APPLICATION OF THE DENTAL AESTHETIC INDEX IN THE PRIORITIZATION OF ORTHODONTIC SERVICE NEEDS

by

PATRICIA MUTSINDA MAUMELA

RESEARCH DISSERTATION
Submitted in fulfilment of the requirements for the degree of

MASTER OF DENTISTRY
in
ORTHODONTICS

in the

DEPARTMENT OF ORTHODONTICS
(School of Oral Health Sciences)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Prof P HLONGWA
CO-SUPERVISOR: Dr MPS SETHUSA
2010
INDEX OF CONTENTS

TITLE PAGE........................................................................................................................................................................i
INDEX OF CONTENTS.................................................................................................................................................................ii
INDEX OF FIGURES........................................................................................................................................................................v
INDEX OF TABLES........................................................................................................................................................................vi
INDEX OF APPENDICES..................................................................................................................................................................vii
INDEX OF ADDENDA.........................................................................................................................................................................viii
LISTS OF ABBREVIATIONS............................................................................................................................................................ix
SUPERVISOR PAGE...........................................................................................................................................................................x
DECLARATION..................................................................................................................................................................................xi
DEDICATION....................................................................................................................................................................................xii
ACKNOWLEDGEMENTS.....................................................................................................................................................................xiii
PRESENTATION................................................................................................................................................................................xiv
SUMMARY.......................................................................................................................................................................................xv

CHAPTER 1: INTRODUCTION...............................................................................................................................................................1
1.1 Background..................................................................................................................................................................................1
1.2 Aim of the study..........................................................................................................................................................................3
1.3 Study objectives...........................................................................................................................................................................3
1.4 Null hypothesis..............................................................................................................................................................................4

CHAPTER 2: LITERATURE REVIEW.......................................................................................................................................................5
2.1 Evaluation of malocclusion...........................................................................................................................................................5
   2.1.1 Occlusal components........................................................................................................................................................5
   2.1.2 Functional components......................................................................................................................................................6
   2.1.3 Aesthetic components......................................................................................................................................................6
   2.1.4 Psychosocial components...............................................................................................................................................7
2.2 Orthodontic indices.......................................................................................................................................................................8
   2.2.1 Treatment priority indices...............................................................................................................................................9
   2.2.1 (a) Indices measuring occlusal traits without combining scores.............................................................................9
      (i) A method for measuring occlusal traits.........................................................9
      (ii) Basic method for recording occlusal traits ..............................................10
2.2.1 (b) Indices measuring occlusal traits with a single score

(i) The Handicapping Labio-lingual Deviations Index

(ii) The Treatment Priority Index

(iii) The Handicapping Malocclusion Assessment Record

(iv) The Occlusal Index

(v) The Index of the Swedish Medical Health Board

(vi) The Need for Orthodontic Treatment Index

(vii) The Standardized Continuum of Aesthetic Need index

(viii) The Index of Orthodontic Treatment Need

(ix) The Index of Complexity, Outcome and Need

(x) The Dental Aesthetic Index

CHAPTER 3: MATERIALS AND METHODS

3.1 Materials

3.2 Method

3.3 Examiner reliability

3.4 Statistical analyses

CHAPTER 4: RESULTS

4.1 Study sample

4.2 Distribution of DAI scores

4.3 Distribution of DAI scores by gender and age

4.4 Distribution of other malocclusion traits

4.5 Prioritization of malocclusion using DAI and other traits

4.6 Examiner reliability

CHAPTER 5: DISCUSSIONS

5.1 Introduction

5.2 Sample

5.3 DAI scores according to age and gender

5.4 Other malocclusion traits

5.5 Comparison of DAI and other malocclusion traits

5.6 Limitations of the study

5.7 Application of the results of the study
5.8 Conclusions........................................................................................................51
5.9 Recommendations..............................................................................................51
REFERENCES..........................................................................................................52
APPENDICES............................................................................................................59
ADDENDA.................................................................................................................61
INDEX OF FIGURES

Figure 1: Aesthetic Component of IOTN.................................................................18
Figure 2: IOTN Dental Health Component ruler.........................................................20
Figure 3: Measuring caliper......................................................................................32
Figure 4: Study model number 69............................................................................32
Figure 5: DAI score by gender..................................................................................38
Figure 6: DAI score by age.......................................................................................38
INDEX OF TABLES

