, esportes, namorar) devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	usualjob
24. Voce já sentiu que a sua vida em geral não estava muito boa devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	satilife
25. Você já se sentiu totalmente incapaz de realizar alguma atividade do seu dia-a-dia devido a problemas causados pelos seus dentes?	0 ❑	1 ❑	2 ❑	3 ❑	4 ❑	unablefu

Nessas questões você **pode circular mais de uma resposta**

☛ (se você gostaria de ter usado aparelho ortodôntico responda as questões 26,27 e 29)
☛ (se você nunca quis usar aparelho ortodôntico responda as questões 28 e 29)

26. Se você gostaria de ter usado aparelho ortodôntico para corrigir a posição dos seus dentes, qual é a principal razão?

1 para melhorar a aparência dos seus dentes — everorth
2 para melhorar a sua mastigação
3 para melhorar a sua fala
4 outro motivo, especificar.....

27. Se você gostaria de ter usado aparelho ortodôntico, qual foi a maior razão para você não ter usado?

1 o tratamento ortodôntico é muito caro — whyortho
2 o tratamento ortodôntico seria muito longo
3 eu não usaria o aparelho ortodôntico
4 o dentista clínico geral não acha/achou que é necessário
5 o ortodontista acha/achou que não é necessário
6 não havia dentista/ortodontista onde eu moro/morava
7 eu não sei/ não sabia muito sobre o que é tratamento ortodôntico
8 não havia vaga (tratamento fornecido por uma faculdade de odontologia)
9 outro motivo, especifique.....

28. Se você nunca quis usar aparelho ortodôntico, qual é/ foi a principal razão?

1 eu não preciso usar aparelho ortodôntico — noortho
2 o tratamento ortodôntico é muito caro
3 o tratamento é muito longo
4 eu não quero usar aparelho ortodôntico
5 o dentista clínico geral acha/achou que eu não preciso
6 o ortodontista acha/achou que eu não preciso
7 não existe dentista clínico geral/ ortodontista onde eu moro/morava
8 eu não sei muito sobre o que é o tratamento ortodôntico
9 outro motivo, especifique .....

29. Como você ficou sabendo sobre o tratamento ortodôntico?

1 através de um dentista clínico geral — knoworth
2 através de um ortodontista
3 através de familiares, amigos, colegas
4 através de revistas
5 através de livros
6 eu não sei muito sobre o que é o tratamento ortodôntico
7 outro motivo, especifique.....

*Dê a sua opinião marcando apenas um **"X"** para cada afirmação abaixo.*

	concordo totalmente	concordo parcialmente	discordo parcialmente	discordo totalmente	para uso de pesquisa
30. Eu tenho dentes bem posicionados	1 ❑	2 ❑	3 ❑	4 ❑	strai1
31. Meus dentes da frente são tortos (encavalados)	1 ❑	2 ❑	3 ❑	4 ❑	crook1
32. Existem muitos espaços entre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	space1
33. Meus dentes da frente não são bem posicionados	1 ❑	2 ❑	3 ❑	4 ❑	notog1
34. meus dentes da frente são muito projetados/salientes	1 ❑	2 ❑	3 ❑	4 ❑	stick1
35. Minha mordida não é boa	1 ❑	2 ❑	3 ❑	4 ❑	badbite1
36. Eu estou satisfeito(a) com a aparência dos meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	satlook1
37. Eu não tenho dificuldades ao mastigar os alimentos	1 ❑	2 ❑	3 ❑	4 ❑	gchew1
38. As pessoas fazem piadas sobre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	tease1
39. Eu me preocupo com a opinião das outras pessoas sobre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	pthink1
40. Ter os dentes corretamente posicionados é muito importante nos dias de hoje	1 ❑	2 ❑	3 ❑	4 ❑	nowday1
41. Eu gostaria de ter os meus dentes mais alinhados	1 ❑	2 ❑	3 ❑	4 ❑	mstrai1
42. Algumas pessoas acham que eu deveria corrigir a posição dos meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	pstrai1
43. Eu realmente acho que eu preciso usar aparelho ortodôntico	1 ❑	2 ❑	3 ❑	4 ❑	likorto1
44. Eu gostaria de conversar com um ortodontista sobre os meus dentes	1 ❑	2 ❑	3 ❑	4 ❑	sportho

45. Marque com um **"X"** as pessoas que moram na sua casa e responda quantos são: | people

- ❑ pai
- ❑ mãe
- ❑ irmãos (incluindo você). quantos? _____
- ❑ empregados que dormem no emprego. quantos? _____
- ❑ outras pessoas. quantas? _____

46. Até que série da escola o seu **pai** estudou? | faeduc

- ❑ não sabe ler nem escrever
- ❑ 1° grau incompleto
- ❑ 1° grau completo (até a oitava série)
- ❑ 2° grau incompleto
- ❑ 2° grau completo (até o 3° colegial)
- ❑ curso universitário incompleto
- ❑ curso universitário completo
- ❑ pós-graduação
- ❑ não sei

47. Até que série da escola a sua **mãe** estudou? | moeduc

- ❑ não sabe ler nem escrever
- ❑ 1° grau incompleto
- ❑ 1° grau completo (até a oitava série)
- ❑ 2° grau incompleto
- ❑ 2° grau completo (até o 3° colegial)
- ❑ curso universitário incompleto
- ❑ curso universitário completo
- ❑ pós-graduação
- ❑ não sei

☛ as próximas perguntas são a respeito da pessoa que **possue a maior renda** na sua casa (quem ganha mais).

48. A pessoa de maior renda na sua casa está trabalhando no momento? | Dowork

- ❑ sim, em atividade
- ❑ sim, e também é aposentado
- ❑ não, está desempregado
- ❑ não, aposentado
- ❑ não, outra situação. qual? _____
- ❑ não sei

49. A pessoa de maior renda na sua casa **é** ou **era**: | Typejob

- ❑ empregado asssalariado **com** carteira profissional assinada
- ❑ empregado asssalariado **sem** carteira profissional assinada
- ❑ trabalho não remunerado na firma da própria família
- ❑ conta própria ou autônomo **com** estabelecimento
- ❑ conta própria ou autônomo **sem** estabelecimento
- ❑ empregador. quantos funcionários fixos? _____.

50. Qual é a profissão da pessoa de maior renda na sua casa e o que ela faz/fazia nesse emprego? (quais as tarefas mais frequentes envolvidas nesse tipo de trabalho)

_____ | dowhat

51. Qual é (ou era) a atividade do estabelecimento em que a pessoa de maior renda renda na sua casa trabalhava/trabalha? (exemplo: comércio, indústria, hospital,clínica, etc.)

_____ | inwhat

The Department of Epidemiology and Public Health
The Royal Free and University College London Medical School, London, UK

The Smile Project

STUDENT'S QUESTIONNAIRE

Thank you for helping us with this survey.
Take your time to read each question in turn and answer it as best you can. These questions are not like a college test. They do not have 'right' and 'wrong' answers, they are about what you think. Please, write down your own answers, don't copy anyone else. **Remember**, we are interested in what **you** think and feel.

Your answers will be looked at by the survey study team and no one else. They will not be seen by your parents or teachers.

