

CHARACTERIZING THE ORTHODONTIC PATIENT'S PURCHASE DECISION

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ABSTRACT

Joseph W. Pittman: Characterizing the Orthodontic Patient's Purchase Decision: a Novel Approach Using Netnography
(Under the direction of Ceib Phillips)

Introduction: A deeper and more holistic understanding of why patients do or do not seek orthodontic treatment is needed for effective shared decision-making about receiving treatment. Previous orthodontic qualitative research has identified important factors, but our understanding of a patient's decision and how they interpret benefits and barriers of treatment are lacking. The objective of this study is to expand our current list of factors and create a conceptual framework to describe the decision-making process. **Methods:** Blogs and discussion boards, rich in orthodontic decision-making data, were identified and analyzed with qualitative methods, specifically grounded theory and netnography methodology. An iterative process of data collection and factor identification and refinement was performed to saturation. A conceptual framework was created to describe the decision-making process. **Results:** Fifty-four factors captured the ideas, influences and motivations discussed in regards to a patient's decision to receive or not receive orthodontic treatment. Ten domains capturing the complexity of orthodontic decision making were identified: function, esthetics, psychosocial benefits, diagnosis, finances, inconveniences, risks of treatment, individual aspects, societal attitudes and child-specific influences, each containing specific descriptive factors and conceptual themes. An individual's desires, self-perception and viewpoints, as well as the public's views on esthetics and orthodontics, impacted perceptions of benefits and barriers associated with orthodontic treatment. **Conclusion:** This study has identified

an expanded list of factors and created a conceptual framework describing the orthodontic patient's decision-making process, providing doctors with a better understanding of patient attitudes and expectations.

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TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF ABBREVIATIONS.....	x
LIST OF SYMBOLS	xi
REVIEW OF THE LITERATURE	12
Introduction.....	12
Medical Decision-Making	13
Orthodontic Qualitative Research.....	14
Netnography.....	16
Use of Online Material in Orthodontics.....	18
Conclusions.....	19
References.....	21
CHARACTERIZING THE ORTHODONTIC PATIENT’S PURCHASE DECISION	24
Introduction.....	24
Materials and Methods.....	25
Results.....	27
Discussion	31
Conclusions.....	34
Tables	35

Figures.....	43
References.....	44

LIST OF TABLES

Table 1 – Primary Documents	35
Table 2 – Descriptions of Domains	36
Table 2 – Individual Aspects	37
Table 3 – Societal Attitudes	38
Table 4 – Child-specific Influences	39
Table 5 – Diagnosis	39
Table 6 – Finances	40
Table 7 – Inconveniences.....	40
Table 8 – Risks of Treatment.....	41
Table 9 – Function	41
Table 10 – Esthetics	42
Table 11 – Psychosocial Benefits	42

LIST OF FIGURES

Figure 1 – Conceptual framework	43
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LIST OF ABBREVIATIONS

IOTN Index of Treatment Needs

et al. and others

LIST OF SYMBOLS

® Registered Trademark

A REVIEW OF THE LITERATURE

Introduction

As the first dental specialty, and one of the most common medical procedures in The United States of America, orthodontics is an important component of the healthcare system. It has become a right-of-passage as it is commonly discussed and depicted in American culture during the time period around when a child enters junior high. It is a somewhat unique field in healthcare in that most patients do not have a history of disease, and no intervention does not have predictable negative consequences¹. In fact, the majority of orthodontic treatment is performed on children whose malocclusions are unlikely to produce any functional deficits. These functional deficits include plaque accumulation, gingivitis, periodontitis, caries and temporomandibular disorder²⁻⁵. As a result, it has been difficult to set a threshold for when orthodontics is required. Only severe traits such as large overjet, increased traumatic overbites and impacted teeth may have negative effects on dental health⁶. However, we know that individuals without these severe malocclusions commonly seek orthodontics and feel that their treatment was worthwhile. As a result, the measurement for need has been based around needs compared to the average malocclusions present in the population such as the Index of Orthodontic Treatment Need (IOTN)¹. Unfortunately, these normative needs poorly account for the psychological and social variability in people so there is a growing acknowledgement of the importance of the esthetic and psychosocial benefits to orthodontic treatment⁷⁻⁹. People outside the normative needs group often seek treatment, and without an identified disease or severe malocclusion, the decision to seek treatment is elective. Some with mild malocclusions find their condition debilitating and suffer

psychological problems. This decision-making process to initiate treatment is complex and poorly understood because people's opinions vary. Some patients with professionally perceived handicapping malocclusions reject treatment, while others seek treatment for minor deviations. Therefore, the patient's unique perceived benefits are important in the decision making process so some research has been done in this area.¹⁰ Information is filtered through the patient or parent's personal values and experiences, so a patient's decision to seek treatment is a unique combination of reasons¹¹. For example, Davis et al looked into this question by comparing Hispanic and white parent's answers to "Why do you want your child to have braces?" and found differences between the two groups. Understanding what truly motivates each patient to undergo the long, expensive and uncomfortable process of fixed orthodontics is crucial.

Medical Decision-Making

Understanding a patient's decision-making process is important in many areas of healthcare, especially as increased value is placed on patient centered healthcare. The ideal is shared decision-making, where the patient is well-informed enough to jointly make a wise decision about their care with the doctor's input. Multiple theories have been developed to attempt to capture the complexity of decision-making to help practitioners communicate with patients¹². In addition to lists of factors, categorical descriptions and identification of themes, these theories often include conceptual frameworks, or visual models, that elucidate the basic process¹³. Despite the amount of research in this field, there is still no perfect model for decision making. Herbert A. Simon, a Nobel laureate famous for his research in decision-making, showed that models are typically insufficient because people don't operate rationally¹⁴. He termed this bounded rationality. People's ability to make a rational decisions is limited by their understanding of the problem and their time constraints. As a result, models must include the influence of the individual.

This can vary tremendously, especially considering that people change over time. General decision-making models can be applied to specific fields, and the resulting framework can be adjusted to reflect the unique aspect of a certain medical decisions and can be more accurate. These are much more useful for that specific discipline because the general models are not specific and do not stress the most important components of a decision. For example, a study on breast augmentation described the process as a basic drive developed from certain generating factors, initiated by eliciting factors ¹⁵. The basic drive to have an interest in breast augmentation develops over an extended period of time from generating factors. The decision is then initiated by certain eliciting factors. Another study on total joint replacement focused on the cost-benefit analysis, and they found that symptoms and information sources were the two main factors in the decision ¹⁶. Others described the decision by identifying important themes ¹⁷. A deeper understanding of these thematic elements helped explain the patient's decision. One article on people's decision to pursue plastic surgery explored the themes of self-betterment and self-concept. The background research showed four prior themes of body image, impression management, symbolic self-completion and attainment of possible selves. Other themes emerged from this qualitative study. They were role transitions, sexual and romantic fulfilment, control over one's body and destiny, efficacy and identity reconstruction. They found that localized improvements in body image may lead to general improvements in self-esteem. In addition, people may elect plastic surgery in order to improve their performance in certain social roles ¹⁸. These factors likely have significant overlap with orthodontic decision-making factors. At this point, there is not a conceptual framework describing the decision-making process for orthodontic patients.