Table I: The Dental Health Component of IOTN………………………………………………19
Table II: Summary of DAI components and their weighting……………………………………23
Table III: DAI score treatment needs cut-off points…………………………………………..24
Table IV: Sample distribution…………………………………………………………………37
Table V: Distribution of DAI scores………………………………………………………………37
Table VI: Distribution of other malocclusion traits………………………………………………39
Table VII: Distribution of malocclusion traits using DAI………………………………………..40
Table VIII: Distribution of all malocclusion traits………………………………………………41
Table IX: Distribution of DAI scores ≤ 25 and other malocclusion traits…………………………42
Table X: Distribution of DAI scores 26-30 and other malocclusion traits…………………………43
Table XI: Distribution of DAI scores 31-35 and other malocclusion traits ……………………..44
Table XII: Distribution of DAI scores ≥ 36 and other malocclusion traits ……………………..45
Table XIII: Intra and inter examiner reliability…………………………………………………..46
INDEX OF APPENDICES

Appendix A: DAI recording form .................................................................59
Appendix B: Recording form for other malocclusion traits .................................60
INDEX OF ADDENDA

Pre-treatment study model numbers and patient information…………………………….61
Statistical data………………………………………………………………………………….64
Dissertation manuscript……………………………………………………………………….76
Poster presentation for the Colgate post graduate competition – IADR Kenya…………….88
Certificate of participation – IADR African and Middle East conference 2009…………….89
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAO</td>
<td>American Association of Orthodontists</td>
</tr>
<tr>
<td>AC</td>
<td>Aesthetic Component</td>
</tr>
<tr>
<td>COCSTOC</td>
<td>Commission on Classification and Statistics for Oral Conditions</td>
</tr>
<tr>
<td>DAI</td>
<td>Dental Aesthetic Index</td>
</tr>
<tr>
<td>DHC</td>
<td>Dental Health Component</td>
</tr>
<tr>
<td>FDI</td>
<td>Federation Dentaire International</td>
</tr>
<tr>
<td>HLDI</td>
<td>Handicapping Labio-lingual Deviation Index</td>
</tr>
<tr>
<td>HMAR</td>
<td>Handicapping Malocclusion Assessment Records</td>
</tr>
<tr>
<td>ICON</td>
<td>Index of Complexity, Outcome and Need</td>
</tr>
<tr>
<td>NOTI</td>
<td>Need for Orthodontic Treatment Index</td>
</tr>
<tr>
<td>OHRQoL</td>
<td>Oral-Health-Related Quality of Life</td>
</tr>
<tr>
<td>OI</td>
<td>Occlusal Index</td>
</tr>
<tr>
<td>SASO</td>
<td>South African Society of Orthodontists</td>
</tr>
<tr>
<td>SASOC</td>
<td>Social Acceptability Scale of Occlusal Conditions</td>
</tr>
<tr>
<td>SD</td>
<td>Standard Diviation</td>
</tr>
<tr>
<td>TPI</td>
<td>Treatment Priority Index</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
APPLICATION OF THE DENTAL AESTHETIC INDEX IN THE PRIORITIZATION OF ORTHODONTIC SERVICE NEEDS

BY

Dr P. M. Maumela
BDS (MEDUNSA)

SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF DENTISTRY (ORTHODONTICS) IN THE DEPARTMENT OF ORTHODONTICS, SCHOOL OF ORAL HEALTH SCIENCES, UNIVERSITY OF LIMPOPO.

DATE SUBMITTED: 2010

SUPERVISOR: Prof P. HLONGWA, BOH, BDS, M Dent (Orthodontics) (Medunsa), Head of Department of Orthodontics, University of Pretoria.

SIGNATURE:……………………..

CO-SUPERVISOR: Dr M.P.S. SETHUSA, B (Diag) Rad, BDS (Medunsa), PDD (Stellenbosch), M Dent (Orthodontics)(Medunsa), Acting Head of Department of Orthodontics, University of Limpopo.

SIGNATURE:……………………..
DECLARATION

I declare that the dissertation hereby submitted to the University of Limpopo, for the degree of Master of Dentistry in Orthodontics has not previously been submitted by me for a degree at this or any other university; that this is my work in design and in execution, and that all material contained herein has been dully acknowledged.

……………………………..                                                                      …………………………

P.M. Maumela (Dr)                                                                                       Date
DEDICATION

This research is dedicated to:

My Mom and Dad (Mr T.N. & Mrs L. Maumela) who taught me that knowledge is the best thing that one can acquire in life.