Date of completion: ☐☐ ☐☐ ☐☐
DAY MONTH YEAR

Student's number: ☐☐☐☐

INSTRUCTIONS

In some questions, you will be asked to put a tick in the box that best fits your answer, like this: **Is today's weather good or bad?**

good ☐ bad ☐

In some questions, you will be asked to put a circle round the best answer, like this: **Do you like getting up in the morning?**

yes ◯ I don't know

1. These faces show how you feel. Look at the faces and **put a circle round** the number which shows best how you feel about each thing.

The face which shows best how I feel about ...

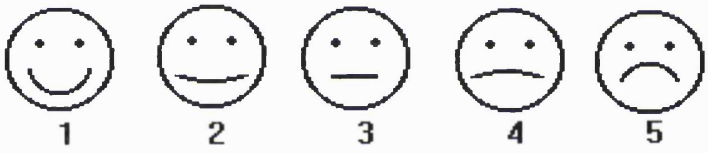
My health

HEALTH

My height

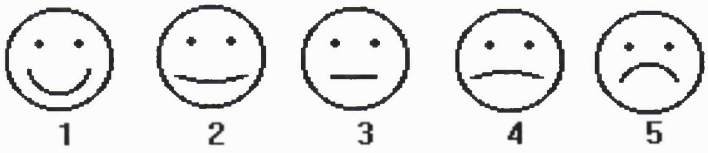
HEIGHT

My teeth



TEETH

My weight



WEIGHT

My looks

LOOKS

2. Read each of the following statements carefully. For each one, please put a **tick** in the box in the **YES** column if you think it does describe you or put a **tick** in the box in the **NO** column if you think it does not describe you.

	YES	NO	*RESEARCHER USE ONLY*
I enjoy getting involved in college activities	1 ☐	2 ☐	INVOLV
I worry a lot	1 ☐	2 ☐	WORRY
I have good ideas	1 ☐	2 ☐	GIDEAS
I like being the way I am	1 ☐	2 ☐	LIKESELF
I often get into trouble	1 ☐	2 ☐	TROUBLE
My looks bother me	1 ☐	2 ☐	BOTHER
I am shy	1 ☐	2 ☐	SHY
My parents expect too much of me	1 ☐	2 ☐	EXPECT
I get nervous when teachers ask me something	1 ☐	2 ☐	NERVOUS
I think I am attractive	1 ☐	2 ☐	ATTRAC
I like college	1 ☐	2 ☐	LSCHOOL
I make friends easily	1 ☐	2 ☐	FRIENDS
People pick on me	1 ☐	2 ☐	PICKED
Whenever I try to do something, it seems to go wrong	1 ☐	2 ☐	PESSIMI
I often feel that I am useless	1 ☐	2 ☐	USELESS
I always like to get my own way	1 ☐	2 ☐	INDEPT

Circle one answer on each question. Please answer **all** questions in this page.

3. How satisfied are you with the general appearance of your teeth ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

APTEETH

4. Are you satisfied with the arrangement of your teeth ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

ARTEETH

5. Do you want to have your teeth straightened ?

1. No, not at all
2. No, I do not think so
3. Yes, I think so
4. Yes, very much

STRTEET

6. How satisfied are you with the appearance of your smile ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

STSMILE

7. Compared to other friends of your age, how do you think your teeth look ?

1. among the nicest
2. better than the average
3. below average
4. among the worst

TLOOK

8. How do you consider your teeth as compared to your entire face?

1. one of the nicest features of your face
2. better than average feature of your face
3. below average feature of your face
4. one of the poorest features of your face

TFACE

In this page we would like to find out how often you visit the dentist and why you visit the dentist **(PLEASE GIVE YOUR ANSWER BY TICKING ONE BOX ONLY).**

9. Have you ever been to the dentist? BEEN DENT

- ☐ yes **(go to question 10)**
- ☐ no **(go to question 13)**

10. In general, do you go to the dentist: WHYDENT

- ☐ when you have trouble with your teeth **(go to question 13)**
- ☐ mainly for check ups **(go to question 11)**
- ☐ follow-up orthodontic visits (braces) **(go to question 12)**
- ☐ other **(go to question 13)**
- ☐ do not know/ cannot remember **(go to question 13)**

11. If check ups, how often do you usually go? OFTENGO

- ☐ more often than 6 months **(go to question 13)**
- ☐ every 6 months **(go to question 13)**
- ☐ once a year **(go to question 13)**
- ☐ once every 2 years **(go to question 13)**
- ☐ less often than once every 2 years **(go to question 13)**
- ☐ do not know/ cannot remember **(go to question 13)**

12. If follow-up orthodontic visits (braces), how often do you usually go? OFTENORT

- ☐ every 4 - 6 weeks **(go to question 13)**
- ☐ less often **(go to question 13)**
- ☐ do not know/ cannot remember **(go to question 13)**

Questions **13** to **26** are about how often your teeth affect your daily activities in the past 6 months. For each question, please give your answer by ticking one box only.

	never	hardly	occasionally	fairly often	very often	
13. Have you had trouble pronouncing any words because of problems with your teeth ?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	pronounc
14. Have you felt that your sense of taste has worsened because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	taste
15. Have you had painful aching in your mouth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	pain
16. Have you found it uncomfortable to eat any foods because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	eatprob
17. Have you been self-concious because of your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	selfconc
18. Have you felt tense because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	tense
19. Has your diet been unsatisfactory because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	unsadiet
20. Have you had to interrupt meals because of problems with teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	meal
21. Have you found it difficulty to relax because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	relax
22. Have you been a bit embarrassed because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	embarr
23. Have you been a bit irritable with other people because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	irrita
24. Have you had difficulty doing your usual daily activities because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	usualjob
25. Have you felt that life in general was less satisfying because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	satilife
26. Have you been totally unable to function because of problem with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	unablefu

RESEARCHE USE ONLY

27. Have you finished with your orthodontic treatment? ENDORTHO

1 no, I'm still in treatment **(go to questions 29,30,31,32)**
2 no, I stopped before treatment was finished **(go to questions 28,29,30,31,32)**
3 yes, less than 1 year ago **(go to questions 29,30,31,32)**
4 yes, between 1 and 2 years ago **(go to questions 29,30,31,32)**
5 yes, between 2 and 4 years ago **(go to questions 29,30,31,32)**
6 yes, more than 4 years ago **(go to questions 29,30,31,32)**

28. Why have you stopped with treatment? **Give your most** important reason why. STOPORTH

1 I was satisfied
2 it was too expensive
3 treatment would last too long
4 the dentist/orthodontist thought treatment complete
5 other, namely .....

29. Why have you been treated? **Give your most** important reason why. WHYORTHO

1 my front teeth were crooked
2 there was too much space between my teeth
3 my front teeth didn't come together properly
4 my front teeth were sticking out
5 my bite was not good
6 to improve my speech
7 I don't remember
8 other, namely .....