Orthodontic Qualitative Research

Considering the elective nature of orthodontics, and the unique benefits provided to each patient, orthodontists have always realized the importance of truly understanding the patient's motivations and expectations. Previous qualitative research has investigated viewpoints on orthodontics, and quantitative research has helped us understand the prevalence of these different opinions. The field of orthodontics has made significant gains in understanding patients through qualitative focus groups and interviews^{10,19-22}. Bennett et al. identified a list of benefits and barriers to treatment then with a quantitative study to determine how important the different factors were. This study organized the factors into benefits, long-term and short-term risks of treatment barriers and inconvenience barriers¹⁰. The benefits were a better bite, better smile, look better, straighter teeth, better-looking teeth, pleased with looks, more attractive profile, easier to brush, teeth straight forever and increased self-esteem. The long-term risks were stains on teeth, injury to teeth, gum disease, damage to roots, more cavities and damage to bones. The short-term risks were change foods, sore or cuts in mouth, pain during appointments, pain after appointments, swollen gums, broken braces. The inconveniences were time-consuming, scheduling difficulties and missing school. The parent's income, father's education level and sex related to treatment values of patient. This study gave us a helpful list of factors to base this our study on through grounded theory technique.

Some of these studies have focused on decision-making and motivation in orthodontics. Trulsson et al. used grounded theory to analyze a teenager's decision to undergo orthodontic treatment. They found there were five descriptive categories in the decision: being like everyone else, being diagnosed, focusing on the mouth, obeying social norms and forced decision-making. Their motivation seemed to be related to social norms and the culture of beauty in our society. The teens were not fully conscious of the external influences that were driving their decision²⁰. This

list was also helpful for this project as it gave some initial factors and categories. This helped the research be grounded in the current literature. However, a list of factors representing benefits and barriers does not completely describe all the factors in the decision. Trulsson et al. explored some individuality in treatment decisions but it was specific to teenagers. Ryan et al. found that motivation ranged between purely external and purely internal in assessing personal facial deformities. The source of the motivation could be directly or indirectly link to the problem and impact of the problem due to the complex array of other factors such as personality, upbringing and relationships ²³. Stanford et al found that the motivating factor of normality could not be solely constructed from biologic variables and that normality was viewed in terms of features that are acceptable biologically, psychologically and socially. They identified components of dentofacial normality, the impact of the dentofacial abnormality and factors influencing the conceptualization of dentofacial normality. They found that media was important in people's decision to get braces ²². These studies both show the importance of the patient perspective in the decision-making process. A list of benefits and barriers must also include a list of patient traits and external influences for better accuracy. There currently remains an incomplete picture of the orthodontic patient population due to the small amount of qualitative research in orthodontic populations, lack of conceptual frameworks and the obtrusive nature of most of the studies. Obtrusiveness describes the certain types of study settings. Psychosocial research suggests that people cannot often express why they do what they do accurately in focus groups and interviews in which they prioritize set benefits, or rank photographs of results as to which look better or worse ^{24,25}.

Netnography

Researchers are increasingly turning to web-based consumer research as it provides a natural and unobtrusive way to observe people and their life experience. Many qualitative analysis

techniques can be used for online data. One approach is to apply the traditional principles of ethnography to web content. This is a new concept that takes advantage of recent developments in technology²⁶. Forums provide a good way for people to discuss a topic and generate data for qualitative analysis. The researcher can choose to prompt and lead a discussion by participating in the chat room, forum or social media platform. However, with this type of netnography a researcher should disclose their position and interests for ethical reasons²⁴. Netnography loses the element of unobtrusiveness with this technique but the researcher can ask pointed questions and probe certain ideas that require more explanation. Due to the fact there are currently qualitative orthodontic studies with focus groups to facilitate pointed questions, there is a need for a study to instead collect data unobtrusively from the public domain. Data is considered public domain because the user posts on their own volition on a publicly available site. As a result, the data was developed organically between user interactions. Although the researcher could not follow-up with vague posts, collecting enough data revealed explanations of similar thoughts, elucidating the ideas in user's posts. Qualitative data is typically collected to saturation point. This means that new discussions are included in the analysis until the factors are repeated. All new ideas can be accurately captured by the current list of themes, factors and ideas. As Netnography is a new area of research with ethnography, the techniques and applications are still being explored. Ethnography is an anthropological social science technique that gives us an ability to better understand desires, symbols and decision making influences^{26,27}. A complementary technique is grounded theory which has goals that are simultaneous data collection and analysis, pursuit of emerging themes, discovery of basic social processes, inductive construction of categories that explain and synthesize processes, sampling to refine categories and integration into a theoretical framework²⁸. The traditional grounded theory techniques are similarly applied with netnography;

however, Susanne Friese, a researcher in Germany, has created more structured and clear qualitative analysis techniques by taking advantage of a new powerful software²⁶, Atlas.ti®. Her goal was to make qualitative analysis more transparent and structured when she published her techniques. As an expert in qualitative analysis and Atlas.ti®, she is able to provide a methodology to qualitative analysis that is data-driven, well-documented, extremely organized and flexible enough to be applied to any field. Her methodology is not a drastic change from traditional grounded theory techniques but instead capitalizes on the organizational ability and analysis capability of Atlas.ti® software. In addition, she is a clear and concise communicator and makes the material accessible for people outside psychology fields. By using the software, one can analyze data systematically and ask questions that would otherwise be too time consuming to ask with manual qualitative research. For example, a researcher can quickly see all quotes having to do with a certain theme. That list can be further limited by assessing quotes that have to do with two separate factors simultaneously. This reveals where a user linked two thoughts together in an explanation. This improves analysis by showing relationships between ideas. Friese also shows how to record your research history so that your work can easily be checked for clarity and consistency. She uses the memo tool in Atlas.ti® to record thoughts, notes, questions throughout the process. The memo tool is also used to record your data analysis. These technologic advancements have greatly improved qualitative research analysis.

Use of Online Material in Orthodontics

Applying netnography techniques to orthodontics is a new research concept as few studies have assessed online material. A previous study recorded posts on Twitter® in regards to orthodontics over a set time period in Australia²¹. The majority of the posts were from children in braces or newly out of braces, and had to do with the difficulties of orthodontics such as pain,

rubber bands, appointments and difficulty eating. The four main themes were excitement about getting braces off, problems with braces, positive comments about braces and negative comments about braces. Because Twitter limits the characters in the post and the posts typically are not interactive, the data provided little in-depth explanations of behaviors, interests and feelings. The study did not significantly improve our understanding of patients except to know that many kids complain about braces through Twitter and post about their excitement when the braces are removed. However, a cursory online search reveals many people are talking about their orthodontic desires and experience in all avenues of self-expression online, in particular forums and blogs. This isn't surprising considering orthodontics can be a challenging experience, but has an outcome that prompts significant patient excitement. These forums are also on a variety of websites that attract different types of users, which is helpful for this study where we hope to expand our current list of decision-making factors. It gives us a larger, more diverse group to confirm previous ideas and explore new unidentified themes that have not emerged from previous, small one-on-one phone interviews or focus groups.