My sisters (Ambu, Lebo, Suzan & Dakalo) who looked after my children and thus enabling this work to come to completion.

My daughter (Mutondi) who believed in me and thus gave me strength and courage to go on when times were hard.

My son (Orlando) who made me to laugh even though times were hard.

God who always guides me through life.
ACKNOWLEDGEMENT

I wish to acknowledge:

Professor P. Hlongwa for her mentorship, guidance, planning and completion of this research.

Dr M.P.S. Sethusa for his total guidance, positive criticism in the implementation and writing up of the research.

Professor H.S. Schoeman for his assistance in the statistical analysis.

Dr S. Monehi for her assistance in the recording of the measurements.
PRESENTATION

IADR Kenya Colgate post-graduate competition September 2009

SUMMARY

Introduction: Orthodontic services in South Africa are mainly offered by the private sector and to a lesser extent by the four government funded training institutions which are plagued by limited resources. The majority of patients cannot afford private fees and seek treatment at these training institutions. The growing number of patients on waiting lists is a problem. Prioritization of orthodontic services would assist to ensure that these services are preferentially provided to those patients most likely to derive the greatest benefit.

The Dental Aesthetic Index (DAI) is used to estimate orthodontic treatment need and can also be used as a screening tool to determine treatment priority (Cons, Jenny & Kohout, 1986). The DAI focuses on aesthetics and therefore omits other malocclusion traits thereby limiting its comprehensiveness as an assessment tool. To date no published study has been found that identified other malocclusion traits not included in the DAI and examined the influence that these malocclusion traits have in the prioritization of orthodontic service needs whilst using the DAI.

Thus the aim of this research was to assess the application of the DAI to prioritize orthodontic services needs within a government funded institution. The objectives were: 1) To identify other malocclusion traits not included in the DAI. 2) To evaluate how much influence other malocclusion traits not included in DAI have in the prioritization of orthodontic service needs. 3) To compare the mean DAI scores according to age and gender.

Materials and methods: One hundred and twenty (120) pre-treatment study models of patients in the permanent dentition stage were collected from the records archive of the Department of Orthodontics, University of Limpopo (Medunsa campus) using a systematic sampling method. The study models were assessed using the DAI by two calibrated examiners.

Other malocclusion traits were identified and recorded according to the basic method for recording occlusal traits (Bezroukov et al., 1979). Specific codes were assigned to each identified malocclusion trait from code 01 to 09. The traits were recorded once, by marking the respective code/malocclusion trait with an x when present on each study model.
Descriptive statistics, Pearson correlation coefficient, Chi-square values and t-tests were employed to analyze the data and p values of less than or equal to 0.05 (p ≤ 0.05) were considered statistical significant.

**Results:** The sample consisted of 58 females and 62 males, aged 10-45 years with a mean age of 17.9 years and a SD of 6.2 years. The DAI scores showed that 19.1% had normal or minor malocclusion, 17.5% had definitive malocclusion, 21.7% had severe malocclusion and 41.7% had handicapping malocclusion. The mean DAI score was 35.2 with a SD of 10.3. A statistical significant difference was found between mean DAI score of adults and adolescence (p < 0.05), while no statistical significant difference was found between males and females (p ≥ 0.05).

The study identified the following other malocclusion traits: crowded and rotated posterior teeth (27.5%), posterior crossbite (22.8%), retained primary teeth (13.4%), missing molars (10.7%), partially erupted teeth (9.4%), deep overbite (8.1%), transposition (3.4%), peg lateral (3.4%) and supernumerary teeth (1.3%). These malocclusion traits accounted for 21.1% of the total malocclusion traits of the sample whilst the DAI accounted for 78.9%.

About 47.6% of these other malocclusion traits were found in handicapping category of the DAI, 19.5% in the severe category, 18.1% in the definitive category and 14.8% in the normal or minor category. The distribution of subjects over the four DAI categories and the distribution of subjects with other malocclusion traits over the same DAI categories did not differ significantly (Chi-square test, p = 0.917). The intra and inter examiner reliability was tested using the Pearson correlation coefficient and found to be highly correlated (r = 0.9).

**Conclusions:** The study showed that the DAI is a valid and reliable index that can be applied to prioritize orthodontic service needs in a financially constrained situations without any modification as two thirds of other malocclusion traits were found in categories which the DAI had already prioritized for treatment.