30. Who said **first** that you needed orthodontic treatment? WHOSAID

1 my dentist/ orthodontist
2 my parents
3 my medical doctor
4 my friends/peers
5 my speech therapist
6 oral surgeon
7 I did myself
8 other, namely .....
9 I can't remember/ I don't know

31. By whom have you been treated?

WHOMTRET

1 family dentist
2 community/ school dentist
3 orthodontic practice
4 hospital orthodontist
5 specialist
6 specialist orthodontist and oral surgeon
7 I can't remember/ I don't know

32. What kind of braces did you have to wear during treatment?

KINDAPPL

1 none **(go to question 33)**
2 removable **(go to question 33)**
3 fixed **(go to question 33)**
4 both **(go to question 33)**
5 other **(go to question 33)**
6 I don't remember/ I don't know **(go to question 33)**

Below you find some statements that refer to **your teeth** and **appearance**, on which you may agree or disagree.
Please give your opinion by **TICKING** one number only on each statement to indicate how much you agree or disagree.
The following statements deal with the way your teeth are now.
(please answer questions **33 to 53)**

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	*RESEARCHER USE ONLY*
33. I have straight teeth	1☐	2☐	3☐	4☐	straight
34. my front teeth are crooked	1☐	2☐	3☐	4☐	crooked
35. there is too much space between my teeth	1☐	2☐	3☐	4☐	space
36. my front teeth don't come together properly	1☐	2☐	3☐	4☐	together
37. my front teeth are sticking out	1☐	2☐	3☐	4☐	stickout
38. my bite is not good	1☐	2☐	3☐	4☐	badbite
39. I'm satisfied with the way my teeth look	1☐	2☐	3☐	4☐	satlook
40. I have no difficulties with chewing	1☐	2☐	3☐	4☐	goodchew

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	*RESEARCHER USE ONLY*
41. I would have liked my teeth to be more straight	1☐	2☐	3☐	4☐	mstraight
42. Other people have teased me because of my teeth	1☐	2☐	3☐	4☐	teased
43. I'm concerned about what other people think of my teeth	1☐	2☐	3☐	4☐	pthink
44. having straight teeth is important nowadays	1☐	2☐	3☐	4☐	nowadays
45. other people think I should have my teeth straightened	1☐	2☐	3☐	4☐	teethstrai
46. I really would like to have further orthodontic treatment myself	1☐	2☐	3☐	4☐	likortho
47. I really wanted treatment myself when I started with it	1☐	2☐	3☐	4☐	wantorth
48. the treatment has really changed my looks	1☐	2☐	3☐	4☐	trelook
49. I am very glad that I have my teeth straightened	1☐	2☐	3☐	4☐	gladstr
50. in my opinion the treatment was worthwhile	1☐	2☐	3☐	4☐	worth
51. I'm satisfied with the result of my treatment	1☐	2☐	3☐	4☐	satend
52. looking back, today I would also have made the decision to have treatment if I was in the same situation	1☐	2☐	3☐	4☐	noregret
53. my teeth have become irregular again after the treatment	1☐	2☐	3☐	4☐	regret

MEASURING BELIEFS ABOUT ORTHODONTIC TREATMENT

54. Please rate from 1 to 6 how important it is to you that after orthodontic treatment is complete, you ...
(Please, tick only one box on each line).

	NOT AT ALL IMPORTANT 1	2	3	4	5	EXTREMELY IMPORTANT 6	
... have improved self esteem as a result of straighter teeth ?	☐	☐	☐	☐	☐	☐	ESTEEM
... have better looking teeth after orthodontic treatment ?	☐	☐	☐	☐	☐	☐	BETLOOK
... become more outgoing as a result of having braces ?	☐	☐	☐	☐	☐	☐	OUTGOING
... find the teeth easier to clean after the braces are removed ?	☐	☐	☐	☐	☐	☐	CLEAN
... have a better smile as a result of orthodontic treatment ?	☐	☐	☐	☐	☐	☐	BSMILE
... find the teeth will stay straight forever ?	☐	☐	☐	☐	☐	☐	STRAIGHT
... have a more attractive profile because of orthodontic treatment ?	☐	☐	☐	☐	☐	☐	ATTRACT
... have straighter teeth as a result of having braces ?	☐	☐	☐	☐	☐	☐	STRTEETH
... care less about your teeth after having braces ?	☐	☐	☐	☐	☐	☐	CARELESS

55. How many **people** live in your **household?** (including your child who **is** participating in the study)

❑ Father: ❑ Natural ❑ Step-father
❑ Mother: ❑ Natural ❑ Step-mother
❑ Children. How many ?
❑ Servants who live in the house. How many ?
❑ Others. How many ?

Total = _____

56. What is the father's educational level?

❑ none (cannot read or write)
❑ primary school not completed. How many years of study?
❑ primary school completed
❑ secondary school not completed. How many years of study?
❑ secondary school completed
❑ university not completed
❑ university completed
❑ post-graduation
❑ I do not know

57. What is the mother's educational level?

❑ none (cannot read or write)
❑ primary school not completed.
❑ How many years of study?
❑ primary school completed
❑ secondary school not completed. How many years of study?
❑ secondary school completed
❑ university not completed
❑ university completed
❑ post-graduation
❑ I do not know

THE NEXT QUESTIONS MUST BE ANSWERED ONLY BY THE HEAD OF THE FAMILY. CONSIDER HEAD OF THE FAMILY AS THE ONE WHO HAS THE HIGHER INCOME.

58. Are you working at the moment?

❑ yes
❑ yes, and also retired
❑ no, unemployed
❑ no, retired
❑ no, other situation. Specify _____

59. In your main job you are (were):

❑ employed with social welfare
❑ employed without social welfare
❑ family employee without salary
❑ self-employed with an establishment
❑ self-employed without an establishment
❑ employer. How many fixed employees in your company?

60. What do (did) you do in your main job? (Describe in detail your main tasks in your job)

_____
_____

61. What is (was) the activity of the establishment where you work (worked)?

_____
_____

THAT'S IT!

THANK YOU

The Department of Epidemiology and Public Health
The Royal Free and University College London Medical School, London, UK

The Smile Project

STUDENT'S QUESTIONNAIRE

Thank you for helping us with this survey.
Take your time to read each question in turn and answer it as best you can. These questions are not like a college test. They do not have 'right' and 'wrong' answers, they are about what you think. Please, write down your own answers, don't copy anyone else. **Remember**, we are interested in what **you** think and feel.

Your answers will be looked at by the survey study team and no one else. They will not be seen by your parents or teachers.

Date of completion: ☐☐ DAY ☐☐ MONTH ☐☐ YEAR

Student's number: ☐☐☐☐

INSTRUCTIONS

In some questions, you will be asked to put a tick in the box that best fits your answer, like this: **Is today's weather good or bad?**

good ☐ bad ☐

In some questions, you will be asked to put a circle round the best answer, like this: **Do you like getting up in the morning?**

yes ◯ I don't know

1. These faces show how you feel. Look at the faces and **put a circle round** the number which shows best how you feel about each thing.

The face which shows best how I feel about ...

My health

HEALTH

My height

HEIGHT

My teeth

TEETH

My weight

WEIGHT

My looks

LOOKS

2. Read each of the following statements carefully. For each one, please put a **tick** in the box in the **YES** column if you think it does describe you or put a **tick** in the box in the **NO** column if you think it does not describe you.