Conclusions

The main focus of this study will be to create a comprehensive factor list. Bennett et al. and Trulsson et al. identified factors in their studies, but the current known list in research is short and was identified in focus groups. Focus groups are obtrusive and can limit what people are willing to share. Online where people feel less inhibitions due to anonymity, we expect to see more reasons. These factors are defined so each is concise and does not overlap with others. Additionally, they are organized into a structured list to help the orthodontist better understand a long list of factors. Furthermore, the data should reveal relationships between important decision making-components, or where certain themes are most applicable. Atlas.ti ® can assist in revealing

relationships using the “co-occurrence” tool which reveals overlap between codes. Overlap in codes occurs when a user links two ideas within one response. This helps us better understand if, for example, patients that are looking for esthetic benefits are concerned about finances, while those pursuing orthodontics for health benefits do not discuss finances. A deeper understanding of the relationships would be best with follow-up questions to the respondent. However, with the unobtrusive nature of this study that will not be possible. That would be a good follow-up study, especially if there are newly identified factors from this study. The results from this study should be relevant and significant for orthodontists. The discipline is facing increased competition from general dentists and corporate dentistry. Being able to communicate in a relevant and powerful way at the case presentation is important for patient conversion rate. This is a pivotal time for the orthodontic practice. By being aware of common factors a patient can be feeling, an orthodontist can address them at an appropriate time in language that resonates with the patient. That might include stressing certain positive factors or explaining other negative factors. Also, addressing common societal expectations or personal biases can be impactful for the patient. For example, if the patient feels that orthodontics is vain, stressing the functional benefits will be important. Discussing the esthetic benefits will not be effective because the patient finds that part of orthodontics questionable. If the patient wants psychosocial benefits, terming orthodontics as an “investment” will be particularly effective. Understanding our patients is an elusive but important goal, and this study will improve our knowledge.

REFERENCES

1. Vig KW, Weyant R, O'Brien K, Bennett E. Developing outcome measures in orthodontics that reflect patient and provider values. *Semin Orthod.* 1999;5(2):85-95.
2. Addy M, Griffiths GS, Dummer PM, et al. The association between tooth irregularity and plaque accumulation, gingivitis, and caries in 11-12-year-old children. *Eur J Orthod.* 1988;10(1):76-83.
3. Katz RV, Katz RV. An epidemiologic study of the relationship between various states of occlusion and the pathological conditions of dental caries and periodontal disease. *J Dent Res.* 1978;57(3):433; 433-439; 439.
4. Ramfjord SP, Ramfjord SP, Ash Jr M. Significance of occlusion in the etiology and treatment of early, moderate and advanced periodontitis. *Journal of periodontology (1970).* 1981;52(9):511; 511-517; 517.
5. Kremenak CR, Kinser DD, Harman HA, Menard CC, Jakobsen JR. Orthodontic risk factors for temporomandibular disorders (TMD). I: Premolar extractions. *American Journal of Orthodontics and Dentofacial Orthopedics.* 1992;101(1):13-20.
6. Shaw WC, O'Brien KD, Richmond S, Brook P. Quality-control in orthodontics - risk benefit considerations. *Br Dent J.* 1991;170(1):33-37.
7. Cunningham SJ, Hunt NP. Quality of life and its importance in orthodontics. *J Orthod.* 2001;28(2):152.
8. Giddon DB. Orthodontic applications of psychological and perceptual studies of facial esthetics. *Semin Orthod.* 1995;1(2):82-93.
9. Hunt O, Hepper P, Johnston C, Stevenson M, Burden D. Professional perceptions of the benefits of orthodontic treatment. *The European Journal of Orthodontics.* 2001;23(3):315-323.
10. Bennett M, Michaels C, O'Brien K, Weyant R. Measuring beliefs about orthodontic treatment: A questionnaire approach. *J Public Health Dent.* 1997;57(4):215; 215-223; 223.
11. Davis BB, Bayirli B, Ramsay DS, Turpin DL, Paige A, Riedy CA. "Why do you want your child to have braces?" investigating the motivations of hispanic/latino and white parents. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2015;148(5):771-781.
12. Durand MA, Durand MA, Stiel M, Boivin J, Elwyn G. The design of patient decision support interventions: Addressing the theory-practice gap. *J Eval Clin Pract.* 2011;17:565; 565-574; 574.
13. Llewellyn-Thomas HA. Patients' health-care decision making: A framework for descriptive and experimental investigations. *Medical Decision Making.* 1995;15(2):101-106.

14. Simon HA(A, 1916-2001. *Administrative behavior : A study of decision-making processes in administrative organizations*. New York: Free Press; 1997.
15. Solvi AS, Foss K, von Soest T, Roald HE, Skolleborg KC, Holte A. Motivational factors and psychological processes in cosmetic breast augmentation surgery. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2010;63(4):673-680.
16. Clark JP, Hudak PL, Hawker GA, Coyte PC, et al. The moving target: A qualitative study of elderly patients' decision-making regarding total joint replacement surgery. *Journal of Bone and Joint Surgery*. 2004;86(7):1366-74.
17. Daniel E, Kent G, Binney V, Pagdin J. Trying to do my best as a mother: Decision-making in families of children undergoing elective surgical treatment for short stature. *British Journal of Health Psychology*. 2005;10(1):101-114.
18. Schouten JW. Selves in transition: Symbolic consumption in personal rites of passage and identity reconstruction. *Journal of Consumer Research*. 1991;17(4):412-425.
19. Bennett M, Tulloch J, Vig K, Phillips C. Measuring orthodontic treatment satisfaction: Questionnaire development and preliminary validation. *J Public Health Dent*. 2001;61(3):155; 155-160; 160.
20. Trulsson U, Strandmark M, Mohlin B, Berggren U. A qualitative study of teenagers' decisions to undergo orthodontic treatment with fixed appliance. *J Orthod*. 2002;29(3):197.
21. Rachel Henzell M, Henzell M, Knight A, Morgaine K, Antoun J. A qualitative analysis of orthodontic-related posts on twitter. *Angle Orthod*. 03;84(2):203; 203-207; 207.
22. Stanford ND, Stanford N, Ip T, Durham J. Adult orthodontic patients' views regarding dentofacial normality: A qualitative study. *American journal of orthodontics and dentofacial orthopedics*. 03;145(3):287; 287-295; 295.
23. Ryan FS, Barnard M, Cunningham SJ. Impact of dentofacial deformity and motivation for treatment: A qualitative study. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2012;141(6):734-742.
24. Kozinets RV, 1964-. *Netnography : Doing ethnographic research online*. Los Angeles, Calif. ;London: Sage; 2010.
25. Kozinets RV. The field behind the screen: Using netnography for marketing research in online communities. *J Market Res*. 2002;39(1):61-72.
26. Friese S, author. *Qualitative data analysis with ATLAS.ti*. London: SAGE; 2014.
27. Miles MB. *Qualitative data analysis : A methods sourcebook*. Thousand Oaks, California: SAGE Publications, Inc; 2014.

28. Bryant A, Charmaz KC. *The SAGE handbook of grounded theory*. SAGE; 01.

CHARACTERIZING THE ORTHODONTIC PATIENT'S PURCHASE DECISION

Introduction

Truly understanding our orthodontic patients is an elusive but important goal. The especially critical time for deep understanding and relevant communication is when the orthodontist presents the patient's diagnosis and their proposed treatment plan. In response, the patient enters into a unique, and maybe even irrational, analysis "aimed at finding courses of action that are feasible or satisfactory in the light of multiple goals and constraints" ¹. This all-encompassing definition reveals the complexities in understanding consumer behavior and their purchase decision.