	YES	NO	*RESEARCHER USE ONLY*
I enjoy getting involved in college activities	1 ☐	2 ☐	INVOLV
I worry a lot	1 ☐	2 ☐	WORRY
I have good ideas	1 ☐	2 ☐	GIDEAS
I like being the way I am	1 ☐	2 ☐	LIKESELF
I often get into trouble	1 ☐	2 ☐	TROUBLE
My looks bother me	1 ☐	2 ☐	BOTHER
I am shy	1 ☐	2 ☐	SHY
My parents expect too much of me	1 ☐	2 ☐	EXPECT
I get nervous when teachers ask me something	1 ☐	2 ☐	NERVOUS
I think I am attractive	1 ☐	2 ☐	ATTRAC
I like college	1 ☐	2 ☐	LSCHOOL
I make friends easily	1 ☐	2 ☐	FRIENDS
People pick on me	1 ☐	2 ☐	PICKED
Whenever I try to do something, it seems to go wrong	1 ☐	2 ☐	PESSIMI
I often feel that I am useless	1 ☐	2 ☐	USELESS
I always like to get my own way	1 ☐	2 ☐	INDEPT

Circle one answer on each question. Please answer **all** questions in this page.

3. How satisfied are you with the general appearance of your teeth ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

APTEETH

4. Are you satisfied with the arrangement of your teeth ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

ARTEETH

5. Do you want to have your teeth straightened ?

1. No, not at all
2. No, I do not think so
3. Yes, I think so
4. Yes, very much

STRTEET

6. How satisfied are you with the appearance of your smile ?

1. very satisfied
2. satisfied
3. rather dissatisfied
4. very dissatisfied

STSMILE

7. Compared to other friends of your age, how do you think your teeth look ?

1. among the nicest
2. better than the average
3. below average
4. among the worst

TLOOK

8. How do you consider your teeth as compared to your entire face?

1. one of the nicest features of your face
2. better than average feature of your face
3. below average feature of your face
4. one of the poorest features of your face

TFACE

In this page we would like to find out how often you visit the dentist and why you visit the dentist **(PLEASE GIVE YOUR ANSWER BY TICKING ONE BOX ONLY).**

9. Have you ever been to the dentist? BEEN DENT

- ☐ yes **(go to question 10)**
- ☐ no **(go to question 13)**

10. In general, do you go to the dentist: WHYDENT

- ☐ when you have trouble with your teeth **(go to question 13)**
- ☐ mainly for check ups **(go to question 11)**
- ☐ follow-up orthodontic visits (braces) **(go to question 12)**
- ☐ other **(go to question 13)**
- ☐ do not know/ cannot remember **(go to question 13)**

11. If check ups, how often do you usually go? OFTENGO

- ☐ more often than 6 months **(go to question 13)**
- ☐ every 6 months **(go to question 13)**
- ☐ once a year **(go to question 13)**
- ☐ once every 2 years **(go to question 13)**
- ☐ less often than once every 2 years **(go to question 13)**
- ☐ do not know/ cannot remember **(go to question 13)**

Questions **12** to **25** are about how often your teeth affect your daily activities in the past 6 months. For each question, please give your answer by ticking one box only.

	never	hardly	occasionally	fairly often	very often	
12. Have you had trouble pronouncing any words because of problems with your teeth ?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	pronounc
13. Have you felt that your sense of taste has worsened because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	taste
14. Have you had painful aching in your mouth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	pain
15. Have you found it uncomfortable to eat any foods because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	eatprob
16. Have you been self-concious because of your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	selfconc
17. Have you felt tense because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	tense
18. Has your diet been unsatisfactory because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	unsadiet
19. Have you had to interrupt meals because of problems with teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	meal
20. Have you found it difficulty to relax because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	relax
21. Have you been a bit embarrassed because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	embarr
22. Have you been a bit irritable with other people because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	irrita
23. Have you had difficulty doing your usual daily activities because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	usualjob
24. Have you felt that life in general was less satisfying because of problems with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	satilife
25. Have you been totally unable to function because of problem with your teeth?	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	unablefu

☛(If you **have ever** wanted orthodontic treatment, please answer questions **26,27 and 29)**
☛(If you **have never** wanted orthodontic treatment, please answer questions **28 and 29)**

26. If you have **ever** wanted orthodontic treatment, **give your most** important reason why.

EVERORTH

1 to improve the appearance of my teeth
2 to improve biting and chewing
3 to improve speech
4 other, namely .....

27. If you have **ever** wanted orthodontic treatment yourself, **give your most** important reason for not having treatment.

WHYORTHO

1 it is too expensive
2 it would take too much of my time
3 I won't wear braces
4 the dentist thinks/ thought it not necessary
5 the orthodontist thinks/ thought it not necessary
6 there is/ was no dentist/ orthodontist where I live
7 I don't/ didn't know enough about orthodontics
8 the waiting list was too long
9 other, namely .....

28. If you **never** wanted orthodontic treatment, **give your most** important reason why.

NOORTHO

1 I don't need it
2 it is too expensive
3 it takes too much time
4 I won't wear braces
5 the dentist thinks it is not necessary
6 the orthodontist thinks it is not necessary
7 there is no dentist/orthodontist where I live
8 I don't know enough about orthodontics
9 other, namely .....

29. From where have you got your knowledge about orthodontics ?

KNOWORTH

1 from my dentist **(go to question 30)**
2 from orthodontist **(go to question 30)**
3 from family, friends, peers **(go to question 30)**
4 from papers/ magazines **(go to question 30)**
5 from books **(go to question 30)**
6 I don't know much about orthodontics **(go to question 30)**
7 other, namely .....**(go to question 30)**

Please give your opinion by **TICKING** one number only on each statement to indicate how much you agree or disagree. Please answer questions **30 to 44**.

	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	*RESEARCHER USE ONLY*
30. I HAVE STRAIGHT TEETH	1❑	2❑	3❑	4❑	STRAIGH2
31. MY FRONT TEETH ARE CROOKED	1❑	2❑	3❑	4❑	CROOK
32. THERE IS TOO MUCH SPACE BETWEEN MY TEETH	1❑	2❑	3❑	4❑	SPACE
33. MY FRONT TEETH DO NOT COME TOGETHER PROPERLY	1❑	2❑	3❑	4❑	NOTOG
34. MY FRONT TEETH ARE STICKING OUT	1❑	2❑	3❑	4❑	STICK
35. MY BITE IS NOT GOOD	1❑	2❑	3❑	4❑	NOBITE
36. I'M SATISFIED WITH THE WAY MY TEETH LOOK	1❑	2❑	3❑	4❑	SATLOOK
37.I HAVE NO DIFFICULTIES WITH CHEWING	1❑	2❑	3❑	4❑	GCHEW
38. OTHER PEOPLE HAVE TEASED ME BECAUSE OF MY TEETH	1❑	2❑	3❑	4❑	TEASE2
39. I'M CONCERNED ABOUT WHAT OTHER PEOPLE THINK OF MY TEETH	1❑	2❑	3❑	4❑	PTHINK2
40. HAVING STRAIGHT TEETH IS IMPORTANT NOWADAYS	1❑	2❑	3❑	4❑	NOWDAY2
41. I WOULD HAVE LIKED MY TEETH TO BE MORE STRAIGHT	1❑	2❑	3❑	4❑	STRAIG3
42. OTHER PEOPLE THINK I SHOULD HAVE MY TEETH STRAIGHTENED	1❑	2❑	3❑	4❑	PSTRAIGH
43. I REALLY WOULD LIKE TO HAVE ORTHODONTIC TREATMENT MYSELF	1❑	2❑	3❑	4❑	LORTHO
44. I WOULD LIKE TO SPEAK TO AN ORTHODONTIST ABOUT MY TEETH	1❑	2❑	3❑	4❑	SPORTHO

45. How many **people** live in your **household?** (including your child who **is** participating in the study)

❑ Father: ❑ Natural ❑ Step-father
❑ Mother: ❑ Natural ❑ Step-mother
❑ Children. How many ?
❑ Servants who live in the house. How many ?
❑ Others. How many ?

Total = _____

46. What is the father's educational level?

❑ none (cannot read or write)
❑ primary school not completed. How many years of study?
❑ primary school completed
❑ secondary school not completed. How many years of study?
❑ secondary school completed
❑ university not completed
❑ university completed
❑ post-graduation
❑ I do not know

47. What is the mother's educational level?

❑ none (cannot read or write)
❑ primary school not completed.
❑ How many years of study?
❑ primary school completed
❑ secondary school not completed. How many years of study?
❑ secondary school completed
❑ university not completed
❑ university completed
❑ post-graduation
❑ I do not know

THE NEXT QUESTIONS MUST BE ANSWERED ONLY BY THE HEAD OF THE FAMILY. CONSIDER HEAD OF THE FAMILY AS THE ONE WHO HAS THE HIGHER INCOME.

48. Are you working at the moment?

❑ yes
❑ yes, and also retired
❑ no, unemployed
❑ no, retired
❑ no,other situation. Specify _____

49. In your main job you are (were):

❑ employed with social welfare
❑ employed without social welfare
❑ family employee without salary
❑ self-employed with an establishment
❑ self-employed without an establishment
❑ employer. How many fixed employees in your company?

50. What do (did) you do in your main job? (Describe in detail your main tasks in your job)

_____
_____

51. What is (was) the activity of the establishment where you work (worked)?

_____
_____

THAT'S IT!

THANK YOU

Appendix 7a: OIDP – Oral Health Related Quality of Life Measure (Portuguese)

I N S T R U Ç Õ E S

Agora nós vamos lhe apresentar um grupo de atividades da sua vida diária como por exemplo **COMER, FALAR, LIMPAR A SUA BOCA, DORMIR, MOSTRAR OS SEUS DENTES, MANTER O SEU ESTADO EMOCIONAL, REALIZAR OS SEUS ESTUDOS, SAIR COM AMIGOS e REALIZAR ESPORTES**. Nesta fase gostaríamos de saber das dificuldades que você possa ter tido em realizar essas atividades na sua vida diária ***durante os últimos 6 meses,*** **causada pelos seus dentes ou pela sua boca.**

Pense cuidadosamente e não tenha pressa. Você tem nesse questionário uma ***lista com 9 atividades:***
Para cada atividade você será perguntado, se você teve ou não dificuldade em realizar a atividade em questão.

1. **Caso você NÃO tenha tido dificuldade em realizar a atividade em questão, você deverá responder a atividade seguinte.**

2. **Se por acaso você tiver tido alguma dificuldade na atividade em questão, você deverá responder SIM. Devendo responder as seguintes perguntas:**

- **Nos últimos seis meses quantas vezes você teve essa dificuldade?**
  Se **menos** de uma vez por mês ou **mais** de uma vez por mês
- **Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?**
  Estabelecendo a severidade e a causa da dificuldade.

1-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para COMER nos últimos seis meses ? (ex: comer o que você quiser, morder maçãs, cenoura crua, beber alimentos frios ou quentes)

❑ Não **(Responda a questão 2)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de mastigar ou abrir a boca)
❑ Moderado efeito	
❑ Muito efeito	❑ Insatisfação com a aparência
❑ Extremo efeito	

Score ☐
Total ☐

2-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para FALAR (ex: pronunciar alguma palavra, principalmente começada com "s") nos últimos seis meses ?

❑ Não **(Responda a questão 03)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de
❑ Moderado efeito	mastigar ou abrir a boca)
❑ Muito efeito	❑ Insatisfação com a
❑ Extremo efeito	aparência

Score ☐
Total ☐

3-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para LIMPAR A SUA BOCA nos últimos seis meses ? (ex. escovar , passar fio dental ou bochechar)

❑ Não **(Responda a questão 4)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de
❑ Moderado efeito	mastigar ou abrir a boca)
❑ Muito efeito	❑ Insatisfação com a
❑ Extremo efeito	aparência

Score ☐
Total ☐

4-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para DORMIR nos últimos seis meses ?

❑ Não **(Responda a questão 5)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês	Score
❑Até 5 dias no total	❑ Menos de uma vez por mês	
❑Até 15 dias no total	❑ Uma ou duas vezes por mês	
❑Até 30 dias no total	❑ Uma ou duas vezes por semana	
❑Até 3 meses no total	❑ 3 -4 vezes por semana	
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias	

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa	Score
❑ Nenhum efeito	❑ Dor	
❑ Muito pouco efeito	❑ Desconforto	
❑ Pouco efeito	❑ Limitação de função (deixar de	**Total**
❑ Moderado efeito	mastigar ou abrir a boca)	
❑ Muito efeito	❑ Insatisfação com a	
❑ Extremo efeito	aparência	

5-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para MOSTRAR SEUS DENTES SEM SE SENTIR ENVERGONHADO nos últimos seis meses ?
(ex: ao sorrir ou gargalhar, ao falar, ao abrir sua boca)

❑ Não **(Responda a questão 6)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês	Score
❑Até 5 dias no total	❑ Menos de uma vez por mês	
❑Até 15 dias no total	❑ Uma ou duas vezes por mês	
❑Até 30 dias no total	❑ Uma ou duas vezes por semana	
❑Até 3 meses no total	❑ 3 -4 vezes por semana	
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias	

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa	Score
❑ Nenhum efeito	❑ Dor	
❑ Muito pouco efeito	❑ Desconforto	
❑ Pouco efeito	❑ Limitação de função (deixar de	**Total**
❑ Moderado efeito	mastigar ou abrir a boca)	
❑ Muito efeito	❑ Insatisfação com a	
❑ Extremo efeito	aparência	

6- Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para MANTER SEU ESTADO EMOCIONAL nos últimos seis meses tornando-o (a) mais emotivo(a) (ex: chorar fácil), ficar triste ou facilmente mais irritado(a) que o normal?

❑ Não **(Responda a questão 7)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de mastigar ou abrir a boca)
❑ Moderado efeito	❑ Insatisfação com a aparência
❑ Muito efeito	
❑ Extremo efeito	

Score ☐
Total ☐

7- Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para REALIZAR SUAS TAREFAS ESCOLARES USUAIS OU SEUS ESTUDOS nos últimos seis meses ?
(ex: falta de concentração durante as aulas, faltar ás aulas)

❑ Não **(Responda a questão 8)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de mastigar ou abrir a boca)
❑ Moderado efeito	❑ Insatisfação com a aparência
❑ Muito efeito	
❑ Extremo efeito	

Score ☐
Total ☐

8-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para SAIR COM OS SEUS AMIGOS nos últimos seis meses?
(ex: festas, passeios, reuniões)

❑ Não **(Responda a questão 9)**
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de mastigar ou abrir a boca)
❑ Moderado efeito	❑ Insatisfação com a aparência
❑ Muito efeito	
❑ Extremo efeito	

Score ☐
Total ☐

9-Você poderia me dizer se os seus dentes ou boca lhe causaram alguma dificuldade para REALIZAR ATIVIDADES FÍSICAS nos últimos seis meses?
(ex: esportes como o futebol)

❑ Não (Muito obrigado por ter preenchido esse questionário)
❑ Sim

Nos últimos seis meses quantas vezes você teve essa dificuldade?