Medical decision-making is a field in consumer behavior and medicine that has many similarities with orthodontics, especially medical procedures that are elective. Multiple theories have been developed to capture the complexity of decision-making in order to help practitioners communicate with patients ^{2,3}. In addition to descriptions of different components of the decision, these theories often include conceptual frameworks that elucidate the basic process. The framework is a visual display of the decision model, revealing organizational flow and relationships. Many decision-making models are broad, capturing many different types of decisions; however, when applied to a specific decision or medical procedure, the model becomes more accurate and precise. For example, one study on total joint replacement described the decision as a cost-benefit analysis and found that symptoms and information sources were the two main factors ⁴. Another study on breast augmentation showed that a basic drive to have the

procedure developed from certain generating factors. This drive was then initiated into a decision with certain eliciting factors ⁵. Other models describe a decision by identifying important themes that resonate with patients ^{6,7}.

These models are generated from data using qualitative research techniques. The field of orthodontics has made significant gains in understanding patients through focus groups and interviews ⁸⁻¹². However, we have an incomplete picture. Psychosocial research suggests that people cannot often express why they do what they do accurately in formal settings in which they prioritize set benefits ^{13,14}. Additionally these studies have rarely focused on decision-making or included conceptual frameworks.

Web-based consumer research provides a natural and unobtrusive way to observe people's reported life experiences. One approach is to apply the traditional principles of ethnography and grounded theory to web content with the same goals of better understanding desires, symbols and decision-making influences, termed netnography ^{15,16}. Applying netnography techniques to orthodontics is a new research concept despite the fact many people are talking about their orthodontic desires and experiences online.

The aim of this study is to better understand the orthodontic patient's decision to receive or not receive orthodontic care by expanding the list of factors, creating an associated conceptual framework and exploring relationships between factors.

Materials and methods

Forums were found on the web using Google ® search that were rich in decision-making concepts about orthodontics. The following terms and phrases were searched by the primary researcher: "I think I need braces", "braces forum", "not sure about orthodontics forum", "are braces worth it", "can't decide if I should get braces" and "should I get braces". Forums were selected

with 2,000 or more words, a minimum of 4 respondents, interactions between users and in-depth explanations. The researchers did not participate in any of the discussions in order to obtain unobtrusive qualitative data. No usernames or passwords were created to access these forums and all content was classified as public data. Names were removed from the data. IRB exemption was approved from the University of North Carolina Research Ethics Board. The text was converted to rich text format and then imported to Atlas.ti ®, a qualitative analysis software program. Websites were collected from Nov-15 2014 to July-31 2015.

The grounded theory qualitative analysis technique was used in order to be grounded in current theory but have the freedom to develop new ideas and themes. The goal of grounded theory is simultaneous data collection and analysis, pursuit of emerging themes, discovery of basic social processes, inductive construction of categories that explain and synthesize processes, sampling to refine categories and integration into a theoretical framework¹⁷. The grounded theory was adjusted to utilize qualitative computer software with the techniques presented by Susanne Friese, which aims to make qualitative data analysis more systematic and more transparent¹⁶.

An important part of the analysis technique used with grounded theory is coding. Codes are words or phrases that describe ideas, emotions, and themes related to the research question. A list of codes was created based on previous qualitative orthodontic studies in order to be grounded in current knowledge^{8,10}. The data from the forums was initially analyzed by coding each concept in a user's explanation of their decision-making process. Codes from the initial code list were used where appropriate but finding new ideas was important. At this point, little focus was on organization and conciseness¹⁵. More forums were analyzed as new ideas continued to emerge. The codes were then assessed for common themes, emotions and values. The data was collected under common code names and comments were used to delineate exactly what the code described.

Structure was added to the code list by creating categories and subcategories. This was an iterative process as the same data was analyzed multiple times, new data was added and the code list adjusted to better describe the decision-making process. Results were shared with peers from the psychology, business and orthodontic field to prevent bias. New data was added until a saturation point was reached, meaning that the code list encompassed all the ideas presented in new data. Memos were used to record a research log.

A major part of the data analysis was creation of the specific codes to describe factors and themes in the data. Additionally, the code list was organized into domains, providing a structure for understanding the extensive and complex list of factors. A conceptual framework was created grounded in current medical decision-making models and orthodontic qualitative research but adjusted using the identified codes and domains. Further analysis was done with the co-occurrence tool, which assesses if a respondent linked factors together in their response.

Results

Data was collected from 15 sites, as shown in Table I. The quotations indicate the number of responses that were coded. Fifty-four factors were created and organized to reflect all the aspects of orthodontic decision-making. These factors can be separated into 10 domains. Information about the domains and their associated factors and quotations are shown in Table 2. The orthodontic decision-making conceptual framework is shown in Figure 1. Three domains describe the individual: internal influences, societal attitudes and child-specific influences. The diagnosis represents the patient's orthodontic problem and their experience with the doctor. The benefits and barriers are esthetics, function, psychosocial benefits, finances, inconveniences and risks of treatment.

The data shows a diverse range of opinions on orthodontics and which factors were most important. There is ultimately a cost/benefit analysis in the decision, but individuals decide differently even when the costs and benefits are the same. As a result, the individual's interpretation of the factors in orthodontics are the ultimate filter in their assessment, which is why the conceptual framework begins with the individual. Three areas relating to the individual impacted orthodontic decision-making significantly: self-perception, desires and viewpoints. The individual aspect factors are listed in Table 3. Particularly noteworthy aspects of self-perception were self-esteem, acceptance of self, and ability to be courageous. A patient's desire to either fit-in or be unique also impacted their decision. Individuals that desired to fit-in were more likely to pursue orthodontics. Patients that desired uniqueness felt that some misalignment gave esthetic character. These patients were less likely to pursue treatment for solely esthetic benefits. A patient's viewpoints impact their decision to pursue intervention as well. One viewpoint was specific to timing of orthodontic treatment. Having treatment done as early as possible was best because that provided the patient with the most time to enjoy the benefits from treatment. Another important viewpoint is the patient's financial priorities. If orthodontics only offered esthetic benefits to a patient, the patient's financial interests became a bigger factor. Lastly, there was wide variation on the esthetic threshold for orthodontic need. Data showed that some users felt that mild misalignment was esthetically sufficient while others desired perfection.

An important type of experience is a person's interaction with society, represented by the domain of societal attitudes. This can be split into two subcategories: orthodontics and esthetics. These factors are shown in Table 4. For esthetics, people discussed different esthetic expectations between genders and between different cultures and how that impacted their decision. Society was often seen as judgmental of poor esthetics. There were many viewpoints of orthodontics ranging

from very positive to negative. The two negative viewpoints were that orthodontics was vain and that orthodontics was not appropriate for adults.

Another type of external influences is child-specific influences which is shown in Table 5. People reported that there is a higher esthetic threshold for kids due to the pervasiveness of orthodontic treatment in Western culture. The most important child-specific influence was the parents and their style of parenting. Some parents felt like they should be the ones to make the decision for their child, while others felt that it was ultimately the decision of the child. This was especially true if orthodontics only offered esthetic benefits in the child's case.

Another key experience was the patient's diagnosis and treatment plan. Factors related to the diagnosis are shown in Table 6. Patients that would experience health benefits from orthodontic therapy tended to report the importance of a dentist or orthodontist's input when making the decision. However, it was important for the patient to trust the doctor. Communication of the diagnosis was important. People were less likely to pursue treatment if they felt like the doctor was dishonest and a salesman.