Menos de uma vez por mês	Mais de uma vez por mês
❑Até 5 dias no total	❑ Menos de uma vez por mês
❑Até 15 dias no total	❑ Uma ou duas vezes por mês
❑Até 30 dias no total	❑ Uma ou duas vezes por semana
❑Até 3 meses no total	❑ 3 -4 vezes por semana
❑Mais de 3 meses no total	❑ Todos ou quase todos os dias

Score ☐

Qual foi a gravidade dessa dificuldade na sua vida diária e qual foi a causa dessa dificuldade ?

Severidade	Causa
❑ Nenhum efeito	❑ Dor
❑ Muito pouco efeito	❑ Desconforto
❑ Pouco efeito	❑ Limitação de função (deixar de mastigar ou abrir a boca)
❑ Moderado efeito	❑ Insatisfação com a aparência
❑ Muito efeito	
❑ Extremo efeito	

Score ☐
Total ☐

Grand Total ☐

CONDIÇÃO ESPECÍFICA

SPECIFIC CONDITION

0 ☐ não sei
1 ☐ dor de dente
2 ☐ falta de dente
3 ☐ dente com mobilidade, mole
4 ☐ cor dos dentes
5 ☐ posição dos dentes (dentes tortos ou muito para frente, espaços)
6 ☐ forma ou tamanho dos dentes
7 ☐ deformidade da boca ou da face
8 ☐ aftas
9 ☐ sensação de boca seca
10 ☐ mau hálito
11 ☐ alteração no paladar
12 ☐ gosto ruim na boca
13 ☐ sangramento nas gengivas
14 ☐ gengiva afastada, alta
15 ☐ abscesso gengival (pus)
16 ☐ barulho ao abrir ou fechar a boca
17 ☐ dificuldade para abrir a boca
18 ☐ restauração mal feita
19 ☐ dentadura ou prótese mal adaptada
20 ☐ aparelho ortodôntico
21 ☐ outro motivo

Appendix 7b: OIDP – Oral Health Related Quality of Life Measure (English)

Instructions

In the past 6 months, I would like you to tell me whether or not problems with your teeth have caused you difficulty in these 9 activities in your everyday life:

- **Eating**
- **Cleaning your teeth**
- **Doing light physical activities**
- **Sleeping**
- **Smiling**
- **Emotional state**
- **Contact with people**
- **Carrying out your college work**

For each activity above:

Column a)
In the past 6 months have you had any difficulty in … **ACTIVITY** … due to problems with your teeth? (Please choose your answer by ticking one box in column **a**).

If you have answered **yes** in column a – please go to column **b**.
If you have answered **no** in column a – please go to next activity.

Column b)
During the past 6 months how often have you had this difficulty in … **ACTIVITY** … ?
(Please choose your answer by ticking one box in column **b**).

If you **have** answered **less than once a month** in column b – please go to column **c.**
If you **have not** answered **less than once a month** in column b – please go to column **d.**

Column c)
Answer this column only if you have answered **less than once a month** in column b.

Column d)
Using a scale from 0 to 5, where 0 is no effect and 5 is very severe effect, how much effect would you say that this difficulty in … **ACTIVITY** … has had on your everyday life?
(Please choose your answer by ticking one box in column d and go to column **e**).

Column e)
Which one of the symptoms in column e has been the cause of this difficulty in … **ACTIVITY** …?

Presence of difficulty in the past 6 months	**a) yes no**	**b) if yes, how often?**	**c) if less than once a month, around how many days in total?**	**d) effect on everyday life**	**e) cause**
Eating and enjoying your food	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Speaking and pronouncing clearly	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Cleaning your teeth	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance

Presence of difficulty in the past 6 months	**a) yes no**	**b) if yes, how often?**	**c) if less than once a month, around how many days in total?**	**d) effect on everyday life**	**e) cause**
Doing light physical activities (eg. sports)	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Sleeping and relaxing	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Smiling, laughing and showing your teeth without Embarrassment	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance

Presence of difficulty in the past 6 months	**a) yes no**	**b) if yes, how often?**	**c) if less than once a month, around how many days in total?**	**d) effect on everyday life**	**e) cause**
Maintaining your usual emotional state without being irritable	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Contact with people (eg. going out with friends)	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance
Carrying out your college work	1❑ 2❑	1❑ less than once a month 2❑ once or twice a month 3❑ once or twice a week 4❑ 3-4 times a week 5❑ every or nearly everyday	1❑ up to 5 days in total 2❑ up to 15 days in total 3❑ up to 30 days in total 4❑ up to 3 months in total 5❑ more than 3 months in total	0❑ no effect 1❑ a very minor effect 2❑ a fairly minor effect 3❑ a moderate effect 4❑ a fairly severe effect 5❑ a very severe effect	1❑ pain 2❑ discomfort 3❑ limitation in function (eg. chewing) 4❑ dissatisfaction with appearance

Specific condition:

0 ☐ cannot specify
1 ☐ toothache
2 ☐ tooth loss
3 ☐ loose tooth
4 ☐ colour of teeth
5 ☐ position of teeth (eg. crooked or projecting, gap)
6 ☐ shape or size of teeth
7 ☐ deformity of mouth or face
8 ☐ oral ulcer or spots (not denture related)
9 ☐ burning sensation of the mouth
10 ☐ bad breath
11 ☐ taste disturbance
12 ☐ unpleasant taste
13 ☐ bleeding gums
14 ☐ receding gums
15 ☐ gum abscess
16 ☐ clicking or grating noise in jaw joint
17 ☐ locking jaw
18 ☐ improper filling (eg. broken, colour)
19 ☐ loose or ill-fitting denture
20 ☐ orthodontic appliances
21 ☐ other (specify)

Appendix 8a: Clinical Form (Portuguese)

FICHA DE EXAME ORTODONTICO

Data: ☐☐ ☐☐ ☐☐ DIA MÊS ANO — DATE

Numero do estudante: ☐☐☐☐ — TEENCOD

Etinia: 1 ❑ B 2 ❑ N 3 ❑ A — ETHNIC

Sexo: 1 ❑ Masculino 2 ❑ Feminino — SEX

Data de nascimento: ☐☐ ☐☐ ☐☐ Dia Mês Ano — BIRTH

Algum dos seus dentes foi extraído (por causa do tratamento?)

1 ❑ Sim 2 ❑ Não — EXTRAC

Se sim, quais dentes? — TEETHEXT

	direita	esquerda
superior	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8
inferior	8 7 6 5 4 3 2 1	1 2 3 4 5 6 7 8

Trauma dental: 1 ❑ Presente 2 ❑ Ausente — TRAUMA

Voce esta satisfeito (a) com a cor dos seus dentes?

1 ❑ Sim 2 ❑ Não — COLOUR

Voce esta satisfeito (a) com o tamanho dos seus dentes?