The patient enters the cost/benefit analysis portion of the decision after the treatment presentation. Six categories were created to capture various benefits and barriers to treatment. Finances are obviously an important factor as orthodontics is expensive and the important factors are shown in Table 7. Some patients reported the cost as expensive while others considered it unaffordable. Users talked about the important of insurance, a payment plan and finding a good deal. Ultimately, a patient's financial priorities most determined their thoughts on finances. Some thought it was a waste of money while many felt it was important to get orthodontics if at all possible. Generally when patients felt that orthodontics would provide health benefits, finances were less of a perceived barrier.

Two barrier specific categories were inconveniences and risks of treatment. The inconvenience category captures the hassles and annoyances experienced when someone is actively receiving orthodontic therapy. These are shown in Table 8. Risks of treatment includes the risks of treatment that were discussed frequently by users and do not capture all the normal risks of treatment from orthodontic therapy. These are long treatment time, pain and poor esthetics while in treatment. Details about these factors are in Table 9.

Three domains captured the benefits to orthodontics: function, esthetics and psychosocial benefits. Functional benefits are shown in Table 10. Respondents discussed general improvement in function frequently. More specific improvements also discussed were an improved bite, easier-to-clean teeth, reduced periodontal problems, reduced pain and reduced TMD symptoms. Some people that were seeking orthodontics for health benefits felt that orthodontics should not be performed if it was solely for esthetic benefits. Health benefits correlated strongly with a decision to receive orthodontic therapy, much more strongly than esthetic benefits. Of the 57 users that discussed health benefits as a factor in their decision, 55 decided to have treatment. When esthetic benefits were discussed as a factor, 84 decided to pursue treatment while 32 decided to not pursue treatment. Esthetic benefits were discussed more often but was less predictive of a treatment response due to individual esthetic preferences.

Factors relating to esthetics are in Table 11. The esthetic benefits were split into three even categories: Improved esthetics specifically of teeth, improvements in smile and improvements in overall esthetics. For many a localized self-improvement in appearance led to an overall better appearance. There was also a group of people that discussed the important of character and uniqueness in your appearance, feeling that orthodontics made teeth unnaturally straight. This correlated with a desire to be unique and self-accepting as discussed in the internal influences

domain. An important esthetics theme was the idea of orthodontics as a cosmetic necessity. In today's society, some see good esthetics as necessary to be successful personally and professionally.

For many users, functional and esthetic benefits led to psychosocial benefits which are shown in Table 12. The primary benefit was confidence. Orthodontics was seen as an investment in yourself – something to be applauded. Interestingly, the objective of an increase in confidence diverged. For some it was the ability to project their true self which is hampered by poor function or poor esthetics. For others, it was for an improvement in their self-concept. For both, the effect was an improvement in their personal life or professional life.

Discussion

As expected, netnography techniques confirmed previously identified decision-making factors, and discovered new factors not previously identified in orthodontic qualitative research studies. Collecting data unobtrusively on the internet until saturation provided a wide range of ideas organically shared by people considering orthodontics. The data was purposely not limited to a certain age range or location in order to capture as many ideas as possible.

Many of the factors are grounded in previous orthodontic qualitative research, especially in the benefits and barriers domains^{8,10}. However, recent qualitative studies had discovered the insufficiencies of these lists because they didn't take into account the individuality of each patient^{12,18}. For instance, Ryan et al. found that motivation ranged between purely external and purely internal in assessing personal facial deformities. The source of the motivation could be directly or indirectly linked to the problem and impact of the problem due to the complex array of other factors such as personality, upbringing and relationships¹⁸. Stanford et al. found that the motivating factor of normality could not be solely constructed from biologic variables and that normality was viewed

in terms of features that are acceptable biologically, psychologically and socially ¹². These ideas match research in the area of medical decision making. Llewellyn's medical decision-making model includes domains for patient perspectives such as information, expectations and preferences, as well as the unique clinical, sociodemographic and psychological profile of the patient ³. An accurate and holistic decision-making model for orthodontics clearly needs to include the internal and external influences of the patient as they ultimately affect the patient's interpretation of the benefits and barriers. This is confirmed by Herbert A. Simon, a Nobel laureate famous for his studies on decision-making, who used the term bounded rationality to describe how a patient's rational understanding of their decision is reduced by their cognitive and environmental limitations.

As orthodontics is a unique field within medicine, a specific framework gives clinicians a better understanding by highlighting what internal and external influences are most impactful. By combining the benefits and barriers with important internal and external influences, it presents a more holistic view that is specific to orthodontic decision-making. Netnography provided a broad sweep inclusive to all factors in the decision and the process of coding helped create specific labels to capture and delineate these factors ^{13,16}. As one interprets the framework, they must remember that this is an overall picture and each patient will not include all the factors in their decision. Certain patients will find certain factors more important, but by knowing common themes the orthodontist can better understand which barriers and benefits will be most significant to communicate.

For example, people with a desire to fit-in or an exacting esthetic threshold were more likely to value esthetic benefits and find orthodontics to be a cosmetic necessity. As parents these people were more likely to force their kids to get braces knowing the benefits it would offer. People

that valued uniqueness or had financial barriers were drawn to functional benefits. If orthodontics only offered esthetic benefits, some parents felt that it should be the child's decision. Society's view on orthodontics significantly impacted a person's decision. People were much more likely to pursue orthodontics if encouraged by others. In fact, many talked about the support they received in online forums being crucial in their decision to move forward with treatment. Others discussed negative feedback received such as seeming vain or being too old in why they decided to not pursue treatment. The patient's diagnosis was an important factor, but how the information was communicated was also important. When the orthodontist appeared to be a salesman that was a deterrent and people discussed the need to have multiple opinions to feel confident they received accurate information.

With an extensive list of factors, orthodontists can be better prepared to communicate with their patients about orthodontics. It is important for orthodontists to be aware of the current ideas, even outliers. For example, previous research has not identified the minority of patients more interested in esthetic character than esthetic perfection. With these patients, the functional benefits of orthodontics should be stressed and these patients might even prefer some misalignment or spacing at the end of treatment.

This list of factors will be helpful for follow-up qualitative and quantitative studies, studies that would address the weaknesses to this study. As this was an unobtrusive data collection technique, pointed follow-up questions to better understand a viewpoint was not possible. Some themes presented could be further explored with direct interviews. The data was collected to saturation but it is possible there are other factors not discovered with this data pool. Additionally, the ideas will change with time, as well as the pervasiveness of different factors. Lastly, a researcher always brings personal biases to a study, especially in qualitative analysis; however,

these biases were avoided with stringent and clear qualitative research techniques and reviewing ideas throughout the analysis with a broad range of experts. For future studies, some of the newly identified themes could be further explored to better understand relations to other factors and underlying motivations. It would be particularly interesting to see how they vary with patient demographics, personality traits, underlying desires and personal viewpoints. Ideally a segmentation model would be created to describe certain types of patients.

Conclusions

The data collected demonstrate the following about orthodontic decision-making.

1. Ten domains capture the decision-making factors: individual aspects, societal attitudes, child-specific influences, diagnosis, function, esthetics, psychosocial benefits, finances, inconveniences and risks of treatment. Fifty-four specific factors were sorted into these domains.
2. The patient's individuality and their surroundings are significant in the interpretation of their diagnosis, as well as the interpretation of the benefits and barriers to orthodontic treatment.

By confirming previously identified factors, identifying new factors and creating a conceptual framework, orthodontists can better understand a person's decision-making process about orthodontic treatment, improving patient communication.

Table 1. Primary Documents

Number	Title	Accessed	Link	Quotations
1	30 years to think about it	11/15/14	http://www.archwired.com/phpbb2/viewtopic.php?f=13&t=47174	9
2	Are your braces a topic of conversation	11/15/14	http://www.archwired.com/phpbb2/viewtopic.php?f=13&t=46373	20
3	Dental braces as an adult	11/15/14	http://forums.catholic.com/showthread.php?t=715575	11
4	Should I get braces for my kids now or later	11/15/14	http://www.coderanch.com/t/41452/md/braces-kids	11
5	I need braces... going to college next year	11/15/14	http://talk.collegeconfidential.com/parents-forum/1167324-i-need-braces-going-to-college-next-year.html	28
6	Do people really need braces	11/15/14	http://www.collegenet.com/elect/app/app?service=external/Forum&sp=58210	18
7	Would you force your teen to get braces	11/15/14	http://www.enotalone.com/forum/showthread.php?t=408467	30
8	Clear or Metal braces	11/15/14	http://forum.purseblog.com/plastic-surgery-and-cosmetic-procedures/adult-orthodontics-braces-667119.html	23
9	Braces and dental flaws	11/15/14	http://forum.starmen.net/forum/General/Discussion/Braces-and-Dental-Flaws	19
10	Getting braces	11/15/14	http://www.womens-health.com/boards/teeth/21742-getting-braces.html	10
11	Would you fix a gap	3/22/15	http://www.city-data.com/forum/parenting/1168453-would-you-get-gap-your-childs.html	81
12	Are braces worth it	7/22/15	http://www.ign.com/boards/threads/are-braces-worth-it.452990999/	23
13	To get braces or not to	7/31/15	http://www.collegenet.com/elect/app/app?service=external/Forum&sp=54926	11
14	30 Something In Braces	7/31/15	https://forums.plentyoffish.com/datingPosts13301268.aspx	18
15	Are my teeth worth it	7/31/15	http://www.givemebackmyfivebucks.com/2011/01/19/the-cost-of-adult-braces/	50

Table 2. Description of domains

Domain	Factors	Quotations
Individual aspects	8	137
Societal attitudes	8	118
Child-specific influences	3	74
Medicalization	4	45
Finances	5	53
Inconveniences	6	73
Risks of treatment	3	88
Function	7	86
Esthetics	5	111
Psychosocial	5	72

Table 3. Individual aspects

Factor	Description	Example quote
Desires	Underlying desires of patient	
Fit-in	Desire to fit-in with others in appearance	I honestly think that some kids are going to be susceptible to peer pressure with regard to their looks, and some are not. Whether it's parenting, personality, confidence, who knows. [...] But if it were my kids, and they were getting teased, probably yes (11:73)
Uniqueness	Desire to stand-out and be unique in appearance	My striking [gap], and my kids' [...] is not something that detracts from our looks, but it does make us stand out in a crowd, especially when we're all together! (11:104)
Self-perception	Patient's understanding of themselves	
Acceptance of self	Comfort in self and acceptance of physical situation	We cannot run around "fixing" physical features that our children are not happy with just because it makes them upset. What needs to be fixed are our children's attitudes towards those features and how it makes them unique. [...] If my mother had given into my every whim and corrected every aspect of my physical appearance that made me unhappy [...] the only two things that would have come of it would be that my self-esteem would be completely crushed AND I'd probably be able to find work as a drag queen (11:75)
Courage to get treatment	Confidence to accept temporary poor esthetics from treatment	A number of people have actually expressed that they wish they had the nerve to go back and get braces too. (2:3)
Self-esteem	Intrinsic self-worth and sense of security felt by patient	I don't think "correcting" these physical features on child is going to do anything other than reinforce the idea that "yes there is something wrong with you, you are not good enough as you are." [...] Some of the most beautiful people I know are also the most insecure, physical perfection does not bring happiness (11:75)
Viewpoints	Patient's understanding of their surroundings	
Esthetic preferences	Describes how people have different esthetic thresholds for requiring treatment	My mom just got braces. Her teeth were a little crooked and a few were close together, but overall I always thought they were fine. [...] Her braces were not a medical necessity, just cosmetic. I haven't told her so, but I think this was a silly thing for her to spend her money on at the age of 66. Still, it's her money, her life and her teeth. (6:26)
Financial priorities	People have different financial priorities such as hobbies, healthcare, ect	What they say: "You didn't need braces. Why are you wasting your money?". What I think: (Operative word: MY money. Not yours. Hush.) What I say: Good thing I work everyday!" (2:6)
Timing	Patient's viewpoint on when braces are appropriate	I didn't get braces until later in life, I am not sure why... but I wish I could have gotten them sooner (13:3)

Table 4. Societal attitudes

Factor	Description	Example quote
Societal view esthetics	External influences in regards to personal appearance	
Cultural differences	Cultural differences in expectations of personal appearance	I'm a Southern Californian and admit to being totally warped about these things. Totally. In LA you are judged by your looks. Not saying that's a good thing but it's a fact of life in that town. (11:57)
Gender differences	Gender difference expectations in personal appearance	However my parents are African and see no importance in braces (they do not understand anything that has to do with appearance really) and my dad says men don't need braces (5:1)
Judgmental	Describes how society judges people based on appearance and imperfections	Yes, I would force my kids into braces if their teeth were bad enough. It's kinda sad but people will judge. (7:11)
Societal view orthodontics	External influences in regards to orthodontics	
Age appropriateness	Describes how it is normal to see kids in braces and not adults	Based on what I perceive the asker's motivation is, I either give them my patented death stare that indicates "Really none of your business" to a flippant "Well, I wanted to have the nicest teeth in the cemetery." Well those are the extremes. A lot of people just notice and I say that I had some issues that I want to correct in order to avoid problems down the road. And I am pretty far down the road... (2:12)
Vanity	Perception that people that get orthodontics are vain or self-consumed	Actually I am glad that most people don't ask me why I am having them. It's nearly as if you have to justify yourself about wearing them, especially to people who never needed them, for that are mostly the people who think it's not necessary (2:28)
Neutral	Apathetic, neutral viewpoint on orthodontics. Not seen as a big deal.	It wasn't terribly embarrassing - other adults have braces and I think people are so preoccupied with THEY look - they don't really care how I look. (3:14)
Positive	Positive viewpoint of orthodontics. Seen as someone doing something good for themselves.	Honey, you are making strides to better yourself, there is absolutely nothing wrong with that. A beautiful smile is so sexy on a person, and I think you're doing the right thing by taking care of your teeth. Good job! (14:4)
Support	Describes important of support from others when choosing to pursue orthodontics, especially for adults	Wow, I'm amazed at how much better I feel just by [explaining my decision to get braces.] In any case, thanks again to everyone reading this. Sharing your experiences is what made me realize I'm not alone and I can do this. (1:25)

Table 5. Child-specific influences

Factor	Description	Example quote
Difference in esthetic threshold	Children are expected to have straighter teeth due to cultural trend of increased orthodontic care	You have brought up a really good point about society's expectations when it comes to appearances. I do think it is expected for people in a certain age range to have straight teeth. (6:23)
Parenting	Influence of parenting and parental techniques on orthodontic decision making	
Parent's decision	Parents should decide if child should get braces due to better understanding of long-term benefits	Got my braces in my senior year in high school. YIKES!!! [...] My parents sat me down and painfully suggested I get them when I was in high school. I myself didn't, (at the time), see the need; so I said, "No, thank you." But they strongly recommended them and the look on their faces meant that they were truly concerned [...] Well it paid off!! [...] When I see pictures of my old mouth, I shudder to think I almost said, "No.". (4:2)
Kid's decision	Kids should decide to receive braces in situations where orthodontics offers only esthetic benefits	I mean if you can afford to do it for your kids that's great, but there's still the pain that comes from braces. Not to mention other kids teasing them or things like not being able to eat or having to go to the dentist often to get them checked or adjusted, ect. I think it should be done if is really necessary and I also think that a child should have a say in it. If the child is old enough and it is not an absolute necessity, then it should be there choice to do if it is going to be for cosmetic purposes. (6:14)