1 ❑ Sim 2 ❑ Não — SIZE

Index of Orthodontic Treatment Need (IOTN)

Aesthetic component (child) — ACCHILD

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐

Aesthetic component (examiner) — ACEXAM

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐

Dental health component (IOTN) | DHEXAM

1☐ 2☐ 3☐ 4☐ 5☐

1☐a 9☐i
2☐b 10☐l
3☐c 11☐m
4☐d 12☐p
5☐e 13☐s
6☐f 14☐t
7☐g 15☐x
8☐h 16☐1

TRAIT

Dental Aesthetic Index (DAI)

	A	B	C	
0 CONSTANT			13	CTE
1 MISSING INCISOR, CANINE AND PREMOLAR TEETH-- MAXILLARY AND MANDIBULAR ENTER TOTAL #		6		MISSING
2 CROWDING IN THE INCISAL SEGMENTS 0= NO SEGMENT CROWDED 1= 1 SEGMENT CROWDED 2= 2 SEGMENTS CROWDED		1		CROWD
3 SPACING IN THE INCISAL SEGMENTS 0= NO SPACING 1= 1 SEGMENT SPACED 2= 2 SEGMENTS SPACED		1		SPACING
4 DIASTEMA mm		3		DIASTEMA
5 LARGEST ANTERIOR IRREGULARITY -- MAXILLA (UPPER) mm		1		LAIMX
6 LARGEST ANTERIOR IRREGULARITY -- MANDIBLE (LOWER) mm		1		LAIMD
7 ANTERIOR MAXILLARY OVERJET (UPPER) mm		2		OVJETMX
8 ANTERIOR MANDIBULAR OVERJET (LOWER) mm		4		OVJETMD
9 VERTICAL ANTERIOR OPENBITE mm		4		OPENBITE
10 ANTERO-POSTERIOR MOLAR RELATION NORMAL= 0 1/2 CUSP= 1 FULL CUSP= 2		3		MOLARREL
11 TOTAL (ADD LINES 0 THROUGH 11)				TOTALDAI

Directions for calculating a DAI score:
For lines 1-10, multiply column A by B and enter result in column C.
Then: add column C including line 0 to obtain DAI score.

Angle's classification

Molar/ canine relationship

☐ 1. CLASS I
☐ 2. CLASS II / DIV. 1
☐ 3. CLASS II / DIV. 2
☐ 4. CLASS III

Pattern of facial growth

☐ 1. DOLICHOCEPHALIC
☐ 2. MESOCEPHALIC
☐ 3. BRACHYCEPHALIC

CLASS / FACE

Occlusion

1 ☐ Normal
2 ☐ Malocclusion

OCCLUS

ICON INDEX

Crowding (upper) (ICONCROW)	Score	Spacing (upper) (ICONSPAC)
❑up to 2mm	0	❑0 to 2mm
❑2.1mm to 5mm	1	❑2.1mm - 5mm
❑5.1mm to 9mm	2	❑5.1mm to 9mm
❑9.1mm to 13mm	3	❑>9mm
❑13.1mm to 17mm	4	
❑>17mm	5	
❑impacted teeth	5	❑impacted teeth

Left + right buccal sagittal (ICONBUC)
❑0 = perfect interdigitation of all teeth
❑1 = any cusp relationship up to but not including cusp to cusp
❑2 = any cusp to cusp relationship

Anterior vertical relationship	
Overbite (deep bite) (ICONAOB)	Open bite (ICONAOP)
❑0 = up to 1/3 tooth coverage	❑0 = no open bite
❑1 = 1/3 to 2/3 tooth coverage	❑1 = less than 1mm
❑2 = greater than 2/3 coverage	❑2 = 1.1 - 2mm
❑3 = full tooth coverage	❑3 = 2.1 - 4mm
	❑4 = 4mm or greater

Aesthetic component of the IOTN index: _____ (ICONAC)

Crossbite: ❑ yes ❑ no (ICONCROS)

PAR INDEX

1) Upper anterior segment (PARUPPER)

Score	Displacement
0	0mm to 1mm
1	1.1mm to 2mm
2	2.1mm to 4mm
3	4.1mm to 8mm
4	greater than 8mm
5	impacted teeth

(3-2) _____
(2-1) _____
(1-1) _____
(1-2) _____
(2-3) _____

2)Lower anterior segment (PARLOW)

Score	Displacement
0	0mm to 1mm
1	1.1mm to 2mm
2	2.1mm to 4mm
3	4.1mm to 8mm
4	greater than 8mm
5	impacted teeth

(3-2) _____
(2-1) _____
(1-1) _____
(1-2) _____
(2-3) _____

3) Right buccal occlusion

Antero-posterior (PARRBUCA)	Transverse (PARRBUCT)
❑0 = good interdigitation class I, II or III	❑0 = no crossbite
❑1 = less than half unit from full interdigitation	❑1 = crossbite tendency
❑2 = half a unit (cusp to cusp)	❑2 = single tooth in crossbite
Vertical (PARRBUCV)	❑3 = more than one tooth in crossbite
❑0 = no open bite	❑4 = more than one tooth in scissors bite
❑1 = lateral open bite on at least two teeth greater than 2mm	

4) Left buccal occlusion

Antero-posterior (PARLBUCA)	Transverse (PARLBUCT)
❑0 = good interdigitation class I, II or III	❑0 = no crossbite
❑1 = less than half unit from full interdigitation	❑1 = crossbite tendency
❑2 = half a unit (cusp to cusp)	❑2 = single tooth in crossbite
Vertical (PARLBUCV)	❑3 = more than one tooth in crossbite
❑0 = no open bite	❑4 = more than one tooth in scissors bite
❑1 = lateral open bite on at least two teeth greater than 2mm	

5) Overjet

Overjet (PAROVER)	Anterior crossbite (PARCROSS)
0 ❑ 0 to 3mm	0 ❑ no crossbite
1 ❑ 3.1 to 5mm	1 ❑ one or more teeth edge to edge
2 ❑ 5.1 to 7mm	2 ❑ one single tooth in crossbite
3 ❑ 7.1 to 9mm	3 ❑ two teeth in crossbite
4 ❑ greater than 9mm	4 ❑ more than two teeth in crossbite

6) Overbite

Open bite (PAROPEN)	Overbite (PAROVBT)
0 ❑ no open bite	0 ❑ less than or equal to one third coverage of the lower incisor
1 ❑ open bite less than or equal to 1mm	1 ❑ greater than one third but less than two thirds coverage of the lower incisor
2 ❑ open bite 1.1 to 2mm	2 ❑ greater than two thirds coverage of the lower incisor
3 ❑ open bite 2.1 to 3mm	3 ❑ greater than or equal to full tooth coverage
4 ❑ open bite greater than or equal to 4mm	

7) Centreline

(PARLINE)

0 ❑ coincident and up to one quarter lower incisor width
1 ❑ one quarter to one half lower incisor width
2 ❑ greater than one half lower incisor width

Appendix 8b: Clinical Form (English)

ORTHODONTIC ASSESSMENT FORM

RESEARCHER USE ONLY

Date: ☐☐ Day ☐☐ Month ☐☐ Year — DATE

Examiner code number: ☐ — EXAMCOD

Student's number: ☐☐☐ ☐ — TEENCOD

Ethnicity: 1☐ W 2☐ B 3☐ A — ETHNIC

Sex: 1☐ Male 2☐ Female — SEX

Date of birth: ☐☐ Day ☐☐ Month ☐☐ Year — BIRTH

Dental trauma ?

1☐ yes 2☐ no — TRAUMA

Are you satisfied with the colour of your teeth?