Table 6. Diagnosis

Factor	Description	Example quote
Diagnosis	Dentist or orthodontist's diagnosis of problem	I have a very narrow upper jaw and major cross bites on both sides with crowding in the front. (1:2)
Treatment	Dentist or orthodontist's proposed treatment plan	I moved to a different town and [...] a new orthodontist also recommended that I get jaw surgery. [...] I went to a different ortho and he said the exact same thing. (5:49)
Communication	Delivery of diagnosis and how it is received by patient	
Honest	Patient feels that doctor is understanding and practices with integrity	Definitely do the consult so he can ask specific questions of the doctor. [...] I love my son's orthodontist because he doesn't believe in pushing things just to conform. (7:36)
Dishonest	Sentiment that orthodontist sell braces to people that don't really need them	My dentist was hinting at braces for me in my last check-up. [...] Then I found out he recently partnered with an orthodontist friend of his, and he gets a cut of the referrals (12:13)

Table 7. Finances

Factor	Description	Example quote
Cost	Expense of treatment	
Expensive	Financial burden of orthodontics	The expense [...] of braces seems like overkill if there is a less invasive route (11:94)
Unaffordable	High cost that prevents patients from pursuing orthodontic care	I didn't get braces because my mom couldn't afford to (7:16)
Reducing factors	Factors that reduce the cost of orthodontics	
Good deal	Finding a good price for orthodontics. Can describe shopping around.	Make an appointment with an Orthodontist and get an estimate. Make sure to shop around as prices do tend to vary all over the place (even in the same city). (5:38)
Insurance	Impact of insurance on ability to have orthodontic care	Dental insurance. Hello and get everything you can out of it. Fix those choppers. (14:15)
Payment plan	Impact of a payment plan on ability to have orthodontic care	You don't have to pay all at once. They usually have a monthly payment plan. (5:29)

Table 8. Inconveniences

Factor	Description	Example quote
Discomfort	Discomfort and the annoyance it causes when in braces	Ultimately, it's your mouth and your dough. If you think it will make a positive difference in your life, go for it. But I have to warn you, it's not cheap or easy There's discomfort involved and you'll have to make some changes in what and how you eat. Braces are NOT sexy. On anyone. (14:12)
Tough for adults	Perception that orthodontics is tougher for adults	I know that the end result will be worth the 2 years, but is a very difficult thing to deal with as an adult (10:7)
Effort	Increase in overall effort when in orthodontics	
Appointments	Challenge to keep regular appointments for an extended period of time when in orthodontics	They figure the sentence will be about 18 months. [...] I travel fairly extensively for work [...] so I decided to put the whole thing off until November when my travel schedule will quiet down. (1:25)
Difficult to function	Difficulty in eating and speaking in braces	When I had braces they gave me headaches because when the wire was tightened I couldn't eat and it had too much pressure. I would get frustrated because when I went out with friends I had to be careful with what I ate because the food got stuck between my teeth. (6:41)
Increased hygiene care	Increased time needed to keep teeth clean	I had braces for a few years in middle school, and the one thing that drove me crazy was trying to floss with those darn threaders. Took FOREVER to do and I still have to use them on the permanent wire along my bottom teeth. (9:10)
Retention	Effort needed to maintain improved occlusion	It seems your teeth are always moving and you're never guaranteed that perfect smile forever. So is it worth all that money and discomfort? (12:1)

Table 9. Risks of treatment

Factor	Description	Example quote
Long treatment time	The deterrent of long treatment time and how a shorter treatment time is better	Willkodontics is much faster: my Ortho figures I will save 6-9 months in braces by going this route (1:32)
Pain	Pain during treatment	I had to wear braces for 3.5 years. I hated it. It was painful and uncomfortable. My gums receded and I had to have 4-6 teeth pulled. I also ended up having to have a root canal around the same time. (13:11)
Temporary poor esthetics	Patient's perception of uglier smile and appearance while receiving orthodontic care	I was supposed to get braces when I was fourteen but I freaked out. I thought I'd get bullied, not specifically for having braces but because I was already being bullied and it'd just give them something else to pick on me for. I regret it now, my teeth aren't horrendous but they aren't Hollywood-perfect. The fact is though I am 23 and people will look at me weirdly at this age if I get braces, I am considering looking into those invisible braces when I am earning enough to start saving towards them (they're expensive!), if they can help without obviously showing then it'd be worth it. (7:47)

Table 10. Function

Factor	Description	Example quote
Not for esthetics	Feeling that decision to get orthodontics should be focused on functional benefits, not solely for esthetics	Was there medical indication for any of you or was it pure vanity like with 99% of people? Braces have become the padded bras of the 21st century it seems. (4:5)
Improved	Improvement in function or health from orthodontics	
Bite	Improved occlusion. Seen as a more stable position for teeth.	I used to bite down wrong on my food to the extent of temporarily loosening front teeth (4:6)
Easier to clean	Aligned teeth are easier to clean well and floss	Yes it can be cosmetic but it can also reduce many teeth problems in mature adults, like [...] difficulty in cleaning when teeth are overlapping. (11:38)
Perio	Avoiding bone loss, recession and gingivitis	If you have messed up teeth and you don't get it fix they can lead to bigger problem such as gingivities/periodontist which will cause loss of bones which cause your teeth to fall out which will cost so much more than braces to get it fixed (5:29)
Reduce pain	Reduce headaches and tooth pain	I'm tired of living with constant headaches (3:11)
TMD	Reduce symptoms of TMD	I went in for TMJ issues (3:14)
Total health	Benefits that improve overall health	Basic straight teeth are just healthy - you can't even floss between overcrowded teeth, which leads to gum disease, which can lead to heart disease, stroke and diabetes (7:32)

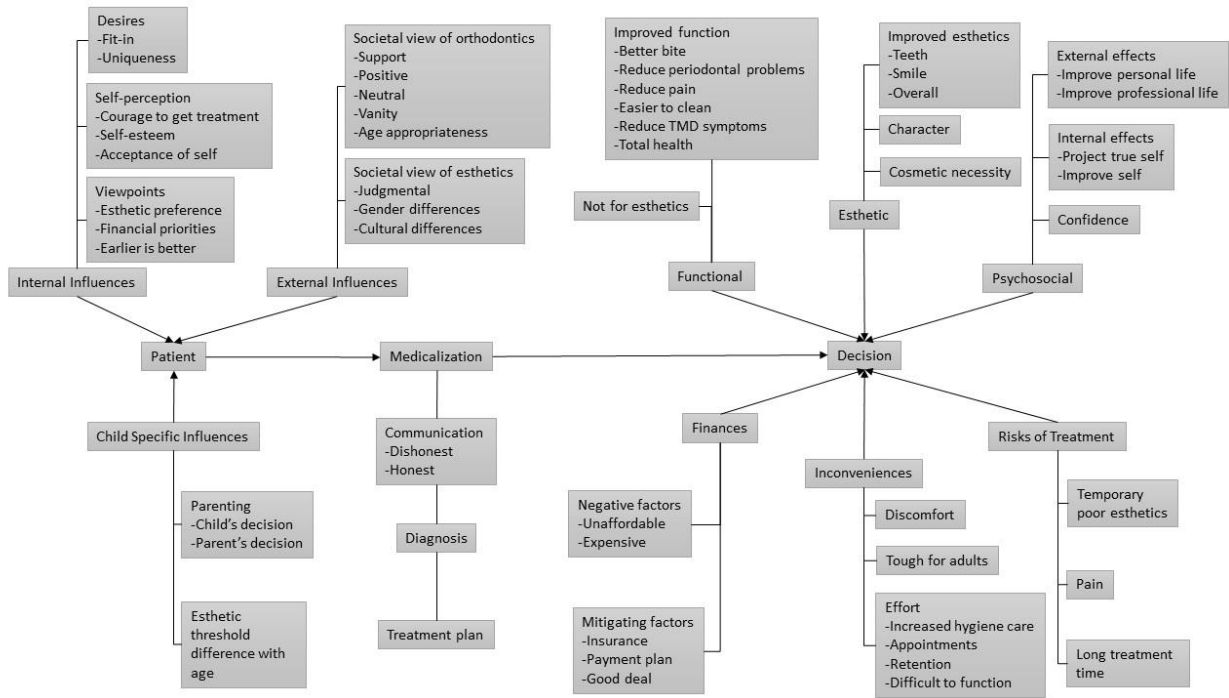
Table 11. Esthetics

Factor	Description	Example quote
Character	Desire to have imperfections in teeth in order to be unique	My hat goes off to all of the actors who've never fallen for that processed perfection look. Sometimes those imperfections are what make a person look unique/exotic/beautiful. Get those teeth fixed and they pretty much look like everyone else (11:24)
Cosmetic necessity	Good esthetics are a necessity in today's society	I do think when you get down to it, it is crazy to some extent to get braces for only cosmetic reasons. But then again if you look at the society we live in, it could hurt not to. [...] I guess when you get down to it it's really up to the person, but I think as time goes on we will be moving closer and closer to more cosmetic "necessities" such as this. (6:5)
Improved	Improvement in appearance	
Teeth	Improvement in appearance of teeth	Yes, braces are definitely worth it. [...] My teeth are beautiful now. (10:5)
Smile	Improvement in appearance of smile	I say go for it and get the smile you have always wanted (14:18)
Overall	Improvement in overall appearance	You can't imagine what beauty queen I will look like when they are off (10:14)

Table 12. Psychosocial benefits

Factor	Description	Example quote
Confidence	Confidence in smile and appearance	I was horribly sensitive about my smile before I had braces. [...] I tend to dip in the shallower end of the pool around these here parts anyway, but I love a beautiful smile (11:28)
External effects	External effects of increased confidence	
Personal life	Improvement in personal life including peer and romantic relationships	Maybe someone wanted to get braces because they want to be more attractive so they can find the perfect person, and by getting braces they look more attractive to potential mates. What if another person was getting it so they could finally feel confident enough to take a good school picture? (6:20)
Professional life	Improvement in professional life from improvement in first impressions, interviewing and better work relationships	It was one of the best things I ever did - not for appearances, but for self-approval and added confidence. My teeth weren't noticeably bad before I got braces, partly because I was good at hiding it. I do public speaking and social events so for me it was one less thing to be self-conscious about (14:7)
Internal effects	Internal effects of increased confidence	
Improve self-concept	Orthodontics as an investment and way for self-improvement	I'm glad my parents invested in braces for me, to be honest. I used to hate my smile, and didn't smile often enough, at all. Now that I like my smile, I smile a lot more, and hopefully come off as a happier person. (13:7)
Project true self	Crooked teeth can be a distraction from who you really are. Confidence helps someone be themselves.	Cosmetic reasons are totally valid reasons, particularly for people who see their outward appearance as a projection of themselves (6:35)

Figure 1. Conceptual framework



REFERENCES

1. Simon HA(A, 1916-2001. *Administrative behavior : A study of decision-making processes in administrative organizations*. New York: Free Press; 1997.
2. Durand MA, Durand MA, Stiel M, Boivin J, Elwyn G. The design of patient decision support interventions: Addressing the theory-practice gap. *J Eval Clin Pract*. 2011;17:565; 565-574; 574.
3. Llewellyn-Thomas HA. Patients' health-care decision making: A framework for descriptive and experimental investigations. *Medical Decision Making*. 1995;15(2):101-106.
4. Clark JP, Hudak PL, Hawker GA, Coyte PC, et al. The moving target: A qualitative study of elderly patients' decision-making regarding total joint replacement surgery. *Journal of Bone and Joint Surgery*. 2004;86(7):1366-74.
5. Solvi AS, Foss K, von Soest T, Roald HE, Skolleborg KC, Holte A. Motivational factors and psychological processes in cosmetic breast augmentation surgery. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2010;63(4):673-680.
6. Schouten JW. Selves in transition: Symbolic consumption in personal rites of passage and identity reconstruction. *Journal of Consumer Research*. 1991;17(4):412-425.
7. Daniel E, Kent G, Binney V, Pagdin J. Trying to do my best as a mother: Decision-making in families of children undergoing elective surgical treatment for short stature. *British Journal of Health Psychology*. 2005;10(1):101-114.
8. Bennett M, Michaels C, O'Brien K, Weyant R. Measuring beliefs about orthodontic treatment: A questionnaire approach. *J Public Health Dent*. 1997;57(4):215; 215-223; 223.
9. Bennett M, Tulloch J, Vig K, Phillips C. Measuring orthodontic treatment satisfaction: Questionnaire development and preliminary validation. *J Public Health Dent*. 2001;61(3):155; 155-160; 160.
10. Trulsson U, Strandmark M, Mohlin B, Berggren U. A qualitative study of teenagers' decisions to undergo orthodontic treatment with fixed appliance. *J Orthod*. 2002;29(3):197.
11. Rachel Henzell M, Henzell M, Knight A, Morgaine K, Antoun J. A qualitative analysis of orthodontic-related posts on twitter. *Angle Orthod*. 03;84(2):203; 203-207; 207.
12. Stanford ND, Stanford N, Ip T, Durham J. Adult orthodontic patients' views regarding dentofacial normality: A qualitative study. *American journal of orthodontics and dentofacial orthopedics*. 03;145(3):287; 287-295; 295.
13. Kozinets RV, 1964-. *Netnography : Doing ethnographic research online*. Los Angeles, Calif. ;London: Sage; 2010.

14. Kozinets RV. The field behind the screen: Using netnography for marketing research in online communities. *J Market Res.* 2002;39(1):61-72.
15. Miles MB. *Qualitative data analysis : A methods sourcebook*. Thousand Oaks, California: SAGE Publications, Inc; 2014.
16. Friese S, author. *Qualitative data analysis with ATLAS.ti*. London: SAGE; 2014.
17. Bryant A, Charmaz KC. *The SAGE handbook of grounded theory*. SAGE; 01.
18. Ryan FS, Barnard M, Cunningham SJ. Impact of dentofacial deformity and motivation for treatment: A qualitative study. *American Journal of Orthodontics and Dentofacial Orthopedics.* 2012;141(6):734-742.