1☐ yes 2☐ no — COLOUR

Are you satisfied with the size of your teeth?

1☐ yes 2☐ no — SIZE

Has any of your teeth been extracted to improve your appearance?

1☐ yes 2☐ no — EXTRAC

If yes, which teeth?

	right	left
upper	7 6 5 4 3 2 1	1 2 3 4 5 6 7
lower	7 6 5 4 3 2 1	1 2 3 4 5 6 7

TEETHEXT

AESTHETIC COMPONENT **(CHILD)** — ACCHILD

1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐

AESTHETIC COMPONENT **(EXAMINER)** — ACEXAM

1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ 8☐ 9☐ 10☐

Dental health component (IOTN) | DHEXAM

1☐ 2☐ 3☐ 4☐ 5☐

1❑a 9❑i
2❑b 10❑l | TRAIT
3❑c 11❑m
4❑d 12❑p
5❑e 13❑s
6❑f 14❑t
7❑g 15❑x
8❑h 16❑1

Dental Aesthetic Index (DAI)

	A	B	C	
0 CONSTANT			13	CTE
1 MISSING INCISOR, CANINE AND PREMOLAR TEETH-- MAXILLARY AND MANDIBULAR ENTER TOTAL #		6		MISSING
2 CROWDING IN THE INCISAL SEGMENTS 0= NO SEGMENT CROWDED 1= 1 SEGMENT CROWDED 2= 2 SEGMENTS CROWDED		1		CROWD
3 SPACING IN THE INCISAL SEGMENTS 0= NO SPACING 1= 1 SEGMENT SPACED 2= 2 SEGMENTS SPACED		1		SPACING
4 DIASTEMA mm		3		DIASTEMA
5 LARGEST ANTERIOR IRREGULARITY -- MAXILLA (UPPER) mm		1		LAIMX
6 LARGEST ANTERIOR IRREGULARITY -- MANDIBLE (LOWER) mm		1		LAIMD
7 ANTERIOR MAXILLARY OVERJET (UPPER) mm		2		OVJETMX
8 ANTERIOR MANDIBULAR OVERJET (LOWER) mm		4		OVJETMD
9 VERTICAL ANTERIOR OPENBITE mm		4		OPENBITE
10 ANTERO-POSTERIOR MOLAR RELATION NORMAL= 0 1/2 CUSP= 1 FULL CUSP= 2		3		MOLARREL
11 TOTAL (ADD LINES 0 THROUGH 11)				TOTALDAI

Directions for calculating a DAI score:
For lines 1-10, multiply column A by B and enter result in column C.
Then: add column C including line 0 to obtain DAI score.

Angle's classification

Molar/ canine relationship

☐ 1. CLASS I
☐ 2. CLASS II / DIV. 1
☐ 3. CLASS II / DIV. 2
☐ 4. CLASS III

Pattern of facial growth

☐ 1. DOLICHOCEPHALIC
☐ 2. MESOCEPHALIC
☐ 3. BRACHYCEPHALIC

CLASS / FACE

Occlusion

1 ❑ Normal
2 ❑ Malocclusion

OCCLUS

ICON INDEX

Crowding (upper) (ICONCROW)	Score	Spacing (upper) (ICONSPAC)
❑up to 2mm	0	❑0 to 2mm
❑2.1mm to 5mm	1	❑2.1mm - 5mm
❑5.1mm to 9mm	2	❑5.1mm to 9mm
❑9.1mm to 13mm	3	❑>9mm
❑13.1mm to 17mm	4	
❑>17mm	5	
❑impacted teeth	5	❑impacted teeth

Left + right buccal sagittal (ICONBUC)
❑0 = perfect interdigitation of all teeth
❑1 = any cusp relationship up to but not including cusp to cusp
❑2 = any cusp to cusp relationship

Anterior vertical relationship	
Overbite (deep bite) (ICONAOB)	Open bite (ICONAOP)
❑0 = up to 1/3 tooth coverage	❑0 = no open bite
❑1 = 1/3 to 2/3 tooth coverage	❑1 = less than 1mm
❑2 = greater than 2/3 coverage	❑2 = 1.1 - 2mm
❑3 = full tooth coverage	❑3 = 2.1 - 4mm
	❑4 = 4mm or greater

Aesthetic component of the IOTN index: _____ (ICONAC)

Crossbite: ❑ yes ❑ no (ICONCROS)

PAR INDEX

1) Upper anterior segment (PARUPPER)

Score	Displacement
0	0mm to 1mm
1	1.1mm to 2mm
2	2.1mm to 4mm
3	4.1mm to 8mm
4	greater than 8mm
5	impacted teeth

(3-2) _____
(2-1) _____
(1-1) _____
(1-2) _____
(2-3) _____

2)Lower anterior segment (PARLOW)

Score	Displacement
0	0mm to 1mm
1	1.1mm to 2mm
2	2.1mm to 4mm
3	4.1mm to 8mm
4	greater than 8mm
5	impacted teeth

(3-2) _____
(2-1) _____
(1-1) _____
(1-2) _____
(2-3) _____

3) Right buccal occlusion

Antero-posterior (PARRBUCA)	Transverse (PARRBUCT)
❑0 = good interdigitation class I, II or III	❑0 = no crossbite
❑1 = less than half unit from full interdigitation	❑1 = crossbite tendency
❑2 = half a unit (cusp to cusp)	❑2 = single tooth in crossbite
Vertical (PARRBUCV)	❑3 = more than one tooth in crossbite
❑0 = no open bite	❑4 = more than one tooth in scissors bite
❑1 = lateral open bite on at least two teeth greater than 2mm	

4) Left buccal occlusion

Antero-posterior (PARLBUCA)	Transverse (PARLBUCT)
❑0 = good interdigitation class I, II or III	❑0 = no crossbite
❑1 = less than half unit from full interdigitation	❑1 = crossbite tendency
❑2 = half a unit (cusp to cusp)	❑2 = single tooth in crossbite
Vertical (PARLBUCV)	❑3 = more than one tooth in crossbite
❑0 = no open bite	❑4 = more than one tooth in scissors bite
❑1 = lateral open bite on at least two teeth greater than 2mm	

5) Overjet

Overjet (PAROVER)	Anterior crossbite (PARCROSS)
0 ❑ 0 to 3mm	0 ❑ no crossbite
1 ❑ 3.1 to 5mm	1 ❑ one or more teeth edge to edge
2 ❑ 5.1 to 7mm	2 ❑ one single tooth in crossbite
3 ❑ 7.1 to 9mm	3 ❑ two teeth in crossbite
4 ❑ greater than 9mm	4 ❑ more than two teeth in crossbite

6) Overbite

Open bite (PAROPEN)	Overbite (PAROVBT)
0 ❑ no open bite	0 ❑ less than or equal to one third coverage of the lower incisor
1 ❑ open bite less than or equal to 1mm	1 ❑ greater than one third but less than two thirds coverage of the lower incisor
2 ❑ open bite 1.1 to 2mm	2 ❑ greater than two thirds coverage of the lower incisor
3 ❑ open bite 2.1 to 3mm	3 ❑ greater than or equal to full tooth coverage
4 ❑ open bite greater than or equal to 4mm	

7) Centreline

(PARLINE)

0 ❑ coincident and up to one quarter lower incisor width
1 ❑ one quarter to one half lower incisor width
2 ❑ greater than one half lower incisor width